BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Application of Pacific Gas and Electric Company for Approval of its Residential Rate Design Window Proposals, including to Implement a Residential Default Time-Of-Use Rate along with a Menu of Residential Rate Options, followed by addition of a Fixed Charge Component to Residential Rates (U39E)	Application 17-12-011
And Related Matters.	Application 17-12-012 Application 17-12-013

Exhibit No. SDG&E-___

PREPARED REBUTTAL TESTIMONY OF

LESLIE WILLOUGHBY

ON BEHALF OF SAN DIEGO GAS & ELECTRIC COMPANY

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

June 7, 2018

SDGE

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PREPARED REBUTTAL TESTIMONY OF

LESLIE WILLOUGHBY

I. OVERVIEW AND PURPOSE

The purpose of my testimony is to rebut the Office of Ratepayer Advocate ("ORA") claims that San Diego Gas & Electric Company's ("SDG&E") preferred default 3-period time-of-use ("TOU") rate has lower customer acceptance than the optional 2-period TOU rate.[1] ORA also claims that SDG&E's optional 2-period TOU rate is easier to understand than the 3-period TOU rate.[2] SDG&E disagrees with ORA's claims, and my Rebuttal Testimony will show that:

A. Customers on SDG&E's 2017 Opt-In TOU Pilot ("Opt-In Pilot") rates (both the 3-period and 2-period[3]) had similar opt-out rates;

B. The 3-period Opt-In Pilot rate had similar or better load reductions than the 2-period Opt-In Pilot rate;

C. Compared to customers under the 2-period Opt-In Pilot rate, customers under the 3-period Opt-In Pilot rate had a better understanding of the time of day when the price of electricity is most expensive.

D. Preliminary results of the 2018 Default TOU pilot ("Default Pilot) show that the 3-period rate has a lower opt-out rate than the 2-period rate.

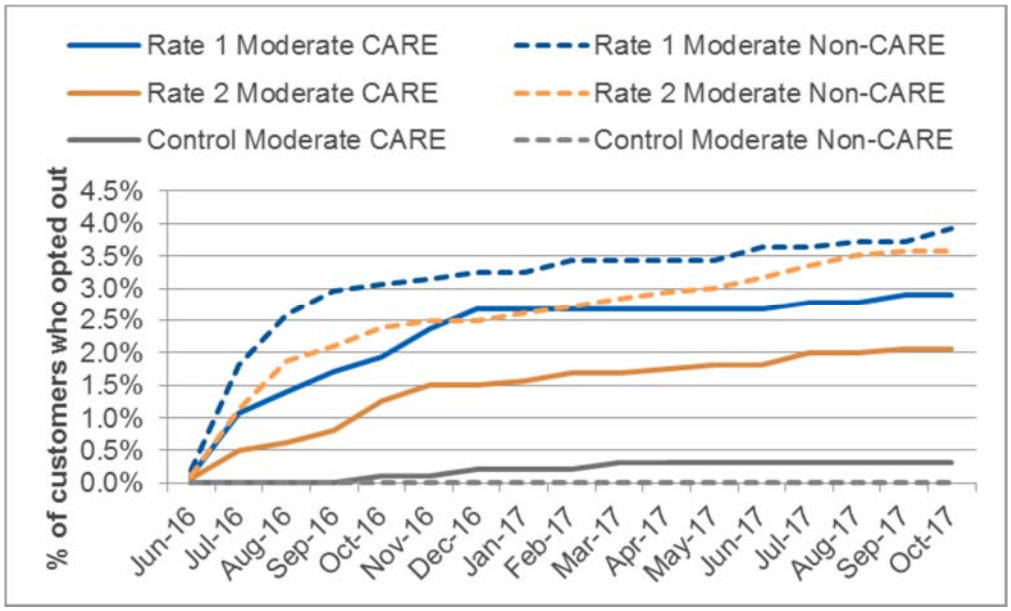
A. SDG&E's Opt-In Pilot Rates (both the 2-period and 3-period rates) had Similar Opt-Out Rates

In general, SDG&E experienced relatively low opt out-rates for its Opt-In Pilot. In the Moderate Climate Region ("Moderate Zone"), the opt-out rates were slightly higher, ranging roughly from 3.5% to 3.9% for the non-California Alternate Rates for Energy ("CARE")/Family Electric Rate Assistance ("FERA") customers, and roughly 1.5%-2.5% for the CARE/FERA

[1] ORA *Testimony on 2018 Residential Rate Design Window Phase 2A* (May 7, 2018) ("ORA Direct Testimony"), at 1-2.
[2] *Id.* at 1-5.
[3] Throughout my rebuttal testimony I refer to 3-period and 2-period rates. It should be noted that the 3-period and 2-period rates corresponds to the "Rate 1" and "Rate 2" references in ORA's testimony as well as the Nexant and Research into Action ("RIA") reports referenced below.

customers. As ORA points out in their Figure 1-4 (Figure 5.2-2 of the Nexant Final Opt-In TOU Report) SDG&E's 3-period rate had slightly higher opt-out rates in the Moderate Zone than the 2-period rate.[4] See Figure LW-1, below, for SDG&E's Moderate Zone opt-outs.

Figure LW-1: Cumulative SDG&E Opt Outs by Month – Moderate Zone[5]



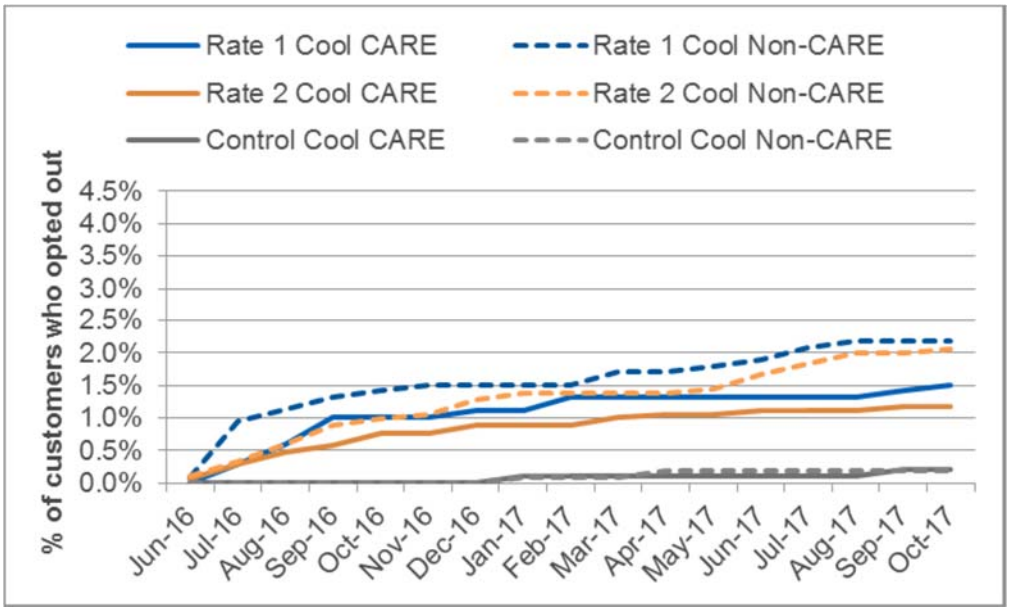
Note: SDG&E's Rate 1 is the 3-period rate, Rate 2 is the 2-period rate.

Figure LW-2, below, shows the similar graphic for SDG&E's Cool Climate Region ("Cool Zone") opt-outs. ORA did not provide the opt-out rate information for SDG&E's Cool Zone, as the opt-out rates are lower across all segments in the Cool Zone. The differences between the 2-period and 3-period rates are also smaller. After the second summer, the opt-out rates for the Cool Zone for all segments was about 2%, which is lower than the Moderate Zone opt-out rates. The Cool Zone opt-out percentages between the 2-period and 3-period rates were

[4] Nexant's California Statewide Opt-in Time-of-Use Pricing Pilot Final Report is attached to this rebuttal testimony as Attachment A.
[5] Nexant, Inc. and Research Into Action, *California Statewide Opt-in Time-of-Use Pricing Pilot Final Report*, (March 30, 2018) ("Nexant Final Opt-In TOU Report") Figure 5.2-2 at 113.

less than half of a percentage point. ORA does not discuss these Cool Zone facts in its testimony.

Figure LW-2: Cumulative SDG&E Opt Outs by Month – Cool Zone)[4]



Note: SDG&E's Rate 1 is the 3-period rate, Rate 2 is the 2-period rate.

It should also be noted that the data in these figures (LW-1 and LW-2) are not weighted to reflect SDG&E's eligible TOU population. Table LW-1, below, provides the population weights showing that the Cool Zone Non-CARE weight is nearly 50%, whereas the Moderate Zone Non-Care weight is only 30%.

Table LW-1: SDG&E Opt-in Pilot Population Weights

Segment		Eligible	Weight
Hot		9,141	1%
Moderate	CARE	75,910	9%
	Non-CARE	243,241	30%
Cool	CARE	78,756	10%
	Non-CARE	398,139	49%
Total		805,187	100%

If this data were weighted, the overall differences between the two rates would be reduced as SDG&E's Cool Zone has the highest percentage of population. Additionally, the CARE/FERA customer weights are also much smaller relative to non-CARE/FERA.

In sum, ORA's analysis is incomplete because it only presents opt-out information for the Moderate Zone. Indeed, ORA excludes data regarding SDG&E's most populated climate region (the Cool Zone), which in total comprises nearly 60% of the eligible population.

B. Load Reductions Are Slightly Higher for SDG&E's 3-Period Opt-In Pilot Rate Versus its 2-Period Opt-In Pilot Rate

ORA's testimony includes a figure (Figure 1-52) that comes from the Nexant Final Opt-In TOU Report, showing the average peak period load reductions for both the 2-period and 3-period Opt-In rates.[6] The population weighted peak reduction is higher for the 3-period rate than the 2-period rate[7]. A good comparison of the load impacts for both the 3-period and 2-period rates can be found in the Executive Summary of the Nexant Final Opt-In TOU Report.[8] For ease

[6] ORA Direct Testimony, at 1-7.
[7] Nexant, Final Opt-In TOU Report, Table 12.1 at 4.
[8] *Id.*

of reference, the information from the Final Opt-In TOU Pilot Report pertaining to SDG&E is provided in Table LW-2, below, and shows SDG&E's peak load reductions by rate.[9]

Table LW-2 – Weekday Peak Period Load Reductions*

	Rate 1 (3-period)			Rate 2 (2-period)		
Metric	Summer 2016	Winter 2016/2017	Summer 2017	Summer 2016	Winter 2016/2017	Summer 2017
Peak Period Hours	4pm to 9pm			4pm to 9pm		
Percent Impact	5.4%	2.3%	4.6%	4.6%	1.7%	4.1%
Absolute Impact (kW)	0.04 kW	0.02 kW	0.03 kW	0.04 kW	0.01 kW	0.03 kW

*All Impacts presented here are statistically significant.[10]

Table LW-2 shows the peak period load reductions for the 3-period rate are a higher percentage of load reductions as compared with the 2-period rate. Moreover, the absolute kilowatt ("kW") load reductions for the 3-perod and 2-period rates are similar during the two summers, and slightly higher in the winter for the 3-period rate. Based on these facts, it can be reasonably concluded that the Opt-In Pilot customers on the 3-period rate were similarly responsive when compared to customers on the 2-period rate.

C. SDG&E's 3-Period Customers Have a Better Understanding of When the Price of Electricity Is Most Expensive on Their Rate Plan Versus 2-Period Customers

ORA's testimony includes the following statement: "more complex TOU rate structures such as 3-period rate create a barrier to customer understanding, which, in turn, will affect how they respond to TOU price signals."[11] This statement is based on ORA Figure 1-3, which relies

[9] *Id.*
[10] Statistical significance means that the estimate is statistically different from zero.
[11] ORA Direct Testimony, at 1-2. 8

on survey results presented in the RIA Second Interim report.[12] ORA Figure 1-3 shows the percentage of respondents who selected over half of the correct ***"factors" that influence the price of electricity*** on their rate plan.[13] In response, respondents correctly identified the following factors:

- time of day;
- day of week;
- seasons;
- weather or temperatures; and
- total amount of energy.

Based on these survey results, ORA Figure 1-3 compares the percent that selected over half the correct answers with the control group.[14] It is noteworthy that the Cool and Moderate Zone comparison between non-CARE/FERA for Rate 1 (3-period) and Rate 2 (2-period) and the control group are similar, ranging from 49% to 52%.[15] It is also noteworthy that Rate 1 (3-period) was lower by only one percentage point for non-CARE/FERA customers. In any event, based on this data, ORA concludes that "RIA found that SDG&E's simpler Rate 2 [2-period] had a higher proportion of customers that understand the factors that influence the price of electricity, than SDG&E's more complex Rate 1 [3-period]."[16]

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[12] ORA Direct Testimony, Figure 1-3 at 1-6. Figure 1-3 is Table 5-41 in Research Into Action, Inc., *California Statewide Opt-In Time-Of-Use Pricing Pilot: 2017 Customer Survey Results, Final Second Interim Evaluation* ("RIA Final Second Interim Report"), (November 1, 2017) at 231. The RIA report with the Executive Summary, Introduction, Methodology and SDG&E's section is attached to this rebuttal testimony as Attachment B.

13 ORA Direct Testimony, Figure 1-3 at 1-6.

14 *Id.*

15 *Id.*

[16] ORA Direct Testimony, at 1-5 (citations omitted). 6

Contrary to ORA, SDG&E believes it is more important to focus on customer understanding of the times of the day when electricity is most expensive, as opposed to the factors that influence the price of electricity. That is, customer understanding of when electricity is most expensive is a better metric of whether they understand how TOU pricing will impact their bills. Indeed, as even ORA points out, "the Commission has found that if customers are '*not aware of the electricity price in a given hour, the hourly price will not incent the customer to shift or decrease usage in that hour*.'"[17]

The RIA report includes a table showing the percentage of respondents who understood the "***times of the day" when the price of electricity is most expensive on their rate plan***.[18] ORA does not address this part of the RIA report in their testimony.

Table LW-3
Based on RIA Table 5-42: Percentage of Respondents Who Selected None or Over Half of the Correct Times of the Day When the Price of Electricity is Most Expensive on their Rate Plan**

		%Selected No Correct Answers		% Selected Over 50% correct Answers	
Climate Region	**Segment**	**R1 (3-period)**	**R2 (2-period)**	**R1 (3-period)**	**R2 (2-period)**
Hot	**General**	**-**	**14%**	**-**	**57%**
Moderate	**Non-CARE/FERA**	**6%**	**14%**	**61%***	**60%**
	CARE/FERA	**13%**	**28%**	**40%***	**39%**
Cool	**Non-CARE/FERA**	**5%**	**13%**	**61%**	**63%**
	CARE/FERA	**12%**	**25%**	**43%***	**39%**

** Asked only to Rate groups since Control group customers' rate does not vary by time of day.

Table LW-3 shows that a lower percentage (half as low as for the 2-period TOU rate) of the 3-period customers selected no correct answers in regard to the times of the day when the price of

[17] ORA Direct Testimony, at 1-2 (citations omitted) (emphasis added).
[18] RIA Final Second Interim Report, at 231-232.

electricity is most expensive. For example, 6% of respondents in the Moderate Zone for non-CARE/FERA customers on the 3-period rate selected no correct answers as compared to 14% of respondents on the 2-period rate. Table LW-3 also shows that among 3 (see * in Table LW-3) of the 4 segments groups, a higher percentage of the 3-period respondents selected over 50% of the correct answers. Generally, these facts would indicate that Rate 1 (3-period) customers have a better understanding of how the times of the day affect their price of electricity. Moreover, the RIA report states that "between 39% and 63% of customers selected over half of the correct hours for their rate plan, which is slightly better, on average, than their understanding of the general factors that influence the price of their electricity."[19]

D. Default Pilot Opt-Out Rates for 3-Period Participants Are Lower than they Are for the 2-Period Participants

In March of 2018, SDG&E started implementing its Default Pilot. Similar to the Opt-In Pilot, SDG&E is using 3-period and 2-period TOU rates in the Default Pilot.[20] Table LW-4, below, shows that, as of June 1st, the Default Pilot opt-out rates for its 3-period rate were 14.7% versus 16.5% for the 2-period rate.[21] These preliminary results show a lower opt-out rate for SDG&E's preferred 3-period rate. Another preliminary result worth noting is that 1,294 customers that were defaulted onto the 2-period TOU switched to the 3-period TOU, whereas 1,021 customers switched from the 3-period TOU rate over to the 2-period TOU rate. While these results are preliminary it does not appear that the structure of the 3-period TOU rate is too complex for customers to comprehend; nor does it provide a "barrier to customer understanding".[22]

[19] *Id.* at 231.
[20] The general rate designs use the same TOU periods, but the individual pricing is slightly different.
[21] Data behind these opt-out rates were provided using SDG&E's data warehouse which is populated from SDG&E's CISCO system, which is the official customer record.
[22] ORA Direct Testimony, at 1-2.

Table LW-4
SDG&E Default TOU Pilot Attrition and Opt-Out Rates

SDG&E Default TOU Current Status 6/1/18	TOUDR1 3-Period TOU	%	TOUDR2 2-Period TOU	%	Total
Closed	6,323	5.5%	1,593	5.5%	7,916
Opted Out - Closed	399	0.3%	128	0.4%	527
Opted Out	16,894	**14.7%**	4,737	**16.5%**	21,631
Remain on Tier - Other	2,066	1.8%	551	1.9%	2,617
Active on Destination Rate	86,632	75.6%	20,082	70.0%	106,714
Switch to Other TOU	1,227	1.1%	319	1.1%	1,546
Switch to Tiered	21	0.0%	5	0.0%	26
Switch to TOUDR1		0.0%	**1,294**	4.5%	1,294
Switch to TOUDR2	**1,021**	0.9%		0.0%	1,021
Total	**114,583**	**100.0%**	**28,709**	**100.0%**	**143,292**

This concludes my Rebuttal Testimony.

Attachment A
Nexant's California Statewide Opt-in Time-of-Use Pricing Pilot Final Report

Final Report

California Statewide Opt-in Time-of-Use Pricing Pilot

Final Report

March 30, 2018

Prepared for
The TOU Working Group,
under contract to:
Southern California Edison Company

Prepared by
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1 Executive Summary

This document constitutes the final evaluation report for California's statewide, residential opt-in time-of-use (TOU) pricing pilots implemented by Pacific Gas and Electric Company (PG&E), Southern California Edison Company (SCE) and San Diego Gas and Electric Company (SDG&E). These pilots were implemented in response to California Public Utilities Commission (CPUC) Decision 15-07-001. A key objective of the pilots was to develop insights that would help guide the IOUs' applications filed in January 2018 proposing the implementation of default TOU pricing for the majority of residential electricity customers and the CPUC's policy decisions regarding default pricing.[1]

Findings from the first summer—June through October 2016—are documented in the "Statewide Opt-in TOU Evaluation First Interim Report"[2] dated April 11, 2017 (hereafter referred to as the First Interim Report). This report contains detailed background information on the pilot, describes the pilot design and the evaluation methodology used for analysis, discusses each IOUs pilot implementation and treatments, and presents load impacts, bill impacts, and survey findings covering the 2016 summer period. The Second Interim Report[3] contains estimated load impacts, bill impacts, and survey findings from the winter period (October through May for PG&E and SCE, and November through April for SDG&E) and first full year of the pilot. This Final Report contains a brief summary of findings documented in more detail in the prior two reports, but focuses primarily on load impacts from the second summer period in 2017 as well as the persistence of load impacts across the two summers for the subset of customers that were enrolled for the full duration of the pilot.

The summer 2017 results provide load impacts for the entire summer rate period of June through September for PG&E and SCE, and May through October for SDG&E. This was the first analysis of a full summer season, as customer enrollment in the Pilot didn't complete until July 2016. Due to the differences in months between the first and second summer evaluations, along with changes in the participant population over time and weather differences, the results from the second summer should not be compared directly with the first summer. The persistence analysis was designed to facilitate this comparison by limiting the evaluation to months common between the two summers, and only including the subset of customers who were enrolled for the full duration of the pilot. These restrictions help control for as many differences between the two summers as possible, with the exception of the weather. The remaining differences in impacts between the summers in the persistence analysis are attributable to customers' responses to the pilot rates, and any differences in the weather. Findings from Nexant's high-level review of the relationship between weather and impact persistence is included in Section 1.2 below.

[1] The pilots could not be implemented using default enrollment due to legal restrictions on defaulting customers onto TOU rates prior to January 2018. Default TOU rate pilots are currently underway and initial results will become available near the end of 2018 and additional results will be available in spring 2019.

[2] The First Interim Report can be found here: http://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=6442453144
Additional related documents on the CPUC website can be found here: http://www.cpuc.ca.gov/General.aspx?id=12154

[3] The Second Interim Report is contained in two volumes, one authored by Nexant covering the load and bill impact analysis and the second, authored by Research Into Action covering the second survey.
The Nexant report can be found at the following link: http://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=6442455573
The RIA report can be found at: http://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=6442455572

Collectively, the pilots implemented across the three IOUs tested nine different TOU rate options. For eight of the nine options, more than 50,000 households were enrolled and assigned to one of the TOU rates or retained in the study on the standard tiered rate to act as a control group for those who were placed on the new tariffs. The ninth rate option was a complex, dynamic rate that SDG&E tested on a very small group of customers. Recruitment for this rate led to enrollment of roughly 65 customers. Due to the low enrollment number, it is not possible to estimate load or bill impacts for customers on the ninth rate. Consequently, this rate is not covered in the evaluation.

1.1 Pilot Design and Evaluation

Evaluation of the opt-in pilots focused on a number of important research objectives, including:

- Determining the change in electricity use in different time periods for different customer segments and climate regions from each rate treatment and in response to the technology and information treatments that were also included in the pilot as described in the First Interim Report;
- Estimating the distribution of bill impacts associated with each rate option both before and after enrolling on the TOU rates;
- Assessing the extent to which the TOU rates cause unreasonable hardship among selected customer segments such as seniors and economically vulnerable customers in hot climate areas;
- Determining satisfaction with and perceptions about, understanding of and reported changes in behavior associated with different treatment options.

Although recruitment for the pilots was done on an opt-in basis, not opt out, customers were not recruited onto a specific rate. Instead, the pilots were implemented through what came to be called a "pay-to-play" (PTP) recruitment strategy. Under this approach, prospective participants were offered an economic incentive for agreeing to be in the pilot and were then randomly assigned to one of three[4] rate options or to the control condition after agreeing to participate. Since a key motivation for enrolling on the study was likely to be the PTP incentive rather than the attractiveness of any particular rate feature, this approach eliminates any differential selection bias that might have otherwise occurred if customers were recruited onto each rate separately. It also adheres strictly to the design standard of a randomized control trial (RCT), which is the gold standard of experimental design. The PTP recruitment design may also result in enrollment of a mix of customers more similar to those who would be enrolled under default conditions for reasons discussed in detail in Section 2.1 of the First Interim Report.

Load and bill impacts were estimated for CARE/FERA[5] and non-CARE/FERA customer segments in each of three climate regions (hot, moderate, and cool) in each IOU service territory. In the hot climate region in the PG&E and SCE service territories, senior households (e.g., households with at least one resident who is 65 years or older) and households with incomes below 100% of Federal Poverty Guidelines (FPG) were oversampled for one rate option in order to assess whether TOU rates might cause undue hardship for these segments.

[4] For SDG&E, participants were assigned to one of two rate options or the control group.

[5] California Alternate Rates for Energy (CARE) and Family Electric Rate Assistance (FERA) customers receive significant electricity price subsidies. Participation in these programs is tied to income and household size.

Load impacts for each rate and technology treatment were estimated by comparing loads for customers randomly assigned to each TOU tariff (e.g., treatment customers) with loads for customers randomly assigned to the otherwise applicable tariff (OAT) (e.g., control customers). The difference in loads between treatment and control customers in each rate period before customers are placed on the TOU rate (e.g., the pretreatment period) is subtracted from the difference after customers are placed on the rate (e.g., the treatment period) to ensure that there is no bias in the estimated impact due to random chance. This is referred to as a "difference-in-differences" (DiD) analysis. When applied to data collected through an RCT design, DiD analysis produces the most accurate load impact estimates possible through experimental research.

Bill impacts[6] were estimated in a similar manner to load impacts in that a DiD analysis was conducted in order to control for exogenous factors that might impact bills between the pre- and post-treatment periods. Bill impacts were estimated as the difference between bills using pre- or post-treatment loads based on the TOU tariff compared with the OAT. Average bill impacts are reported as well as changes in the percent of customers who experience bill impacts above a certain threshold.

Assessing the extent to which TOU rates cause unreasonable hardship among selected customer segments such as seniors and economically vulnerable customers in hot climate regions is done primarily through survey questions designed to measure hardship. Two surveys were conducted, one following the first summer period and another at the end of the first year on the pilot rates.[7] Both surveys were sent to the entire treatment and control population using a mixed mode, email, mail and phone (EMP) methodology. Responses between treatment and control customers were compared to determine if TOU rates significantly increase the percent of customers that report hardship conditions. Satisfaction with, perceptions about, understanding of, and reported changes in behavior associated with different rates and other treatment options were also determined through surveys. Response rates varied somewhat across customer segments and treatment cells but were quite high (e.g., ranging from 66% to 92%) in all segments. As such, any differential response bias across segments and treatments is believed to be insignificant. The survey was designed, managed and analyzed by Research Into Action (RIA).

1.2 Load Impacts

Table 1.2-1 presents the average weekday peak period load reductions for each rate and season for each IOU.[8] Key findings for load impacts are summarized following the table.

[6] Bill impacts were estimated following the first summer and after completion of the first year of the pilot. Impacts were not estimated again after the second summer. For convenience, key findings from the first two interim reports are included in this report.

[7] Key findings from the two surveys are included in this report but no additional surveys were conducted after the end of the first year. Very detailed survey results are contained in the First and Second Interim Reports.

[8] The values in the table represent the average reduction for each peak period for each rate for the active participants during that season. They do not represent average reductions for a common set of hours or a common set of customers. As such, variation in average load reductions across rates may be due to a differences in the peak-to-off-peak price ratios as well as differences in the length and timing of the peak period. Variation in average load reductions across seasons may be due to changing customer populations, differences in weather conditions, and perhaps other exogenous factors.

Table 1.2-1: Weekday Peak Period Load Reductions*

Utility	Metric	Rate 1			Rate 2			Rate 3		
		Summer 2016	Winter 2016/2017	Summer 2017	Summer 2016	Winter 2016/2017	Summer 2017	Summer 2016	Winter 2016/2017	Summer 2017
PG&E	Peak Period Hours	4 PM - 9 PM			6 PM - 9 PM			4 PM - 9 PM		
	% Impact	5.8%	3.6%	5.3%	6.1%	3.6%	3.8%	5.5%	3.5%	5.6%
	Absolute Impact (kW)	0.06 kW	0.03 kW	0.06 kW	0.06 kW	0.03 kW	0.04 kW	0.06 kW	0.03 kW	0.06 kW
SCE	Peak Period Hours	2 PM - 8 PM			5 PM - 8 PM			4 PM - 9 PM		
	% Impact	4.4%	1.4%	3.6%	4.2%	2.0%	4.1%	2.7%	3.2%	4.0%
	Absolute Impact (kW)	0.06 kW	0.01 kW	0.04 kW	0.06 kW	0.02 kW	0.06 kW	0.03 kW	0.03 kW	0.05 kW
SDG&E	Peak Period Hours	4 PM - 9 PM			4 PM - 9 PM			N/A		
	% Impact	5.4%	2.3%	4.6%	4.6%	1.7%	4.1%			
	Absolute Impact (kW)	0.04 kW	0.02 kW	0.03 kW	0.04 kW	0.01 kW	0.03 kW			

* All impacts presented here are statistically significant

- **Customers can and will respond to TOU price signals during evening hours.** All eight tariffs included in the pilots had a substantial portion of the peak period covering key evening hours. Indeed, the common hours across all eight tariffs are from 6 PM to 8 PM. Some tariffs had peak periods extending until 9 PM and some had shoulder periods extending until midnight. Statistically significant load reductions were found for all rates tested for each IOU service territory for each season. Table 1.2-1 summarizes the percentage and absolute peak-period load reductions for each rate and service territory by season. For the first summer of the pilot, the lowest load impact occurred for SCE's Rate 3, showing an average reduction of 2.7% and 0.03 kW, and the highest occurred for PG&E's Rate 2, which had an average percentage reduction of 6.1% and 0.06 kW. In winter months, the lowest load impact occurred for SCE's Rate 1, showing an average reduction of 1.4% and 0.01 kW, and the highest and the highest occurred for PG&E's Rate 1 and Rate 2, which had average percentage reductions of 3.6% and 0.03 kW. In the second summer, the lowest impacts were 3.6% or 0.04 kW for SCE's Rate 1 and the highest were 5.6% or 0.06 kW for PG&E's Rate 3. On average across all rates, the average peak period reduction for the two summers was 4.6%. With TOU price signals (Tier 2 peak to off-peak price ratios) ranging from around 1.3 to 2.0, the load reductions are not just statistically significant, but could meaningfully reduce the need for peaking capacity, especially if similar impacts could be obtained through default enrollment for all residential customers.

- **Persistence in load impacts between the first and second summer varied by utility.** At PG&E, summer load reductions either declined or remained the same between the first and second summer of the pilot. Most customer segments at SCE showed comparable summer load reductions from the first summer to the second. At SDG&E, percent[9] load reductions in the first and second summer were nearly identical. Weather does not appear to have been a significant driver of persistence. Upon examination of the correlation between weather and impact persistence, no drop-off or increase in persistence appeared to be associated with weather.

- **Customers can and will respond to TOU price signals on weekends.** An important policy question given shifting load patterns at some utilities is the magnitude of peak-period load reductions on weekends. Not all pilot rates had peak-period prices in effect on weekends but for those that did, peak-period reductions and the pattern of load reductions across rate periods on weekends were generally similar to weekday impacts.

- **Peak period reductions in winter were significantly less than in summer.** The average peak-period reduction in winter across all eight rates was 2.7%, with a range from 1.4% for Rate 2 in SCE's service territory to 3.6% for Rates 1 and 2 in PG&E's service territory.

- **Most TOU rates produced overall reductions in electricity use.** Also of interest is whether TOU rates lead to overall reductions, increases, or no change in electricity use. At the service territory level, the average reduction in daily electricity use in summer 2016 across all eight rates equaled 1.9%, with a range from 0.4% for Rate 2 at PG&E to 3.4% for Rate 2 at SDG&E. In summer 2017, the average across all rates was 1.4% with a range from 0.1% to 2.2%. Reductions in the winter were smaller, averaging 0.7% across all rates. There was significant variation in estimated

[9] Percent load reductions rather than kW were evaluated for the persistence analysis to allow for comparison of impacts relative to the available load. For example: if the second summer were cooler than the first, the kW impacts may be lower due to less cooling load, but customers may still be responding similarly between summers given the available load to curtail. The percent impacts help to normalize for any level differences in usage between the summers.

impacts across rates, climate regions and customer segments (CARE/FERA or non-CARE/FERA) but the majority of rate/season/climate region/segment combinations showed small but statistically significant reductions in daily electricity use.

- **Summer peak-period load impacts varied across climate regions and service territories.** In both summers, the absolute impacts at both PG&E and SDG&E were largest in the hot climate region, second largest in the moderate region and smallest in the cool region for all rates. The pattern was similar for percentage impacts although not all differences across regions were statistically significant. At SCE, the pattern was different. In general, the differences across regions were smaller than at PG&E or SDG&E and in some cases, the largest load reduction was found in the cool climate region and the smallest in the hot region. It is noteworthy that SCE's hot region has many more hot days than PG&E's hot region and SCE's moderate region is much hotter than PG&E or SDG&E's moderate regions. These differences, combined with the fact that some of SCE's rates had long shoulder periods during which prices were higher than in the off-peak period may have made it difficult for customers in hot regions to reduce energy use and still stay reasonably comfortable.

- **CARE/FERA customers had lower average percent and absolute peak period load reductions in summer compared with non-CARE/FERA customers.** This pattern was typically (although not universally) true at PG&E and SDG&E for all rates and climate regions. Once again, SCE had a different result for some rates and climate regions. In selected cases, CARE/FERA customers even had larger load reductions than non-CARE/FERA customers in SCE's service territory. The SCE results notwithstanding, the smaller load reductions by CARE/FERA customers in most service territory/climate region combinations compared with non-CARE/FERA customers, could be due to greater difficulty by CARE/FERA customers in reducing or shifting loads. For example, lower income households may lack quality insulation or may have undersized air conditioning equipment, resulting in a greater burden for them to reduce cooling energy use compared to a household with higher quality insulation or adequately sized air conditioning units. Low income customers may also work two jobs, or longer hours, limiting their flexibility to shift loads such as laundry or cooking. It may also be that low income households have lower saturations of end uses such as dishwashers and clothes driers, that can easily be shifted from peak to off-peak periods.

- **Load impacts for households with incomes below 100% of FPG in hot climate regions differed between PG&E and SCE.** This segment did not show statistically significant peak-period load reductions in PG&E's service territory until the second summer of the pilot. However, in SCE's hot climate region, these very low income households had load reductions similar to or slightly larger than the general population in the hot climate region in all three seasons.

- **Senior households in the hot climate region had load impacts very similar to those of the general population.** This was true for both PG&E and SCE in summer 2016 and in winter period. In the second summer, seniors households in SCE's hot climate region actually had greater impacts than the general population in the hot climate region (5.6% vs. 2.9%).

- **Smart thermostats appear to increase load reductions when automated through vendor support.** SCE recruited customers who already owned smart thermostats into the study and randomly assigned them to rate and treatment groups. In the first summer, absolute load impacts for smart thermostat owners were similar to those for the general population even though they had larger usage overall and, therefore, might be expected to have larger load

reductions. In winter, smart thermostat owners reduced peak period usage by approximately 4.9% in the SCE service territory, which was significantly higher compared to the non-CARE/FERA population weighted load reductions of 1.8%. In the second summer, the smart thermostat provider implemented specialized thermostat programming optimized for TOU rates, and load reductions increased significantly relative to the first summer. Load impacts in the first summer (July, August, and September) were 3.1%; in the same months during the second summer, impacts increased to 8.1% for the common set of customers enrolled in both summers.

- **The incremental impact of Weekly Usage Alert emails at SDG&E is mixed.** SDG&E tested whether delivery of weekly summaries of usage and bills to TOU customers would produce greater load reductions compared with households on TOU rates that did not receive this information. There was no statistically significant impact for WAEs in summer 2016. However, during the winter months, WAE recipients in SDG&E's moderate climate region had small but statistically significant increases in load reductions equal to approximately 0.01 kW, whereas customers in the cool climate region had impacts decline by approximately 0.01 kW. In summer 2017, customers in the moderate climate region who received the WAEs had statistically significant incremental impacts equal to 0.02 kW.

- **Acceptance rates for PG&E's smart phone app were very low.** PG&E offered a smart phone app that provides a variety of information to those who download it that might help them to manage their energy use. The number of customers who successfully downloaded and accessed the app was quite low and there were not enough users to determine whether the app had an impact on load reductions. App users were surveyed and those who responded reported liking the app.

- **Higher incentives for smart thermostats produced higher acceptance rates.** SDG&E offered rebates for smart thermostats to customers on TOU rates through the Whenergy program**.** Roughly 14,000 rebated offers were made, with roughly 30% of the offers being made through direct mail and the remainder through email. About half of the offers involved a $100 rebate and the other half a $200 rebate. 349 applications (2.4%) were received, and of those, 246[10] were deemed eligible and ultimately accepted. The eligible acceptance rate for the $100 rebate was 1.3% and for the $200 rebate, it was 2.1%.

1.3 Bill Impacts

Average monthly bill impacts were estimated for summer, winter and the year as a whole. Key findings include the following:

- **At PG&E and SCE, average summer monthly bills were higher for all TOU rates than they would have been on the OAT for all customer segments and all climate regions.** Average monthly bill increases over three summer months ranged from a low of roughly $5 to as much as $40**.** Absolute summer bill impacts were typically largest in the hot climate region, second largest in the moderate region and smallest in the cool region.

[10] Load impacts were not estimated for the customers who received the rebates due the sample size being too small to yield statistically significant impacts.

- **Average monthly winter bills were lower for all TOU rates than they would have been on the OAT for nearly all customer segments and all climate regions at PG&E and SCE.** The exception was CARE/FERA customers on Rate 3 in SCE's cool climate region, which saw a very small ($1/month) bill increase in winter. Average monthly bill reductions over the winter months ranged from a low of roughly $1 to as much as $12.

- **Bill impacts at SDG&E were quite different from those at PG&E and SCE**, with very small structural impacts in both summer and winter months. At SDG&E, some customer segments were able to more than offset small structural bill increases with load shifting or conservation behavior and, thus, had slightly lower bills even during the summer period than they would have had on the OAT. Customers faced winter bill impacts that were generally less than 1% in either direction, at the territory level and at the CARE/FERA and non-CARE/FERA level.

- **Total annual bill impacts were very small at all three utilities, with average monthly impacts ranging between 0% (no change) and savings of up to 2%.** The 12-month bill impact varied significantly by climate region and CARE/FERA status. At SCE, CARE/FERA customers faced greater bill increases than non-CARE/FERA customers in most cases (on a percentage basis).

The stark contrast between the relatively large bill increases for TOU customers during the summer months at PG&E and SCE relative to SDG&E is noteworthy. This large difference did not stem from SDG&E having significantly more modest peak-to-off-peak price differentials or smaller differentials between peak prices and the OAT price relative to the other two utilities. Indeed, SDG&E's price differentials were larger than for several of the pilot rates at PG&E and SCE. Rather, the much more modest bill impacts at SDG&E had to do with the fact that both SDG&E's OAT and TOU rates are seasonally price differentiated, with higher prices in the summer than in the winter. SCE and PG&E's OATs are not seasonally differentiated, but their TOU rates are. As a result, the summer bill differentials between their TOU and OAT rates were much greater than SDG&E's.

Although most customers saw very modest bill decreases on an annual basis, the seasonal volatility at PG&E and SCE is concerning, although it should be noted that, especially in hot climate regions, there is significant seasonal variation in bills even under the OAT due to seasonal variation in usage and the tiered rate structure. It is important to keep in mind that bill volatility across seasons can be managed through tools designed specifically to address bill volatility, such as balanced payment plans, which allow customers to pay the same bill each month based on historical usage and current rates (with periodic true-ups). The extent to which this option might mute TOU price signals is subject to debate and will be examined in the default pilots that are currently in the field at each IOU.

A final point to keep in mind is that all customers who will be defaulted onto TOU rates in 2019 will receive bill protection for the first full year on the new tariff. As such, while summer bills may be higher than under the OAT, customers who stay for a full year will not pay a higher bill than they would under the OAT.

1.4 Customer Attrition

Customer attrition is driven by three very different factors. One is customers who move, referred to as customer churn. Another is customers who become ineligible as a result of factors such as installing solar, going onto medical baseline, or switching to service from a Community Choice Aggregator (CCA).

The final factor is customers who consciously opt out of the rate because they are unhappy being on a TOU rate. Importantly, opt-out rates in these pilots were likely influenced, perhaps significantly so, by the incentives that were paid to customers over the first year of the pilot. Customers received a portion of their enrollment incentive upon enrollment, a portion when the first survey was completed in fall 2016 and the final portion after the second survey was completed in late spring 2017. As such, absolute opt-out rates may not be an accurate guide to what would occur in the absence of the incentive payments. Relative opt-out rates across tariffs, however, may provide useful insight regarding the relative preferences of customers for various rate options.

Key findings concerning customer attrition include the following:

- **Cumulative opt-out rates between enrollment and the end of September 2017 were quite low for nearly all rates and customer segments.** Opt-out rates varied across tariffs, service territories, climate regions and customers segments. At the granular customer segment level, the cumulative percent of treatment customers who dropped off the rate was between 1% and 10% at PG&E, and at SCE it was between 0.5% and 14%. For SDG&E, customer segment level opt-out rates were between 1% and 3.9%. Territory wide at PG&E and SCE, there are small differences in the cumulative percent of opt outs between tariffs at each utility. Cumulative opt-out rates territory wide are greatest for PG&E's Rate 2 and SCE's Rate 3 (about 7% and 6%, respectively). At SDG&E, the greatest cumulative opt-out rate, about 3.5%, is for customers in the hot climate region on Rate 2.
- **The number of customers dropping off the TOU rates was highest in the hot region,** second in the moderate region and lowest in the cool climate region for all tariffs.
- **Opt-out rates were slightly lower for CARE/FERA customers in PG&E and SDGE's service territory compared with non-CARE/FERA customers.** In SCE's territory, the differences between CARE/FERA and non-CARE/FERA were small. Opt-out rates leveled off over the course of the winter but ramped up again during the second summer, especially at PG&E.
- **Overall attrition ranged from as low as 12% to as high as 39%** with the highest being for CARE/FERA customers in SCE's hot climate region on Rate 3. Attrition was generally about 10 percentage points higher at SCE than at PG&E, with roughly two thirds of the overall attrition driven by customer churn or CCA activity. Attrition has also been high in PG&E's moderate and cool climate regions for some segments due primarily to customers switching to CCAs, which are quite active in PG&E's service territory.

1.5 Survey Findings

Key findings from the surveys that were administered include the following:

- **Economic hardship was not materially increased by TOU rates for most segments of interest in hot climate regions.** Economic hardship was assessed through survey questions that were used to develop an economic hardship index. Comparisons in index values were made between treatment and control customers in PG&E and SCE's hot climate regions for CARE/FERA customers, senior households, households with incomes below 100% of FPG and households with incomes between 100% and 200% of FPG.[11] In spite of large increases in bills relative to the

[11] The First and Second Interim Reports contain similar comparisons for other climate regions and segments although these segments were not required to be investigated as part of the regulatory decisions guiding implementation of the TOU pilots.

OAT, there were no statistically significant differences in the economic index for any customer segment at PG&E in the first summer period. At SCE, Rate 3 CARE/FERA customers and Rate 2 customers with incomes between 100% and 200% of FPG had higher economic index scores when compared with control group customers. In the second survey, covering winter and spring, none of the segments of interest at SCE showed any statistically significant difference between treatment and control customers. PG&E Rate 3 customers in the hot climate region had a higher economic index score than control customers. For context, the size of the difference in the economic index scores in the above cases is equivalent to the difference in the value of the index from using one additional non-income based method to pay bills or from having difficulty paying one additional bill over the relevant time period (e.g., summer or winter/spring).

- **Health hardship was not materially increased by TOU rates for most segments of interest in hot climate regions.** The surveys also asked customers with air-conditioning equipment and a disability whether members of their household had sought medical attention due to excessive heat in summer, and the second survey asked space-heating customers with a disabled household member whether they sought attention for excessive cold in winter. No difference in the health metric was found for PG&E customers in the summer or winter periods. At SCE, about 10% more Rate 1 and Rate 3 CARE/FERA customers reported seeking medical attention due to excessive heat in the summer and about 6% of Rate 1 and 2 CARE/FERA eligible customers reported seeking medical attention due to excessive cold in the winter compared with control customers. In addition, the second survey included an index to measure overall health hardship, and no differences in average health hardship scores were found at PG&E or SCE.

- **TOU rates do not appear to materially increase or decrease customer satisfaction ratings for the rate or the utility.** Satisfaction with the rate and the IOU were measured on an 11-point scale in both the first and second survey and average ratings were compared between treatment and control customers. Following the first summer at PG&E and SCE, when bills were higher for nearly all customers relative to the OAT, satisfaction ratings with the TOU rate and with the utility were typically slightly lower for TOU rate customers than for control customers and these differences were sometimes statistically significant. However, all differences were less than 1 point on an 11-point scale. In the second survey, following the winter season when bills were much lower, satisfaction ratings for both the IOU and the rate were significantly higher for many of PG&E's and SCE's rate segments, and SDG&E's Rate 2 segments, compared to the first survey results, indicating a significant improvement in satisfaction. Average ratings were slightly lower, however, for many Control group segments compared to first survey results.

- **More customers on TOU rates received bills that were higher than expected in summer.** A large percent of both treatment and control customers reported that their summer bills were higher than expected, but this perception was greater for more customers on TOU rates for most rates, customer segments, and climate regions. The second survey showed that a significantly smaller percent of most customers on TOU rates received bills during the previous six months that were higher than expected compared to the summer months, especially in the hot and moderate regions. This is an important finding that should influence not only the timing of enrollment for customers on TOU rates (e.g., enrolling customers during winter or spring, not in summer or early-fall) but also the content of ME&O materials, which should be designed to prepare customers for higher than expected bills in summer while reminding them about lower bills at other times of the year.

- **CARE/FERA customers had much lower understanding of the timing of the peak period than non-CARE/FERA customers.** Both surveys showed a significant disparity in understanding of the timing of the peak period between CARE/FERA and non-CARE/FERA customers. For some rates and climate regions, between 30% and 40% of CARE/FERA customers could not identify a single hour that fell during the peak-period rate window on the first survey. This disparity could partly be due to the fact that more CARE/FERA customers have English as a second language, but there may be other explanations. In the second survey, a significant improvement in the understanding of peak hours was found for most of PG&E's customers, SCE's Rate 3 customers, and SDG&E's Rate 1 customers, but understanding significantly declined for SCE's Rate 1 and 2 customers and SDG&E's Rate 2 CARE/FERA customers.

- **Many customers may not accurately understand bill protection.** In the second surveys, customers were asked if they knew when bill protection ends and about half to two-thirds of customers reported knowing this. At SCE and SDG&E, customers were also given a brief explanation of bill protection and asked if they understood what it means (e.g., yes/no). Over 86% reported they did understand. PG&E customers, however, were provided the same brief explanation but were asked to choose what bill protection means among four possible choices. Between 28% and 59% selected the correct meaning while 25% to 51% chose the wrong answer. Customers may overwhelmingly understand bill protection generally, but many do not understand the specifics when presented with other possible meanings (e.g. several customers think they will receive a bill credit each month during the first year instead of receiving one credit after the first year).

- **For all three utilities, customers on TOU rates were more likely to take time-specific actions than customers on the OAT.** For example, while a similar proportion of customers from control and treatment groups indicated they turned off their lights to conserve energy, a larger proportion of treatment customers indicated they shifted doing laundry and running the dishwasher during peak hours. Differences in the number of actions taken between treatment and control customers were found in both the first and second surveys.

2 Introduction

In Decision 15-07-001, the California Public Utilities Commission (CPUC or the Commission) ordered California's three investor owned utilities (IOUs) to conduct certain "pilot" programs and studies of residential Time-of-Use (TOU) electric rate designs (TOU Pilots and Studies) beginning the summer of 2016, and to file applications no later than January 1, 2018 proposing default TOU rates for the majority of residential electric customers. The IOUs were also directed to form a working group (TOU Working Group) to address issues regarding the TOU pilots and to hire one or more qualified independent consultants to assist with the design and implementation of the TOU Pilots and Studies. Nexant, Inc. was engaged as the independent consultant.

Collectively, the pilots implemented across the three IOUs are testing nine different TOU rate options. For eight of the nine options, more than 50,000 households were enrolled and assigned to one of the TOU rates or retained in the study on the standard tiered rate to act as a control group for those who were placed on the new tariffs. The ninth rate option is a complex, dynamic rate that SDG&E is testing on a very small group of customers. Recruitment for this rate led to enrollment of roughly 65 customers. A key objective of the pilots was to develop insights that would help guide the IOUs' applications filed in January 2018 proposing the implementation of default TOU pricing for the majority of residential electricity customers and the CPUC's policy decisions regarding default pricing.[12]

Findings from the first summer—June through October 2016—are documented in the "Statewide Opt-in TOU Evaluation First Interim Report"[13] dated April 11, 2017 (hereafter referred to as the First Interim Report). This report contains detailed background information on the pilot, describes the pilot design and the evaluation methodology used for analysis, discusses each IOUs pilot implementation and treatments, and presents load impacts, bill impacts, and survey findings covering the 2016 summer period. The Second Interim Report[14] contains estimated load impacts, bill impacts, and survey findings from the winter period and first full year of the pilot. This Final Report contains a brief summary of findings documented in more detail in the prior two reports but focuses primarily on load impacts from the second summer period in 2017 as well as the persistence of load impacts across the two summers for the subset of customers that were enrolled for the full duration of the pilot.

A brief summary of the pilot design and evaluation approach is contained in the Executive Summary (Section 1.2). The remainder of this report is organized as follows. Sections 3, 4, and 5 summarize the load impact results along with a synthesis section for PG&E, SCE, and SDG&E, respectively. Each section starts with a discussion of customer opt-out rates and attrition over the course of the entire pilot. Following the attrition section, load impacts by rate period are presented for each rate option and relevant customer segment for the second summer. The next subsection discusses impact persistence between the first and second summers for a common set of customers that were enrolled over the

[12] The pilots could not be implemented using default enrollment due to legal restrictions on defaulting customers onto TOU rates prior to January 2018. Default TOU rate pilots are currently underway and initial results will become available near the end of 2018 and additional results will be available in spring 2019.

[13] The First Interim Report can be found here: http://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=6442453144 Additional related documents on the CPUC website can be found here: http://www.cpuc.ca.gov/General.aspx?id=12154

[14] The Second Interim Report can be found here: http://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=6442455573

entire course of the pilot. The final subsections of Sections 3 through 5 provide a high level summary and synthesis of the impact and survey results for each IOU.

Section 6 provides a comparison of results across the utilities as well as overall conclusions that can (or cannot) be drawn from the entire body of research. While the pilots were designed jointly and are meant to be complementary, they were not designed specifically to allow cross-utility comparisons in most instances. For example, it is not appropriate to compare Rate 1 from SCE's pilot to Rate 2 from PG&E's pilot and conclude that one rate produced greater load impacts than the other due to differences in rate structure because differences in other factors, such as climate, customer demographics, customer satisfaction, perceptions about the utility, economic conditions and perhaps others may partially or fully explain any observed differences in the load impacts between the two rate options. Nevertheless, cross-utility comparisons are likely to be made by reviewers and some comparisons are more valid than others. As such, we provide a brief comparison of some key findings across utilities in this final section.

Appendix A to this report contains a list of Microsoft Excel files that have been filed as electronic tables in conjunction with the primary report. These electronic tables allow readers to access the underlying data that created the figures and tables in the report, and to determine actual values for data points within the figures.

A summary of key findings from the first and second customer surveys are available in the second volume of this report "California Statewide Opt-In Time-Of-Use Pricing Pilot: 2016 & 2017 Customer Survey Results Summary & Comparisons", written by Research Into Action. This volume also includes two additional series of analyses and results. First, statistical comparisons of the differences between results for the questions that were included in both surveys were made to measure change over time. Second, cross-tabulations of key metrics based on two respondent characteristics, customer language preference (English vs. non-English) and customers' level of understanding of their on-peak hours (high vs. low understanding), were conducted to determine if results varied significantly by these characteristics.

The First Interim Report contained detailed background information on the pilot, a detailed methodology section, and detailed descriptions of each IOUs pilot implementation and treatments. Readers interested in this background information are encouraged to review the first report, as this information is not repeated here. Interested readers may also wish to review the TOU Pilot Design Report,[15] which contains a detailed discussion of research issues and explanations for the design decisions that were made by the TOU Working Group. The IOU advice letters[16] and the CPUC resolutions may also contain information of interest.[17]

[15] George, S., Sullivan, M., Potter, J., & Savage, A. (2015). Time-of-Use Pricing Opt-in Pilot Plan. *Nexant, Inc.*

[16] SCE: Advice Letter 3335-E; PG&E: Advice Letter 4764-E; and SDG&E: Advice Letter 2835-E.

[17] SCE: Resolution E-4761; PG&E: Resolution E-4762; and SDG&E: Resolution E-4769.

3 PG&E Evaluation

This report section summarizes the attrition and load impacts for the second summer of PG&E's pilot. It also includes a discussion of load impact persistence throughout the entire pilot. Load and bill impacts from the first summer season can be found in the First Interim Report and similar results for the winter season may be found in the Second Interim Report.

3.1 Summary of Pilot Treatments

Figure 3.1-1 through Figure 3.1-3 summarize the three tariffs that were tested in the PG&E service territory. All three tariffs have peak periods that include the prime evening hours from 6 PM to 9 PM. The rates have changed since the launch of the pilot, and the figures represent the tariffs that were in effect in March 2017 and do not reflect the baseline credit of 8.8 ¢/kWh. Appendix B shows the prices that were in effect in each rate period for each tariff, including the OAT. Two sets of prices are shown in the appendix, one covering the period from pilot start through February 2017, and the other beginning on March 1, 2017. While several minor rate changes occurred over the course of the pilot, the rate adjustment that occurred on March 1, 2017 was more significant and, as such, was factored into the estimation of bill impacts in the Second Interim Report.

Rate 1 is a simple, two-period rate with a weekday peak period from 4 PM to 9 PM all year long and off-peak prices in effect on all other weekday hours and all hours on weekends. The tier-2 (price without baseline credit), peak-to-off-peak price ratio[18] in the summer is roughly 1.3 to 1 and is very modest in the winter (non-summer months).

Rate 2 is slightly more complex than Rate 1 as it adds a summer "Partial-Peak" period covering the two hours immediately preceding and the one hour immediately following the three-hour peak period that runs from 6:00 PM to 9:00 PM on weekdays and weekends. In order to offset the additional complexity incurred with a third TOU period, PG&E kept the same prices in effect on both weekdays and weekends.

Rate 3 is more complex than Rates 1 and 2. It includes TOU pricing in the spring (from March until May) that differs from pricing in the winter in order to allow for lower prices during low-cost hours from 10:00 AM until 4:00 PM to be charged in a "Super-Off-Peak" period. The "Super-Off-Peak" period coincides with the period CAISO identifies as being at high risk for excess supply in the future. Rate 3 has the same design as Rate 1 for the summer and winter seasons, with peak times from 4:00 PM to 9:00 PM and all other hours being off-peak. In the spring, the peak hours are also the same as Rate 1, but the remaining hours are divided into off-peak and super-off-peak periods.

[18] The peak-to-off-peak price ratio is equal to the peak price divided by the off-peak price.

Figure 3.1-1: PG&E Pilot Rate 1 (March 2017)[19]

Tariff	Season	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24:00
Weekday	Summer	Off-Peak (30.7¢)																Peak (41.0¢)							
	Winter	Off-Peak (26.1¢)																Peak (28.0¢)							
	Spring	Off-Peak (26.1¢)																Peak (28.0¢)							
Weekend	Summer	Off-Peak (30.7¢)																							
	Winter	Off-Peak (26.1¢)																							
	Spring	Off-Peak (26.1¢)																							

Figure 3.1-2: PG&E Pilot Rate 2 (March 2017)

Tariff	Season	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24:00
Weekday	Summer	Off Peak (28.6¢)																Partial Peak		Peak (43.5¢)					
	Winter	Off Peak (26.0¢)																		Peak (28.6¢)					
	Spring	Off Peak (26.0¢)																		Peak (28.6¢)					
Weekend	Summer	Off Peak (28.6¢)																Partial Peak		Peak (43.5¢)					
	Winter	Off Peak (26.0¢)																		Peak (28.6¢)					
	Spring	Off Peak (26.0¢)																		Peak (28.6¢)					

Figure 3.1-3: PG&E Pilot Rate 3 (March 2017)

Tariff	Season	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24:00
Weekday	Summer	Off-Peak (27.8¢)																Peak (55.6¢)							
	Winter	Off-Peak (26.1¢)																Peak (28.0¢)							
	Spring	Off Peak (25.8¢)										Super Off-Peak (17.4¢)						Peak (34.7¢)							
Weekend	Summer	Off-Peak (27.8¢)																							
	Winter	Off-Peak (26.1¢)																							
	Spring	Off Peak (25.8¢)										Super Off-Peak (17.4¢)													

Figure 3.1-4 presents the seasons for each rate. For all three rates, the summer season covers the months of June through September. The winter season is October through May for Rates 1 and 2, and October through February for Rate 3. The spring period for Rate 3 is March through May.

Figure 3.1-4 Seasons by Rate

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rate 1	Winter					Summer				Winter		
Rate 2	Winter					Summer				Winter		
Rate 3	Winter		Spring			Summer				Winter		

The following section contains a discussion of customer attrition over the entire pilot. Section 3.3 presents the load impact estimates for the summer 2017 period for each rate and Section 3.4 summarizes the persistence of load impacts over the course of the pilot.

[19] See Appendix B for comparison of tariffs.

3.2 Customer Attrition

Figure 3.2-1 through Figure 3.2-3 show the cumulative opt-out rates over time for each test cell and climate region. As discussed in the prior reports, there is an important distinction between opt-out rates and overall attrition. Opt out refers to customers actively deciding to transfer off a pilot rate whereas attrition refers to customers that leave the study for any reason, including becoming ineligible due to closing their account (customer churn), taking service from a Community Choice Aggregator (CCA), becoming a net metered solar customer, and others. Opt-out rates are much lower than attrition rates. It should also be noted that pilot customers had a financial incentive tied to staying on the pilot rates through completion of the second survey near the end of the first year of enrollment. As such, the overall opt-out rate may be biased downward compared to a situation where no incentive was offered, at least until after the first year. Since all rates had the same financial incentive to stay enrolled for a year, the relative opt-out rates across tariffs may be a valid indicator of the relative customer satisfaction with and preference for each rate.

Overall, opt-out rates are low and steady over the course of the first 12-month period and the differences between customer segments are small. However, the opt-out rates ramp up during the second summer of the pilot, which is especially noticeable in the hot climate region for Rate 2 and Rate 3 for non-CARE customers. This could be explained by the final incentive payments going out after the second survey, but it could also be due to the expectation of higher bills in the summer months. Opt out rates are greatest in the hot climate region, followed by the moderate region and then the cool region. In general, non-CARE/FERA customers opted out at a higher rate than CARE/FERA customers. Customers began to receive the final incentive payment and bill protection was ending during July and August when the increase in non-CARE/FERA opt-outs was observed. Non-CARE customers likely experienced higher bills under TOU during the summer, and non-CARE/FERA customer bills may have been significantly higher than bills for CARE/FERA customers, creating a greater financial motivation to opt-out from the rate.

Figure 3.2-1: Cumulative PG&E Opt Outs by Month – Hot Climate Region

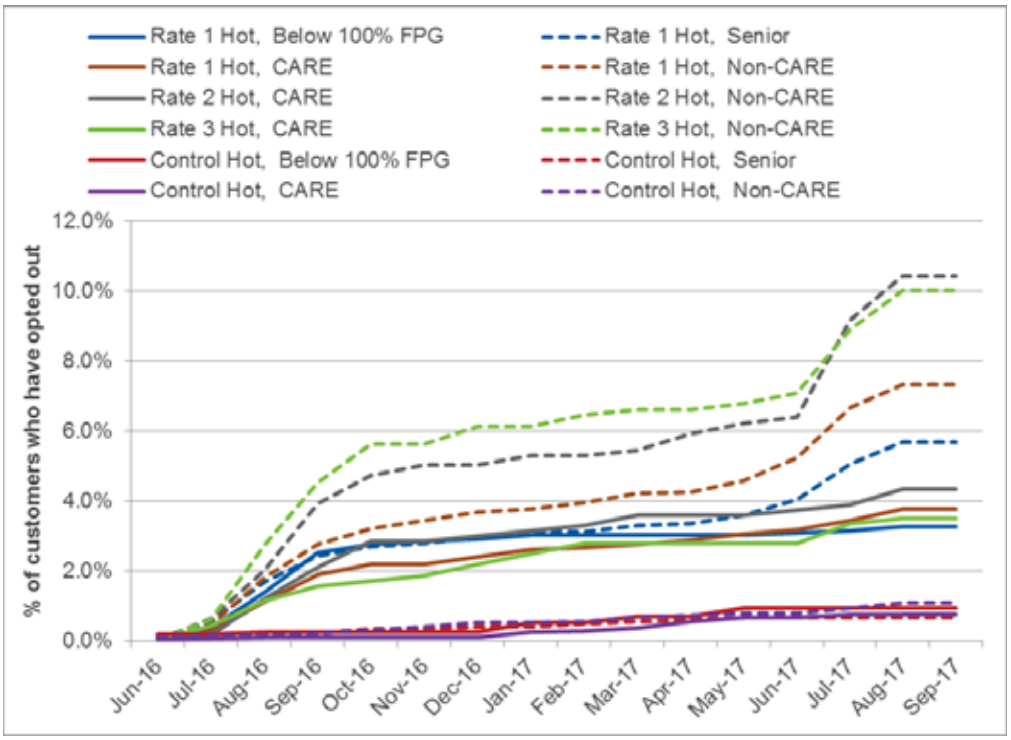


Figure 3.2-2: Cumulative PG&E Opt Outs by Month – Moderate Climate Region

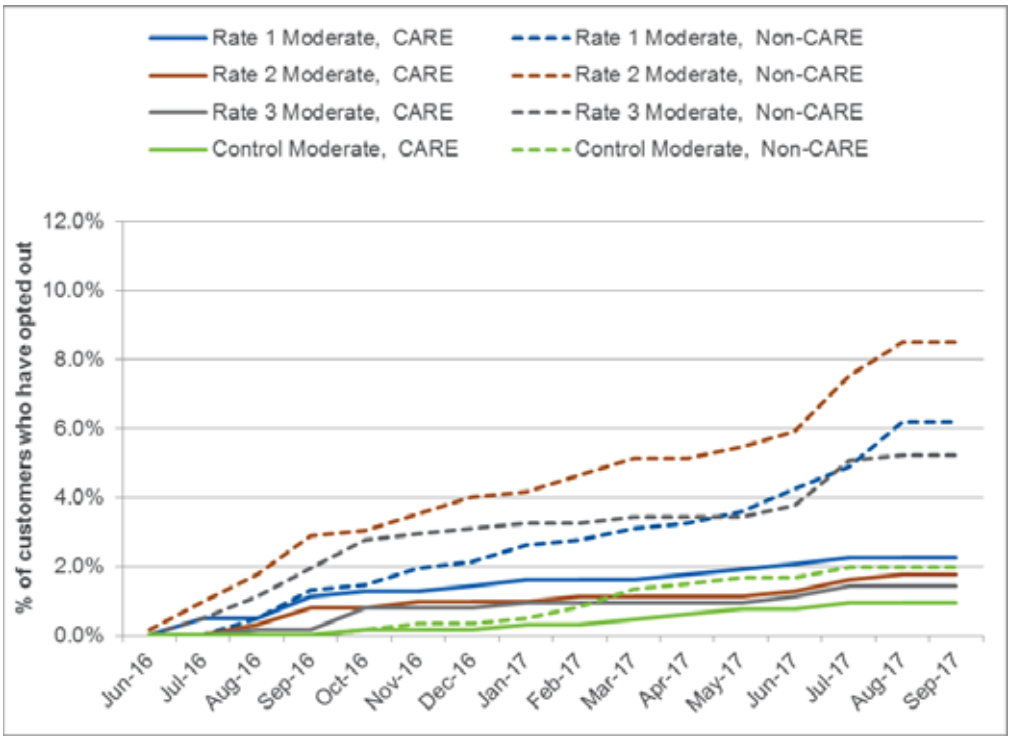


Figure 3.2-3: Cumulative PG&E Opt Outs by Month – Cool Climate Region

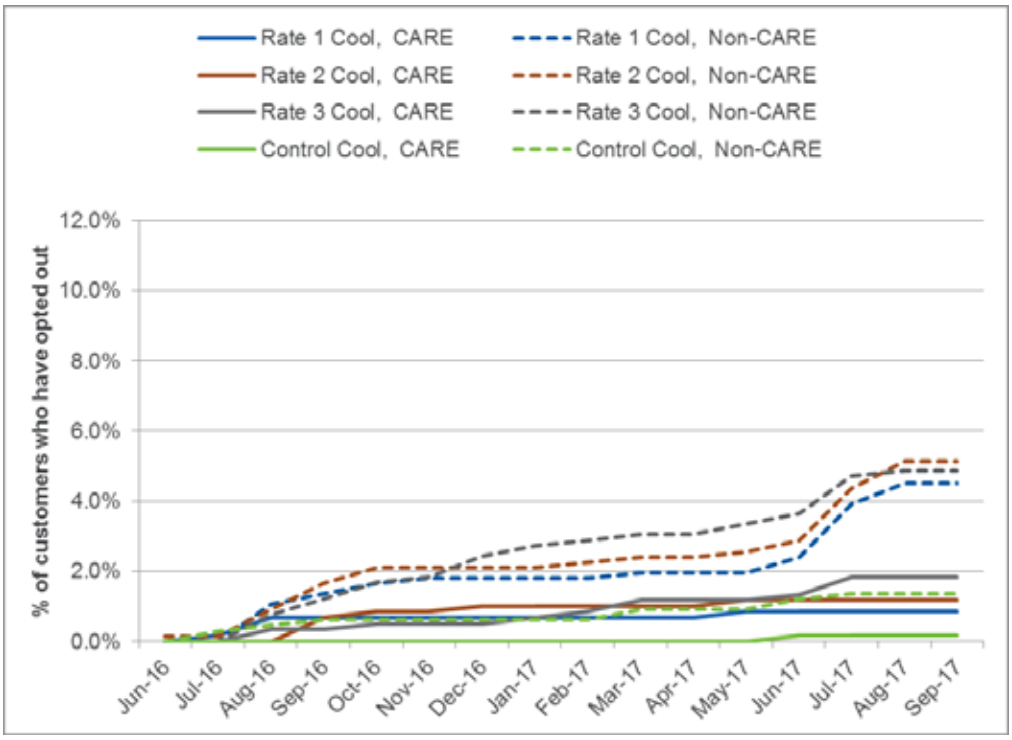


Figure 3.2-4 shows the cumulative percent of customers that opted out of each tariff for the CARE/FERA and non-CARE/FERA segments and for the total population across PG&E's service territory as a whole. As seen, the cumulative percent of customers opting out was quite low for all rates and segments. The lowest cumulative percent opt out was for CARE/FERA customers on Rate 3 and the highest was for non-CARE/FERA customers on Rate 2. For the service territory as a whole, Rate 2 saw the most opt outs. Customers on Rate 1 had the lowest opt-out rate.

Figure 3.2-4: Cumulative Opt Outs by Rate and Customer Segment for the PG&E Service Territory

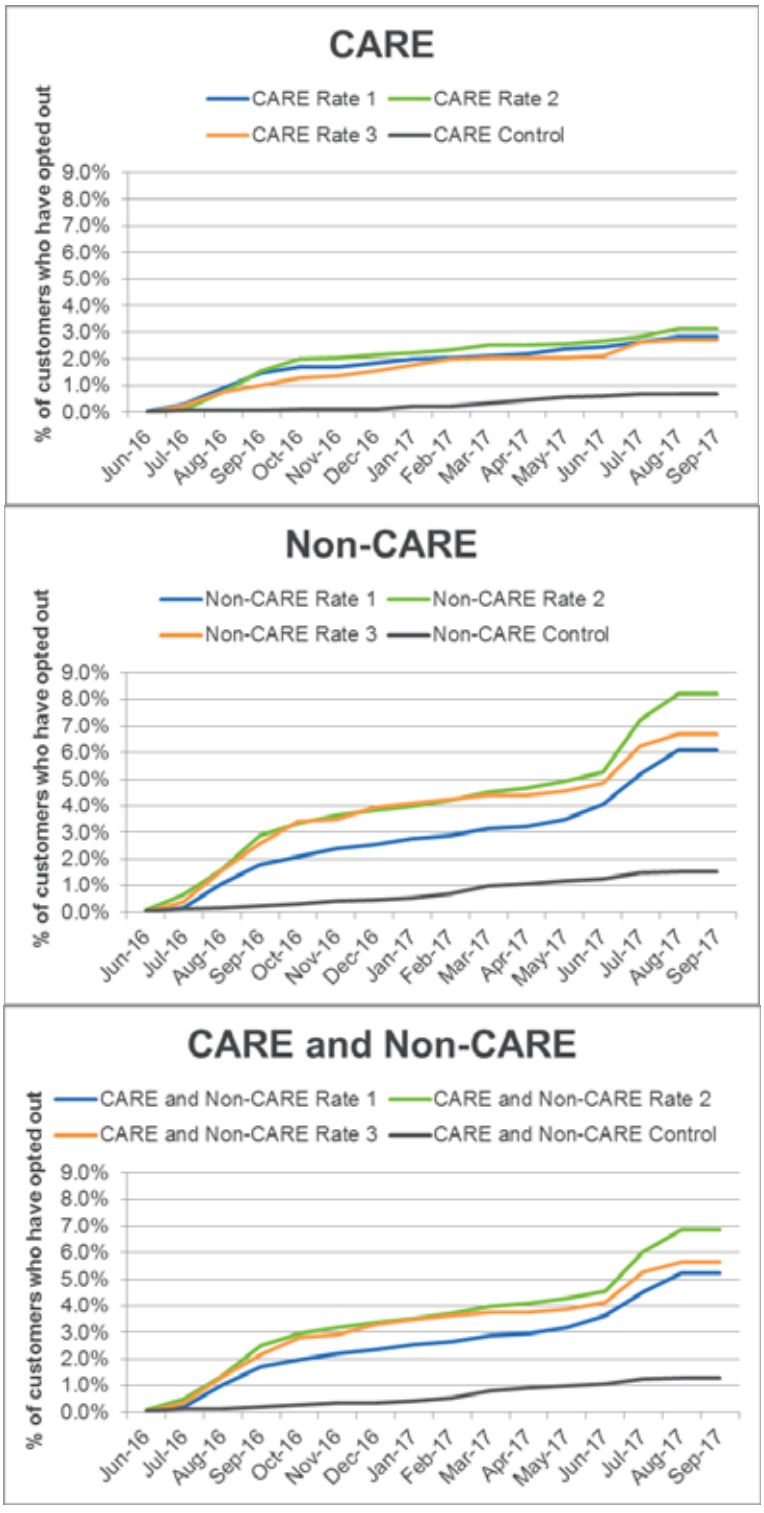


Figure 3.2-5 through Figure 3.2-7 show the overall attrition rate over time for each climate region, customer segment, and TOU rate. As seen in Figure 3.2-5, the attrition rate is quite constant over time in the hot region, with the final attrition rate ranging from a low of roughly 12% for senior households in the control group to a high of over 25% for control households with incomes below 100% of FPG in the hot climate region. The attrition graphs in the moderate and cool climate regions have a very different shape over time, with a significant increase in attrition starting in August in the moderate region and in September in the cool region. These higher rates coincide with more active transitions of customers to CCAs during those periods, especially among non-CARE/FERA customers in the cool climate region. The higher attrition rates are also in line with the end of the first year of the pilot.

Figure 3.2-5: Cumulative PG&E Attrition by Month – Hot Climate Region

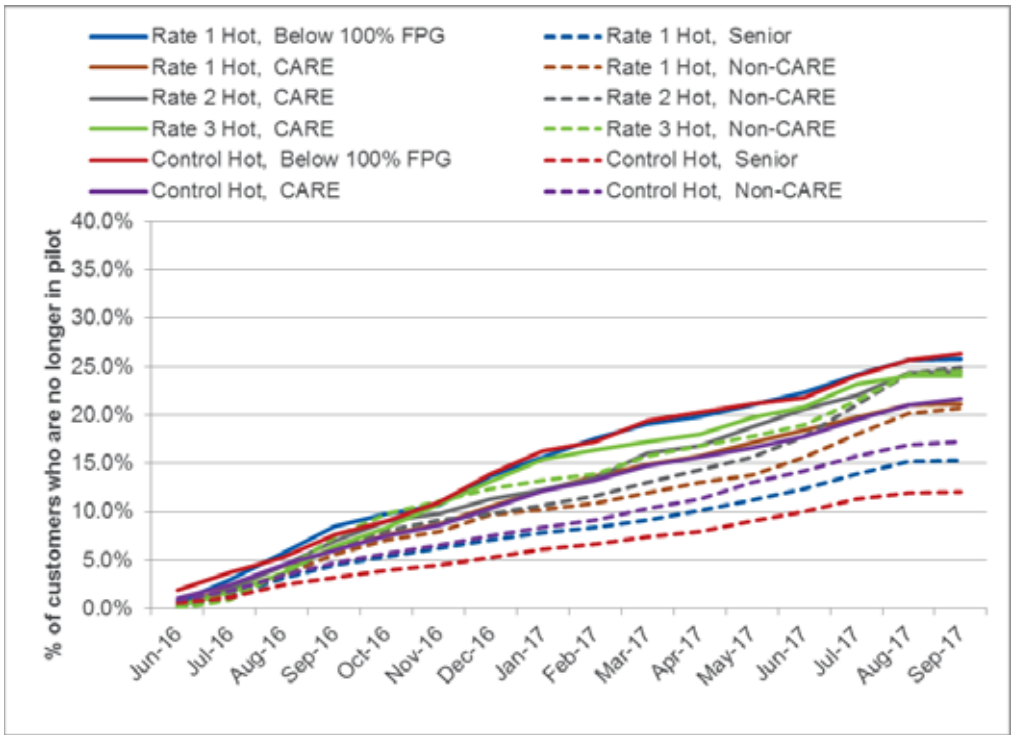
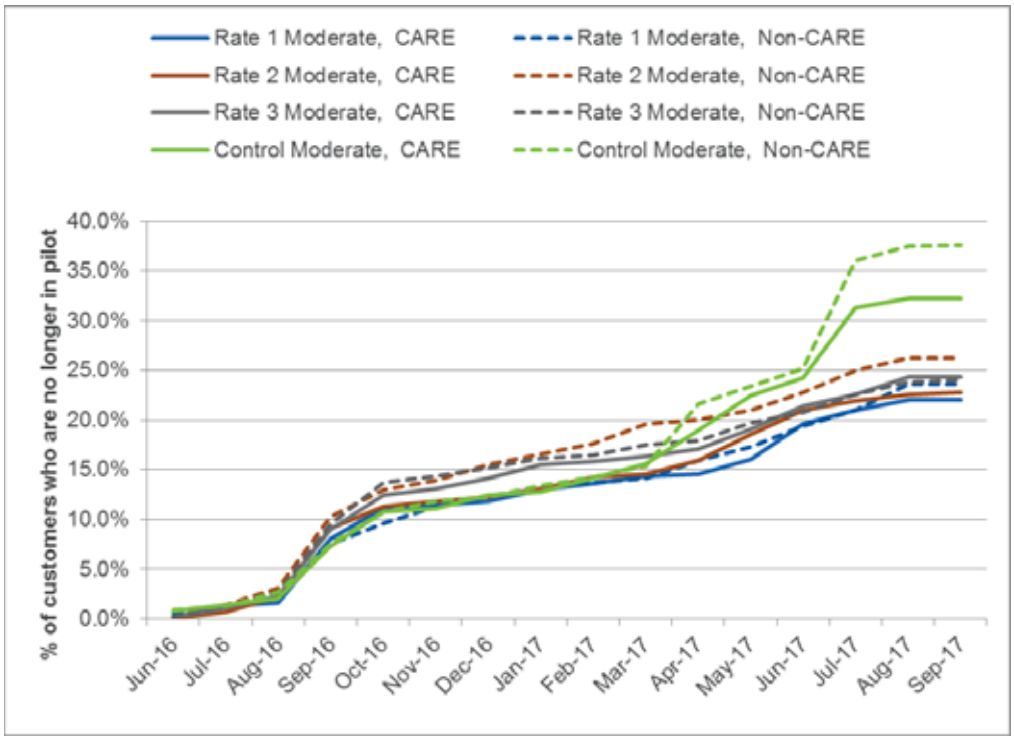
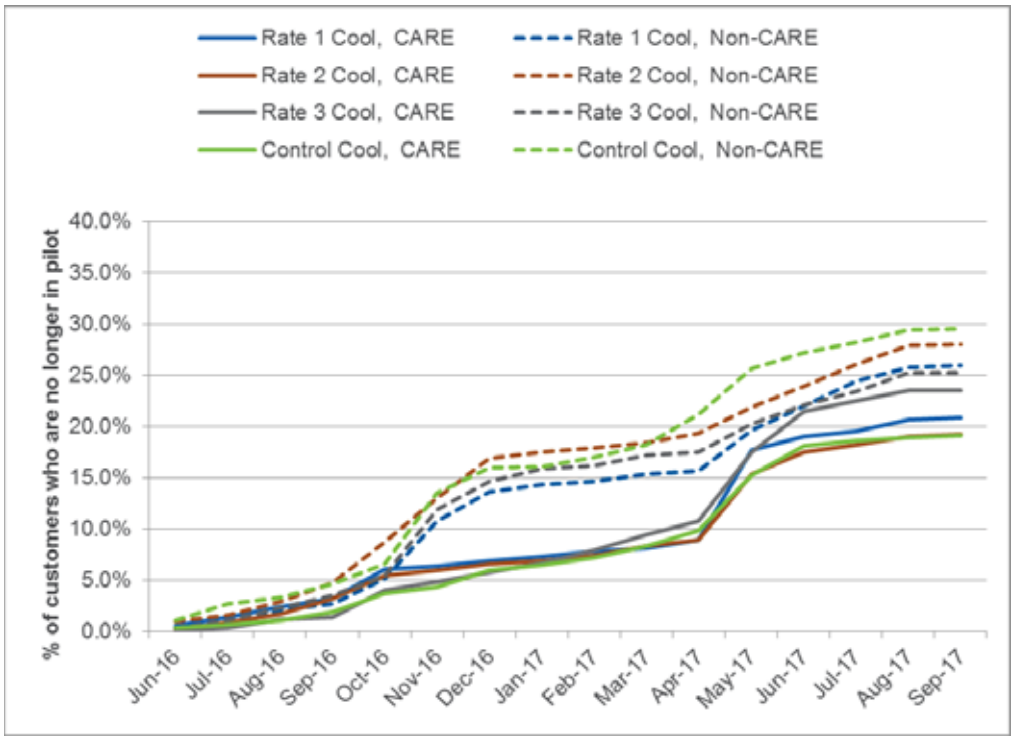


Figure 3.2-6: Cumulative PG&E Attrition by Month – Moderate Climate Region[20]



[20] There is a slight spike in ineligibilities in the Moderate climate region due to customers' transition onto the Redwood Coast Energy Authority and Sonoma Clean Power CCAs.

Figure 3.2-7: Cumulative PG&E Attrition by Month – Cool Climate Region



3.3 Load Impacts

This section summarizes the load impact estimates for the three rate treatments tested by PG&E for summer 2017. A comparison of load impacts across the two summer periods for a common group of participants is discussed in Section 3.4. The CPUC resolution approving PG&E's pilot requires that load impacts be estimated for the peak and off-peak periods and for daily energy use for the following rates, customer segments, and climate regions:

- Seniors, CARE/FERA customers, non-CARE/FERA customers and households with incomes below 100% of FPG in PG&E's hot climate region for Rate 1;
- For all three rates for all customers in PG&E's service territory as a whole and for all customers in PG&E's hot and moderate climate regions; and
- For CARE/FERA and non-CARE/FERA customers on each rate across PG&E's service territory as a whole.

In addition to these required segments, Nexant estimated load impacts for CARE/FERA and non-CARE/FERA customers for each rate for each climate region. Load impacts are reported for each rate period for the average weekday, average weekend and average monthly peak day for the summer months of June through September in 2017. The impacts presented here represent the second summer of the pilot. Impacts are reported for each rate, climate zone and customer segment summarized above. Underlying the values presented in the report are electronic tables that contain estimates for each hour of the day for each day type, segment and climate zone and for each month separately. These values are contained in Excel spreadsheets that are available upon request through the CPUC.

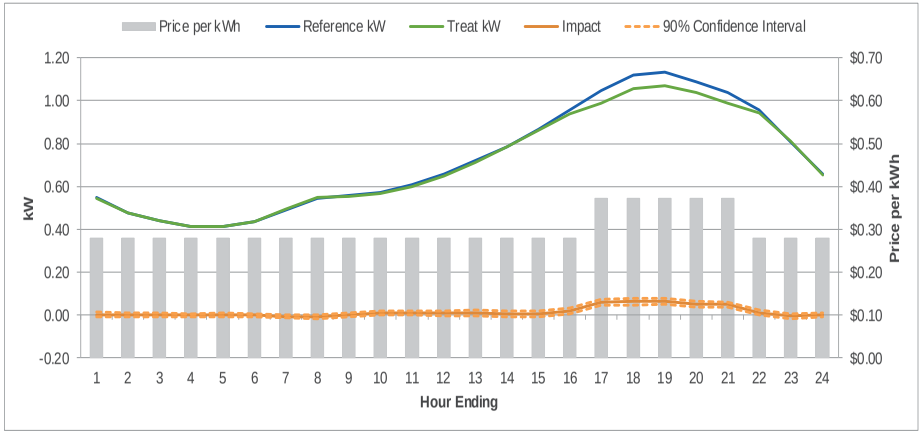
Figure 3.3-1 shows an example of the content of these electronic tables for PG&E Rate 1 for all eligible customers in the service territory. Pull down menus in the upper left hand corner allow users to select different customer segments, climate regions, day types (e.g., weekdays, weekends, monthly peak day) and time period (individual months or the average of each season).

The remainder of this section is organized by rate treatment – that is, load impacts are presented for each relevant customer segment and climate region for each of the three rates. Following the summary for each rate, load impacts are compared across rates. This comparison is made only for the hours within each peak period that are common across all three rates (6 PM to 9 PM). Because the rates differ with respect to the length and timing of peak and off-peak periods, differences in load impacts across rates for any particular rate period may be due not only to differences in prices within the rate period but also due to differences in the length or timing of the rate periods.

Figure 3.3-1: Example of Content of Electronic Tables Underlying Load Impacts Summarized in this Report (PG&E Rate 1, Average Summer 2017 Weekday, All Customers)

Segment	All
Rate	Rate 1
Month	Summer 2017
Day Type	Average Weekday
Treated Customers	5,416

Period	Reference kW	Treat kW	Impact	Percent Impact	90% Confidence Interval	
Peak	1.09	1.03	0.06	5.3%	0.05	0.06
Partial Peak	N/A	N/A	N/A	N/A	N/A	N/A
Off Peak	0.63	0.62	0.00	0.5%	0.00	0.01
Super Off Peak	N/A	N/A	N/A	N/A	N/A	N/A
Daily kWh	17.33	16.98	0.35	2.0%	0.29	0.40



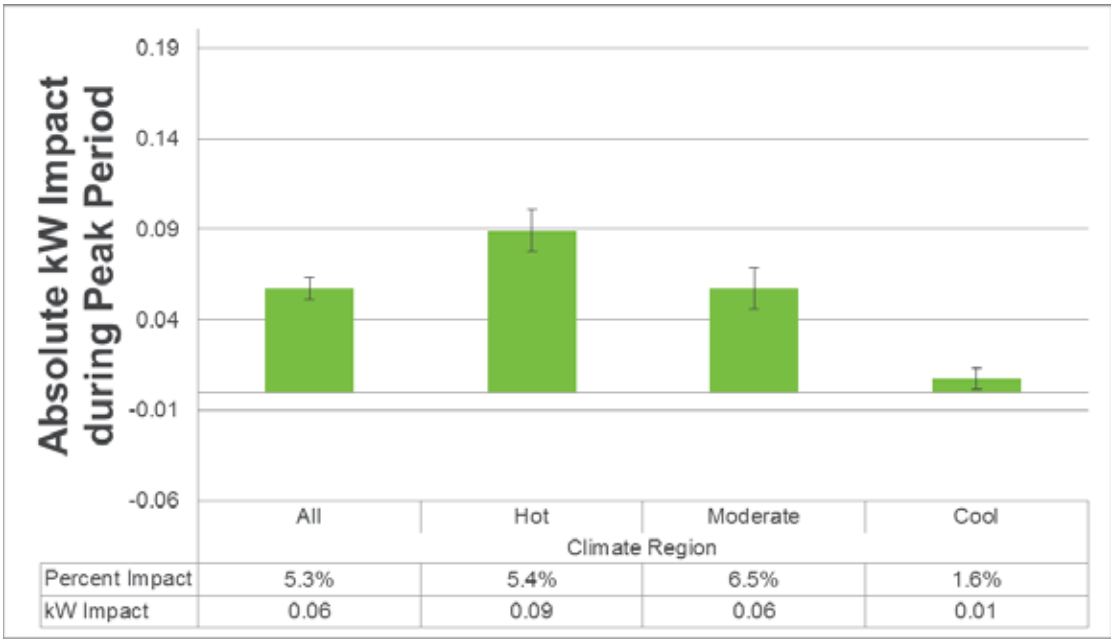
Hour Ending	Reference kW	Treat kW	Impact	Percent Impact	90% Confidence Interval		Price	Period
1	0.55	0.54	0.00	0.5%	-0.01	0.01	$0.28	Off Peak
2	0.48	0.48	0.00	0.3%	-0.01	0.01	$0.28	Off Peak
3	0.44	0.44	0.00	0.1%	-0.01	0.01	$0.28	Off Peak
4	0.41	0.41	0.00	0.0%	-0.01	0.01	$0.28	Off Peak
5	0.41	0.41	0.00	0.2%	-0.01	0.01	$0.28	Off Peak
6	0.43	0.44	0.00	-0.2%	-0.01	0.01	$0.28	Off Peak
7	0.49	0.50	-0.01	-1.3%	-0.01	0.00	$0.28	Off Peak
8	0.54	0.55	-0.01	-1.3%	-0.02	0.00	$0.28	Off Peak
9	0.56	0.55	0.00	0.3%	-0.01	0.01	$0.28	Off Peak
10	0.57	0.57	0.01	1.4%	0.00	0.02	$0.28	Off Peak
11	0.61	0.60	0.01	1.5%	0.00	0.02	$0.28	Off Peak
12	0.66	0.65	0.01	1.4%	0.00	0.02	$0.28	Off Peak
13	0.72	0.71	0.01	1.2%	0.00	0.02	$0.28	Off Peak
14	0.79	0.78	0.00	0.5%	-0.01	0.02	$0.28	Off Peak
15	0.86	0.86	0.01	0.6%	-0.01	0.02	$0.28	Off Peak
16	0.96	0.94	0.02	1.9%	0.00	0.03	$0.28	Off Peak
17	1.05	0.99	0.06	5.6%	0.04	0.07	$0.37	Peak
18	1.12	1.06	0.06	5.6%	0.05	0.08	$0.37	Peak
19	1.14	1.07	0.06	5.7%	0.05	0.08	$0.37	Peak
20	1.09	1.04	0.05	4.7%	0.04	0.06	$0.37	Peak
21	1.04	0.99	0.05	4.8%	0.04	0.06	$0.37	Peak
22	0.96	0.94	0.01	1.2%	0.00	0.02	$0.28	Off Peak
23	0.81	0.81	-0.01	-0.7%	-0.02	0.01	$0.28	Off Peak
24	0.66	0.65	0.00	0.2%	-0.01	0.01	$0.28	Off Peak
Daily kWh	**17.33**	**16.98**	**0.35**	**2.0%**	**0.29**	**0.40**	**N/A**	**N/A**

3.3.1 Rate 1

PG&E's Rate 1 is a two-period rate with a peak-period from 4 PM to 9 PM on weekdays. In summer, for electricity usage above the baseline quantity, prices equal roughly 41.0 ¢/kWh[21] in the peak period and 30.7¢/kWh in the off-peak period. All usage on weekends is priced at the off-peak price. For usage below the baseline quantity, a credit of 8.8 ¢/kWh is applied.

Figure 3.3-2 shows the absolute peak period load reduction for Rate 1 for PG&E's service territory as a whole and for each climate region. The lines bisecting the top of each bar in the figure show the 90% confidence band for each estimate. If the confidence band includes 0, it means that the estimated load impact is not statistically different from 0 at the 90% level of confidence. If the confidence bands for two bars do not overlap, it means that the observed difference in the load impacts is statistically significant. If they do overlap, it does not necessarily mean that the difference is not statistically significant.[22] In these cases, t-tests were calculated to determine whether the difference is statically significant.[23]

Figure 3.3-2: Average Load Impacts for Peak Period for PG&E Rate 1[24]
(Positive values represent load reductions)



	All	Hot	Moderate	Cool
Percent Impact	5.3%	5.4%	6.5%	1.6%
kW Impact	0.06	0.09	0.06	0.01

As seen in the figure, all of the average peak-period load impacts for the service territory as a whole and for each climate region are statistically significant at the 90% level of confidence. On average, pilot

[21] Prices reflect the rates that went into effect on March 1, 2017. The original prices are included in Appendix B.

[22] For further discussion of this topic, see https://www.cscu.cornell.edu/news/statnews/stnews73.pdf

[23] The test was applied at the 90% confidence level which means that a t-value exceeding 1.65 indicates statistical significance

[24] PG&E Rate 1 summer impacts represent June through September 2017.

participants across PG&E's service territory reduced peak-period electricity use by 5.3% or 0.06 kW, [25] across the five-hour peak period from 4 PM to 9 PM. The average peak-period load reductions range from a high of 6.5% and 0.06 kW in the moderate climate region to a low of 1.6% and 0.01 kW in the cool climate region. In the hot climate region, load reductions equal 5.4% or 0.09 kW. The variation in absolute impacts across climate regions is greater than the variation in percent impacts due in large part to variation in electricity usage (e.g., the reference load) across regions. The differences in load impacts are statistically significant across the three climate regions.

Table 3.3-1 shows the average percent and absolute load impacts for each rate period for weekdays and weekends and for the average monthly system peak day for the PG&E service territory as a whole and for the participant population in each climate region. The percent reduction equals the load impact in absolute terms (kW) divided by the reference load. Shaded cells in the table contain load impact estimates that are not statistically significant at the 90% confidence level. The percentage and absolute values in the first row of Table 3.3-1, which represent the load impacts in the peak period on the average weekday, equal the values shown in Figure 3.3-2, discussed above.

The reference loads shown in Table 3.3-1 are based on a control group and represent estimates of what customers on the TOU rate would have used if they had not responded to the price signals contained in the TOU tariff. [26] As seen in the table, average hourly usage during the peak period on weekdays is roughly 1.09 kW for the service territory as a whole, and around 0.72 kW over the 24 hour average weekday. In the hot climate region, average usage in the peak period is more than 50% larger, at 1.66 kW. Average usage in the moderate region is 0.88 kW and in the cool region, at 0.48 kW, it is roughly one-third what it is in the hot region.

As seen in Table 3.3-1, nearly all load impacts are statistically significant for each rate period and day type. The average load reduction during the peak period is similar in percentage terms on the average weekday and the monthly system peak day but the absolute impact is statistically significantly larger on the monthly system peak day due to the higher reference loads. All rates show an overall conservation effect between 2.0% and 2.6% for the service territory as a whole and for the hot and moderate climate regions on the average weekday and a reduction of 3.7% for the monthly system peak day in the moderate climate region. In the moderate climate regions, daily loads increased by roughly 2.0%.

[25] The kW value represents the average kWh/hour across the five our peak period. It is not an instantaneous measure of peak demand during the period. The value can be multiplied by the number of hours in the peak period to determine the total reduction in energy use (kWh) that occurred over the period.

[26] See Section 3.1 in the First Interim Report for more detail.

Table 3.3-1: Rate 1 Load Impacts by Rate Period[27] and Day Type*
(Positive values represent load reductions, negative values represent load increases)

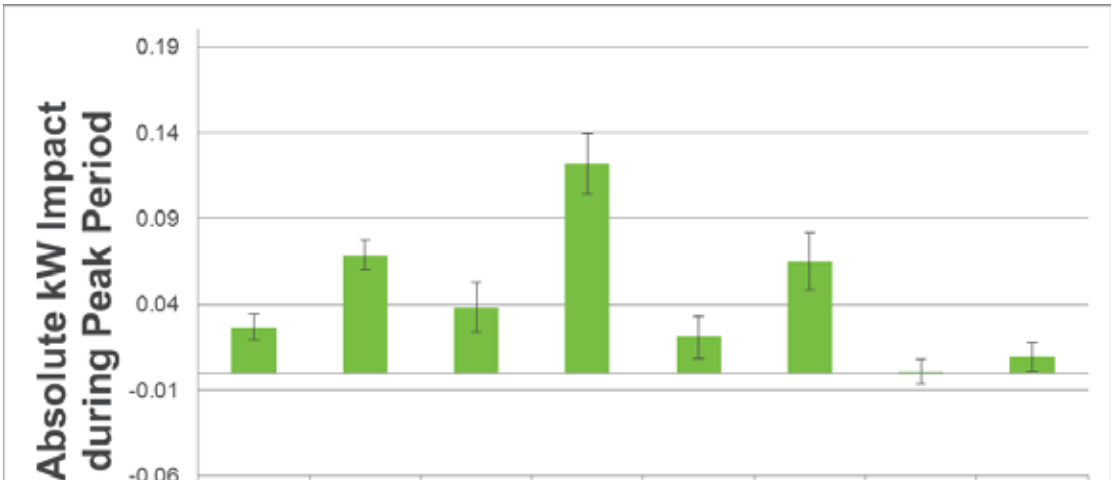
Rate 1														
Day Type	Period	Hours	All			Hot			Moderate			Cool		
			Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact
Average Weekday	Peak	4 PM to 9 PM	1.09	0.06	5.3%	1.66	0.09	5.4%	0.88	0.06	6.5%	0.48	0.01	1.6%
	Off Peak	12 AM to 4 PM, 9 PM to 12 AM	0.63	0.00	0.5%	0.88	0.01	1.3%	0.54	0.00	0.8%	0.35	-0.01	-3.1%
	Day	**All Hours**	**0.72**	**0.01**	**2.0%**	**1.04**	**0.03**	**2.6%**	**0.61**	**0.02**	**2.5%**	**0.38**	**-0.01**	**-1.9%**
Average Weekend	Off Peak	All Hours	0.79	0.01	1.7%	1.14	0.02	1.8%	0.69	0.02	3.1%	0.40	-0.01	-1.9%
	Day	**All Hours**	**0.79**	**0.01**	**1.7%**	**1.14**	**0.02**	**1.8%**	**0.69**	**0.02**	**3.1%**	**0.40**	**-0.01**	**-1.9%**
Monthly System Peak Day	Peak	4 PM to 9 PM	1.61	0.09	5.8%	2.48	0.14	5.6%	1.44	0.10	7.2%	0.50	0.00	0.6%
	Off Peak	12 AM to 4 PM, 9 PM to 12 AM	0.85	0.00	0.2%	1.26	0.00	0.0%	0.73	0.01	1.9%	0.36	-0.01	-3.7%
	Day	**All Hours**	**1.01**	**0.02**	**2.1%**	**1.51**	**0.03**	**1.9%**	**0.88**	**0.03**	**3.7%**	**0.39**	**-0.01**	**-2.5%**

* A shaded cell indicates estimate is not statistically significant

[27] Statistically significant small daily load increases or decreases may be a treatment effect, or it is also possible they are attributable to random differences between the treatment group and the control group. The increased number of hours at the daily level compared to the hourly level may increase the statistical power of the analysis, resulting in statistically significant impacts at the daily level when the impacts at the hourly level are not necessarily statistically significant.

Figure 3.3-3 shows the absolute peak period load impacts for Rate 1 for CARE/FERA and non-CARE/FERA customers for the service territory as a whole and for each climate region. For the service territory as a whole, and in each climate region, both the percent and absolute load impacts in the peak period are greater for non-CARE/FERA customers than for CARE/FERA customers, often significantly greater. For example, in the hot climate region, the average weekday, peak period reduction is 7.0% and 0.12 kW for non-CARE/FERA customers whereas for CARE/FERA customers, the average reduction is 2.5% and 0.04 kW, which is less than half as much as for non-CARE/FERA customers. Load reductions in the cool climate region are not statistically significantly different from zero for CARE/FERA customers, and are very small for non-CARE/FERA customers.

Figure 3.3-3: Average Load Impacts for Peak Period for PG&E Rate 1 for CARE/FERA and Non-CARE/FERA Customers (Positive values represent load reductions)



	CARE	Non-CARE	CARE	Non-CARE	CARE	Non-CARE	CARE	Non-CARE
	All		Hot		Moderate		Cool	
Percent Impact	2.4%	6.4%	2.5%	7.0%	3.0%	7.0%	0.2%	1.9%
kW Impact	0.03	0.07	0.04	0.12	0.02	0.06	0.00	0.01

Table 3.3-2 shows the estimated load impacts for each rate period and day type by climate zone and for the service territory as a whole for non-CARE/FERA customers and Table 3.3-3 shows the estimated values for CARE/FERA customers. It should be noted that, within each climate region, CARE/FERA customers have average peak-period reference loads on weekdays that are slightly smaller than non-CARE/FERA customers. However, for the service territory as a whole, CARE/FERA and non-CARE/FERA loads are very similar and, indeed, CARE/FERA loads are slightly larger. This change at the service territory level is because the distribution of CARE/FERA and non-CARE/FERA customers varies across climate regions, with a greater share of CARE/FERA customers being located in the hotter regions.

For the service territory as a whole, both customer segments reduced average daily usage on weekdays by a statistically significant amount. On weekends, non-CARE/FERA customers reduced electricity use by 2.4% while CARE/FERA customers had a statistically insignificant increase in electricity use (0.1%). In the hot climate region, non-CARE/FERA customers reduced total daily electricity use on weekdays by 4.1%. In the cool climate region, both non-CARE/FERA and CARE/FERA customers had a small but statistically significant increase in daily electricity use on weekdays.

Table 3.3-2: Rate 1 Load Impacts by Rate Period and Day Type – Non-CARE/FERA Customers*
(Positive values represent load reductions, negative values represent load increases)

Rate 1														
Day Type	Period	Hours	All, Non-CARE			Hot, Non-CARE			Moderate, Non-CARE			Cool, Non-CARE		
			Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact
Average Weekday	Peak	4 PM to 9 PM	1.07	0.07	6.4%	1.74	0.12	7.0%	0.92	0.06	7.0%	0.49	0.01	1.9%
	Off Peak	12 AM to 4 PM, 9 PM to 12 AM	0.62	0.01	0.9%	0.91	0.02	2.6%	0.56	0.00	0.5%	0.36	-0.01	-3.2%
	Day	**All Hours**	**0.72**	**0.02**	**2.6%**	**1.08**	**0.04**	**4.1%**	**0.64**	**0.02**	**2.5%**	**0.39**	**-0.01**	**-1.9%**
Average Weekend	Off Peak	All Hours	0.79	0.02	2.4%	1.20	0.04	3.0%	0.72	0.02	3.2%	0.41	-0.01	-1.6%
	Day	**All Hours**	**0.79**	**0.02**	**2.4%**	**1.20**	**0.04**	**3.0%**	**0.72**	**0.02**	**3.2%**	**0.41**	**-0.01**	**-1.6%**
Monthly System Peak Day	Peak	4 PM to 9 PM	1.64	0.11	6.8%	2.70	0.20	7.2%	1.53	0.12	7.6%	0.52	0.00	0.7%
	Off Peak	12 AM to 4 PM, 9 PM to 12 AM	0.85	0.00	0.3%	1.33	0.01	0.5%	0.77	0.01	1.6%	0.37	-0.01	-4.0%
	Day	**All Hours**	**1.01**	**0.03**	**2.5%**	**1.62**	**0.05**	**2.8%**	**0.93**	**0.03**	**3.7%**	**0.40**	**-0.01**	**-2.7%**

* A shaded cell indicates estimate is not statistically significant

Table 3.3-3: Rate 1 Load Impacts by Rate Period and Day Type – CARE/FERA Customers*
(Positive values represent load reductions, negative values represent load increases)

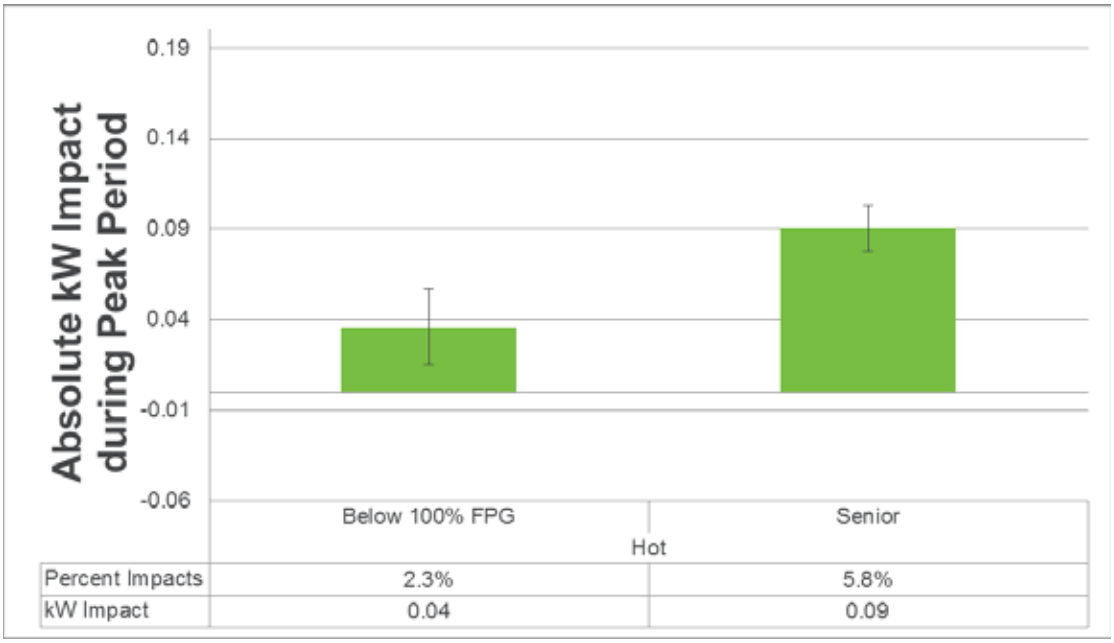
Rate 1														
Day Type	Period	Hours	All, CARE			Hot, CARE			Moderate, CARE			Cool, CARE		
			Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact
Average Weekday	Peak	4 PM to 9 PM	1.12	0.03	2.4%	1.53	0.04	2.5%	0.70	0.02	3.0%	0.44	0.00	0.2%
	Off Peak	12 AM to 4 PM, 9 PM to 12 AM	0.64	0.00	-0.5%	0.83	-0.01	-1.0%	0.46	0.01	3.0%	0.31	-0.01	-2.7%
	Day	**All Hours**	**0.74**	**0.00**	**0.4%**	**0.97**	**0.00**	**0.1%**	**0.51**	**0.02**	**3.0%**	**0.34**	**-0.01**	**-1.9%**
Average Weekend	Off Peak	All Hours	0.80	0.00	-0.1%	1.05	0.00	-0.4%	0.55	0.02	3.0%	0.35	-0.01	-3.3%
	Day	**All Hours**	**0.80**	**0.00**	**-0.1%**	**1.05**	**0.00**	**-0.4%**	**0.55**	**0.02**	**3.0%**	**0.35**	**-0.01**	**-3.3%**
Monthly System Peak Day	Peak	4 PM to 9 PM	1.54	0.04	2.7%	2.14	0.05	2.5%	0.98	0.05	4.6%	0.44	0.00	0.1%
	Off Peak	12 AM to 4 PM, 9 PM to 12 AM	0.85	0.00	-0.2%	1.15	-0.01	-0.7%	0.57	0.02	3.5%	0.32	-0.01	-2.4%
	Day	**All Hours**	**0.99**	**0.01**	**0.7%**	**1.35**	**0.00**	**0.3%**	**0.66**	**0.03**	**3.9%**	**0.35**	**-0.01**	**-1.8%**

* A shaded cell indicates estimate is not statistically significant

Figure 3.3-4 shows the absolute load reduction during the peak period on average weekdays for seniors and households with incomes below 100% of FPG in the hot climate region. Table 3.3-4 shows the estimated values for other rate periods and day types for each segment and for the hot climate region as a whole.

A comparison of the values in Figure 3.3-4 with those for the hot region in Figure 3.3-2 shows that load impacts for senior households were very similar to the hot climate region, participant population as a whole in both percentage (well over 5%) and absolute (0.09 kW) terms. The reference load for senior households (1.54 kW) is only slightly smaller than that of the general participant population in the hot climate region (1.66 kW). That is, senior households do not, on average, consume materially less electricity than the average customer in PG&E's hot climate region. Estimated load impacts in the off-peak period, which were statistically different from 0, and a 3.5% reduction in daily energy use on weekdays indicates that senior households did more conservation than load shifting. This conservation effect carried over into the weekend, which showed a 2.7% load reduction on average over the summer. Peak-period load reductions on the average monthly system peak day were smaller in percentage terms (5.3%) than on weekdays.

Figure 3.3-4: Average Load Impacts for Peak Period for PG&E Rate 1 for Senior Households and Households with Incomes Below 100% FPG in the Hot Climate Region (Positive values represent load reductions)



Load impacts for households with incomes less than or equal to 100% of FPG were quite different from those of senior households or the general population. These households have similar reference loads compared with senior households (1.54 kW) but only reduced peak usage by 2.3% or 0.04 kW. On weekdays and weekends, households with incomes less than or equal to 100% of FPG decreased overall daily consumption, but not by a statistically significant amount. On monthly system peak days, these customers did not have any statistically significant load reductions.

Table 3.3-4: Rate 1 Load Impacts by Rate Period and Day Type for PG&E for Senior Households and Households with Incomes Below 100% FPG in the Hot Climate Region* (Positive values represent load reductions, negative values represent load increases)

Rate 1								
Day Type	Period	Hours	Hot, Below 100% FPG			Hot, Senior		
			Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact
Average Weekday	Peak	4 PM to 9 PM	1.54	0.04	2.3%	1.55	0.09	5.8%
	Off Peak	12 AM to 4 PM, 9 PM to 12 AM	0.86	-0.01	-0.8%	0.81	0.02	2.4%
	Day	**All Hours**	**1.00**	**0.00**	**0.2%**	**0.97**	**0.03**	**3.5%**
Average Weekend	Off Peak	All Hours	1.07	0.00	0.4%	1.05	0.03	2.7%
	Day	**All Hours**	**1.07**	**0.00**	**0.4%**	**1.05**	**0.03**	**2.7%**
Monthly System Peak Day	Peak	4 PM to 9 PM	2.12	0.03	1.5%	2.36	0.13	5.3%
	Off Peak	12 AM to 4 PM, 9 PM to 12 AM	1.17	-0.01	-1.1%	1.17	0.01	0.6%
	Day	**All Hours**	**1.37**	**0.00**	**-0.3%**	**1.42**	**0.03**	**2.3%**

* A shaded cell indicates estimate is not statistically significant

3.3.2 Rate 2

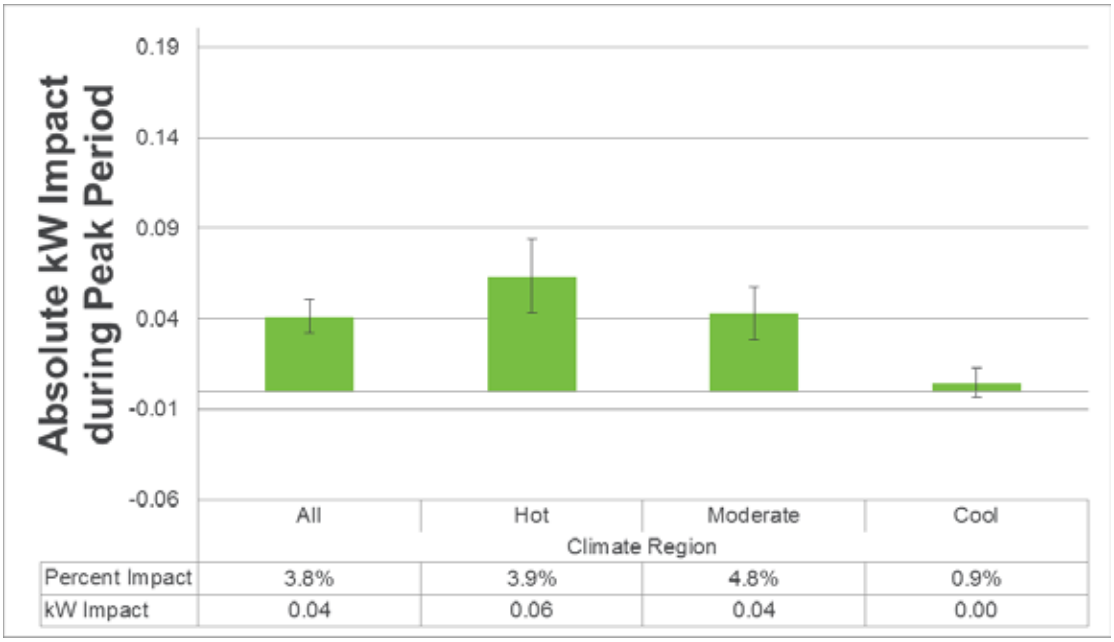
PG&E's Rate 2 differs from Rate 1 in several important ways. First, Rate 2 has three rate periods on weekdays in the summer, rather than two rate periods. Second, the Rate 2 peak period is shorter, with a three-hour peak period covering only the evening hours from 6 PM to 9 PM compared with the five-hour peak period from 4 PM to 9 PM in Rate 1. Rate 2 has a partial peak period from 4 PM to 6 PM and from 9 PM to 10 PM. Finally, on weekends, the same three rate periods as on weekdays are in effect with Rate 2, whereas for Rate 1, all weekend hours are charged at the off-peak, weekday price. Rate 2 peak-period prices above the baseline usage amount are about 2.5 ¢/kWh higher than Rate 1 peak period prices and the off-peak price for Rate 2 is roughly 2.0 ¢/kWh lower. The shoulder period price for Rate 2 is 38.3 ¢/kWh.

Figure 3.3-5 shows the absolute load impacts for the weekday peak period for Rate 2 for PG&E's service territory as a whole and for each climate region. From a policy perspective, it is important to note that there are statistically significant and materially significant load reductions in the Rate 2 peak period, which coincides completely with evening hours from 6 PM to 9 PM. The pattern of load reductions across climate regions is similar between Rates 1 and 2, but the impacts are slightly smaller for Rate 2. The average weekday peak-period load reduction for Rate 2 equals 3.8% and 0.04 kW, while for Rate 1 they are 5.3% and 0.06 kW. The estimated impact in the hot region is 3.9% or 0.06 kW. In the moderate climate region, the percent reduction in the peak period on weekdays for Rate 2, 4.8%, is smaller than the 6.5% reduction for Rate 1, but the difference is not statistically significant in percentage or absolute terms. The difference in peak-period impacts between the moderate and hot climate regions is not

statistically significant, but the difference between the moderate and cool climate regions is, in percentage and absolute terms.

Table 3.3-5 contains load impact estimates for each rate period and day type for Rate 2. Importantly, peak-period load reductions are similar on weekends and weekdays, and larger on monthly system peak days. None of the day types show statistically significant decreases in daily usage for Rate 2, which is different from Rate 1.

Figure 3.3-5: Average Load Impacts for Peak Period for PG&E Rate 2[28] (Positive values represent load reductions)



[28] PG&E Rate 2 winter impacts represent October 2016 through May 2017.

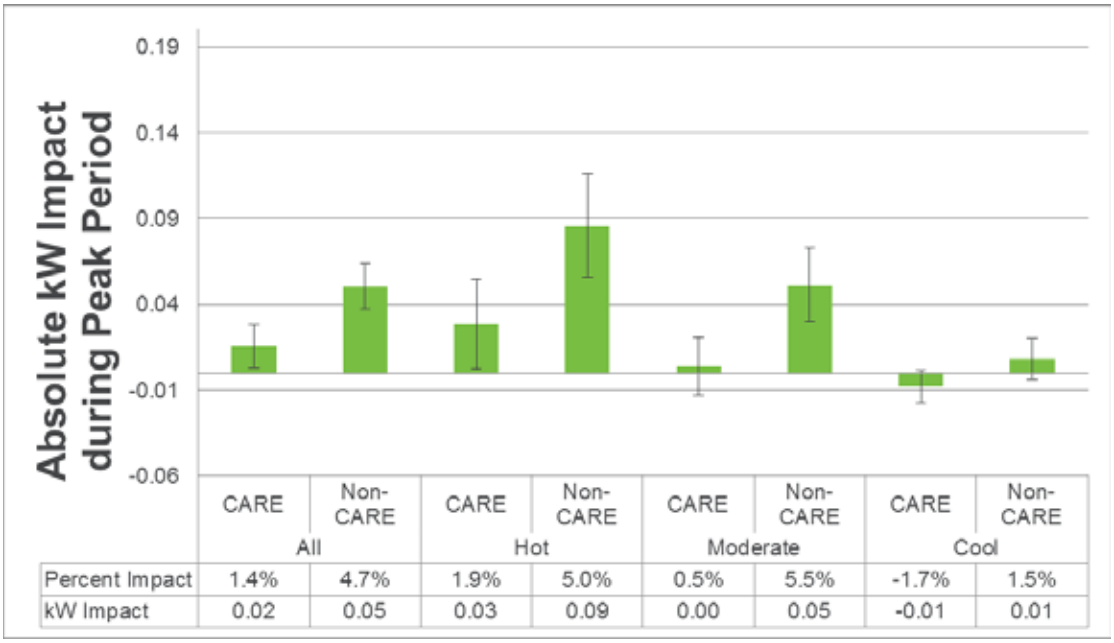
Table 3.3-5: Rate 2 Load Impacts by Rate Period and Day Type*
(Positive values represent load reductions, negative values represent load increases)

Rate 2														
Day Type	Period	Hours	All			Hot			Moderate			Cool		
			Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact
Average Weekday	Peak	6 PM to 9 PM	1.09	0.04	3.8%	1.62	0.06	3.9%	0.90	0.04	4.8%	0.52	0.00	0.9%
	Partial Peak	4 PM to 6 PM, 9 PM to 10 PM	1.04	0.03	2.5%	1.59	0.05	3.3%	0.85	0.02	2.3%	0.46	-0.01	-1.3%
	Off Peak	12 AM to 4 PM, 10 PM to 12 AM	0.61	-0.01	-1.8%	0.85	-0.01	-1.7%	0.53	-0.01	-1.8%	0.34	-0.01	-2.2%
	Day	**All Hours**	**0.72**	**0.00**	**0.0%**	**1.04**	**0.00**	**0.3%**	**0.61**	**0.00**	**0.1%**	**0.38**	**-0.01**	**-1.5%**
Average Weekend	Peak	6 PM to 9 PM	1.16	0.04	3.5%	1.72	0.07	4.2%	0.99	0.03	2.9%	0.53	0.01	1.5%
	Partial Peak	4 PM to 6 PM, 9 PM to 10 PM	1.14	0.03	2.4%	1.72	0.05	2.9%	0.97	0.02	2.3%	0.48	0.00	-0.2%
	Off Peak	12 AM to 4 PM, 10 PM to 12 AM	0.68	-0.01	-1.4%	0.95	-0.01	-1.3%	0.59	-0.01	-1.2%	0.36	-0.01	-2.5%
	Day	**All Hours**	**0.79**	**0.00**	**0.2%**	**1.14**	**0.01**	**0.5%**	**0.69**	**0.00**	**0.2%**	**0.40**	**-0.01**	**-1.5%**
Monthly System Peak Day	Peak	6 PM to 9 PM	1.58	0.09	5.5%	2.41	0.12	4.9%	1.41	0.11	7.8%	0.54	0.01	1.4%
	Partial Peak	4 PM to 6 PM, 9 PM to 10 PM	1.55	0.05	3.3%	2.38	0.10	4.3%	1.39	0.05	3.4%	0.49	-0.02	-4.6%
	Off Peak	12 AM to 4 PM, 10 PM to 12 AM	0.82	-0.03	-3.2%	1.22	-0.04	-3.3%	0.71	-0.02	-2.5%	0.35	-0.02	-4.6%
	Day	**All Hours**	**1.01**	**0.00**	**-0.2%**	**1.51**	**0.00**	**-0.2%**	**0.88**	**0.01**	**0.7%**	**0.39**	**-0.01**	**-3.5%**

* A shaded cell indicates estimate is not statistically significant

Figure 3.3-6 shows the estimated peak period load impacts for Rate 2 for CARE/FERA and non-CARE/FERA households for the service territory as a whole and for each climate region. Unlike Rate 1, several segments did not have statistically significant load reductions during the peak period, including CARE/FERA customers in the cool and moderate climate regions and non-CARE/FERA customers in the cool climate region. Non-CARE/FERA customers had the greatest load impacts, equal to 5.0% or 0.09 kW. For the service territory as a whole, CARE/FERA customers had rather small but statistically significant load impacts equal to 1.4% or 0.02 kW. For all climate regions and for the service territory as a whole, non-CARE/FERA customers had greater load impacts than CARE/FERA customers.

Figure 3.3-6: Average Load Impacts for Peak Period for PG&E Rate 2 for CARE/FERA and Non-CARE/FERA Customers (Positive values represent load reductions)



	All		Hot		Moderate		Cool	
	CARE	Non-CARE	CARE	Non-CARE	CARE	Non-CARE	CARE	Non-CARE
Percent Impact	1.4%	4.7%	1.9%	5.0%	0.5%	5.5%	-1.7%	1.5%
kW Impact	0.02	0.05	0.03	0.09	0.00	0.05	-0.01	0.01

Table 3.3-6 and Table 3.3-7 show the load impacts for non-CARE/FERA and CARE/FERA customers, respectively, for each rate period and day-type. As a reminder, the values in the first row of each table are the same as those found in Figure 3.3-6. CARE/FERA customers had small but statistically significant daily load increases on the average weekday in all climate regions and in the territory as a whole. Non-CARE/FERA customers had statistically significant daily load reductions on weekdays and weekends for the territory as a whole and the hot climate region, but not in the moderate or cool regions.

Table 3.3-6: Rate 2 Load Impacts by Rate Period and Day Type – Non-CARE/FERA Customers*
(Positive values represent load reductions, negative values represent load increases)

Rate 2														
Day Type	Period	Hours	All, Non-CARE			Hot, Non-CARE			Moderate, Non-CARE			Cool, Non-CARE		
			Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact
Average Weekday	Peak	6 PM to 9 PM	1.08	0.05	4.7%	1.71	0.09	5.0%	0.94	0.05	5.5%	0.53	0.01	1.5%
	Partial Peak	4 PM to 6 PM, 9 PM to 10 PM	1.02	0.03	3.3%	1.65	0.08	4.8%	0.88	0.02	2.6%	0.47	0.00	-1.1%
	Off Peak	12 AM to 4 PM, 10 PM to 12 AM	0.60	-0.01	-1.2%	0.88	-0.01	-0.6%	0.54	-0.01	-1.8%	0.35	-0.01	-1.7%
	Day	**All Hours**	**0.72**	**0.01**	**0.7%**	**1.08**	**0.02**	**1.5%**	**0.64**	**0.00**	**0.3%**	**0.39**	**0.00**	**-1.1%**
Average Weekend	Peak	6 PM to 9 PM	1.17	0.05	4.4%	1.84	0.11	5.8%	1.04	0.03	3.0%	0.55	0.01	2.4%
	Partial Peak	4 PM to 6 PM, 9 PM to 10 PM	1.15	0.04	3.7%	1.83	0.09	5.1%	1.02	0.03	2.6%	0.50	0.00	0.8%
	Off Peak	12 AM to 4 PM, 10 PM to 12 AM	0.67	-0.01	-0.8%	0.99	0.00	-0.2%	0.61	-0.01	-1.0%	0.38	-0.01	-2.0%
	Day	**All Hours**	**0.79**	**0.01**	**1.0%**	**1.20**	**0.02**	**2.0%**	**0.72**	**0.00**	**0.4%**	**0.41**	**0.00**	**-0.9%**
Monthly System Peak Day	Peak	6 PM to 9 PM	1.62	0.11	7.0%	2.62	0.16	6.2%	1.51	0.14	9.1%	0.56	0.01	2.1%
	Partial Peak	4 PM to 6 PM, 9 PM to 10 PM	1.57	0.06	4.1%	2.58	0.15	5.7%	1.47	0.06	4.0%	0.50	-0.03	-5.4%
	Off Peak	12 AM to 4 PM, 10 PM to 12 AM	0.82	-0.02	-2.9%	1.29	-0.04	-2.9%	0.74	-0.02	-2.3%	0.36	-0.02	-4.6%
	Day	**All Hours**	**1.01**	**0.00**	**0.4%**	**1.62**	**0.01**	**0.7%**	**0.93**	**0.01**	**1.3%**	**0.40**	**-0.01**	**-3.6%**

* A shaded cell indicates estimate is not statistically significant

Table 3.3-7: Rate 2 Load Impacts by Rate Period and Day Type – CARE/FERA Customers*
(Positive values represent load reductions, negative values represent load increases)

Rate 2														
Day Type	Period	Hours	All, CARE			Hot, CARE			Moderate, CARE			Cool, CARE		
			Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact
Average Weekday	Peak	6 PM to 9 PM	1.10	0.02	1.4%	1.48	0.03	1.9%	0.71	0.00	0.5%	0.46	-0.01	-1.7%
	Partial Peak	4 PM to 6 PM, 9 PM to 10 PM	1.09	0.00	0.3%	1.49	0.01	0.6%	0.69	0.00	0.1%	0.42	-0.01	-2.4%
	Off Peak	12 AM to 4 PM, 10 PM to 12 AM	0.62	-0.02	-3.4%	0.80	-0.03	-3.6%	0.45	-0.01	-1.9%	0.30	-0.01	-4.0%
	Day	**All Hours**	**0.74**	**-0.01**	**-1.8%**	**0.97**	**-0.02**	**-1.7%**	**0.51**	**-0.01**	**-1.1%**	**0.34**	**-0.01**	**-3.3%**
Average Weekend	Peak	6 PM to 9 PM	1.14	0.01	1.1%	1.53	0.02	1.2%	0.74	0.02	2.5%	0.45	-0.01	-2.7%
	Partial Peak	4 PM to 6 PM, 9 PM to 10 PM	1.14	-0.01	-1.0%	1.56	-0.02	-1.0%	0.73	0.00	0.7%	0.42	-0.02	-4.2%
	Off Peak	12 AM to 4 PM, 10 PM to 12 AM	0.68	-0.02	-3.3%	0.89	-0.03	-3.3%	0.49	-0.01	-2.3%	0.32	-0.01	-4.4%
	Day	**All Hours**	**0.80**	**-0.02**	**-2.1%**	**1.05**	**-0.02**	**-2.1%**	**0.55**	**-0.01**	**-1.0%**	**0.35**	**-0.01**	**-4.1%**
Monthly System Peak Day	Peak	6 PM to 9 PM	1.50	0.02	1.3%	2.08	0.04	2.2%	0.97	-0.02	-2.1%	0.47	-0.01	-1.6%
	Partial Peak	4 PM to 6 PM, 9 PM to 10 PM	1.49	0.02	1.1%	2.08	0.03	1.6%	0.96	-0.01	-0.5%	0.43	-0.01	-1.2%
	Off Peak	12 AM to 4 PM, 10 PM to 12 AM	0.82	-0.03	-4.0%	1.11	-0.04	-4.0%	0.55	-0.02	-4.0%	0.31	-0.01	-4.3%
	Day	**All Hours**	**0.99**	**-0.02**	**-2.1%**	**1.35**	**-0.02**	**-1.7%**	**0.66**	**-0.02**	**-3.0%**	**0.35**	**-0.01**	**-3.4%**

* A shaded cell indicates estimate is not statistically significant

3.3.3 Rate 3

PG&E's Rate 3 is structurally identical to Rate 1 in the summer (and winter) periods, with a peak period from 4 PM to 9 PM on weekdays and off-peak prices in effect for all hours on the weekends. In spring, Rate 3 has a super off-peak price in effect from 10 AM to 4 PM on weekdays to encourage increased electricity use during a time when high levels of hydroelectric generation combined with below average electricity use create minimum load issues for the CAISO. In summer, the peak-period price is significantly higher for Rate 3 than for Rate 1 (57.2 ¢/kWh for Rate 3 compared with 42.0 ¢/kWh for Rate 1), and the off-peak price is lower (28.6 ¢/kWh versus 31.7 ¢/kWh).

Figure 3.3-7 shows the peak period load reductions on average weekdays for Rate 3. Once again, the overall load reduction and the pattern in the load reductions across climate regions are very similar to Rates 1 and 2. The differences in absolute and percent load impacts across climate regions are all statistically significant, with customers in the hot climate region producing the greatest load impacts, 6.9% or 0.11 kW. Customers in the cool climate region had load impacts that were just barely statistically significant, at 1.3% or 0.01 kW.

Figure 3.3-7: Average Load Impacts for Peak Period for PG&E Rate 3[29]
(Positive values represent load reductions)

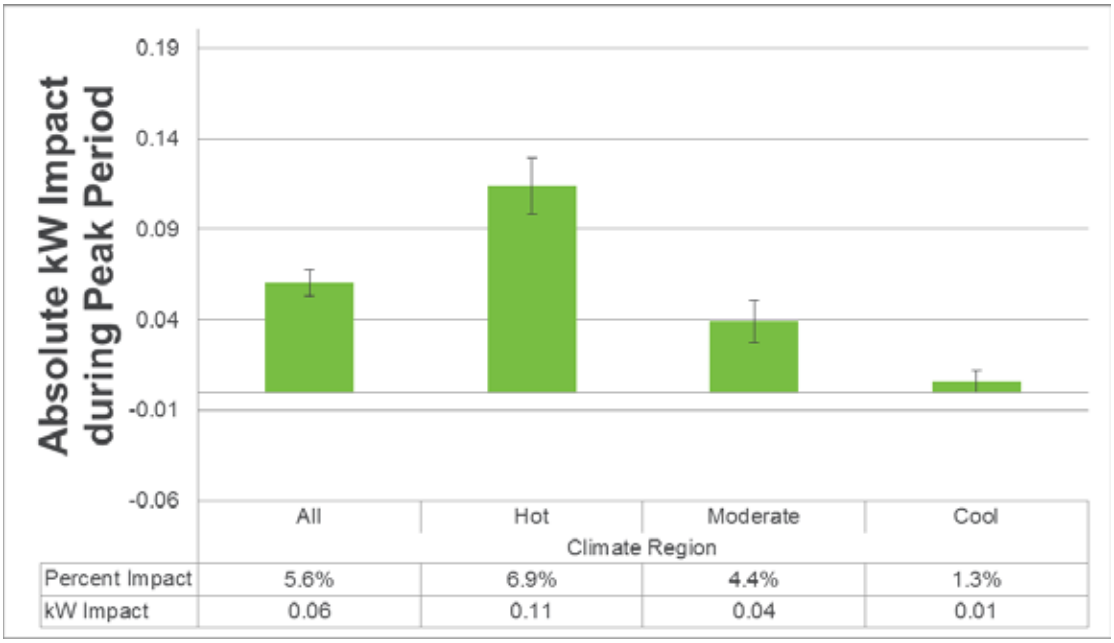


Table 3.3-8 contains estimates of load impacts for all relevant rate periods and day types. On weekdays, customers in the hot climate region and the territory as a whole reduced their average weekday usage by 4.0% and 2.2%, respectively. Customers in the moderate climate region did not have statistically significant weekday usage reductions. On weekends, customers in PG&E's service territory reduced their overall consumption by 2.1% or 0.02 kW.

[29] PG&E Rate 3 winter impacts represent October 2016 through February 2017.

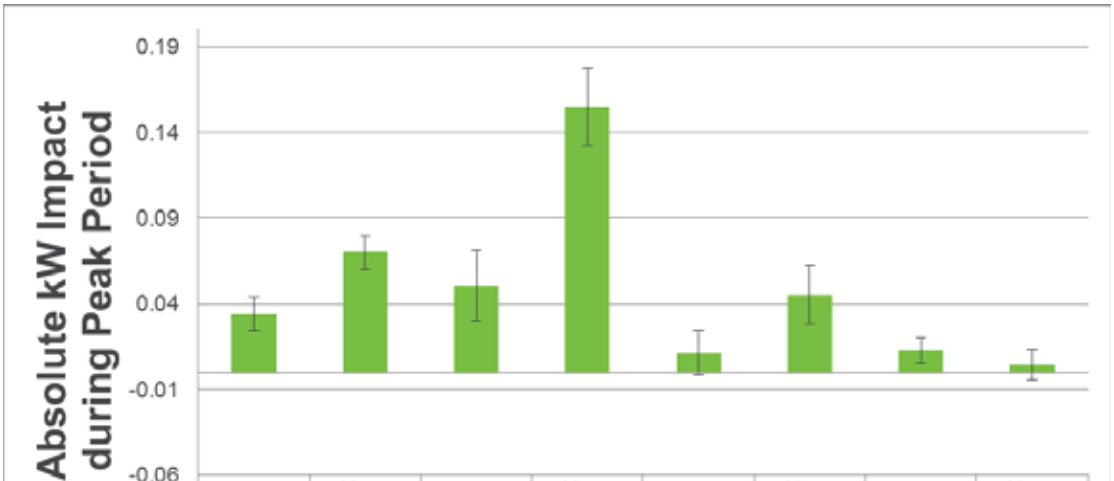
Table 3.3-8: Rate 3 Load Impacts by Rate Period and Day Type*
(Positive values represent load reductions, negative values represent load increases)

Rate 3														
Day Type	Period	Hours	All			Hot			Moderate			Cool		
			Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact
Average Weekday	Peak	4 PM to 9 PM	1.09	0.06	5.6%	1.66	0.11	6.9%	0.88	0.04	4.4%	0.48	0.01	1.3%
	Off Peak	12 AM to 4 PM, 9 PM to 12 AM	0.63	0.00	0.7%	0.88	0.02	2.6%	0.54	-0.01	-1.2%	0.35	-0.01	-2.6%
	Day	**All Hours**	**0.72**	**0.02**	**2.2%**	**1.04**	**0.04**	**4.0%**	**0.61**	**0.00**	**0.5%**	**0.38**	**-0.01**	**-1.6%**
Average Weekend	Off Peak	All Hours	0.79	0.02	2.1%	1.14	0.04	3.2%	0.69	0.01	1.8%	0.40	-0.01	-2.0%
	Day	**All Hours**	**0.79**	**0.02**	**2.1%**	**1.14**	**0.04**	**3.2%**	**0.69**	**0.01**	**1.8%**	**0.40**	**-0.01**	**-2.0%**
Monthly System Peak Day	Peak	4 PM to 9 PM	1.61	0.09	5.4%	2.48	0.12	4.9%	1.44	0.11	7.6%	0.50	0.00	0.6%
	Off Peak	12 AM to 4 PM, 9 PM to 12 AM	0.85	0.00	-0.2%	1.26	0.00	0.2%	0.73	0.00	0.4%	0.36	-0.01	-3.6%
	Day	**All Hours**	**1.01**	**0.02**	**1.7%**	**1.51**	**0.03**	**1.8%**	**0.88**	**0.03**	**2.9%**	**0.39**	**-0.01**	**-2.5%**

* A shaded cell indicates estimate is not statistically significant

Figure 3.3-8 shows the peak period load reductions on weekdays for non-CARE/FERA and CARE/FERA customers and Figure 3.3-9 and Figure 3.3-10 show the load impacts for each rate period and day type for the two segments. As seen in the figures, there are large and statistically significant differences in peak period load reductions between CARE/FERA and non-CARE/FERA customers in the service territory as a whole and in the hot and moderate regions. Except for in the cool climate region, non-CARE/FERA customers had greater load impacts than CARE/FERA customers.

Figure 3.3-8: Average Load Impacts for Peak Period for PG&E Rate 3 for CARE/FERA and Non-CARE/FERA Customers (Positive values represent load reductions)



	All		Hot		Moderate		Cool	
	CARE	Non-CARE	CARE	Non-CARE	CARE	Non-CARE	CARE	Non-CARE
Percent Impact	3.0%	6.5%	3.3%	8.9%	1.6%	4.9%	2.9%	0.9%
kW Impact	0.03	0.07	0.05	0.15	0.01	0.05	0.01	0.00

As seen in Table 3.3-9 and Table 3.3-10 there are also significant differences in the load impacts between CARE/FERA and non-CARE/FERA customers for other rate periods and day types. While CARE/FERA customers generally did not reduce their daily electricity use, non-CARE/FERA customers did in the hot climate zone and in the PG&E territory as a whole – both on weekdays and weekends.

Table 3.3-9: Rate 3 Load Impacts by Rate Period and Day Type – Non-CARE/FERA*
(Positive values represent load reductions, negative values represent load increases)

Rate 3														
Day Type	Period	Hours	All, Non-CARE			Hot, Non-CARE			Moderate, Non-CARE			Cool, Non-CARE		
			Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact
Average Weekday	Peak	4 PM to 9 PM	1.07	0.07	6.5%	1.74	0.15	8.9%	0.92	0.05	4.9%	0.49	0.00	0.9%
	Off Peak	12 AM to 4 PM, 9 PM to 12 AM	0.62	0.01	1.4%	0.91	0.04	4.9%	0.56	-0.01	-1.2%	0.36	-0.01	-3.1%
	Day	**All Hours**	**0.72**	**0.02**	**3.0%**	**1.08**	**0.07**	**6.3%**	**0.64**	**0.00**	**0.6%**	**0.39**	**-0.01**	**-2.1%**
Average Weekend	Off Peak	All Hours	0.79	0.02	3.1%	1.20	0.06	5.3%	0.72	0.01	2.1%	0.41	-0.01	-2.4%
	Day	**All Hours**	**0.79**	**0.02**	**3.1%**	**1.20**	**0.06**	**5.3%**	**0.72**	**0.01**	**2.1%**	**0.41**	**-0.01**	**-2.4%**
Monthly System Peak Day	Peak	4 PM to 9 PM	1.64	0.11	6.4%	2.70	0.17	6.3%	1.53	0.12	8.1%	0.52	0.00	0.3%
	Off Peak	12 AM to 4 PM, 9 PM to 12 AM	0.85	0.01	0.8%	1.33	0.03	2.1%	0.77	0.00	0.6%	0.37	-0.01	-4.0%
	Day	**All Hours**	**1.01**	**0.03**	**2.7%**	**1.62**	**0.06**	**3.5%**	**0.93**	**0.03**	**3.2%**	**0.40**	**-0.01**	**-2.9%**

* A shaded cell indicates estimate is not statistically significant

Table 3.3-10: Rate 3 Load Impacts by Rate Period and Day Type – CARE/FERA*
(Positive values represent load reductions, negative values represent load increases)

Rate 3														
Day Type	Period	Hours	All, CARE			Hot, CARE			Moderate, CARE			Cool, CARE		
			Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact
Average Weekday	Peak	4 PM to 9 PM	1.12	0.03	3.0%	1.53	0.05	3.3%	0.70	0.01	1.6%	0.44	0.01	2.9%
	Off Peak	12 AM to 4 PM, 9 PM to 12 AM	0.64	-0.01	-1.1%	0.83	-0.01	-1.2%	0.46	0.00	-1.0%	0.31	0.00	-0.5%
	Day	**All Hours**	**0.74**	**0.00**	**0.2%**	**0.97**	**0.00**	**0.2%**	**0.51**	**0.00**	**-0.3%**	**0.34**	**0.00**	**0.4%**
Average Weekend	Off Peak	All Hours	0.80	0.00	-0.5%	1.05	-0.01	-0.6%	0.55	0.00	0.1%	0.35	0.00	-0.4%
	Day	**All Hours**	**0.80**	**0.00**	**-0.5%**	**1.05**	**-0.01**	**-0.6%**	**0.55**	**0.00**	**0.1%**	**0.35**	**0.00**	**-0.4%**
Monthly System Peak Day	Peak	4 PM to 9 PM	1.54	0.04	2.5%	2.14	0.05	2.2%	0.98	0.04	4.4%	0.44	0.01	2.3%
	Off Peak	12 AM to 4 PM, 9 PM to 12 AM	0.85	-0.02	-2.9%	1.15	-0.04	-3.3%	0.57	-0.01	-1.0%	0.32	-0.01	-1.9%
	Day	**All Hours**	**0.99**	**-0.01**	**-1.1%**	**1.35**	**-0.02**	**-1.5%**	**0.66**	**0.00**	**0.7%**	**0.35**	**0.00**	**-0.8%**

* A shaded cell indicates estimate is not statistically significant

3.3.4 Comparison Across Rates

Figure 3.3-9 compares the load impacts for the three rates tested by PG&E for the common set of peak-period hours, 6 PM to 9 PM, shared by all three tariffs. Using a common set of hours reduces differences in impacts across rates that might be due to differences in the number of hours included in the peak period or the timing of those hours. The hours from 6 PM to 9 PM define the peak period for Rate 2, which is a three-period rate with a shoulder period from 4 PM to 6 PM and 9 PM to 10 PM. Rates 1 and 3 are two-period rates with the same peak period, from 4 PM to 9 PM. Rate three has a higher peak to off-peak price ratio than Rate 1. As such, one would expect the peak-period load reductions to be higher for Rate 3 than for Rate 1. The peak to off-peak price ratio for Rate 2 is in between the other two but the partial peak period and the shorter peak period makes it difficult to predict whether the load reductions might be greater or less than for the other rates.

As seen in Figure 3.3-9, there are generally no statistically significant differences in load impacts for the common hours from 6 PM to 9 PM across the three rates in absolute terms for the service territory as a whole or in any climate region. Figure 3.3-10 shows the average daily kWh impact for each rate. The reduction in daily usage differs between Rate 2 and the other two rates for the service territory as a whole as well as in the hot climate region. This could be attributable to the shorter peak period on Rate 2, which makes it easier to shift loads from the peak to the off-peak period. It also means that the same percent reduction in peak period load for all three rates would produce a smaller overall conservation effect in Rate 2 compared to the other two rates because there are fewer hours in the Rate 2 peak period. Daily impacts also vary across rates in the cool climate region but the differences are not statistically significant.

Figure 3.3-9: Average Impacts from 6 PM to 9 PM Across Rates

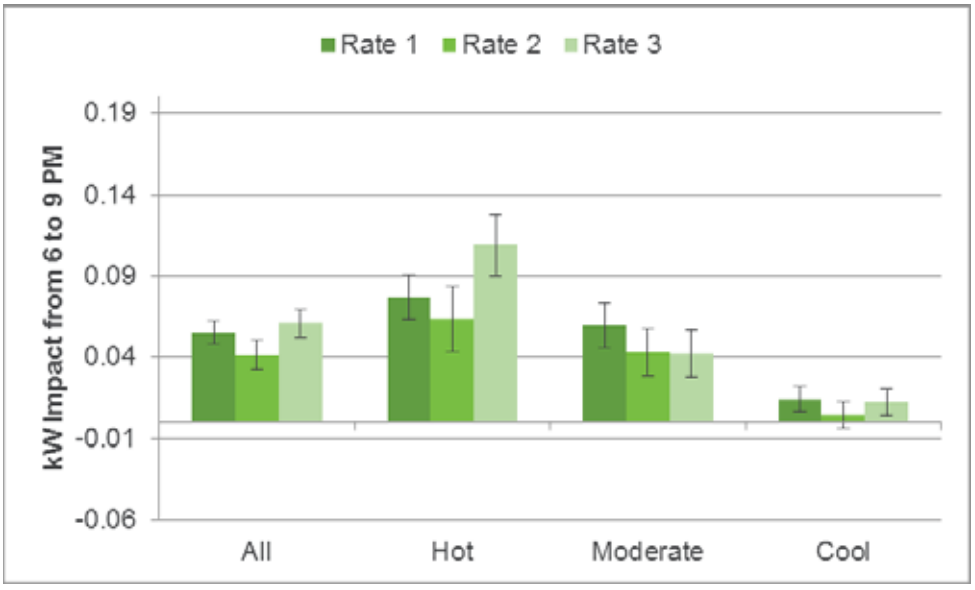
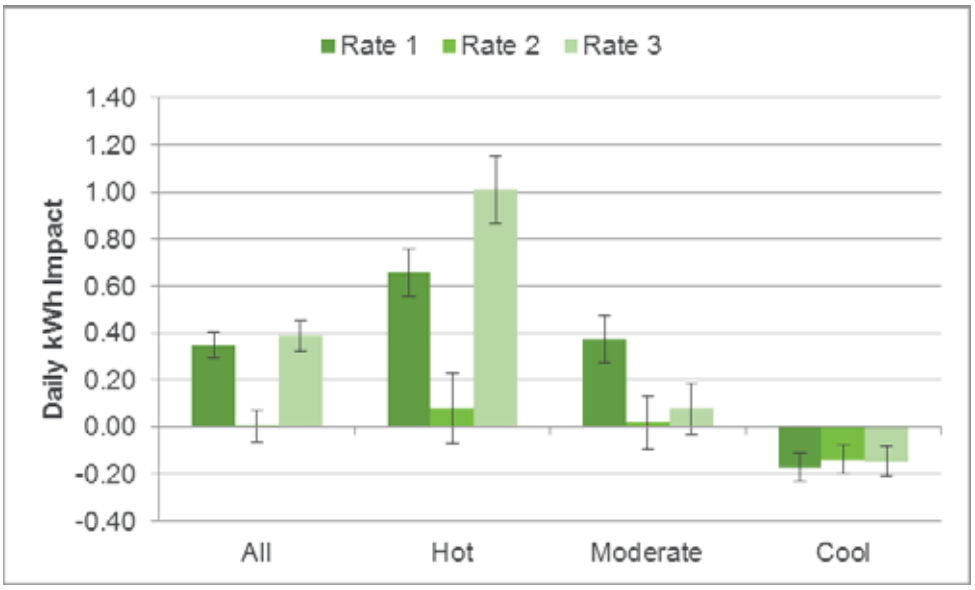


Figure 3.3-10: Average Daily kWh Impacts Across Rates



3.4 Persistence Analysis

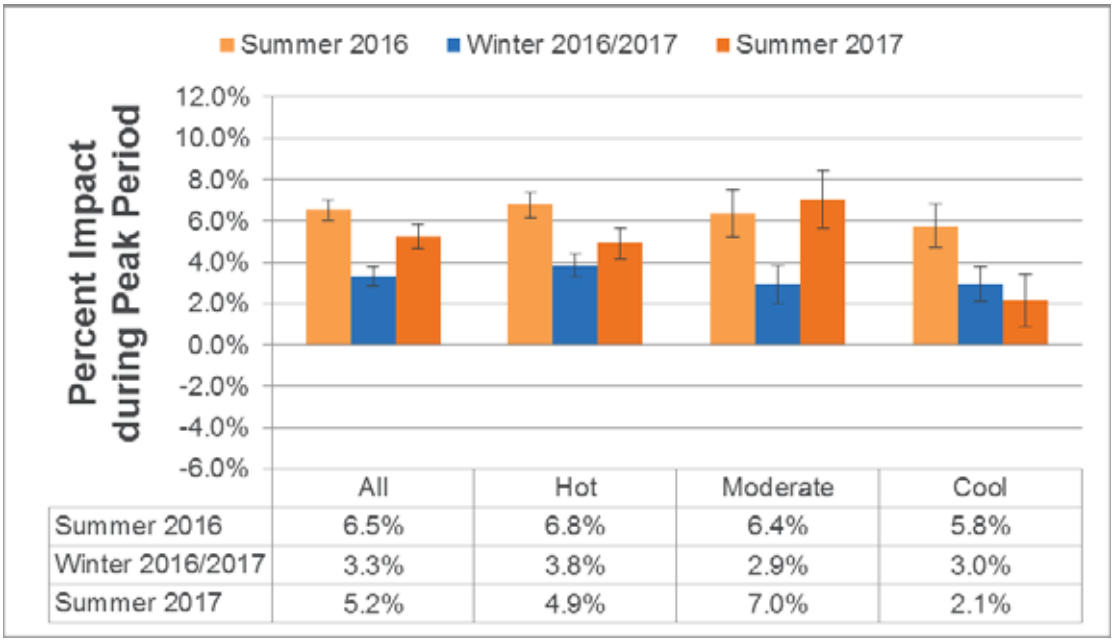
This section examines the persistence of load impacts over the course of the pilot. Most relevant is whether load impacts in summer 2017 are greater, smaller or about the same as load impacts in 2016. When analyzing persistence, it is important to compare load impacts for the same group of customers over time. A comparison of load impacts for customers enrolled in 2016 with those enrolled in 2017 is not a valid estimate of persistence since any observed difference might be due in large part to changes in the participant population rather than changes in behavior of customers that participated in both summer periods. As such, load impacts presented in this section pertain to the population of customers that remained enrolled over the entire period starting in July 2016 through the end of September 2017. Because not all customers were enrolled until the end of June 2016, the summer load impacts reported here represent the months of July through September in each year. While there is not a second winter for persistence comparison, the winter and spring impacts for the subset of customers who were enrolled for the full duration of the pilot are included with the two summer impacts to illustrate the relative differences in impacts between the summer and winter seasons for a common set of customers. Winter and spring impacts presented in this section match the rate-specific winter and spring months described in Section 3.1.

3.4.1 Rate 1

Figure 3.4-1 shows percent impacts for the peak period for customers on Rate 1, for the territory as a whole and for each climate region. As seen, for the same group of customers, load impacts in winter were roughly half of what they were in summer 2016. Comparing load impacts across the two summer periods, for the territory as a whole, summer impacts fell from 6.5% in the first summer to 5.2% in the second summer, and the difference is statistically significant. Load impacts also fell by roughly the same percentage in the hot climate region and by a much greater percentage in the cool climate region,

where 2017 load impacts were only about 35% as much as the 2016 load impacts for the same group of customers. In contrast, load impacts in the moderate climate region were very similar across the two summer periods. Indeed, load impacts appear to have increased a bit in the second summer although the difference in load impacts for the two summers is not statistically significant.

Figure 3.4-1: Percent[30] Impacts for Peak Period for PG&E Rate 1, by Season (Positive values represent load reductions)



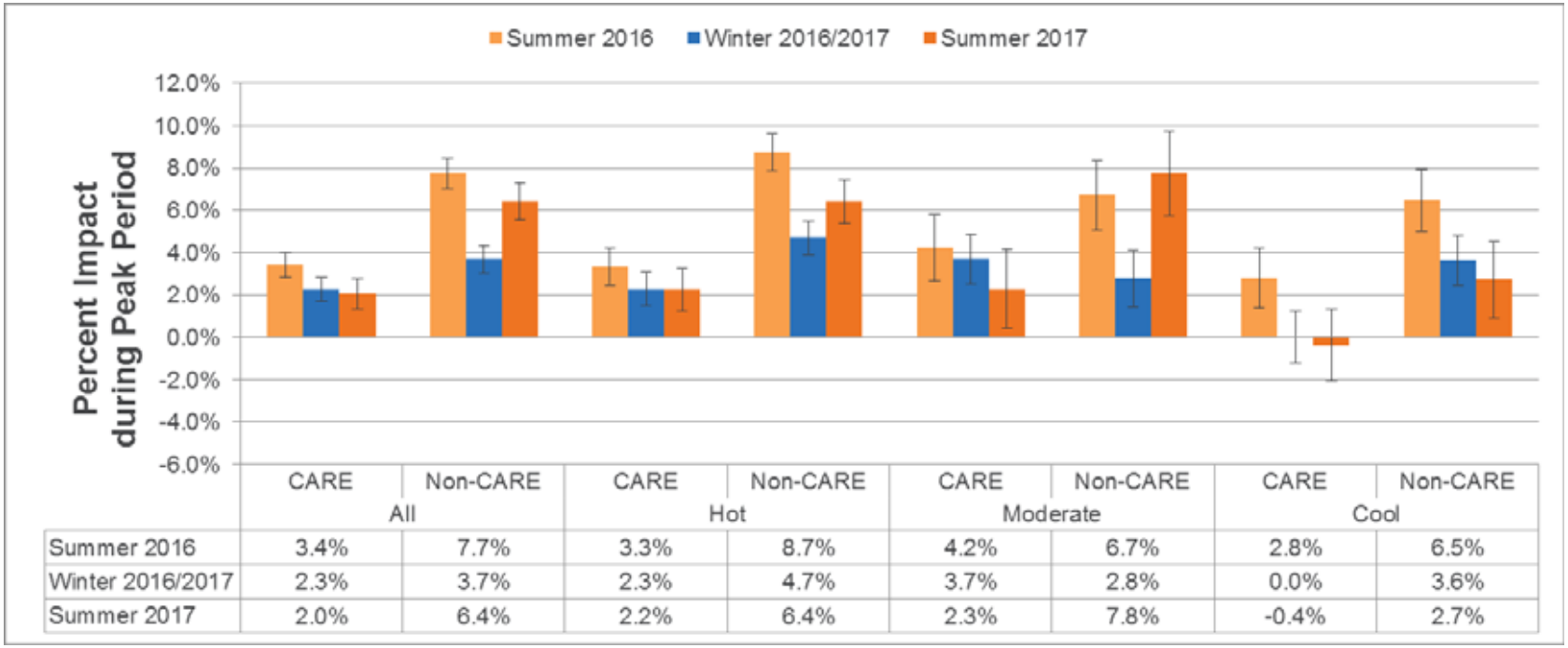
	All	Hot	Moderate	Cool
Summer 2016	6.5%	6.8%	6.4%	5.8%
Winter 2016/2017	3.3%	3.8%	2.9%	3.0%
Summer 2017	5.2%	4.9%	7.0%	2.1%

Figure 3.4-2 shows percent impacts by season for CARE/FERA and non-CARE/FERA customers on Rate 1. Summer impacts for CARE/FERA customers fell from 3.4% to 2.0% for the territory as a whole and this difference was statistically significant. In the hot and moderate climate regions, the difference in peak period load impacts across the two summers for CARE/FERA customers were not statistically significant, but in the cool climate region, the difference across summers was large and statistically significant for CARE/FERA customers.

For non-CARE/FERA customers on Rate 1 for the service territory as a whole, the difference in load impacts across summers was not statistically significant. However, the fall in percent impacts in the hot and cool climate regions were statistically significant, indicating that customers did not respond to TOU rates as well in the second summer.

[30] Percent load reductions rather than kW were evaluated for the persistence analysis to allow for comparison of impacts relative to the available load. For example: if the second summer were cooler than the first, the kW impacts may be lower due to less cooling load, but customers may still be responding similarly between summers given the available load to curtail. The percent impacts help to normalize for any level differences in usage between the summers.

Figure 3.4-2: Percent Impacts for Peak Period for PG&E Rate 1, by Season for CARE/FERA and Non-CARE/FERA Customers (Positive values represent load reductions)

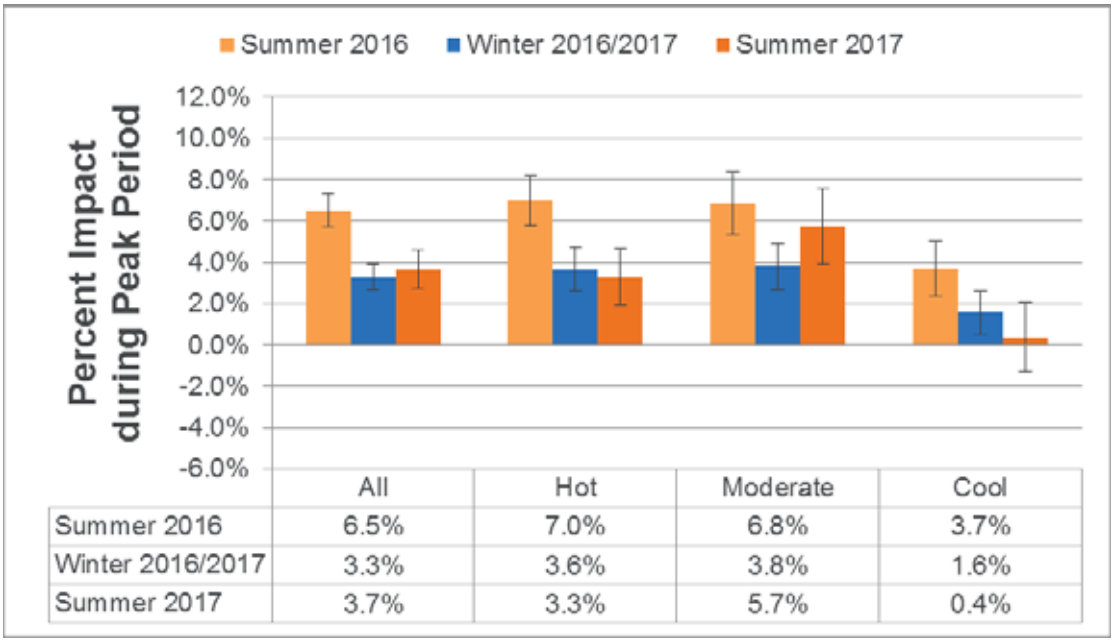


	All		Hot		Moderate		Cool	
	CARE	Non-CARE	CARE	Non-CARE	CARE	Non-CARE	CARE	Non-CARE
Summer 2016	3.4%	7.7%	3.3%	8.7%	4.2%	6.7%	2.8%	6.5%
Winter 2016/2017	2.3%	3.7%	2.3%	4.7%	3.7%	2.8%	0.0%	3.6%
Summer 2017	2.0%	6.4%	2.2%	6.4%	2.3%	7.8%	-0.4%	2.7%

3.4.2 Rate 2

Figure 3.4-3 shows peak percent impacts for customers on Rate 2 for each season of the pilot. Recall that the impacts presented here only include customers who were enrolled until September 2017- through the entire duration of the pilot. For the territory as a whole, load impacts fell from 6.5% to 3.7%, and the change was statistically significant. The hot and cool climate regions also had statistically significant reductions in peak impacts, about 4 and 3 percentage points, respectively. In fact, both climate regions had larger impacts in the winter months than in the summer of 2017. The cool climate region did not have statistically significant impacts in summer 2017, which could indicate that customers stopped responding to the rate. The moderate climate zone saw smaller summer 2017 impacts as well, but the reduction was not statistically significant.

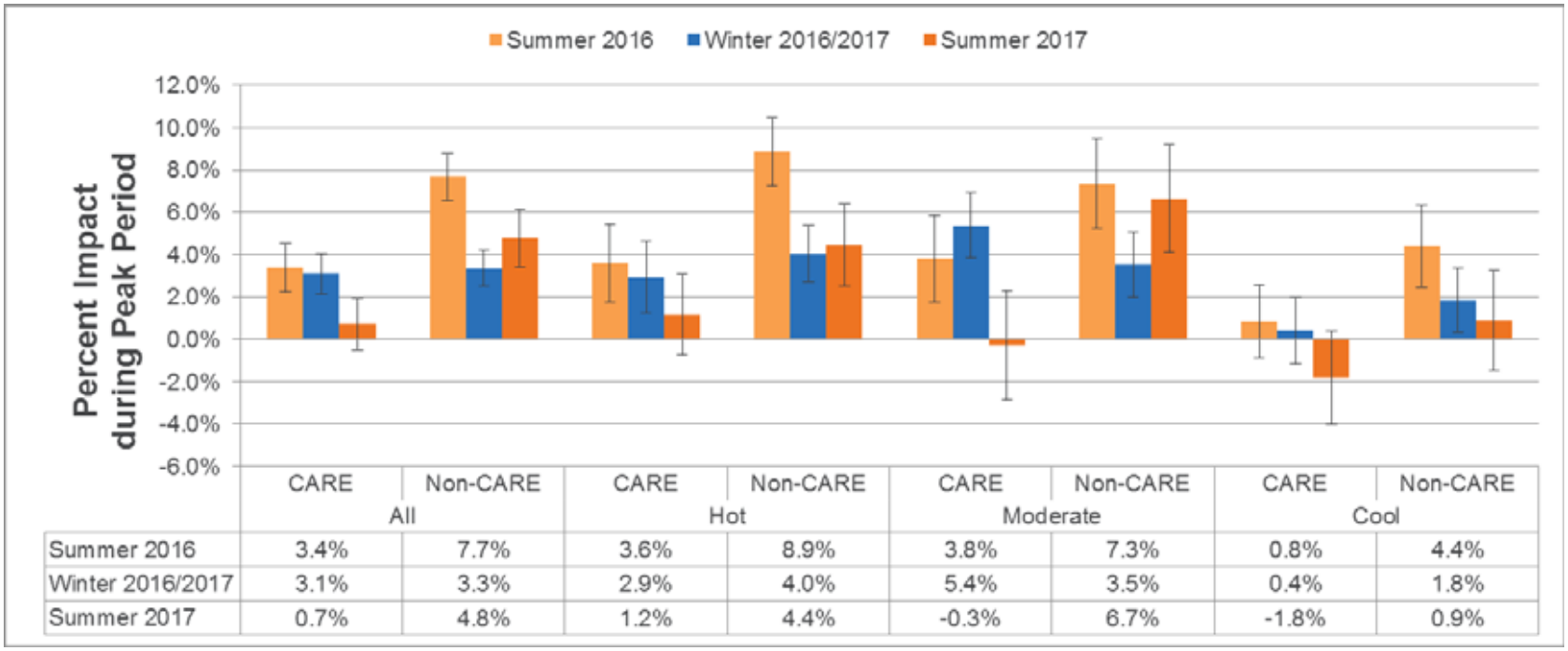
Figure 3.4-3: Percent Impacts for Peak Period for PG&E Rate 2, by Season (Positive values represent load reductions)



	All	Hot	Moderate	Cool
Summer 2016	6.5%	7.0%	6.8%	3.7%
Winter 2016/2017	3.3%	3.6%	3.8%	1.6%
Summer 2017	3.7%	3.3%	5.7%	0.4%

Figure 3.4-4 shows peak period impacts for CARE/FERA and non-CARE/FERA customers on Rate 2. For the territory as a whole and for each climate region, there were very dramatic decreases in load response by CARE/FERA customers across the two summer periods. Indeed, in the second summer, load impacts for CARE/FERA customers were not statistically significant in the service territory as a whole or in any of the climate regions, whereas load impacts were statistically significant for this customer segment in the hot and moderate regions and for the service territory as a whole in summer 2016. For whatever reason, CARE/FERA customers on Rate 2 changed their behavior significantly over the course of the pilot. There were also statistically significant differences in load impacts across the two summer periods for non-CARE/FERA customers for the service territory as a whole and in the hot climate region. The difference across summers was very small and not statistically significant in the moderate climate zone for non-CARE/FERA customers. Load impacts for this segment in the cool climate region were statistically significant in 2016 but not in 2017.

Figure 3.4-4: Percent Impacts for Peak Period for PG&E Rate 2, by Season for CARE/FERA and Non-CARE/FERA Customers (Positive values represent load reductions)



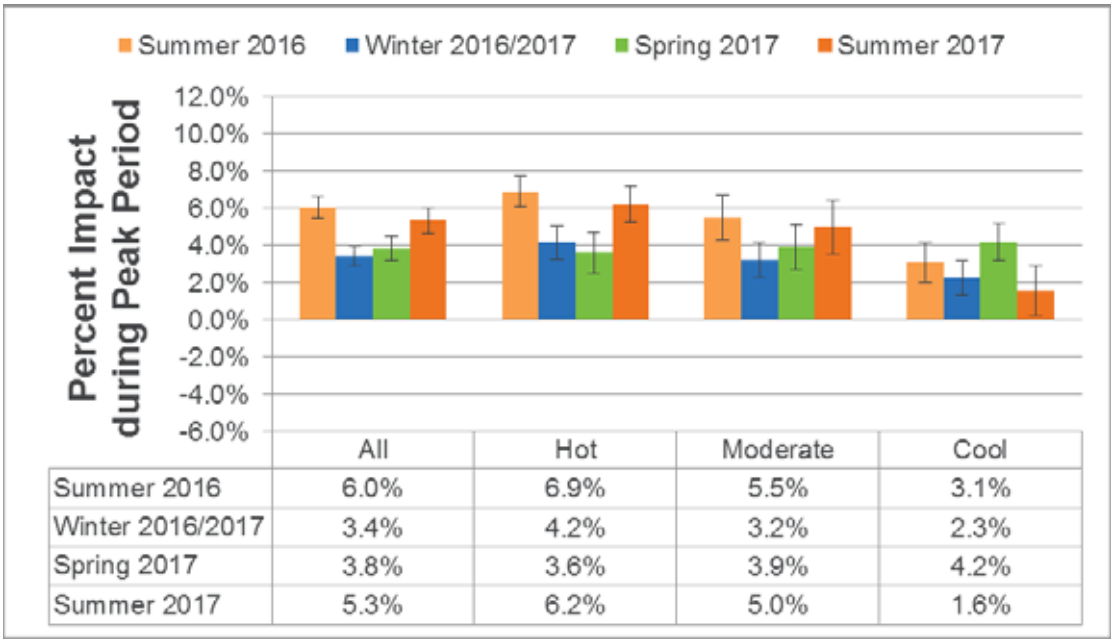
	All		Hot		Moderate		Cool	
	CARE	Non-CARE	CARE	Non-CARE	CARE	Non-CARE	CARE	Non-CARE
Summer 2016	3.4%	7.7%	3.6%	8.9%	3.8%	7.3%	0.8%	4.4%
Winter 2016/2017	3.1%	3.3%	2.9%	4.0%	5.4%	3.5%	0.4%	1.8%
Summer 2017	0.7%	4.8%	1.2%	4.4%	-0.3%	6.7%	-1.8%	0.9%

3.4.3 Rate 3

Figure 3.4-5 presents average percent impacts for customers on Rate 3 for each season in the pilot. Recall that unlike the previous two rates, PG&E's Rate 3 has three seasons: summer, winter, and spring. Compared to Rate 1 and Rate 2, the drop in peak impacts was small between summer 2016 and summer 2017, only 0.7 percentage points. This reduction was not statistically significant, nor was it statistically significant in the individual climate regions.

Customers on Rate 3 appeared to maintain meaningful load impacts in the second summer of the pilot, meaning they are still responding to the TOU rate even after a year. This finding is generally true even for CARE/FERA and non-CARE/FERA customers.

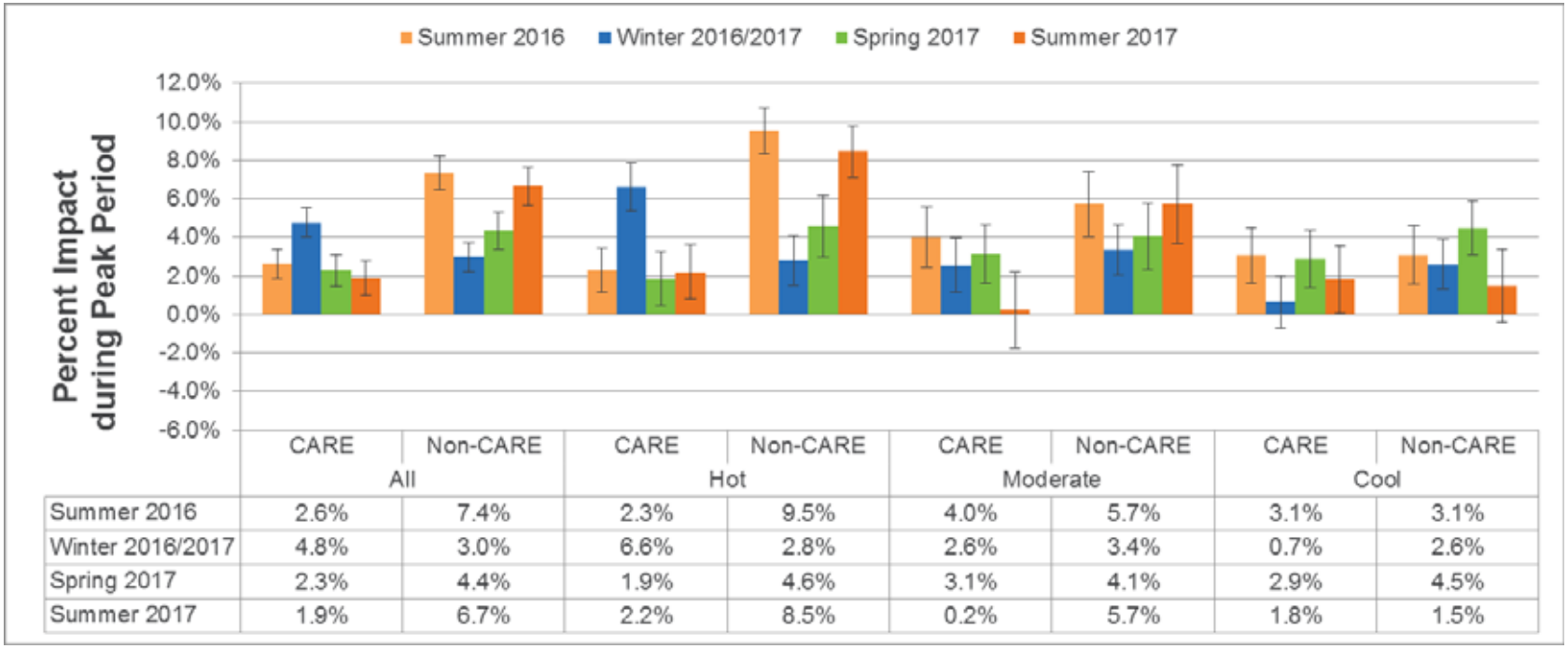
Figure 3.4-5: Percent Impacts for Peak Period for PG&E Rate 3, by Season (Positive values represent load reductions)



	All	Hot	Moderate	Cool
Summer 2016	6.0%	6.9%	5.5%	3.1%
Winter 2016/2017	3.4%	4.2%	3.2%	2.3%
Spring 2017	3.8%	3.6%	3.9%	4.2%
Summer 2017	5.3%	6.2%	5.0%	1.6%

Figure 3.4-6 presents peak period impacts for each time period for CARE/FERA and non-CARE/FERA customers on Rate 3. In the hot and cool climate regions and for the service territory as a whole, CARE/FERA customers showed greater impacts in the first summer of the pilot compared to the second – but the differences were not statistically significant. For example, customers in the hot climate zone had impacts equal to 2.3% in 2016 and 2.2% in 2017. Non-CARE/FERA customers maintained meaningful summer impacts in both years, except in the cool climate region where impacts were not statistically significant in summer 2017.

Figure 3.4-6: Percent Impacts for Peak Period for PG&E Rate 3, by Season for CARE/FERA and Non-CARE/FERA Customers (Positive values represent load reductions)



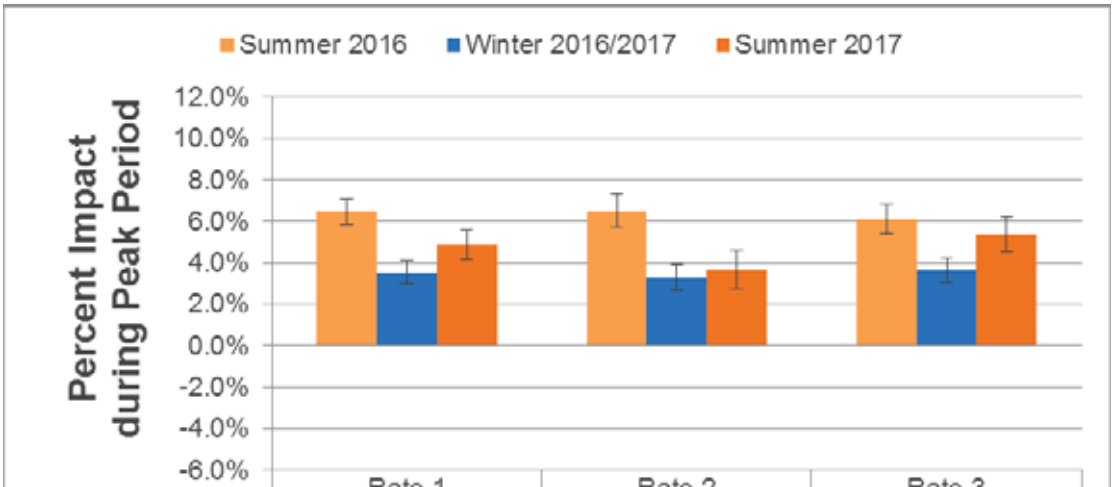
	All		Hot		Moderate		Cool	
	CARE	Non-CARE	CARE	Non-CARE	CARE	Non-CARE	CARE	Non-CARE
Summer 2016	2.6%	7.4%	2.3%	9.5%	4.0%	5.7%	3.1%	3.1%
Winter 2016/2017	4.8%	3.0%	6.6%	2.8%	2.6%	3.4%	0.7%	2.6%
Spring 2017	2.3%	4.4%	1.9%	4.6%	3.1%	4.1%	2.9%	4.5%
Summer 2017	1.9%	6.7%	2.2%	8.5%	0.2%	5.7%	1.8%	1.5%

3.4.4 Comparison Across Rates

Figure 3.4-7 compares the load impacts for the three rates tested by PG&E for the common set of peak-period hours from 6 PM to 9 PM for the summer months of July through September and the winter months of October through May.

All three rates had similar first summer impacts, when the program was relatively new. In the second summer, we see greater variation in load impact magnitude. This could be a result of customers better understanding how their bills change under the TOU rates, and responding (or not responding) to the price signal accordingly based on their experience with bills during the first summer. For all three rates, summer impacts decline slightly from 2016 to 2017, and the difference is statistically significant for Rate 1 and Rate 2. Winter impacts are smaller than summer impacts in every case.

Figure 3.4-7 Percent Impacts from 6 PM to 9 PM Across Rates, by Season



	Rate 1	Rate 2	Rate 3
Summer 2016	6.5%	6.5%	6.1%
Winter 2016/2017	3.5%	3.3%	3.6%
Summer 2017	4.9%	3.7%	5.4%

3.5 Synthesis for PG&E Pilot

This section compares input from the load impact and persistence analysis, the bill impact analysis, and the survey analysis. The objective of these comparisons, at least in part, is to determine if the information and conclusions observed for individual metrics are supported by findings from other metrics or, alternatively, findings for one metric contradict those for another metric. We also look for clues from the survey findings that might help explain why load or bill impacts for one rate differ from those for other rates. For example, if we find that the load impacts are significantly different across rates or across segments for a specific rate, we could turn to the survey questions concerning the level of understanding of rate features to see if there are significant differences in customer understanding of key rate features that might explain the observed differences across rates and/or customer segments.

When reviewing the synthesis tables and discussion below, it is important to keep in mind, as discussed in the interim reports, that the statistical analysis of survey questions is “over powered” That is, with the

very large sample sizes for each treatment and control group, combined with the high survey response rate, even very small differences in values across segments can be statistically significant. While any decision regarding whether a statistically significant difference is meaningful from a policy perspective is inherently subjective, it nevertheless is critical. For example, reporting that there is a statistically significant difference in the satisfaction rating of one rate compared to another and concluding or recommending that the rate with the lower satisfaction rating is inferior from a customer engagement perspective would be very misleading if, for example, the satisfaction rating for one was 6.2 and the other was 6.7 on an 11 point scale.

3.5.1 Synthesis

Table 3.5-1 through Table 3.5-3 summarize relevant findings from the load impact, persistence, bill impact and survey analysis. No additional bill impact analysis or surveys were completed for this report. Therefore, results from the first and second interim report were carried forward to this synthesis section in order to provide a more complete overview of the pilot. Before summarizing the results, we provide the following guide to the information in Table 3.5-1 as well as a map to prior tables and figures from which the information was taken for Rate 1, including those contained in the separate RIA Report. This way, readers can easily refer back to those more complete tables and figures.

In each cell in the tables, in addition to the reported values, there is either a colored triangle facing up or down, a (-), N/A, I/S or nothing at all. Cells containing N/A indicate that the specific segment was not included in the analysis, and cells containing I/S indicate the segment was analyzed but didn't have sufficient sample size to warrant reporting the results. If there is a colored triangle in the cell, it means the value in the cell is statistically significantly different relative to the control group. Green triangles symbolize a desirable outcome (e.g., peak period load reductions are good) and red triangles an undesirable outcome (e.g., peak period load increases are not good). If (-) appears, the value is not statistically significant and if there is no symbol at all (as in the column labeled "Understanding TOU Pricing (None Correct)", it means a comparison to the control group is not relevant (in this example, the control group was not on a TOU rate so couldn't respond to questions about rate periods, etc.). N/A indicates that a statistical significance test was not appropriate. The content of each column and guidance on where the values can be found elsewhere in this report or in prior reports is explained below:

- **Summer 2016 Peak Period Load Reduction:** The percent reduction in peak-period electricity use on average weekdays for the months of July through September 2016. Positive values mean customers reduced use and negative values mean customers increased use during the peak period relative to the control group (e.g., reference load). Reductions are desirable, and therefore indicated by a green triangle, and increases are undesirable, and represented by a red triangle. These values carried over from the First Interim Report.
- **Winter Peak Period Load Reduction:** The percent reduction in peak-period electricity use on average weekdays for the months of October 2016 through May 2017.[31] Positive values mean

[31] PG&E's Rate 3 has a spring period in addition to the summer and winter. Results presented in the synthesis tables reflect the winter period specific to Rate 3 (October 2016 through February 2017).

customers reduced use and negative values mean customers increased use during the peak period relative to the control group (e.g., reference load). These values were carried over from the Second Interim Report.

- **Summer 2017 Peak Period Load Reduction:** The percent reduction in peak-period electricity use on average weekdays for the months of June through September 2017. Positive values mean customers reduced use and negative values mean customers increased use during the peak period relative to the control group (e.g., reference load). Once again, reductions are desirable, and therefore indicated by a green triangle, and increases are undesirable, and represented by a red triangle. These values are summarized in Section 3.3 of this report.
- **Net Annual kWh Change %:** The percent reduction in annual electricity use for the year starting July 2016 and ending June 2017. Positive values mean customers reduced use and negative values mean customers increased use. These values were carried forward from the Second Interim Report.
- **Persistence: Summer Impact Percent Point Change:** The percentage point difference between percent load impacts from July through September 2016 and July through September 2017 for the common set of customers who remained enrolled for the full duration of the pilot. Negative values represent a reduction in percent impacts between the first and second summer, which are undesirable and represented by a red triangle. Increases are desirable and represented with a green triangle. These findings were discussed in Section 3.4 of this report.
- **Annual Total Bill Impact ($ or %):** This is the change in the average customer's bill on Rate 1 due to the impact of both the structural change in the tariff, holding usage constant, and the change in the bill due to changes in usage. These values were carried forward from the Second Interim Report.

Note regarding all survey related values: All reported survey values are from the second (final) customer survey and have been carried forward from the RIA Second Interim Report. Table references relate to the document produced by Research Into Action as part of the Second Interim Report.

- **Health Index:** The values in this column represent the mean values of the health index for each customer segment. Values for Rate 1 were taken from Table 3-7 in the RIA Second Interim Report. Cells with red triangles indicate that the index mean value for the segment is higher than the mean value for the control group and the difference is statistically significant. Cells with green arrows mean that the treatment group index is actually lower than the control group value and the difference is statistically significant.
- **Bill Higher Than Expected:** The values in this column are taken from Table 3-49 in the RIA Report and equal the percent of customers reporting that their bills since December 2016 had been higher than they expected. The values do not represent the difference in the percentage between treatment and control customers. Many control customers also reported that bills were higher than expected, reflecting the usual seasonal variation in bills that occurs due to seasonal changes in rates, higher air conditioning use in the summer and the tiered structure of the rates. Cells with red triangles represent values that are higher than the percentage reported by control group customers and where the difference is statistically significant. These values were carried forward from the RIA Second Interim Report.
- **Difficulty Paying Bills:** The values in this column are taken from Table 3-26 in the RIA Report and represent the percent of customers reporting having difficulty paying bills since December 2016.

Cells with red or green triangles represent values that are higher or lower than control group values, respectively, and where the differences are statistically significant. These values were carried forward from the Second Interim Report.

- **Economic Index:** The values in this column represent the mean values of the economic index for each customer segment. Values for Rate 1 were taken from Table 3-6 in the RIA Second Interim Report. Cells with red triangles indicate that the index mean value for the segment is higher than the mean value for the control group and the difference is statistically significant.
- **Understanding TOU Pricing:** This variable is based on a survey question asking respondents to identify the hours of the day when prices are the highest. The values in the table come from Table 3-52 in the RIA Second Interim Report and indicate the percent of customers that failed to correctly identify ANY peak period hours associated with the TOU rate. The higher this percentage, the less likely that a group of customers would make significant reductions during the peak period- this is because fewer customers would know when the peak period was.
- **Satisfaction with Rate:** These values represent the average satisfaction rating for the rate plan on an 11 point scale, from 0 to 10, with higher values indicating higher satisfaction. These values are taken from Table 3-39 in the RIA Second Interim Report. Values with red triangles represent cells where the average rating for the treatment group on the TOU rate is lower than for the control group on the OAT, and the difference is statistically significant.
- **Satisfaction with Utility:** The same 11-point scale as above was used to assess satisfaction with PG&E. The values in the column are also taken from Table 3-39 in the RIA Second Interim Report. As above, red triangles represent statistically significant differences between average values for the control and treatment groups.

Looking across the various metrics for each customer segment and rate, we did not observe any internal inconsistencies. In fact, quite the opposite—overall, the load impact, bill impact and survey findings typically align quite well. Below is a summary by customer segment.

Table 3.5-1: Load Impacts, Bill Impacts, and Selected Survey Findings for PG&E Rate 1[32]

Climate	Segment	Load Impacts					Bill Impacts		Survey						
		Summer 2016 Peak Period Load Reduction* %	Winter Peak Period Load Reduction** %	Summer 2017 Peak Period Load Reduction %	Net Annual kWh Change** %	Persistence: Summer Impact Pct. Point Change	Annual Total Bill Impact** $	Annual Total Bill Impact** %	Health Index (Range 0-10)**	Bill Higher than Expected**	Difficulty Paying Bills**	Economic Index (Range 0-10)**	Understanding TOU Pricing (None-Correct)**	Satisfaction w/ Rate (11 pt. Scale)**	Satisfaction w/ Utility (11 pt. Scale)**
Hot	Non-CARE/FERA	8.7% ▼	5.4% ▼	7.0% ▼	3.1% ▼	-2.3 ▼	$4 -	0% -	2.20 -	31% ▼	25% -	2.4 -	5% -	6.2 -	6.8 -
	CARE/FERA	3.2% ▼	2.6% ▼	2.5% ▼	0.9% ▼	-1.1 -	$0 -	0% -	2.90 -	27% ▼	68% -	4.1 -	14% -	6.9 -	7.4 -
	Senior	7.0% ▼	4.8% ▼	5.8% ▼	2.6% ▼	-2.1 ▼	-$8 ▼	-1% ▼	2.80 -	26% ▼	37% -	3.0 -	12% -	6.9 ▲	7.4 -
	HH < 100% FPG	-0.4% -	0.8% -	2.3% ▼	-0.9% ▲	2.2 -	$37 ▲	4% ▲	2.90 -	31% ▼	70% -	4.3 -	13% -	7.0 -	7.5 -
	100% FPG < HH < 200% FPG	N/A	N/A	N/A	N/A	N/A	-$23 ▼	-2% ▼	2.90 -	28% ▼	60% -	3.9 -	11% -	6.7 -	7.2 -
Moderate	Non-CARE/FERA	4.7% ▼	3.5% ▼	7.0% ▼	0.3% ▼	1.1 -	-$20 ▼	-2% ▼	2.40 -	26% ▼	15% ▼	1.9 ▼	5% -	6.6 ▲	6.8 -
	CARE/FERA	3.9% ▼	2.5% ▼	2.1% ▼	1.7% ▼	-2.0 -	-$36 ▼	-5.4% ▼	2.90 -	27% ▼	62% -	4.1 -	14% -	7.3 -	7.7 -
Cool	Non-CARE/FERA	4.6% ▼	3.3% ▼	1.9% ▼	0.8% ▼	-3.8 ▼	-$26 ▼	-2.8% ▼	2.10 -	35% -	15% ▼	1.9 -	3% -	6.3 -	6.6 -
	CARE/FERA	1.4% ▼	-0.9% -	0.2% -	-2.2% ▲	-3.2 ▼	-$8 ▼	-1.6% ▼	2.80 -	33% -	57% -	3.6 -	16% -	7.1 -	7.4 -

Table 3.5-2: Load Impacts, Bill Impacts, and Selected Survey Findings for PG&E Rate 2

Climate	Segment	Load Impacts					Bill Impacts		Survey						
		Summer 2016 Peak Period Load Reduction* %	Winter Peak Period Load Reduction** %	Summer 2017 Peak Period Load Reduction %	Net Annual kWh Change** %	Persistence: Summer Impact Pct. Point Change	Annual Total Bill Impact** $	Annual Total Bill Impact** %	Health Index (Range 0-10)**	Bill Higher than Expected**	Difficulty Paying Bills**	Economic Index (Range 0-10)**	Understanding TOU Pricing (None-Correct)**	Satisfaction w/ Rate (11 pt. Scale)**	Satisfaction w/ Utility (11 pt. Scale)**
Hot	Non-CARE/FERA	9.0% ▼	3.7% ▼	5.0% ▼	1.5% ▼	-4.4 ▼	$40 ▲	2.5% ▲	2.40 -	32% -	28% -	2.4 -	11% -	6.0 -	6.5 -
	CARE/FERA	2.8% ▼	3.3% ▼	1.9% ▼	0.5% ▼	-2.4 -	$7 ▲	0.8% ▲	2.90 -	25% ▼	68% -	4.3 -	27% -	7.1 -	7.6 ▲
Moderate	Non-CARE/FERA	6.8% ▼	4.3% ▼	2.4% -	-0.1% -	-0.7 -	-$18 ▼	-1.4% ▼	2.20 -	36% ▼	17% -	2.0 -	10% -	6.3 -	6.9 -
	CARE/FERA	2.8% ▼	5.0% ▼	0.5% -	1.9% ▼	-4.1 -	-$31 ▼	-5.0% ▼	3.10 -	30% -	60% -	3.9 -	24% -	7.3 -	7.6 -
Cool	Non-CARE/FERA	4.7% ▼	2.5% ▼	1.5% -	0.3% ▼	-3.5 -	-$16 ▼	-1.8% ▼	2.20 -	33% -	18% -	2.0 -	11% -	6.3 -	6.9 -
	CARE/FERA	0.3% -	0.0% -	-1.7% -	-2.4% ▲	-2.6 -	-$4 ▼	-0.8% ▼	2.90 -	36% -	53% -	3.7 -	22% -	7.2 -	7.5 -

Table 3.5-3: Load Impacts, Bill Impacts, and Selected Survey Findings for PG&E Rate 3

Climate	Segment	Load Impacts					Bill Impacts		Survey						
		Summer 2016 Peak Period Load Reduction* %	Winter Peak Period Load Reduction** %	Summer 2017 Peak Period Load Reduction %	Net Annual kWh Change** %	Persistence: Summer Impact Pct. Point Change	Annual Total Bill Impact** $	Annual Total Bill Impact** %	Health Index (Range 0-10)**	Bill Higher than Expected**	Difficulty Paying Bills**	Economic Index (Range 0-10)**	Understanding TOU Pricing (None-Correct)**	Satisfaction w/ Rate (11 pt. Scale)**	Satisfaction w/ Utility (11 pt. Scale)**
Hot	Non-CARE/FERA	9.5% ▼	2.6% ▼	8.9% ▼	2.6% ▼	-1.1 -	$21 ▲	1.3% ▲	2.20 -	28% ▼	25% -	2.5 -	6% -	6.2 -	6.7 -
	CARE/FERA	1.9% ▼	7.3% ▼	4.1% ▼	2.3% ▼	-0.1 -	-$5 ▼	-0.5% ▼	2.70 -	25% ▼	74% -	4.6 ▲	14% -	7.3 ▲	7.6 ▲
Moderate	Non-CARE/FERA	4.1% ▼	3.7% ▼	4.9% ▼	0.5% ▼	0.0 -	-$8 ▼	-0.8% ▼	2.10 -	32% ▼	15% ▼	2.1 -	3% -	6.6 ▲	7.0 ▲
	CARE/FERA	3.2% ▼	1.8% ▼	1.6% -	0.8% ▼	-3.8 ▼	-$28 ▼	-4.5% ▼	2.90 -	26% ▼	60% -	3.9 -	11% -	7.4 -	7.7 -
Cool	Non-CARE/FERA	3.1% ▼	2.0% ▼	0.9% -	0.4% ▼	-1.6 -	-$24 ▼	-2.8% ▼	2.50 -	32% -	20% -	2.1 -	7% -	6.4 -	6.8 -
	CARE/FERA	2.3% ▼	0.8% -	2.9% ▼	-0.1% -	-1.3 -	-$22 ▼	-4.4% ▼	2.70 ▼	31% -	57% -	3.7 -	13% -	7.3 -	7.5 -

[32] In all three tables, a column with an (*) indicates the values are from the First Interim Report and a column with (**) indicates the values are from one of the two Second Interim Report volumes. A column with neither (*) or (**) means the values are found elsewhere in this report.

Non-CARE/FERA Customers

Non-CARE/FERA customers in the hot climate region have the highest percent reduction in summer 2017 peak-period energy usage among all segments, averaging 7.0% across the three rates.[33] This group had the highest percent reductions in summer 2016 and the second highest in the winter months. These results are consistent with the finding that non-CARE/FERA customers understood the rates better than nearly any other segment, as indicated by the very low percent that failed to identify at least one peak period hour. Non-CARE/FERA customers in the hot region had the highest net annual kWh savings, averaging 2.4% across all rates.

Across all rates and climate regions, population weighted peak period impacts in the second summer decreased by 1.8 percentage points when compared to the first summer for customers who remained on the pilot for the entire duration. Estimating load impacts for a common set of customers across the two summers controls for differences in impacts that might arise due to changes in the characteristics of enrolled customers. Put differently, this comparison focuses on whether or not customers who remain on a TOU rate continue to reduce loads during peak periods. The observed drop in load reductions of 1.8 percentage points from summer to summer may result, in part, from differences in weather or some other exogenous factor (e.g., a strengthening economy) between the first and second summer. Importantly, although there is an observed decline in average load impacts, impacts in the second summer are still quite strong for non-CARE/FERA customers, averaging 5.1% across the three rates.

As referenced in the Second Interim Report, all non-CARE/FERA customer segments across all rates experienced average total bill decreases in the winter but, as indicated in the First Interim Report, nearly all had much higher bills in summer than they would have had under the OAT. On an annual basis, non-CARE/FERA customers experienced the greatest annual total bill increases of approximately $20 per year due to a large portion of customers being structural non-benefiters. They were, however, able to offset 67% of their approximately $60 annual structural loss through behavior change. Total annual bill increases for non-CARE/FERA customers in the hot climate region ranged from a low of $4 on Rate 1 to a high of $40 on Rate 2. Average annual bills decreased for non-CARE/FERA customers in the moderate and cool climate regions for all three rates. In many cases, non-CARE/FERA customers had statistically significantly lower instances of customers receiving a higher bill than expected compared to the control group—meaning more control group customers were surprised by higher than expected bills than treatment group customers.

The non-CARE/FERA customers also had the lowest satisfaction ratings for the rate plan and for PG&E compared with any other segment. However, there were no cases in which the satisfaction levels were significantly lower relative to the control group. In some cases, the satisfaction levels for both the rate and for PG&E were actually higher for the treatment group compared to the control group in the moderate climate region. All of these metrics paint an internally consistent picture of a customer segment that understood the timing of the peak period well, worked hard to reduce usage and bills, and ultimately had satisfaction ratings very similar to those of the control group.

[33] Average based on peak period for each rate and not the common hours.

CARE/FERA Customers

In the summer months in 2017, CARE/FERA customers in the cool climate region had the lowest reductions in peak-period electricity use, an average of about 0.5% across all three rates. In each climate region, CARE/FERA customers had smaller load impacts than non-CARE/FERA customers. The smaller load reductions by CARE/FERA customers compared to non-CARE/FERA customers could be due to greater difficulty by CARE/FERA customers in reducing or shifting loads. For example, lower income households may lack quality insulation or may have undersized air conditioning equipment, resulting in a greater burden for them to reduce cooling energy use compared to a household with higher quality insulation or adequately sized air conditioning units. Low income customers may also work two jobs, or work longer hours, limiting their flexibility to shift loads such as laundry or cooking. It may also be that low income households have lower saturations of end uses such as dishwashers and clothes driers, that can easily be shifted from peak to off-peak periods.

When comparing load impacts with the previous summer for the set of customers who were enrolled for the entire pilot, the average customer impact dropped by 2.3 percentage points. However, for many customer segments the difference between the first and second summer was not statistically significantly different. The two exceptions were CARE/FERA customers in the cool climate region on Rate 1, and the moderate climate region customers on Rate 3. These segments experienced load impact reductions of 3.2 and 3.8 percentage points, respectively. This could be because CARE/FERA customers in the moderate and cool climate regions both had structural bill decreases of around $20 (3-4%) on an annual basis, which could have led customers to believe they do not need to shift their usage as much as they did in the first summer.

CARE/FERA customers on Rate 3 in the hot climate region had the highest percent of customers expressing difficultly paying bills, at 74%. While this metric was not statistically significantly different compared to the control group, they also had the highest economic index score of 4.6, which was significantly higher compared to the control group. In the first survey, 22% of these customers were not able to identify any of the TOU pricing periods correctly. In the second survey, this dropped by nearly one-third, to 14%. This group initially faced an annual structural loss of approximately $14, and through behavior change was able to reduce their bills by $19, resulting in a net savings of $5 per year.

CARE/FERA customers had significant economic challenges, and were successful in adjusting their energy consumption, at least in the winter period, in order to ultimately lower their bills. It should also be noted that these customers had some of the highest satisfaction scores with both the rate and with PG&E, with scores from both satisfaction metrics being significantly higher compared to the control group for customers in the hot climate region on Rate 3, and no worse compared to the control group for any rates across any climate region. This is consistent with findings from many other surveys of this customer class which in general tends to have higher satisfaction ratings overall for all IOU programs. In all climate regions, none of the satisfaction ratings for CARE/FERA customers were statistically significantly lower than the control group ratings—in fact, they were higher for the Rate 3 hot climate regions customers. CARE/FERA customers also had higher ratings for satisfaction with PG&E than non-CARE/FERA customers in all climate regions for all rates.

Turning to other metrics of interest, there was essentially no change in total annual bills in the hot climate region for CARE/FERA customers averaged across the three tariffs. These customers were able

to offset 80% of their annual structural bill increase of around $9. While on an annual basis the difference is negligible, customers did experience higher bills in the summer that were ultimately offset by lower bills in the winter. Between 53% and 74% of CARE/FERA customers reported having difficulty paying bills, which was three times higher on average than for non-CARE/FERA customers, but this was also true for control customers. The economic index for CARE/FERA customers was roughly twice as high as for non-CARE/FERA customers in all climate regions and for all rate options, including the control group. In short, CARE/FERA customers had higher economic index scores compared with non-CARE/FERA customers, but the increase in the economic index scores moving from the OAT to TOU rates is not statistically significant except for the Rate 3 hot climate region customers noted above.

Senior Households

Senior households in the hot climate region had load reductions in the summer 2017 peak period for the average weekday that were comparable to average reductions for the overall population in the hot region. The average peak-period load impact of 5.8% is closer to the slightly larger load impacts of the non-CARE/FERA group of 7.0% than the smaller impacts from the CARE/FERA group with 2.5%. Senior household summer load impacts in 2017 were 2.1 percentage points lower than impacts in 2016 for a common set of customers, a change that was statistically significant. This indicates that these customers are less responsive to the rates in the second year, possibly as a result of small annual bill reductions not providing a strong price signal.

On Rate 1, 26% of seniors indicated that their bills were higher than expected. However, this percentage was statistically significantly lower for the customers on TOU rates compared to the OAT. There was no statistically significant difference in the percent of seniors reporting difficulty in paying bills, or in the economic index, compared with the control group.

Senior households appear to have a higher percentage of participants that could not identify any peak period hours compared with the population as a whole in the hot region. Weighted average values for CARE/FERA and non-CARE/FERA customers for this variable for Rate 1 is 8.5% compared to 12% for seniors. Though it should be noted this is an improvement over the first survey where 18% of seniors couldn't identify any of the peak periods. In addition, about 56% of combined CARE/FERA and non-CARE/FERA customers selected over half of the correct peak hours compared to 50% of seniors (see Table 3-52 in the RIA Report). This was also an improvement, up from 42% in the first survey.

Finally, satisfaction ratings by seniors for the rate plan (6.9) and for PG&E (7.4) were somewhat higher than the ratings for the hot climate zone population as a whole (as calculated by a weighted average for CARE/FERA and non-CARE/FERA households, whose ratings were 6.5 and 7.0 respectively). Seniors on TOU rates also had a statistically different higher average satisfaction rating for the rate plan compared with the control group, but did not have statistically significantly different ratings for satisfaction with PG&E.

Households with Incomes Below 100% of FPG

Households with incomes below 100% of FPG on Rate 1 in the hot climate region did not have statistically significant peak period load reductions in the first summer or winter months. However, they were able to reduce their peak period loads by 2.3% in summer 2017. Customers in this segment were among the highest percent of participants who could not identify any peak period hours among all

segments on Rate 1, which may explain their small peak load impacts. This group had a statistically significant increase in net annual kWh electricity use equal to almost 1% in the hot climate region. Consistent with these changes, bill impacts due to behavior change actually led to higher bills over and above the structural bill impact for Rate 1. The average annual cost increase for this segment was $37 or 4%.

This segment was tied for the highest percentage on the health index compared to other segments on Rate 1.[34] However, the percentage was not statistically different for the treatment group compared to the control group on this index. 70% of customers with incomes below 100% of FPG reported that they had difficulty paying bills and this segment had the highest economic index score (4.3) of any segment. This may have led to the increase in load impacts in the second summer of the pilot. The difference in the economic index for TOU customers compared with the control group was not statistically significant for customers on Rate 1. The percentage of customers reporting difficulty paying bills was also not statistically different from the percent of control customers reporting difficulty. 31% of customers with incomes below 100% of FPG stated they received bills higher than expected. However, this was statistically significantly lower than the control group, and was a general trend across Rate 1 customer segments in the hot and moderate climate regions.

For Rate 1, this segment did not have statistically different levels of satisfaction with the rate or with PG&E. Satisfaction was not measured for this segment on Rates 2 or 3.

3.5.2 Key Findings

Key findings pertaining to second summer load impacts from the PG&E pilots include:

1. In the second summer, customers continued to respond to TOU rates with peak periods that extend well into the evening. During the second summer, customers achieved load reductions as high as 8.9% for non-CARE/FERA customers in the hot climate region on Rate 3.
2. Summer 2017 peak load reductions declined by small, and in several cases, statistically significant amounts compared to summer 2016. Statistically significant differences were observed among the following segments: non-CARE/FERA customers in the hot climate region on Rate 1 and Rate 2, CARE/FERA customers in the moderate climate region on Rate 3, and CARE/FERA and non-CARE/FERA customers in the cool climate region on Rate 1.
3. Households with incomes less than 100% of FPG and non-CARE/FERA customers in the moderate climate region on Rate 1 were the only two segments that increased their summer peak load impacts from 2016 to 2017. However, these increases were not statistically significant.
4. CARE/FERA customers had significantly lower peak period load reductions compared with non-CARE/FERA customers during the second summer.
5. Senior households on Rate 1 in the hot climate region had load impacts very similar to the hot climate region population as a whole in each season.

[34] This metric is not reported for Rates 2 or 3.

6. Households with incomes below 100% of FPG on Rate 1 in the hot climate region had no statistically significant reduction in peak period until summer 2017, where they reduced their demand by 2.3%.
7. In general, summer 2017 load impacts, in both absolute and percentage terms, were largest in the hot climate region, second largest in the moderate region, and lowest in the cool region, but these differences were not always statistically significant.

Overall findings and conclusions for the pilot include:

- Customers continued to respond to the TOU price signals at the end of the pilot. As expected, the load impacts were lower during the winter compared to the first summer. Load impacts decreased slightly from the first summer to the second, but the change was not always statistically significant.
- The majority of customers across all three rates experienced slight net annual total bill decreases. However, customers in the hot climate regions were more likely to experience net annual bill increases, especially non-CARE/FERA customers.
- Evidence continues to suggest that the more complex, three-period TOU rate (Rate 2) was harder for all customers to fully understand and this was especially true for low income customers. While peak period reductions are roughly the same for all three rates, the reduction in net annual electricity use for Rate 2 was significantly less than for Rates 1 and 3. Complexity may have also been a factor in lower impacts observed the second summer, as the largest single difference was observed on Rate 2. There is no evidence that Rate 2 has other advantages to offset the disadvantages summarized above although it may be possible with better education and outreach to overcome some of these shortcomings.
- After a year, there is no evidence indicating that senior households as a group in PG&E's service territory fare better or worse than the general population as a whole. Generally speaking, metrics such as load and bill impacts, and the scores on nearly all survey questions—including those related to hardship—were in between the scores for CARE/FERA and non-CARE/FERA customers in the same climate region, and is reflective of the composition of CARE/FERA and non-CARE/FERA customers within the Senior Segment.
- For households with incomes below 100% of FPG, there was no statistically significant increase in economic or health index scores after a full year on Rate 1 (the only rate where measurements are reported for this segment).

4 SCE Evaluation

This report section summarizes the attrition and load impacts for the second summer of SCE's pilot. It also includes a discussion of load impact persistence over the entire pilot. Load and bill impacts from the first summer season can be found in the First Interim Report and findings for the winter season are available in the Second Interim Report.

4.1 Summary of Pilot Treatments

Figure 4.1-1 through Figure 4.1-3 summarize the three tariffs that were tested in the SCE service territory. All three tariffs have peak periods that include the prime evening hours from 5 PM to 8 PM. The rates have changed since the launch of the pilot, and the figures represent the tariffs that were in effect in January 2017 and do not reflect the baseline credit of 9.1 ¢/kWh. Appendix B shows the prices that were in effect in each rate period for each tariff, including the OAT. Two sets of prices are shown in the appendix, one covering the period from pilot start through December 2016, and the other beginning on January 1, 2017. While several minor rate changes occurred over the course of the pilot, the rate adjustment that occurred on January 1, 2017 was more significant and, as such, was factored into the estimation of bill impacts in the Second Interim Report.

Figure 4.1-1: SCE Pilot Rate 1 (January 2017)[35]

Tariff	Season	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24:00
Weekday	Summer	Super Off-Peak (23.2¢)								Off-Peak (27.8¢)						Peak (34.8¢)									
	Winter	Super Off-Peak (22.7¢)								Off-Peak (22.7¢)						Peak (27.3¢)									
Weekend	Summer	Super Off-Peak (23.2¢)								Off Peak (27.8¢)															
	Winter	Super Off-Peak (22.7¢)								Off Peak (22.7¢)															

Figure 4.1-2: SCE Pilot Rate 2 (January 2017)

Tariff	Season	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24:00
Weekday	Summer	Super Off-Peak (17.6¢)								Off-Peak (29.1¢)									Peak (55.2¢)						
	Winter	Super Off-Peak (17.7¢)								Off-Peak (25.5¢)									Peak (27.6¢)						
Weekend	Summer	Super Off-Peak (17.6¢)								Off-Peak (29.1¢)															
	Winter	Super Off-Peak (17.7¢)								Off-Peak (25.5¢)															

Figure 4.1-3: SCE Pilot Rate 3 (January 2017)

Tariff	Season	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24:00
Weekday	Summer	Off Peak (16.3¢)											Peak (22.6¢)					Super On-Peak (37.0¢)							
	Winter	Off Peak (18.3¢)																Mid Peak (21.1¢)							
	Spring	Off Peak (18.3¢)											Super Off Peak (10.0¢)					Peak (25.0¢)							
Weekend	Summer	Off Peak (16.3¢)																Mid Peak (18.7¢)							
	Winter	Off Peak (18.3¢)											Super Off Peak (10.39¢)					Mid Peak (21.1¢)							
	Spring	Off Peak (18.3¢)											Super Off Peak (10.0¢)					Mid Peak (21.1¢)							

[35] See Appendix B for comparison of tariffs.

The prices shown in the above figures for Rates 1 and 2 do not reflect the credit of 9.1¢/kWh for usage below the baseline quantity in each climate zone. This credit significantly reduces average prices, especially for lower usage customers. Rate 3 does not include a baseline credit. Given this difference in baseline credits between Rates 1 and 2 and Rate 3, it is not possible to directly compare prices in each rate period from the above figures.

Rate 1 has three rate periods on summer weekdays and two on winter weekdays. The peak period on Rate 1 is the same all year long and runs from 2 PM to 8 PM. The peak to super-off-peak price ratio[18] (ignoring the baseline credit) is 1.2 to 1 in winter and 1.5 to 1 in summer. Customers on SCE's Rate 1 pay off-peak prices on weekends in the winter. In summer, off-peak prices are in effect on weekends from 8 AM to 10 PM, which is the time-period covered by the combination of peak and off-peak prices on weekdays.

SCE's Rate 2 has three rate periods on weekdays all year long. Compared with Rate 1, it has a much shorter peak period but a similar peak price in the winter months (27.6 ¢/kWh). The peak period runs from 5 PM to 8 PM. Rate 2 also features a super off-peak price of roughly 17.7 ¢/kWh between 10 PM and 8 AM on weekdays all year long. The ratio of peak to super-off-peak prices in the summer is roughly 3 to 1. In winter, the peak-to-super off-peak price ratio is roughly 1.6 to 1. On weekends, customers pay the off-peak price between 8 AM and 10 PM and the super off-peak price during the same overnight hours as on weekdays, from 10 PM to 8 AM.

Rate 3 has a peak-period length of five hours, which is in between the peak-period length for Rates 1 and 2. In addition, the peak period starts later in the day compared with Rate 1, and extends further into the evening (until 9 PM) than either of the other pilot rates. The weekday peak-to-super-off-peak price ratio in the winter on Rate 3 is roughly 2.1 to 1. Another difference between Rate 3 and the other rates is the presence of super off-peak pricing between 11 AM and 4 PM in spring, when excess supply conditions may exist in California. On weekends, Rate 3 has two rate periods in summer and three in spring and winter. The peak period on weekends shown in Figure 4.1-3 has a different color compared with weekday peak periods because the prices on weekends don't match any of the prices during peak, partial, off-peak, or super-off-peak periods on weekdays. Finally, as mentioned above, a very important difference is the lack of a baseline credit in Rate 3.

Figure 4.1-4 presents the seasons for each rate. For all three rates, the summer season covers the months of June through September. The winter season is October through May for Rates 1 and 2, and October through February for Rate 3. The spring period for Rate 3 is March through May.

Figure 4.1-4 Seasons by Rate

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rate 1	Winter					Summer				Winter		
Rate 2	Winter					Summer				Winter		
Rate 3	Winter		Spring			Summer				Winter		

In addition to assessing the rate treatments summarized above based on customers recruited from the general, eligible residential population, SCE also recruited customers who were known to have purchased and installed a smart thermostat. The objective of this treatment group was to estimate load

impacts for smart thermostat owners on TOU rates. The pilot plan called for SCE to partner with a smart thermostat vendor (in this case, Nest) to recruit smart thermostat owners into the study using the same "pay-to-play" recruitment strategy as was used for the general population. However, because Nest does not know the names or addresses of Nest thermostat owners, recruitment was done via email only (the same communication channel that Nest uses to send out monthly reports to each online Nest owner summarizing equipment run time and other behavioral information) rather than through the direct mail solicitation that was employed for the rate treatment groups. Target enrollment for the technology treatment was 3,750 customers and participants were to be randomly assigned to Rates 1 and 3 or to the control condition. In reality, enrollment fell well short of this target and those who enrolled were randomly assigned only to Rate 1 and to the control group.

SCE also varied the education and outreach provided to participants who were on the three TOU rates. The majority of customers (75%) on each of the three TOU rates received what SCE describes as enhanced education and outreach while the remainder received fewer contacts during the post enrollment phase.

The following section contains a discussion of customer attrition over the course of the pilot. Section 4.3 presents the load impact estimates for summer 2017 for each rate and Section 4.4 discusses the persistence of load impacts throughout the pilot.

4.2 Customer Attrition

Figure 4.2-1 through Figure 4.2-3 show the cumulative opt-out rates over time for each test cell and climate region. The cumulative number of opt-outs is highest in the hot region, second highest in the moderate region and lowest in the cool region. The number of control customers dropping out is very low in all climate regions. The cumulative opt-out rate in the moderate region is below 8% and the cumulative opt-out rate in the cool region is below 4% for all rates and for both CARE/FERA and non-CARE/FERA customers. The opt-out rates in the hot climate zone increase between July and August 2016 for Rates 1 and 2, and a bit later for Rate 3. This is likely due to the fact that enrollment in Rate 3 occurred later than it did for the other two rates. CARE/FERA customers in the hot climate region on Rate 3 had the greatest opt-out rate, reaching 14% by the end of the second summer of the pilot (September 2017). This is more than twice the opt-out rate for hot-CARE/FERA customers on Rate 2 and roughly seven times larger than for Rate 1. The opt-out rates generally level off after the first summer season, except for Rate 3 where the cumulative opt outs steadily increase over time.

Figure 4.2-1: Cumulative SCE Opt Outs by Month – Hot Climate Region

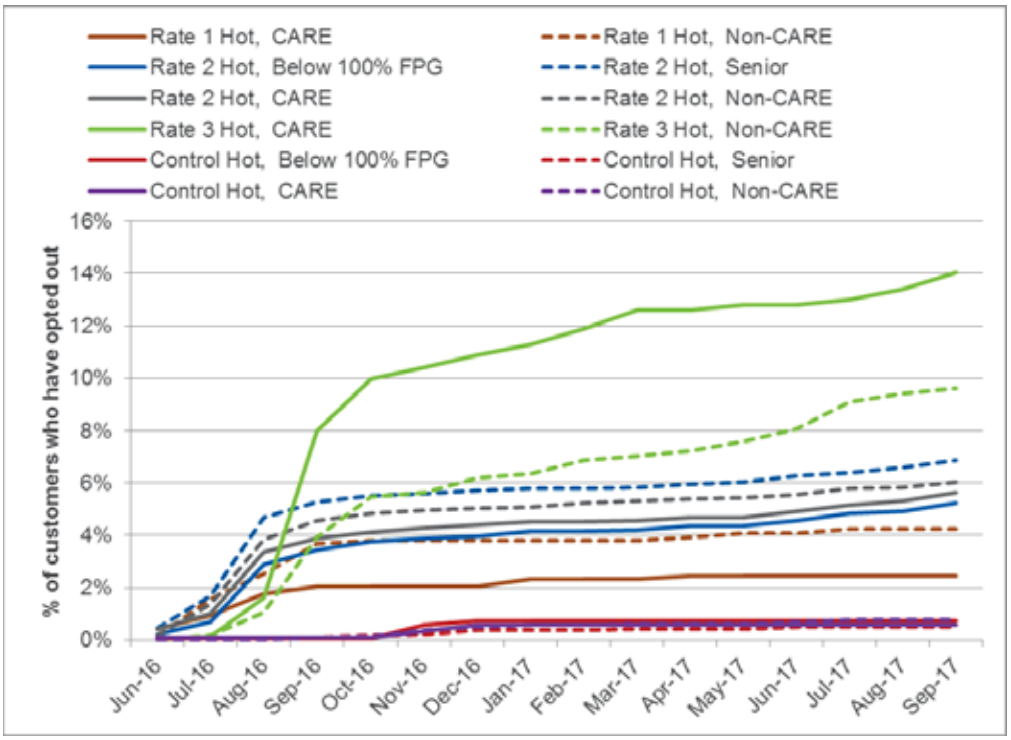


Figure 4.2-2: Cumulative SCE Opt Outs by Month – Moderate Climate Region

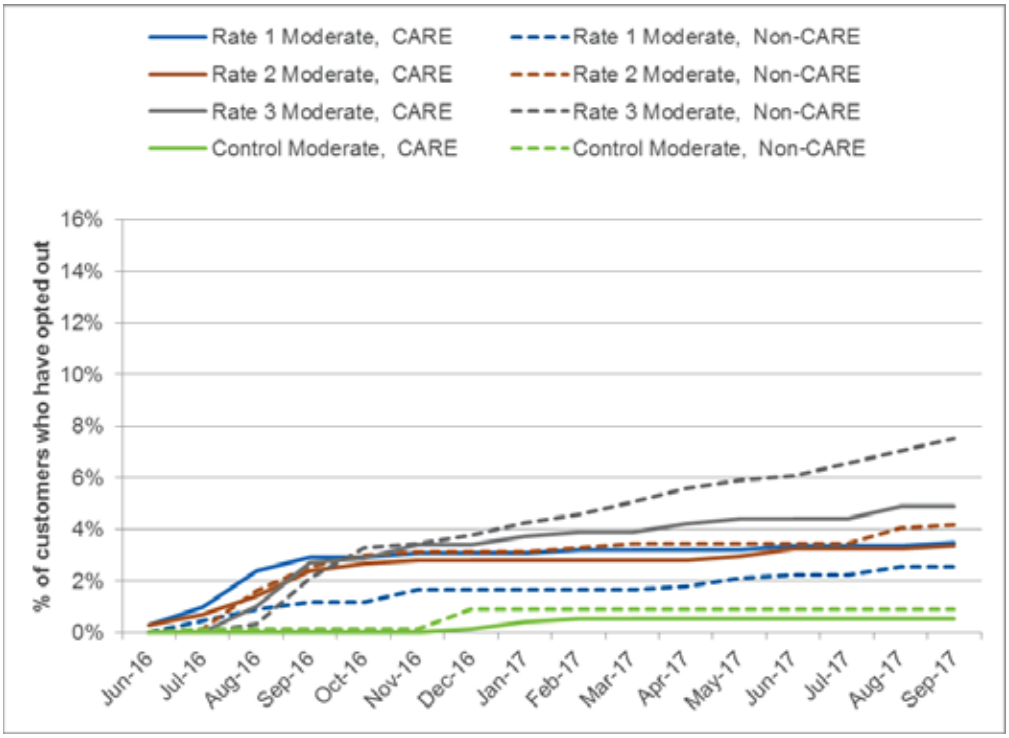


Figure 4.2-3: Cumulative SCE Opt Outs by Month – Cool Climate Region

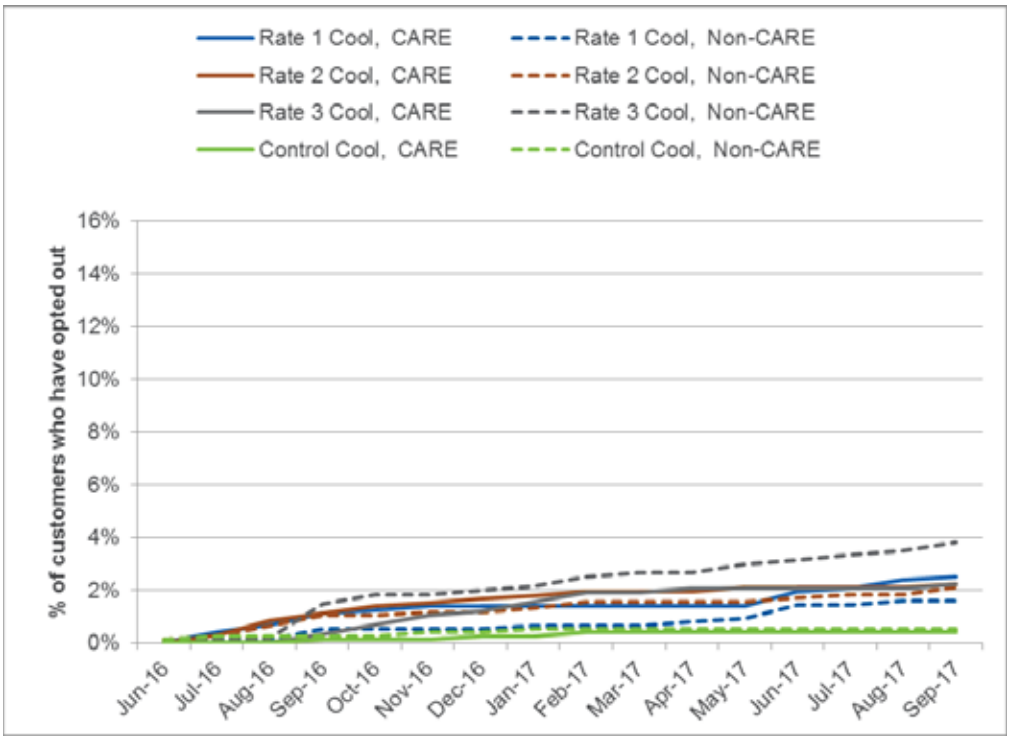


Figure 4.2-4 shows the cumulative percent of customers that opted out of each tariff for the CARE/FERA, non-CARE/FERA segments and for the total population across SCE's service territory as a whole. As seen, the cumulative percent of customers opting out was quite low for all rates and segments. The lowest cumulative percent opt out was for non-CARE/FERA customers on Rate 1 and the highest was for non-CARE/FERA customers on Rate 3. The opt-out percentage was highest for Rate 3 for both CARE/FERA and non-CARE/FERA customers and for the population as a whole. Recall that this is the rate with no baseline credit. The cumulative opt-out rate for each group showed a very rapid increase once bills began to be issued, and then the opt-out rates leveled off for Rate 1 and Rate 2- while Rate 3 continued to climb. There is a small increase in opt outs at the start of the second summer season (June 2017) but the number of opt outs is not nearly as large in the second summer as in the first. Having experienced two summers and one winter on the rate, and having realized that bills are much lower in winter than summer, it may be that customers who remained on the rate are more willing to manage the higher summer bills in anticipation of the lower winter bills.

Figure 4.2-4: Cumulative Opt Outs by Rate and Customer Segment for the SCE Service Territory

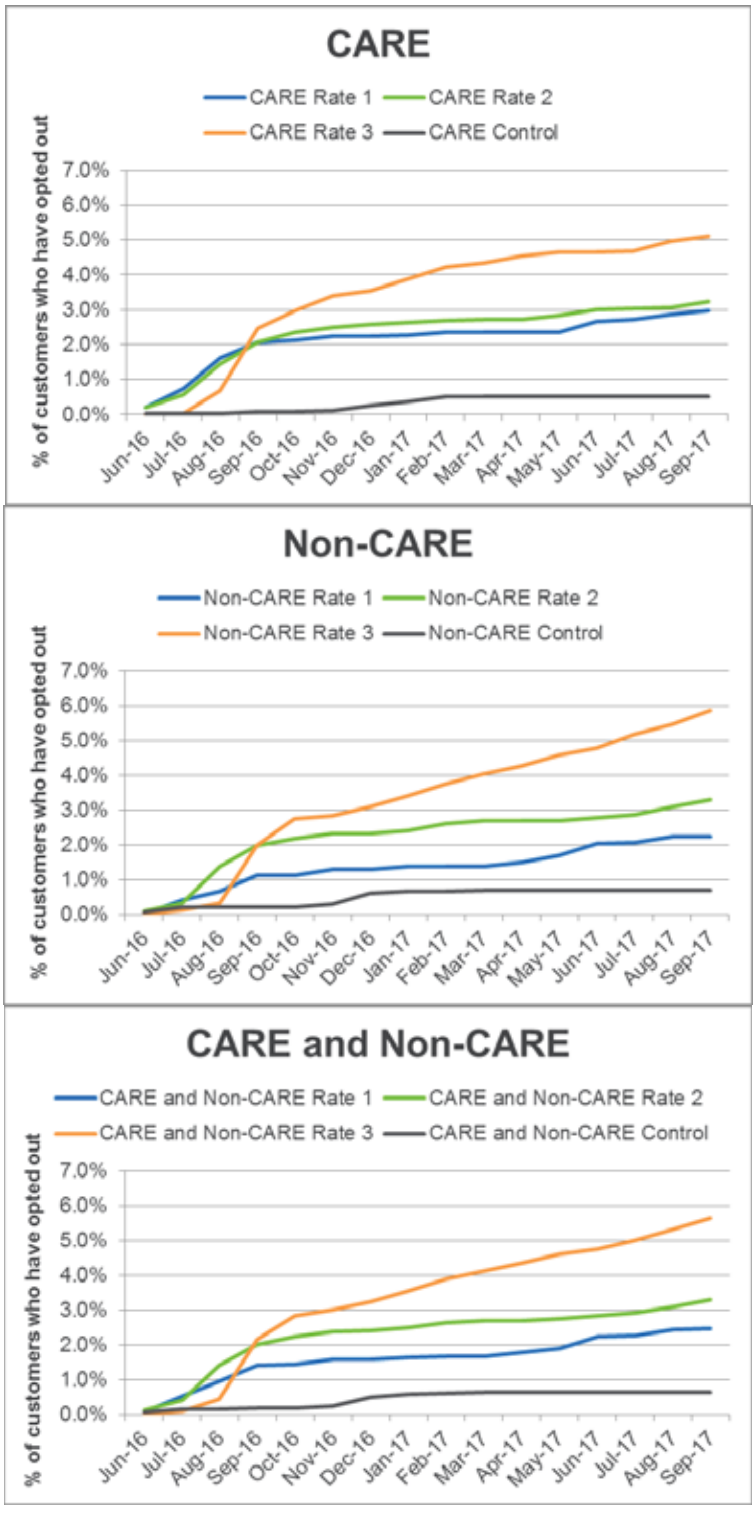


Figure 4.2-5 through Figure 4.2-7 show the overall attrition rate over time for each climate region, customer segment, and TOU rate. As seen in the figures, the cumulative attrition rate is quite constant over time in the moderate and cool climate regions, but not in the hot climate region. Roughly one third of the total attrition for Rate 3 CARE/FERA customers in the hot climate region was due to drop outs while the remainder was due either to customer churn or CCA activity. Overall attrition rates for this group reached nearly 40% by the end of the second summer of the pilot. Customers in the hot climate zone had a slight increase in attrition between March and April 2017 due to customers joining CCAs. Overall attrition rates are below 30% for the moderate climate region and below 25% for the cool climate region.

Figure 4.2-5: Cumulative SCE Attrition by Month – Hot Climate Region

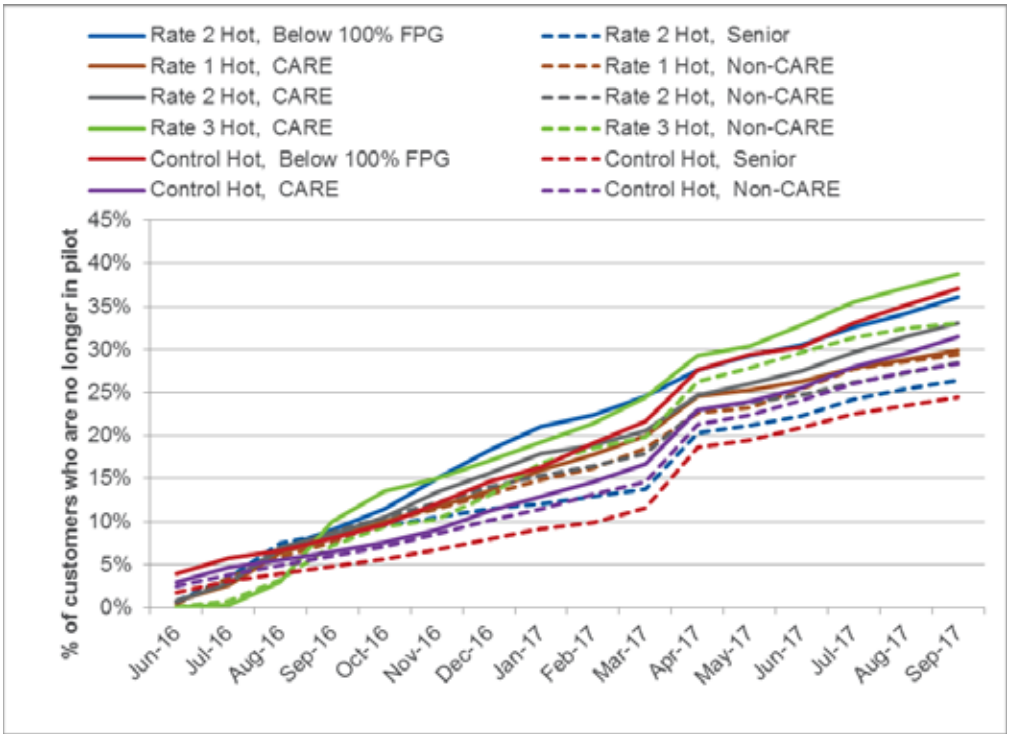


Figure 4.2-6: Cumulative SCE Attrition by Month – Moderate Climate Region

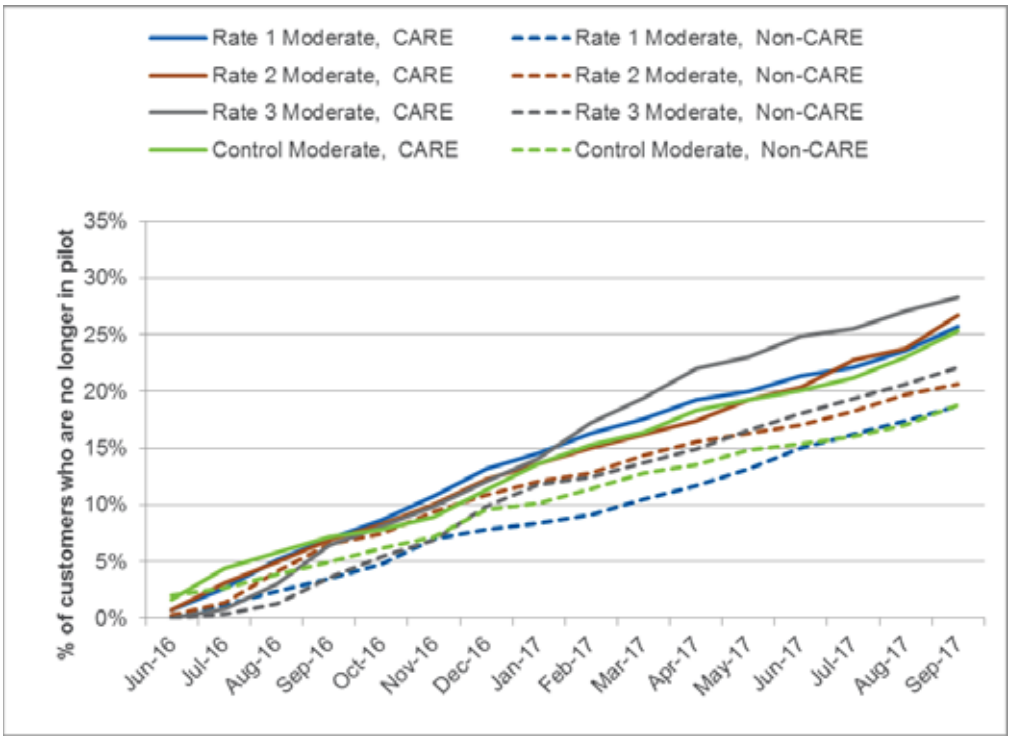
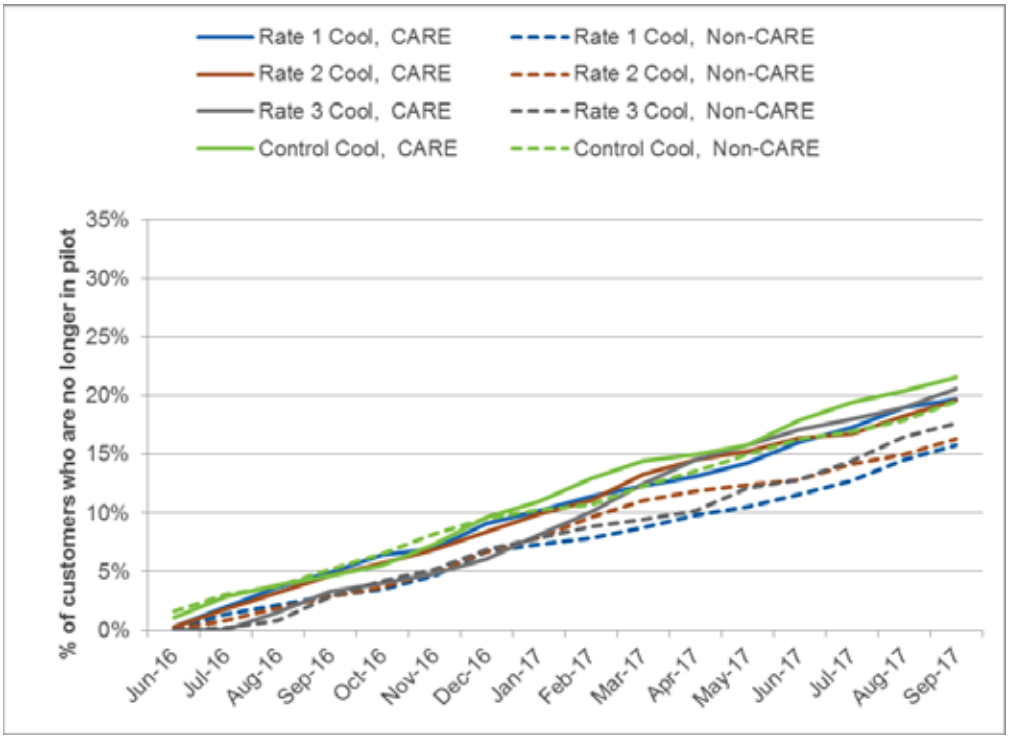


Figure 4.2-7: Cumulative SCE Attrition by Month – Cool Climate Region



4.3 Load Impacts

This section summarizes the load impact estimates for the three rate treatments tested by SCE. The CPUC resolution approving SCE's pilot requires that load impacts be estimated for the peak and off-peak periods and for daily energy use for the following rates, customer segments, and climate regions:

- Seniors, CARE/FERA customers, non-CARE/FERA customers and households with incomes below 100% of FPG in SCE's hot climate region for Rate 2;
- For all three rates for all customers in SCE's service territory as a whole and for all customers in SCE's hot and moderate climate regions; and
- For CARE/FERA and non-CARE/FERA customers on each rate across SCE's service territory as a whole.

In addition to these required segments, Nexant estimated load impacts for CARE/FERA and non-CARE/FERA customers for each rate for each climate region. Load impacts are reported here for each rate period for the average weekday, average weekend and average monthly peak day for the summer months of June through September 2017. Impacts are reported for each rate, climate zone and customer segment summarized above. Underlying the values presented in the report are electronic tables that contain estimates for each hour of the day for each day type, segment and climate zone and for each month separately. These values are contained in Excel spreadsheets that are available upon request through the CPUC.

Figure 4.3-1 shows an example of the content of these electronic tables for SCE Rate 1 for all eligible customers in the service territory. Pull down menus in the upper left hand corner allow users to select different customer segments, climate regions, day types (e.g., weekdays, weekends, monthly peak day) and time period (individual months or seasons).

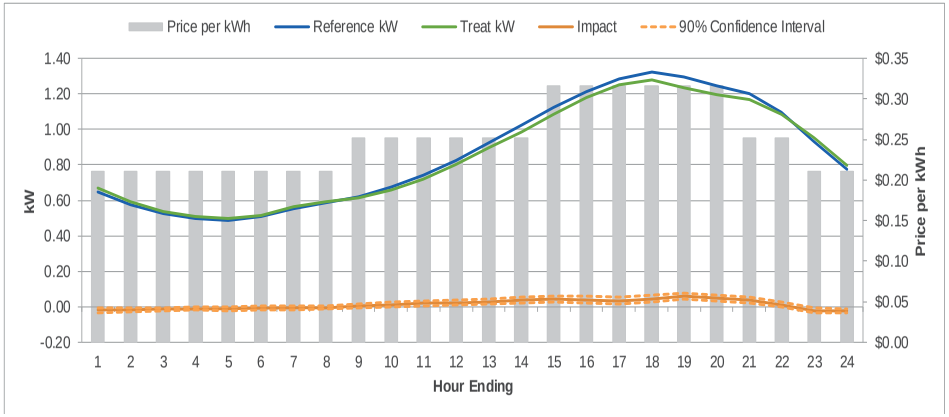
The remainder of this section is organized by rate treatment—load impacts are presented for each relevant customer segment and climate region for each of the three rates. Following the summary for each rate, load impacts are compared across rates. This comparison is made only for the hours within each peak period that are common across all three rates (5 PM to 8 PM). Because the rates differ with respect to the length and timing of peak and off-peak periods, differences in load impacts across rates for any particular rate period may be due not only to differences in prices within the rate period but also due to differences in the length or timing of the rate periods.

As discussed in Section 5 in the First Interim Report, in addition to the three rate treatments, SCE also recruited customers who were known to have purchased and installed a smart thermostat. The objective of this treatment group was to estimate load impacts for smart thermostat owners on TOU rates. Those who enrolled were randomly assigned only to Rate 1 and to the control group. Load impacts for these customers are presented in Section 4.3.1.

Figure 4.3-1: Example of Content of Electronic Tables Underlying Load Impacts Summarized in this Report (SCE Rate 1, Average Summer 2017 Weekday, All Customers)

Segment	All
Rate	Rate 1
Month	Summer 2017
Day Type	Average Weekday
Treated Customers	3,487

Period	Reference kW	Treat kW	Impact	Percent Impact	90% Confidence Interval	
Super On Peak	N/A	N/A	N/A	N/A	N/A	N/A
Peak	1.25	1.20	0.04	3.6%	0.04	0.05
Mid Peak	N/A	N/A	N/A	N/A	N/A	N/A
Off Peak	0.89	0.87	0.02	2.4%	0.02	0.03
Super Off Peak	0.61	0.62	-0.01	-2.4%	-0.02	-0.01
Daily kWh	20.69	20.39	0.29	1.4%	0.22	0.36



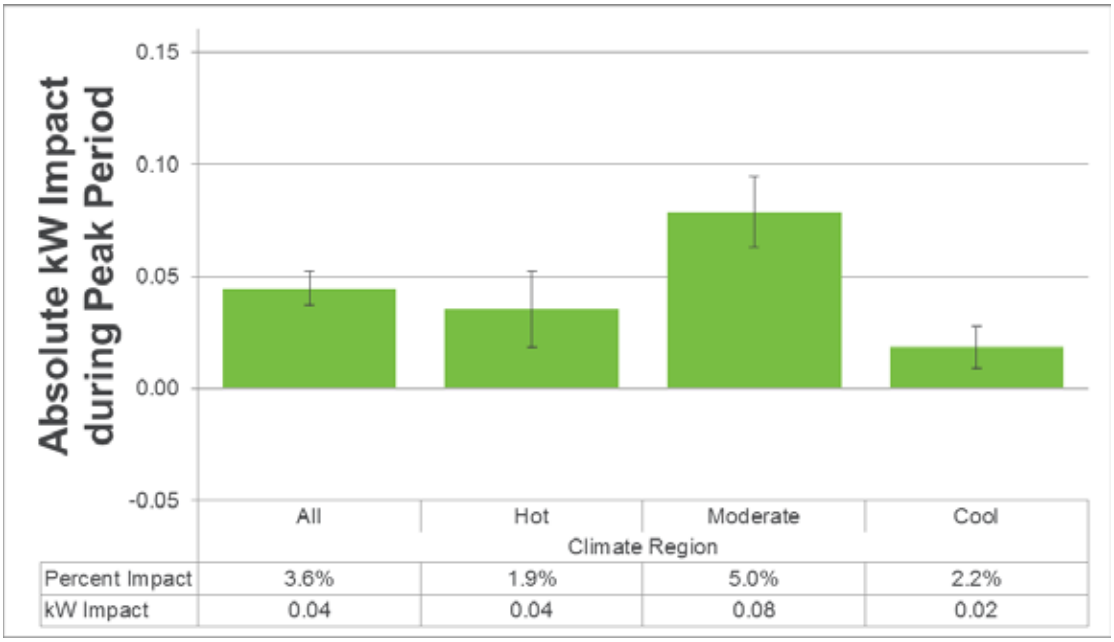
Hour Ending	Reference kW	Treat kW	Impact	Percent Impact	90% Confidence Interval		Price	Period
1	0.65	0.67	-0.02	-3.2%	-0.03	-0.01	$0.21	Super Off Peak
2	0.57	0.59	-0.02	-3.3%	-0.03	-0.01	$0.21	Super Off Peak
3	0.52	0.54	-0.01	-2.8%	-0.02	0.00	$0.21	Super Off Peak
4	0.50	0.51	-0.01	-2.1%	-0.02	0.00	$0.21	Super Off Peak
5	0.49	0.50	-0.01	-2.5%	-0.02	0.00	$0.21	Super Off Peak
6	0.51	0.52	-0.01	-1.6%	-0.02	0.00	$0.21	Super Off Peak
7	0.55	0.56	-0.01	-1.4%	-0.02	0.00	$0.21	Super Off Peak
8	0.59	0.59	0.00	-0.8%	-0.01	0.01	$0.21	Super Off Peak
9	0.62	0.62	0.00	0.7%	-0.01	0.01	$0.25	Off Peak
10	0.67	0.66	0.01	1.8%	0.00	0.02	$0.25	Off Peak
11	0.74	0.72	0.02	2.5%	0.01	0.03	$0.25	Off Peak
12	0.82	0.80	0.02	2.8%	0.01	0.04	$0.25	Off Peak
13	0.92	0.90	0.03	3.1%	0.01	0.04	$0.25	Off Peak
14	1.02	0.99	0.04	3.5%	0.02	0.05	$0.25	Off Peak
15	1.13	1.08	0.04	3.8%	0.02	0.06	$0.32	Peak
16	1.22	1.18	0.04	3.2%	0.02	0.06	$0.32	Peak
17	1.29	1.25	0.03	2.6%	0.01	0.05	$0.32	Peak
18	1.32	1.28	0.04	3.3%	0.02	0.06	$0.32	Peak
19	1.30	1.24	0.06	4.6%	0.04	0.08	$0.32	Peak
20	1.25	1.20	0.05	4.0%	0.03	0.07	$0.32	Peak
21	1.20	1.17	0.04	3.0%	0.02	0.05	$0.25	Off Peak
22	1.10	1.09	0.01	1.0%	0.00	0.03	$0.25	Off Peak
23	0.93	0.95	-0.02	-2.3%	-0.04	-0.01	$0.21	Super Off Peak
24	0.78	0.80	-0.02	-3.0%	-0.04	-0.01	$0.21	Super Off Peak
Daily kWh	**20.69**	**20.39**	**0.29**	**1.4%**	**0.22**	**0.36**	**N/A**	**N/A**

4.3.1 Rate 1

SCE's Rate 1 is a three-period rate with a peak-period from 2 PM to 8 PM on weekdays. In summer, for electricity usage above the baseline quantity, prices equal roughly 34.8 ¢/kWh in the peak period, 27.8 ¢/kWh in the off-peak period and 23.2 ¢/kWh in the super off-peak period. Usage on the weekends is priced at the off-peak price from 8 AM to 10 PM and the super off-peak price from 10 PM to 8 AM. For usage below the baseline quantify, a credit of 9.1 ¢/kWh is applied.

Figure 4.3-2 shows the average peak period load reduction in absolute terms for Rate 1 for SCE's service territory as a whole and for each climate region. The lines bisecting the top of each bar in the figure show the 90% confidence band for each estimate. If the confidence band includes 0, it means that the estimated load impact is not statistically different from 0 at the 90% level of confidence. If the confidence bands for two bars do not overlap, it means that the observed difference in the load impacts is statistically significant. If they do overlap, it does not necessarily mean that the difference is not statistically significant.[36] In these cases, t-tests were calculated to determine whether the difference is statistically significant.[37]

Figure 4.3-2: Average Load Impacts for Peak Period for SCE Rate 1[38]
(Positive values represent load reductions)



As seen in the figure, the average peak-period load impact for the service territory as a whole and for each climate region is statistically significant at the 90% level of confidence. On average, pilot

[36] For further discussion of this topic, see https://www.cscu.cornell.edu/news/statnews/stnews73.pdf.

[37] The test was applied at the 90% confidence level which means that a t-value exceeding 1.65 indicates statistical significance.

[38] SCE Rate 1 winter impacts represent October 2016 through May 2017.

participants across SCE's service territory on Rate 1 reduced peak-period electricity use by 3.6%, or 0.04 kW, across the six-hour peak period from 2 PM to 8 PM. The average peak-period load reduction ranges from a high of 5.0% and 0.08 kW in the moderate climate region to a low of 1.9% and 0.04 kW in the hot climate region. In the cool climate region, the load reduction equals 2.2% or 0.02 kW.

Table 4.3-1 shows the average percent and absolute load impacts for each rate period for weekdays and weekends and for the average monthly system peak day for the SCE service territory as a whole and for the participant population in each climate region. The percent reduction equals the load impact in absolute terms (kW) divided by the reference load. Shaded cells in the table contain load impact estimates that are not statistically significant at the 90% confidence level. The percentage and absolute values in the first row of Table 4.3-1, which represent the load impacts in the peak period on the average weekday, equal the values shown in Figure 4.3-2, discussed above.

The reference loads shown in Table 4.3-1 represent estimates of what customers on the TOU rate would have used if they had not responded to the price signals contained in the TOU tariff. As seen in the table, average hourly usage during the peak period is roughly 1.25 kW for the service territory as a whole, and around 0.86 kW over the 24 hour average weekday. In the hot climate region, average usage in the peak period is larger at 1.90 kW. Average usage in the moderate climate region is 1.57 kW and in the cool region it is 0.83 kW, which is roughly half what it is in the moderate region.

The monthly system peak day estimates represent the average across the four weekdays, one in each summer month, when SCE's system peaked in 2017. Peak period reference loads are higher on these days than on the average weekday. For the service territory as a whole, the percent reduction in monthly system peak day peak period loads (3.5%) is nearly identical to the load reduction on the average weekday (3.6%); however, the absolute load reduction (0.07 kW) is significantly greater than on the average weekday (0.04 kW). Customers had small but statistically significant daily usage decreases on the average weekend even though off-peak prices were in effect for the majority of weekend hours and super off-peak prices were in effect for the remaining hours.

Table 4.3-1: Rate 1 Load Impacts by Period and Day Type *
(Positive values represent load reductions, negative values represent load increases)

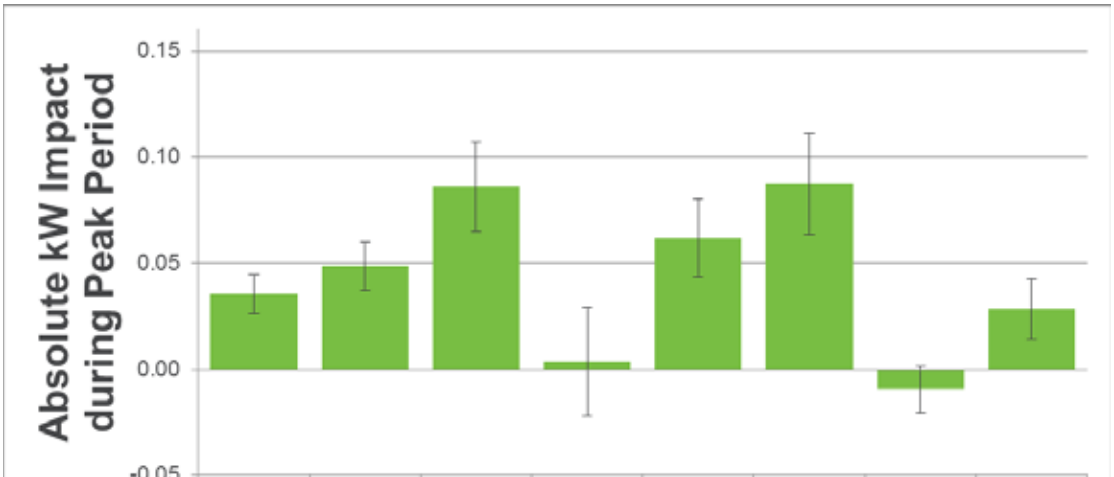
Rate 1														
Day Type	Period	Hours	All			Hot			Moderate			Cool		
			Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact
Average Weekday	Peak	2 PM to 8 PM	1.25	0.04	3.6%	1.90	0.04	1.9%	1.57	0.08	5.0%	0.83	0.02	2.2%
	Off Peak	8 AM to 2 PM, 8 PM to 10 PM	0.89	0.02	2.4%	1.33	0.01	1.0%	1.04	0.04	4.0%	0.66	0.01	0.9%
	Super Off Peak	10 PM to 8 AM	0.61	-0.01	-2.4%	0.86	-0.03	-3.0%	0.69	-0.02	-2.4%	0.48	-0.01	-2.0%
	Day	All Hours	0.86	0.01	1.4%	1.27	0.00	0.2%	1.02	0.03	2.6%	0.63	0.00	0.4%
Average Weekend	Off Peak	8 AM to 10 PM	1.13	0.03	3.0%	1.70	0.01	0.8%	1.37	0.08	5.7%	0.79	0.00	0.3%
	Super Off Peak	10 PM to 8 AM	0.62	-0.01	-1.8%	0.90	-0.03	-3.0%	0.70	-0.01	-1.1%	0.49	-0.01	-2.0%
	Day	All Hours	0.92	0.02	1.7%	1.37	0.00	-0.2%	1.09	0.04	3.8%	0.66	0.00	-0.4%
Monthly System Peak Day	Peak	2 PM to 8 PM	1.89	0.07	3.5%	2.44	0.09	3.8%	2.57	0.09	3.7%	1.20	0.04	3.1%
	Off Peak	8 AM to 2 PM, 8 PM to 10 PM	1.32	0.03	2.4%	1.75	0.05	2.6%	1.73	0.05	2.7%	0.88	0.02	1.9%
	Super Off Peak	10 PM to 8 AM	0.81	-0.01	-1.2%	1.11	-0.03	-2.8%	1.01	-0.01	-1.1%	0.58	0.00	-0.7%
	Day	All Hours	1.25	0.02	1.9%	1.65	0.03	1.5%	1.64	0.03	2.1%	0.83	0.01	1.6%

* A shaded cell indicates estimate is not statistically significant

Figure 4.3-3 shows the absolute peak period load impacts for Rate 1 for CARE/FERA and non-CARE/FERA customers for the service territory as a whole and for each climate region. In the moderate and cool climate regions, and the service territory as a whole, both the percent and absolute load impacts in the peak period appear to be greater for non-CARE/FERA customers than for CARE/FERA customers, although not all differences are statistically significant. For example, in the moderate climate region, the average weekday peak-period reduction is 5.1% and 0.09 kW for non-CARE/FERA customers whereas for CARE/FERA customers, the impact is equal to 4.9% or 0.06 kW. The difference between the two segments is statistically significant in both absolute and percentage terms in the cool climate region. Load reductions in the hot climate were not statistically significant for non-CARE/FERA customers, nor were they statistically significant for CARE/FERA customers in the cool climate region.

One potential reason the non-CARE/FERA customers may not be producing load impacts in that the hot climate region is the price signal is the weakest on Rate 1 relative to the other two rates. As seen in subsequent subsections, impacts for non-CARE/FERA customers in the hot climate zone on the other two rates are observed, so it may be possible the price signal wasn't strong enough to encourage higher income customers in the hottest region to take actions such as adjusting their thermostats. Having said that, the relative load impacts across customer segments and climate regions is quite different in PG&E's service territory compared with the results for SCE. In general, PG&E's service territory, load impacts were larger in the hot region compared with the moderate region, which, in turn, had larger impacts than in the cool region. In addition, non-CARE/FERA customers in each region and for the service territory as a whole, had larger impacts than non-CARE/FERA customers in PG&E's service territory.

Figure 4.3-3: Average Load Impacts for Peak Period for SCE Rate 1 for CARE/FERA and non-CARE/FERA Customers
(Positive values represent load reductions)



	All		Hot		Moderate		Cool	
	CARE	Non-CARE	CARE	Non-CARE	CARE	Non-CARE	CARE	Non-CARE
Percent Impact	3.3%	3.7%	5.1%	0.2%	4.9%	5.1%	-1.4%	3.2%
kW Impact	0.04	0.05	0.09	0.00	0.06	0.09	-0.01	0.03

Table 4.3-2 shows the estimated load impacts for each rate period and day type by climate zone and for the service territory as a whole for non-CARE/FERA customers and Table 4.3-3 shows the estimated values for CARE/FERA customers. For the service territory as a whole, non-CARE/FERA customers have average peak-period reference loads that are larger than CARE/FERA customers (1.33 kW for non-CARE/FERA and 1.07 kW for CARE/FERA). This pattern is consistent across all three climate regions and for daily electricity usage on average summer weekdays.

For the service territory as a whole, CARE/FERA customers decreased average daily usage on weekdays by 1.0% or 0.01 kW, whereas non-CARE/FERA customers decreased their usage by 1.6% or 0.01 kW. On the monthly system peak days, non-CARE/FERA customers reduced daily electricity use by 2.2% and CARE/FERA decreased their overall usage by 0.8%. CARE/FERA customers in the cool climate region increased their daily demand on monthly system peak days.

Table 4.3-2: Rate 1 Load Impacts by Rate Period and Day Type – Non-CARE/FERA Customers*
(Positive values represent load reductions, negative values represent load increases

Rate 1													
Day Type	Period	Hours	All, Non-CARE			Hot, Non-CARE			Moderate, Non-CARE			Cool, Non-CARE		
			Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact
Average Weekday	Peak	2 PM to 8 PM	1.33	0.05	3.7%	2.03	0.00	0.2%	1.72	0.09	5.1%	0.88	0.03	3.2%
	Off Peak	8 AM to 2 PM, 8 PM to 10 PM	0.94	0.02	2.6%	1.42	-0.02	-1.1%	1.13	0.05	4.5%	0.71	0.01	1.9%
	Super Off Peak	10 PM to 8 AM	0.64	-0.01	-2.3%	0.91	-0.05	-5.2%	0.74	-0.01	-1.8%	0.51	-0.01	-1.9%
	Day	All Hours	0.91	0.01	1.6%	1.36	-0.02	-1.8%	1.11	0.03	3.0%	0.67	0.01	1.1%
Average Weekend	Off Peak	8 AM to 10 PM	1.21	0.04	3.1%	1.82	-0.03	-1.7%	1.52	0.09	6.2%	0.85	0.01	0.9%
	Super Off Peak	10 PM to 8 AM	0.65	-0.01	-1.6%	0.95	-0.05	-5.5%	0.76	0.00	-0.2%	0.51	-0.01	-1.7%
	Day	All Hours	0.98	0.02	1.8%	1.46	-0.04	-2.7%	1.20	0.05	4.6%	0.71	0.00	0.1%
Monthly System Peak Day	Peak	2 PM to 8 PM	2.05	0.07	3.5%	2.63	0.07	2.6%	2.89	0.11	3.7%	1.30	0.05	3.5%
	Off Peak	8 AM to 2 PM, 8 PM to 10 PM	1.42	0.04	2.9%	1.89	0.01	0.5%	1.92	0.07	3.6%	0.95	0.02	2.6%
	Super Off Peak	10 PM to 8 AM	0.86	0.00	-0.5%	1.18	-0.06	-5.0%	1.09	0.00	0.2%	0.61	0.00	0.2%
	Day	All Hours	1.34	0.03	2.2%	1.78	0.00	-0.2%	1.82	0.05	2.8%	0.90	0.02	2.2%

* A shaded cell indicates estimate is not statistically significant

Table 4.3-3: Rate 1 Load Impacts by Rate Period and Day Type – CARE/FERA Customers*
(Positive values represent load reductions, negative values represent load increases)

Rate 1													
Day Type	Period	Hours	All, CARE			Hot, CARE			Moderate, CARE			Cool, CARE		
			Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact
Average Weekday	Peak	2 PM to 8 PM	1.07	0.04	3.3%	1.69	0.09	5.1%	1.26	0.06	4.9%	0.66	-0.01	-1.4%
	Off Peak	8 AM to 2 PM, 8 PM to 10 PM	0.77	0.01	1.7%	1.18	0.06	5.0%	0.85	0.02	2.8%	0.53	-0.01	-2.7%
	Super Off Peak	10 PM to 8 AM	0.54	-0.01	-2.4%	0.78	0.01	1.1%	0.58	-0.02	-4.0%	0.41	-0.01	-2.4%
	Day	All Hours	0.75	0.01	1.0%	1.14	0.05	3.9%	0.84	0.01	1.6%	0.51	-0.01	-2.2%
Average Weekend	Off Peak	8 AM to 10 PM	0.95	0.03	2.7%	1.51	0.08	5.5%	1.08	0.04	4.0%	0.62	-0.01	-2.0%
	Super Off Peak	10 PM to 8 AM	0.55	-0.01	-2.2%	0.81	0.01	1.7%	0.60	-0.02	-3.5%	0.41	-0.01	-3.1%
	Day	All Hours	0.78	0.01	1.3%	1.22	0.05	4.5%	0.88	0.02	1.9%	0.53	-0.01	-2.3%
Monthly System Peak Day	Peak	2 PM to 8 PM	1.53	0.05	3.4%	2.13	0.13	6.0%	1.93	0.07	3.5%	0.91	0.01	1.2%
	Off Peak	8 AM to 2 PM, 8 PM to 10 PM	1.10	0.01	1.2%	1.53	0.10	6.8%	1.35	0.00	0.2%	0.68	-0.01	-0.9%
	Super Off Peak	10 PM to 8 AM	0.71	-0.02	-3.1%	1.00	0.01	1.3%	0.84	-0.04	-4.5%	0.48	-0.02	-3.7%
	Day	All Hours	1.04	0.01	0.8%	1.46	0.07	4.9%	1.28	0.00	0.2%	0.65	-0.01	-1.0%

* A shaded cell indicates estimate is not statistically significant

Table 4.3-4 shows the estimated load impacts for smart thermostat customers who were enrolled on Rate 1. As a reminder, these load reductions represent the total reduction for customers who had previously purchased smart thermostats and are on Rate 1 relative to a control group of smart thermostat owners who are on the OAT. The impacts are not the incremental load impact of a smart thermostat for customers on a TOU rate relative to customers on a TOU rate who do not have a smart thermostat. These customers are distributed throughout the service territory and the vast majority are non-CARE/FERA customers.

In August 2017, Nest implemented a program named Time of Savings (TOS) on the smart thermostats of treatment customers. About 90% of treatment customers enrolled in the pilot at the time of the TOS launch were eligible and ran the program on their device. Only 12.3% opted out of the special programming between August 2 and the end of the summer season. While the experiment does not lend itself to measuring incremental impacts, as discussed below, it is clear that TOS has an effect on the overall load profiles of treatment customers, which results in larger peak period impacts.

Figure 4.3-4 and Figure 4.3-5 show the average August weekday load profile for customers in the smart thermostat segment, for 2016 and 2017, respectively. In 2017, after implementation of TOS, customers in the treatment group show evidence of pre-cooling prior to the TOU period with noticeable snapback after peak pricing ends. Load reductions during the peak period are also markedly larger, especially in the initial peak period hours. While it is not possible to compare load reductions for those with and without TOS for the same months, it is possible to compare impacts across summers for those in the thermostat group as a crude estimate of the incremental effect of TOS support while adjusting for differences in weather across seasons. This can be done by using the ratio of loads for the control group in 2016 to those in 2017 as an adjustment to the load impacts in 2017. Using this method, the load impacts were about twice as large with TOS compared to the same month in the prior year when TOS was not offered. While it's impossible to be certain this is all directly attributable to the TOS, it seems reasonable that a good portion of it is.

Figure 4.3-4: Technology Segment – Average August 2016 Weekday

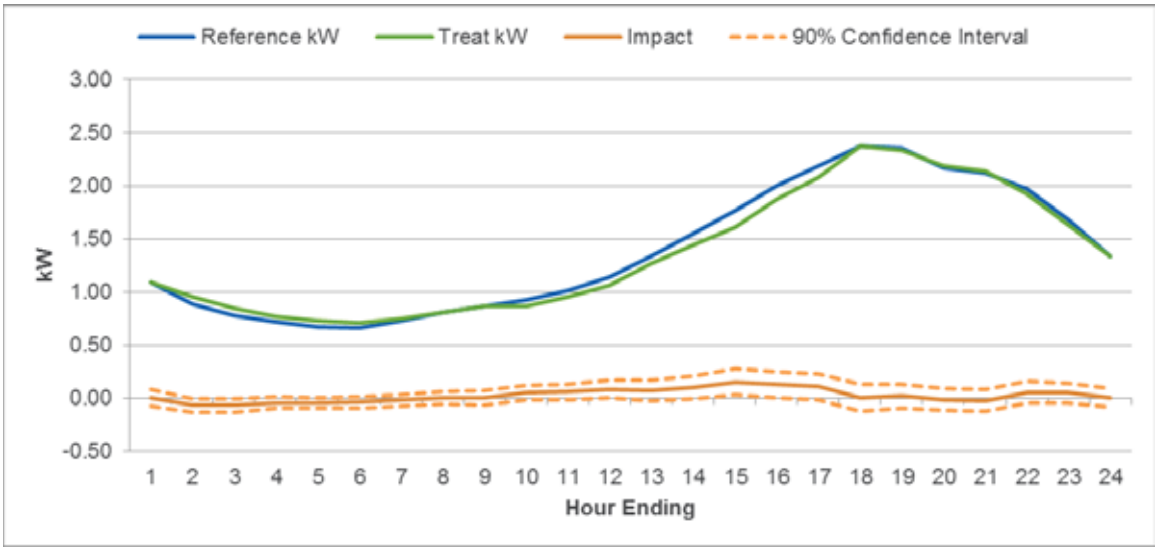


Figure 4.3-5: Technology Segment – Average August 2017 Weekday

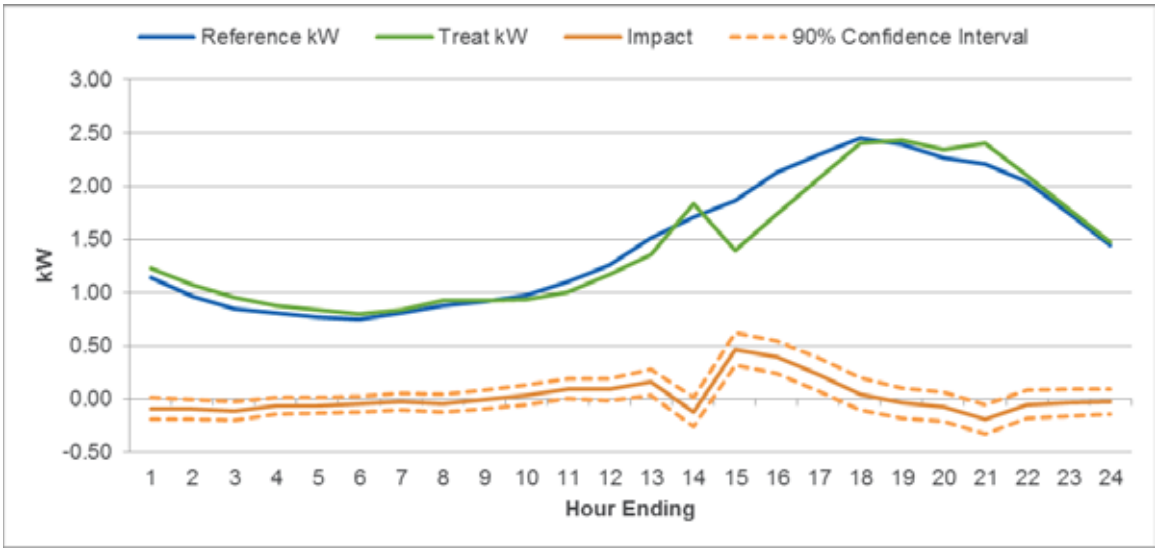


Table 4.3-4 shows the average weekday peak-period reference load for these households (1.99 kW) is higher than the average for households in the service territory as a whole (1.25 kW). The average load reduction for smart thermostat households during the peak period, 6.7% or 0.13 kW, was nearly double the average for all households in the service territory (3.6% or 0.04 kW). This result is in contrast to what was found in the first summer, as reported in the First Interim Report, where smart thermostat households had reductions similar to those of the general population. In the second summer, smart thermostat households reduced average daily use by 2.5%, or 0.03 kW, and had comparable reductions in daily usage on weekends. Peak-period load reductions on the monthly system peak day were greater than those on the average weekday in absolute terms (0.14 kW versus 0.13 kW) but smaller in percentage terms (4.7% versus 6.7%).

Table 4.3-4: Rate 1 Load Impacts by Rate Period and Day Type – Technology Customers* (Positive values represent load reductions, negative values represent load increases)

Rate 1					
Day Type	Period	Hours	Technology		
			Ref. kW	Impact kW	% Impact
Average Weekday	Peak	2 PM to 8 PM	1.99	0.13	6.7%
	Off Peak	8 AM to 2 PM, 8 PM to 10 PM	1.34	0.06	4.4%
	Super Off Peak	10 PM to 8 AM	0.91	-0.05	-5.2%
	Day	All Hours	1.32	0.03	2.5%
Average Weekend	Off Peak	8 AM to 10 PM	1.75	0.07	4.2%
	Super Off Peak	10 PM to 8 AM	0.93	-0.04	-4.8%
	Day	All Hours	1.41	0.02	1.7%
Monthly System Peak Day	Peak	2 PM to 8 PM	3.06	0.14	4.7%
	Off Peak	8 AM to 2 PM, 8 PM to 10 PM	2.04	0.04	1.8%
	Super Off Peak	10 PM to 8 AM	1.21	-0.11	-8.7%
	Day	All Hours	1.95	0.00	0.2%

* A shaded cell indicates estimate is not statistically significant

4.3.2 Rate 2

SCE's Rate 2 differs from Rate 1 in several important ways. While both rates have three rate periods on summer weekdays, the Rate 2 peak period is only three hours long, from 5 PM to 8 PM, compared to the six-hour peak period for Rate 1. The Rate 2 peak period price is 55.2 ¢/kWh, which is much greater than the Rate 1 peak price of 34.8 ¢/kWh. The structures of Rate 1 and Rate 2 are identical on weekends, but Rate 2 has a lower super off-peak price at 17.6 ¢/kWh (compared to 23.2 ¢/kWh for Rate 1). The off-peak prices are similar between the two rates, 27.8 ¢/kWh for Rate 1 and 29.1 ¢/kWh for Rate 2. For usage below the baseline quantify, a credit of 9.1 ¢/kWh is applied in both cases.

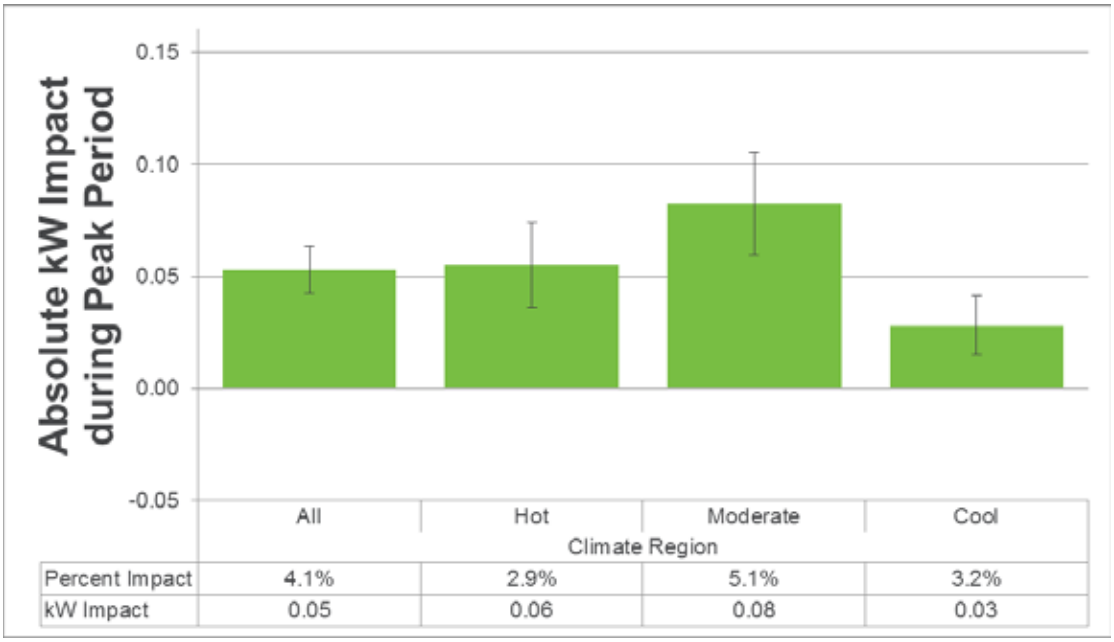
Figure 4.3-6 shows the percent and absolute load impacts for the weekday peak period for Rate 2 for SCE's service territory as a whole and for each climate region. Percent and absolute impacts for the service territory as a whole, 4.1% and 0.05 kW, are greater than those for Rate 1 (3.6% and 0.04 kW), but this difference is not statistically significant in percent or absolute terms. The average weekday peak-period load reduction for customers in the hot climate region on Rate 2, 2.9% and 0.06 kW, are also larger than the impacts for Rate 1, but again this difference is not statistically significant.

Looking at the pattern of load impacts across climate regions for customers on Rate 2, the difference in impacts between the hot and moderate regions is not statistically significant on an absolute basis, but they are on a percentage basis. The cool region has the lowest absolute and percentage impacts and differences between the cool and moderate or hot regions are statistically significant on an absolute basis but not on a percentage basis.

Table 4.3-5 contains load impact estimates for each rate period and day type for Rate 2. For the service territory as a whole, daily electricity usage was similar on average summer weekdays and weekends, 0.86 kW and 0.92 kW. Reductions in daily electricity use were also similar on weekdays and weekends, although quite small in both percentage and absolute terms (1.1% and 0.01 kW). Electricity use and impacts were the largest on monthly system peak days, with load reductions of about 1.4% or 0.02 kW.

Customers in every climate region provided statistically significant peak and off-peak demand reductions for Rate 2 during all three day-types except for customers in the cool climate region on the average monthly system peak day. Customers in each climate region increased their electricity use during the super off-peak period on weekdays, weekends, and monthly system peak days, which could indicate load shifting or increased consumption of selected end uses during the lower priced period.

Figure 4.3-6: Average Load Impacts for Peak Period for SCE Rate 2[39]
(Positive values represent load reductions)



	All	Hot	Moderate	Cool
Percent Impact	4.1%	2.9%	5.1%	3.2%
kW Impact	0.05	0.06	0.08	0.03

[39] SCE Rate 2 winter impacts represent October 2016 through May 2017.

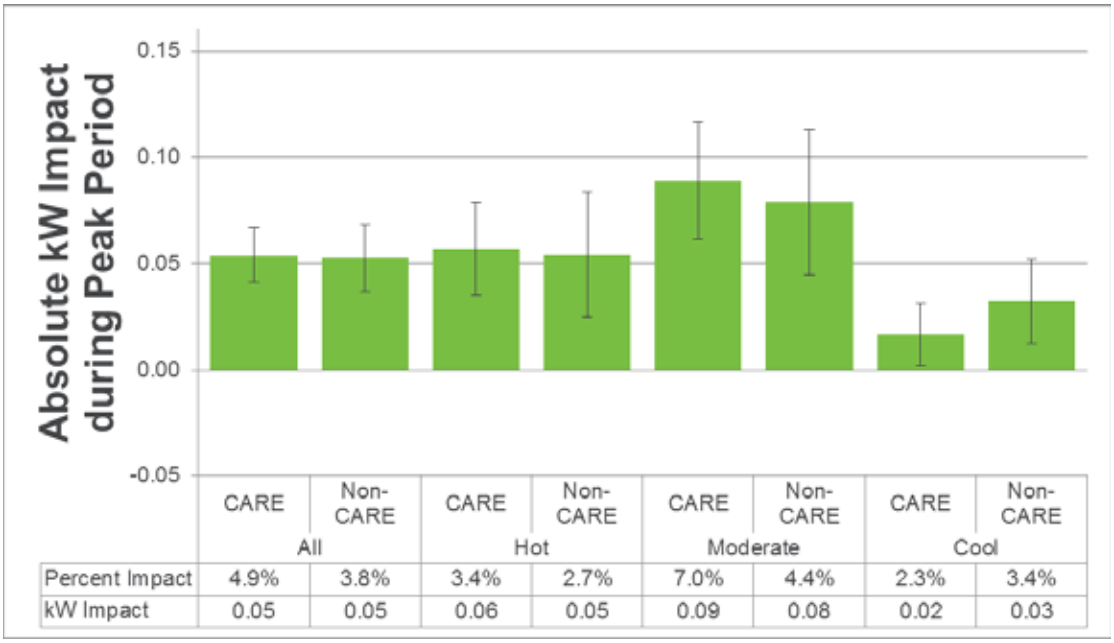
Table 4.3-5: Rate 2 Load Impacts by Rate Period and Day Type*
(Positive values represent load reductions, negative values represent load increases)

Rate 2													
Day Type	Period	Hours	All			Hot			Moderate			Cool		
			Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact
Average Weekday	Peak	5 PM to 8 PM	1.29	0.05	4.1%	1.89	0.06	2.9%	1.61	0.08	5.1%	0.88	0.03	3.2%
	Off Peak	8 AM to 5 PM, 8 PM to 10 PM	0.98	0.03	2.6%	1.48	0.04	2.7%	1.17	0.04	3.8%	0.69	0.01	1.0%
	Super Off Peak	10 PM to 8 AM	0.61	-0.02	-3.5%	0.86	-0.02	-2.8%	0.69	-0.04	-5.3%	0.48	-0.01	-1.6%
	Day	All Hours	0.86	0.01	1.1%	1.27	0.02	1.2%	1.02	0.02	1.5%	0.63	0.00	0.5%
Average Weekend	Off Peak	8 AM to 10 PM	1.13	0.03	2.9%	1.70	0.03	2.1%	1.37	0.05	4.0%	0.79	0.01	1.7%
	Super Off Peak	10 PM to 8 AM	0.62	-0.02	-3.4%	0.90	-0.02	-2.4%	0.70	-0.03	-4.6%	0.49	-0.01	-2.3%
	Day	All Hours	0.92	0.01	1.1%	1.37	0.01	0.8%	1.09	0.02	1.7%	0.66	0.00	0.5%
Monthly System Peak Day	Peak	5 PM to 8 PM	1.91	0.09	4.6%	2.39	0.11	4.4%	2.56	0.14	5.5%	1.25	0.04	3.1%
	Off Peak	8 AM to 5 PM, 8 PM to 10 PM	1.47	0.04	2.5%	1.95	0.07	3.4%	1.96	0.07	3.4%	0.95	0.01	0.7%
	Super Off Peak	10 PM to 8 AM	0.81	-0.03	-3.1%	1.11	-0.02	-2.0%	1.01	-0.04	-4.1%	0.58	-0.01	-2.2%
	Day	All Hours	1.25	0.02	1.4%	1.65	0.03	2.0%	1.64	0.03	1.9%	0.83	0.00	0.3%

* A shaded cell indicates estimate is not statistically significant

Figure 4.3-7 shows the estimated peak period load impacts for Rate 2 for CARE/FERA and non-CARE/FERA households for the service territory as a whole and for each climate region. There were no statistically significant differences in absolute load reductions between CARE/FERA and non-CARE/FERA customers within any climate region or across the entire service territory. In the moderate climate region, CARE/FERA customers had the greatest reduction in peak-period energy use at 7.0% and 0.09 kW and the percent reduction was significantly larger for non-CARE/FERA customers.

Figure 4.3-7: Average Load Impacts for Peak Period for SCE Rate 2 for CARE/FERA and non-CARE/FERA Customers
(Positive values represent load reductions)



	CARE	Non-CARE	CARE	Non-CARE	CARE	Non-CARE	CARE	Non-CARE
	All		Hot		Moderate		Cool	
Percent Impact	4.9%	3.8%	3.4%	2.7%	7.0%	4.4%	2.3%	3.4%
kW Impact	0.05	0.05	0.06	0.05	0.09	0.08	0.02	0.03

Table 4.3-6 and Table 4.3-7 show the load impacts for non-CARE/FERA and CARE/FERA customers, respectively, for each rate period and day-type. Once again, the values in the first row of each table are the same as those found in Figure 4.3-7. For the service territory as a whole, non-CARE/FERA customers have higher peak period usage, 1.38 kW, than CARE/FERA customers, 1.09 kW. Daily consumption is also greater for non-CARE/FERA customers than for CARE/FERA customers on Rate 2. However, the CARE/FERA group was able to reduce their average weekday use by about 1.5% while non-CARE/FERA customers reduced their usage by 0.9%.

Table 4.3-6: Rate 2 Load Impacts by Rate Period and Day Type – Non-CARE/FERA Customers*
(Positive values represent load reductions, negative values represent load increases)

Rate 2													
Day Type	Period	Hours	All, Non-CARE			Hot, Non-CARE			Moderate, Non-CARE			Cool, Non-CARE		
			Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact
Average Weekday	Peak	5 PM to 8 PM	1.38	0.05	3.8%	2.02	0.05	2.7%	1.78	0.08	4.4%	0.94	0.03	3.4%
	Off Peak	8 AM to 5 PM, 8 PM to 10 PM	1.03	0.03	2.5%	1.59	0.04	2.7%	1.28	0.04	3.1%	0.74	0.01	1.6%
	Super Off Peak	10 PM to 8 AM	0.64	-0.02	-3.6%	0.91	-0.04	-4.0%	0.74	-0.04	-5.9%	0.51	0.00	-0.9%
	Day	All Hours	0.91	0.01	0.9%	1.36	0.01	0.8%	1.11	0.01	0.9%	0.67	0.01	1.1%
Average Weekend	Off Peak	8 AM to 10 PM	1.21	0.03	2.8%	1.82	0.02	1.4%	1.52	0.06	3.8%	0.85	0.02	2.0%
	Super Off Peak	10 PM to 8 AM	0.65	-0.02	-3.5%	0.95	-0.04	-3.9%	0.76	-0.04	-4.9%	0.51	-0.01	-1.7%
	Day	All Hours	0.98	0.01	1.0%	1.46	0.00	-0.1%	1.20	0.02	1.5%	0.71	0.01	0.9%
Monthly System Peak Day	Peak	5 PM to 8 PM	2.07	0.09	4.3%	2.57	0.12	4.6%	2.88	0.15	5.3%	1.36	0.04	2.7%
	Off Peak	8 AM to 5 PM, 8 PM to 10 PM	1.59	0.04	2.5%	2.11	0.08	3.7%	2.19	0.07	3.1%	1.03	0.01	1.0%
	Super Off Peak	10 PM to 8 AM	0.86	-0.03	-3.2%	1.18	-0.03	-2.9%	1.09	-0.05	-4.6%	0.61	-0.01	-1.4%
	Day	All Hours	1.34	0.02	1.3%	1.78	0.04	2.0%	1.82	0.03	1.6%	0.90	0.01	0.7%

* A shaded cell indicates estimate is not statistically significant

Table 4.3-7: Rate 2 Load Impacts by Rate Period and Day Type – CARE/FERA Customers*
(Positive values represent load reductions, negative values represent load increases)

Rate 2													
Day Type	Period	Hours	All, CARE			Hot, CARE			Moderate, CARE			Cool, CARE		
			Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact
Average Weekday	Peak	5 PM to 8 PM	1.09	0.05	4.9%	1.69	0.06	3.4%	1.27	0.09	7.0%	0.70	0.02	2.3%
	Off Peak	8 AM to 5 PM, 8 PM to 10 PM	0.85	0.03	3.1%	1.32	0.04	2.9%	0.96	0.05	5.7%	0.56	-0.01	-1.4%
	Super Off Peak	10 PM to 8 AM	0.54	-0.02	-3.2%	0.78	0.00	-0.6%	0.58	-0.02	-3.9%	0.41	-0.02	-4.1%
	Day	All Hours	0.75	0.01	1.5%	1.14	0.02	2.0%	0.84	0.03	3.2%	0.51	-0.01	-1.6%
Average Weekend	Off Peak	8 AM to 10 PM	0.95	0.03	3.2%	1.51	0.05	3.4%	1.08	0.05	4.6%	0.62	0.00	0.6%
	Super Off Peak	10 PM to 8 AM	0.55	-0.02	-3.1%	0.81	0.00	0.4%	0.60	-0.02	-3.9%	0.41	-0.02	-4.3%
	Day	All Hours	0.78	0.01	1.4%	1.22	0.03	2.6%	0.88	0.02	2.2%	0.53	-0.01	-1.0%
Monthly System Peak Day	Peak	5 PM to 8 PM	1.53	0.08	5.4%	2.10	0.09	4.1%	1.91	0.12	6.2%	0.93	0.04	4.8%
	Off Peak	8 AM to 5 PM, 8 PM to 10 PM	1.22	0.03	2.7%	1.70	0.05	2.7%	1.51	0.06	4.2%	0.74	0.00	-0.6%
	Super Off Peak	10 PM to 8 AM	0.71	-0.02	-2.9%	1.00	0.00	-0.3%	0.84	-0.02	-2.9%	0.48	-0.02	-4.8%
	Day	All Hours	1.04	0.02	1.6%	1.46	0.03	2.1%	1.28	0.03	2.7%	0.65	-0.01	-0.9%

* A shaded cell indicates estimate is not statistically significant

Figure 4.3-8 shows the load impacts in absolute terms for senior households and households with incomes below 100% of FPG. Table 4.3-8 shows the estimated values for other rate periods and day types for each segment. Of greatest interest is whether load impacts for these two customer segments differ from those of the average population in the hot climate region. As seen previously in Figure 4.3-2, average load impacts for the hot climate region population overall equaled 0.06 kWh or 2.9%. As seen in Figure 4.3-8, load impacts for households with incomes below 100% of FPG were actually larger in both absolute and percentage terms compared with the general population and load impacts for senior households were even larger. The difference in percentage terms was statistically significant.

Figure 4.3-8: Average Load Impacts for Peak Period for SCE Rate 2 for Senior Households and Households with Incomes Below 100% of FPG in the Hot Climate Region

(Positive values represent load reductions)

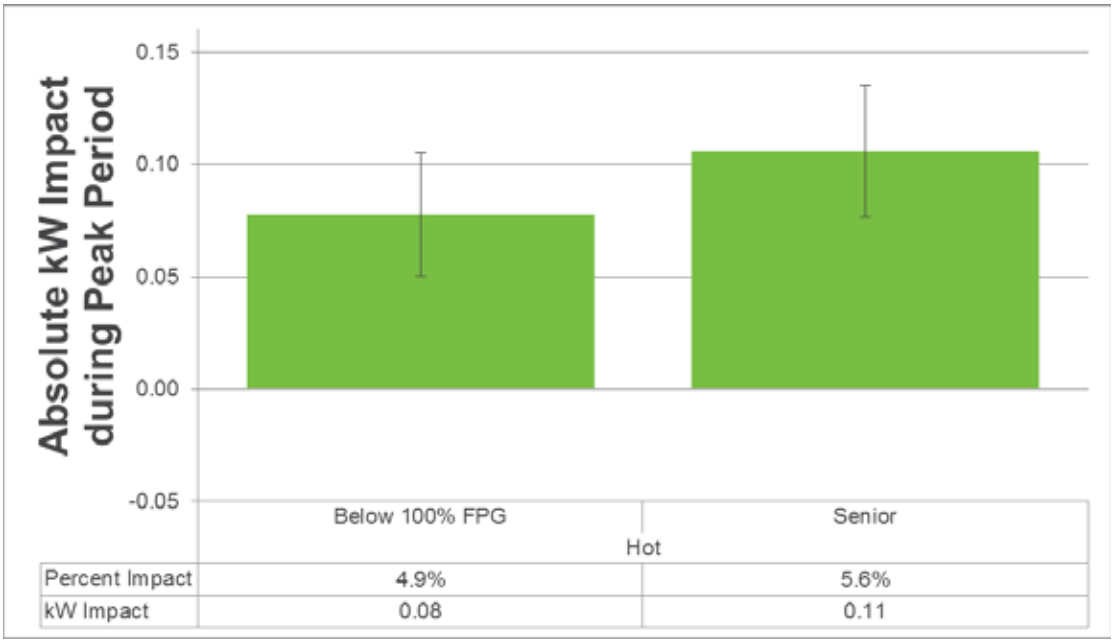


Table 4.3-8: Rate 2 Load Impacts by Rate Period and Day Type for Senior Households and Households with Incomes Below 100% of FPG in the Hot Climate Region*

(Positive values represent load reductions, negative values represent load increases)

Rate 2								
Day Type	Period	Hours	Hot, Below 100% FPG			Hot, Senior		
			Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact
Average Weekday	Peak	5 PM to 8 PM	1.58	0.08	4.9%	1.88	0.11	5.6%
	Off Peak	8 AM to 5 PM, 8 PM to 10 PM	1.25	0.06	5.0%	1.50	0.05	3.7%
	Super Off Peak	10 PM to 8 AM	0.76	0.00	0.0%	0.78	-0.02	-2.4%
	Day	All Hours	1.08	0.04	3.5%	1.25	0.03	2.5%
Average Weekend	Off Peak	8 AM to 10 PM	1.41	0.06	4.5%	1.67	0.06	3.5%
	Super Off Peak	10 PM to 8 AM	0.79	0.01	0.9%	0.81	-0.02	-1.9%
	Day	All Hours	1.15	0.04	3.4%	1.31	0.03	2.1%
Monthly System Peak Day	Peak	5 PM to 8 PM	1.95	0.11	5.8%	2.37	0.17	7.4%
	Off Peak	8 AM to 5 PM, 8 PM to 10 PM	1.57	0.08	4.9%	2.00	0.08	4.0%
	Super Off Peak	10 PM to 8 AM	0.97	0.01	1.2%	1.02	-0.03	-2.8%
	Day	All Hours	1.37	0.05	4.0%	1.64	0.05	2.8%

* A shaded cell indicates estimate is not statistically significant

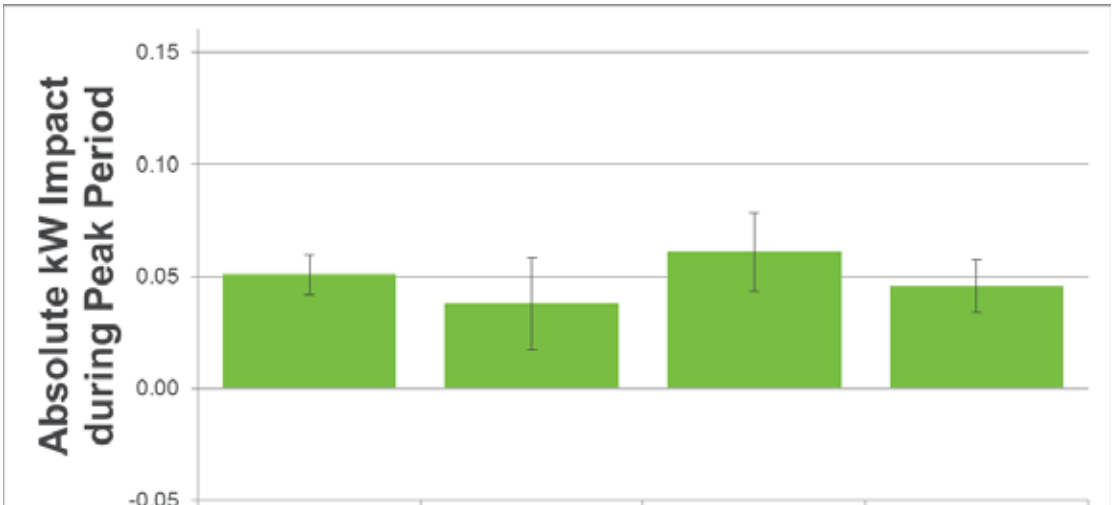
4.3.3 Rate 3

SCE's Rate 3 also has three rate periods on summer weekdays, and two rate periods on summer weekends. For this tariff, SCE refers to the highest price period during weekdays as the super peak period, which is five hours long, from 4 PM to 9 PM, with a price of 37.0 ¢/kWh for non-CARE/FERA customers. While this price is greater than the Tier 2 peak price for Rate 1 and smaller than the Tier 2 price for Rate 2, these prices are not directly comparable because Rate 3 does not include a baseline credit like Rates 1 and 2. As such, average prices for Rate 3 may be higher for low use customers and lower for high use customers than Rate 1 and 2 average prices. The Rate 3 peak period (or shoulder period in this instance) runs from 11 AM to 4 PM and 9 PM to 11 PM, which is significantly shorter than the Rate 2 shoulder period and is the same length as the Rate 1 shoulder period but covering different hours.

Figure 4.3-9 shows the mid peak period load reductions on average weekdays for Rate 3. The load reductions for the SCE territory as a whole, 4.0% or 0.05 kW, are very similar to those for Rate 2 (4.1% or 0.05 kW). Load impacts were greatest in the moderate climate region (3.8% or 0.06 kW), but the differences between the moderate region and the other two climate regions were not statistically significant in absolute terms.

Table 4.3-9 contains estimates of load impacts for all relevant rate periods and day types. Super on-peak peak demand was the smallest among customers in the cool climate region at 0.87 kW, but percent impacts were the greatest (5.2%). On the average weekend, customers in the moderate climate region had the greatest percent impacts at 4.9% (0.08 kW). On weekdays, the average reduction in daily electricity use was statistically significant overall in each climate region, ranging from 1.3% in the moderate zone to 3.1 % in the cool zone.

Figure 4.3-9: Average Load Impacts for Mid Peak Period for SCE Rate 3[40]
(Positive values represent load reductions)



	All	Hot	Moderate	Cool
Percent Impact	4.0%	2.0%	3.8%	5.2%
kW Impact	0.05	0.04	0.06	0.05

[40] SCE Rate 3 winter impacts represent October 2016 through February 2017.

Table 4.3-9: Rate 3 Load Impacts by Rate Period and Day Type*
(Positive values represent load reductions, negative values represent load increases)

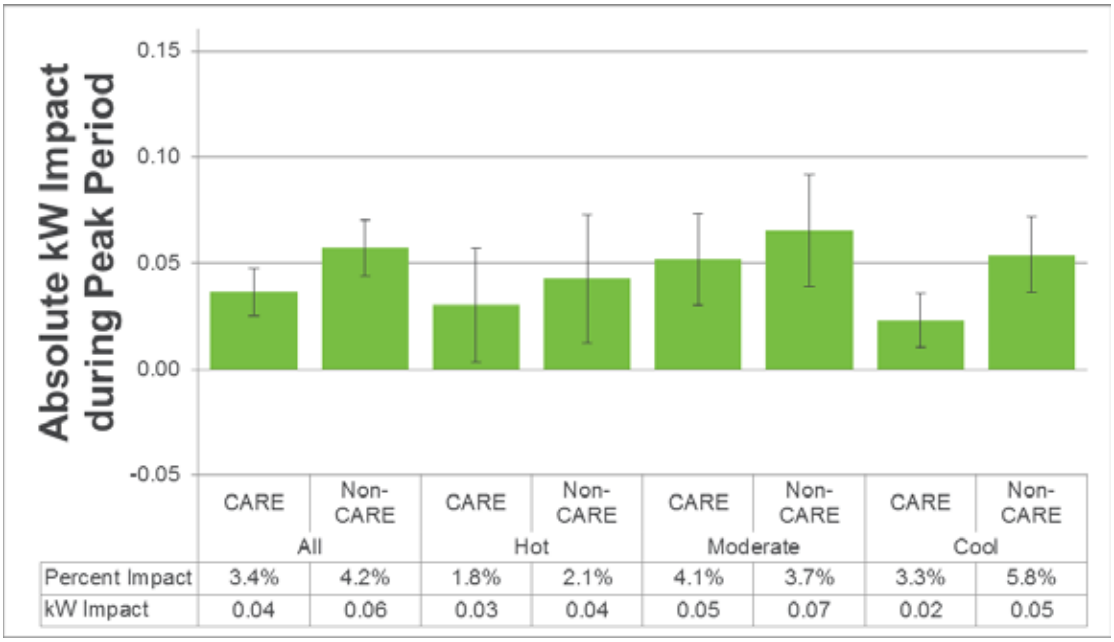
Rate 3													
Day Type	Period	Hours	All			Hot			Moderate			Cool		
			Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact
Average Weekday	Super On Peak	4 PM to 9 PM	1.27	0.05	4.0%	1.87	0.04	2.0%	1.58	0.06	3.8%	0.87	0.05	5.2%
	Peak	11 AM to 4 PM, 9 PM to 11 PM	1.02	0.02	2.3%	1.55	0.04	2.7%	1.24	0.02	1.8%	0.71	0.02	2.8%
	Off Peak	11 PM to 11 AM	0.60	0.00	-0.1%	0.86	0.00	-0.2%	0.66	-0.01	-1.8%	0.48	0.01	1.8%
	Day	All Hours	0.86	0.02	2.0%	1.27	0.02	1.5%	1.02	0.01	1.3%	0.63	0.02	3.1%
Average Weekend	Mid Peak	4 PM to 9 PM	1.31	0.05	4.0%	1.95	0.01	0.6%	1.64	0.08	4.9%	0.88	0.04	4.4%
	Off Peak	9 PM to 4 PM	0.81	0.01	1.1%	1.21	0.00	-0.3%	0.95	0.00	0.4%	0.61	0.02	2.7%
	Day	All Hours	0.92	0.02	2.0%	1.37	0.00	0.0%	1.09	0.02	1.8%	0.66	0.02	3.2%
Monthly System Peak Day	Super On Peak	4 PM to 9 PM	1.88	0.06	3.2%	2.36	0.05	2.2%	2.53	0.07	2.8%	1.24	0.05	4.3%
	Peak	11 AM to 4 PM, 9 PM to 11 PM	1.59	0.02	1.1%	2.07	0.08	4.0%	2.15	0.02	0.8%	1.01	0.00	0.1%
	Off Peak	11 PM to 11 AM	0.79	-0.01	-1.3%	1.12	0.00	-0.4%	0.97	-0.03	-2.8%	0.56	0.00	0.4%
	Day	All Hours	1.25	0.01	1.0%	1.65	0.03	2.0%	1.64	0.01	0.4%	0.83	0.01	1.5%

* A shaded cell indicates estimate is not statistically significant

Figure 4.3-10 shows the peak period load reductions on weekdays for non-CARE/FERA and CARE/FERA customers, and Table 4.3-10 and Table 4.3-11 show the load impacts for each rate period and day type for the two segments. Load reductions were statistically significant for all customer segments and climate regions. The differences in absolute impacts between CARE/FERA and non-CARE/FERA customers were statistically significant for the service territory as a whole as well as in the cool climate regions.

As seen in Table 4.3-10 and Table 4.3-11, there are significant average weekday load reductions for non-CARE/FERA and CARE/FERA customers in the SCE territory as a whole. Load reductions were also significant, and over 3%, for non-CARE/FERA and CARE/FERA customers on average weekends and monthly system peak days.

Figure 4.3-10: Average Load Impacts for Peak Period for SCE Rate 3 for CARE/FERA and Non-CARE/FERA Customers
(Positive values represent load reductions)



	All		Hot		Moderate		Cool	
	CARE	Non-CARE	CARE	Non-CARE	CARE	Non-CARE	CARE	Non-CARE
Percent Impact	3.4%	4.2%	1.8%	2.1%	4.1%	3.7%	3.3%	5.8%
kW Impact	0.04	0.06	0.03	0.04	0.05	0.07	0.02	0.05

Table 4.3-10: Rate 3 Load Impacts by Rate Period and Day Type – Non-CARE/FERA Customers*
(Positive values represent load reductions, negative values represent load increases)

Rate 3													
Day Type	Period	Hours	All, Non-CARE			Hot, Non-CARE			Moderate, Non-CARE			Cool, Non-CARE		
			Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact
Average Weekday	Super On Peak	4 PM to 9 PM	1.35	0.06	4.2%	1.99	0.04	2.1%	1.74	0.07	3.7%	0.93	0.05	5.8%
	Peak	11 AM to 4 PM, 9 PM to 11 PM	1.08	0.02	1.7%	1.65	0.06	3.5%	1.35	0.00	0.1%	0.76	0.02	3.2%
	Off Peak	11 PM to 11 AM	0.63	0.00	-0.8%	0.92	-0.01	-1.3%	0.72	-0.02	-3.3%	0.51	0.01	2.1%
	Day	All Hours	0.91	0.01	1.6%	1.36	0.02	1.5%	1.11	0.00	0.2%	0.67	0.02	3.6%
Average Weekend	Mid Peak	4 PM to 9 PM	1.40	0.05	3.9%	2.09	-0.01	-0.4%	1.82	0.08	4.6%	0.95	0.05	4.9%
	Off Peak	9 PM to 4 PM	0.86	0.01	0.9%	1.29	-0.02	-1.5%	1.04	-0.01	-0.5%	0.65	0.02	3.6%
	Day	All Hours	0.98	0.02	1.8%	1.46	-0.02	-1.2%	1.20	0.01	1.1%	0.71	0.03	3.9%
Monthly System Peak Day	Super On Peak	4 PM to 9 PM	2.04	0.06	3.0%	2.54	0.04	1.7%	2.84	0.07	2.5%	1.35	0.06	4.2%
	Peak	11 AM to 4 PM, 9 PM to 11 PM	1.71	0.00	-0.1%	2.22	0.12	5.3%	2.40	-0.02	-0.8%	1.09	-0.01	-1.0%
	Off Peak	11 PM to 11 AM	0.84	-0.02	-2.3%	1.20	-0.01	-1.2%	1.05	-0.05	-5.0%	0.60	0.01	0.8%
	Day	All Hours	1.34	0.00	0.2%	1.78	0.04	2.0%	1.82	-0.02	-0.9%	0.90	0.01	1.2%

* A shaded cell indicates estimate is not statistically significant

Table 4.3-11: Rate 3 Load Impacts by Rate Period and Day Type –CARE/FERA Customers*
(Positive values represent load reductions, negative values represent load increases)

Rate 3													
Day Type	Period	Hours	All, CARE			Hot, CARE			Moderate, CARE			Cool, CARE		
			Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact
Average Weekday	Super On Peak	4 PM to 9 PM	1.08	0.04	3.4%	1.67	0.03	1.8%	1.26	0.05	4.1%	0.70	0.02	3.3%
	Peak	11 AM to 4 PM, 9 PM to 11 PM	0.89	0.03	3.7%	1.40	0.02	1.1%	1.03	0.06	6.2%	0.58	0.01	1.1%
	Off Peak	11 PM to 11 AM	0.52	0.01	1.6%	0.77	0.01	1.8%	0.56	0.01	2.2%	0.40	0.00	0.6%
	Day	All Hours	0.75	0.02	2.9%	1.14	0.02	1.6%	0.84	0.04	4.2%	0.51	0.01	1.5%
Average Weekend	Mid Peak	4 PM to 9 PM	1.10	0.05	4.2%	1.73	0.04	2.6%	1.27	0.07	5.8%	0.69	0.02	2.8%
	Off Peak	9 PM to 4 PM	0.70	0.01	1.7%	1.08	0.02	2.0%	0.78	0.02	2.8%	0.49	0.00	-0.3%
	Day	All Hours	0.78	0.02	2.4%	1.22	0.03	2.2%	0.88	0.03	3.7%	0.53	0.00	0.5%
Monthly System Peak Day	Super On Peak	4 PM to 9 PM	1.52	0.06	3.8%	2.08	0.06	3.1%	1.90	0.07	3.7%	0.93	0.04	4.7%
	Peak	11 AM to 4 PM, 9 PM to 11 PM	1.32	0.06	4.4%	1.82	0.02	1.3%	1.66	0.09	5.5%	0.79	0.04	4.5%
	Off Peak	11 PM to 11 AM	0.68	0.01	1.4%	0.99	0.01	1.2%	0.80	0.02	3.0%	0.46	-0.01	-1.3%
	Day	All Hours	1.04	0.03	3.3%	1.46	0.03	1.8%	1.28	0.05	4.2%	0.65	0.02	2.5%

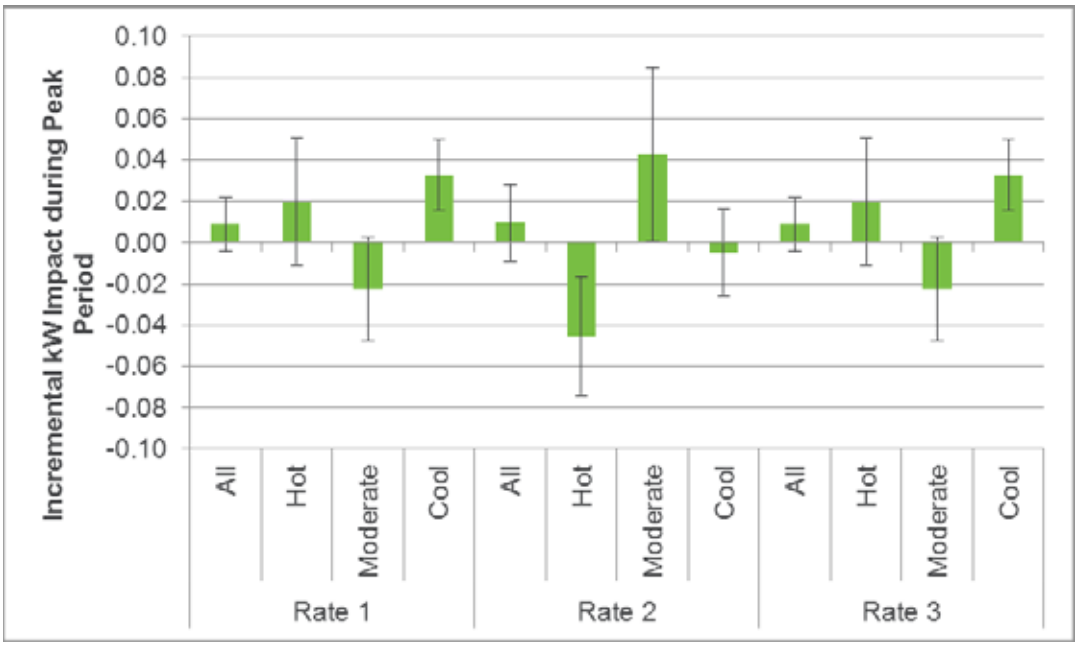
* A shaded cell indicates estimate is not statistically significant

4.3.4 Advanced ME&O

SCE varied the education and outreach provided to participants who were on the three TOU rates. The majority of customers (75%) on each of the three TOU rates received what SCE describes as enhanced education and outreach while the remainder received fewer contacts during the post enrollment phase. The customers chosen at random to receive the enhanced education treatment for each rate received a postcard at the end of August containing tips and reminders about their rate. Starting in late September, the roughly 19% of participants in the enhanced education group who indicated at the time of enrollment that they were willing to receive information via text messages were sent additional reminders and tips via text message.

Figure 4.3-11 shows the average incremental impact attributable to the enhanced education and outreach for each climate region and rate, as well as for the territory as a whole. Positive values in the figure indicate an incremental increase in load reductions (e.g., load reductions are larger with enhanced education) while a negative value means load reductions were smaller for the enhanced education group relative to the less frequent communication. As seen, incremental impacts were both positive and negative although hardly any incremental impacts were statistically significant. A key exception is for customers on Rate 2 in the moderate climate region, where incremental impacts were much larger in absolute terms compared with the non-enhanced group. Just the opposite is seen for Rate 2 customers in the hot climate region, where impacts were much lower for customers in the enhanced education test cell.

Figure 4.3-11: Incremental Impacts among Customers Receiving Advanced ME&O



4.3.5 Comparison Across Rates

Figure 4.3-12 compares the load impacts for the three rates tested by SCE for the common set of peak-period hours from 5 PM to 8 PM for the entire summer of 2017. Using a common set of hours reduces

differences in impacts across rates that might be due to differences in the number of hours included in the peak period or the timing of those hours. The hours from 5 PM to 8 PM define the peak period for SCE's Rate 2. Rate 1 has a six hour peak period, from 2 PM to 8 PM and Rate 3 has a five hour peak period from 4 PM to 9 PM. All three tariffs have three rate periods in summer. The peak and shoulder periods combined cover the same hours for Rates 1 and 2 (8 AM to 10 PM) while the two periods combined for Rate 3 cover fewer hours, from 11 AM to 11 PM. Recall that Rate 3 also differs from Rates 1 and 2 in that it does not provide a baseline credit while Rates 1 and 2 do.

With a shorter peak period and a much higher Tier 2, peak period price (and lower Tier 2 super off-peak price), one might expect the peak period load reductions for Rate 2 to be higher than for Rate 1. As seen in the figures, for the service territory as a whole and for the moderate and cool climate regions, this is not always the case. In fact, the pattern of differences between the rates is not consistent across climate regions and none of the differences are statistically significant. Figure 4.3-13 presents the average daily kWh impacts for each rate during the summer 2017 period. Daily impacts vary across rates and climate regions with no clear pattern.

Figure 4.3-12: Average Impacts from 5 PM to 8 PM Across Rates

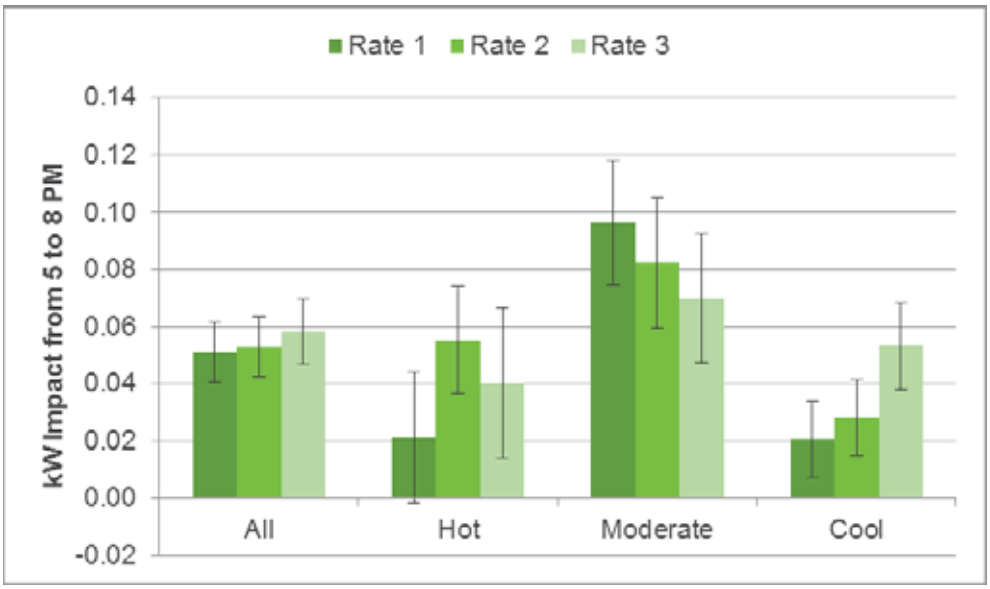
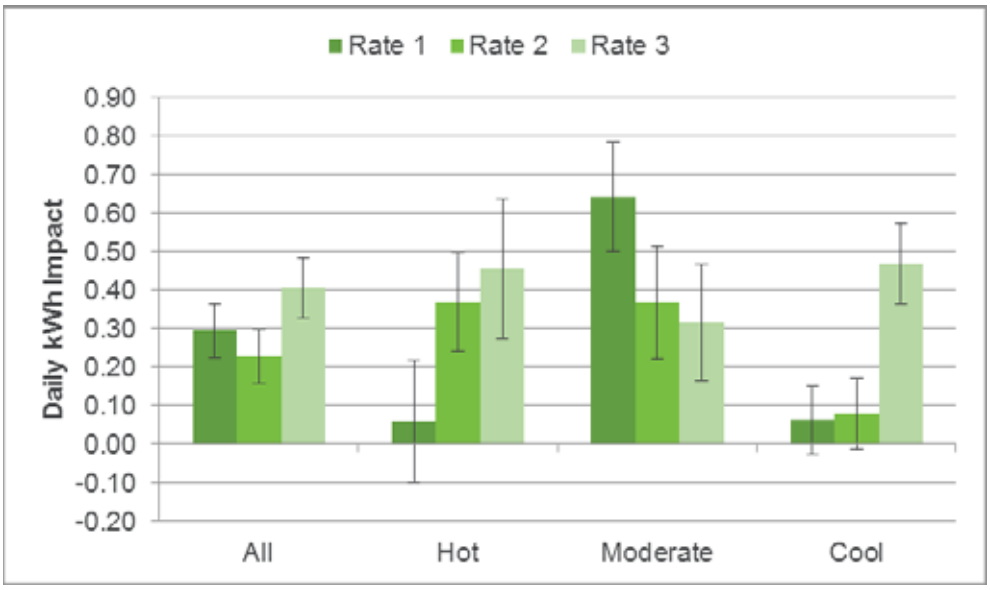


Figure 4.3-13: Average Daily kWh Impacts Across Rates



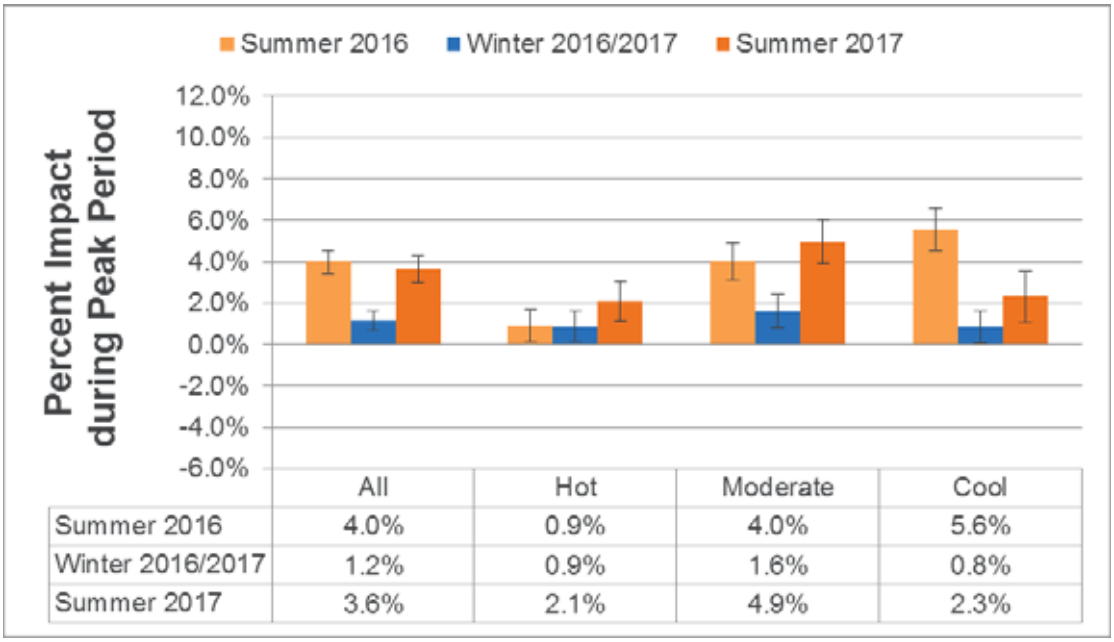
4.4 Persistence Analysis

The impacts in this section represent customers who were enrolled in the pilot until the end of September 2017- the full duration of the pilot. Using this method, it is possible to compare impacts between seasons for a single group of customers, rather than a changing population. It is important to keep in mind that these customers may not be representative of a typical customer on a default TOU rate. In other words, people who were unhappy with their new rate and opted out of the pilot are not included in this analysis. Because enrollment was not complete in June 2016, only the months of July through September are included for the summer estimates (and only August and September are included for Rate 3 because enrollment for Rate 3 occurred roughly a month later than for the other two rates). While there is not a second winter for persistence comparison, the winter and spring impacts for the subset of customers who were enrolled for the full duration of the pilot are included with the two summer impacts to illustrate the relative differences in impacts between the summer and winter seasons for a common set of customers. Winter and spring impacts presented in this section match the rate-specific winter and spring months described in Section 4.1.

4.4.1 Rate 1

Figure 4.4-1 presents the average percent impacts for the peak period for customers who remained on Rate 1 throughout the entire pilot. All three seasons are presented for the territory as a whole and for each climate region. For the territory as a whole and for each climate, load impacts were smaller in winter than in the summer seasons. Impacts for the first and second summer were very similar for the territory as a whole, about 4.0% in 2016 and 3.6% in 2017. The difference was not statistically significant. Summer impacts increased for customers in the hot and moderate climate regions, but not for customers in the cool climate region where percent impacts decreased from 5.6% to 2.3%.

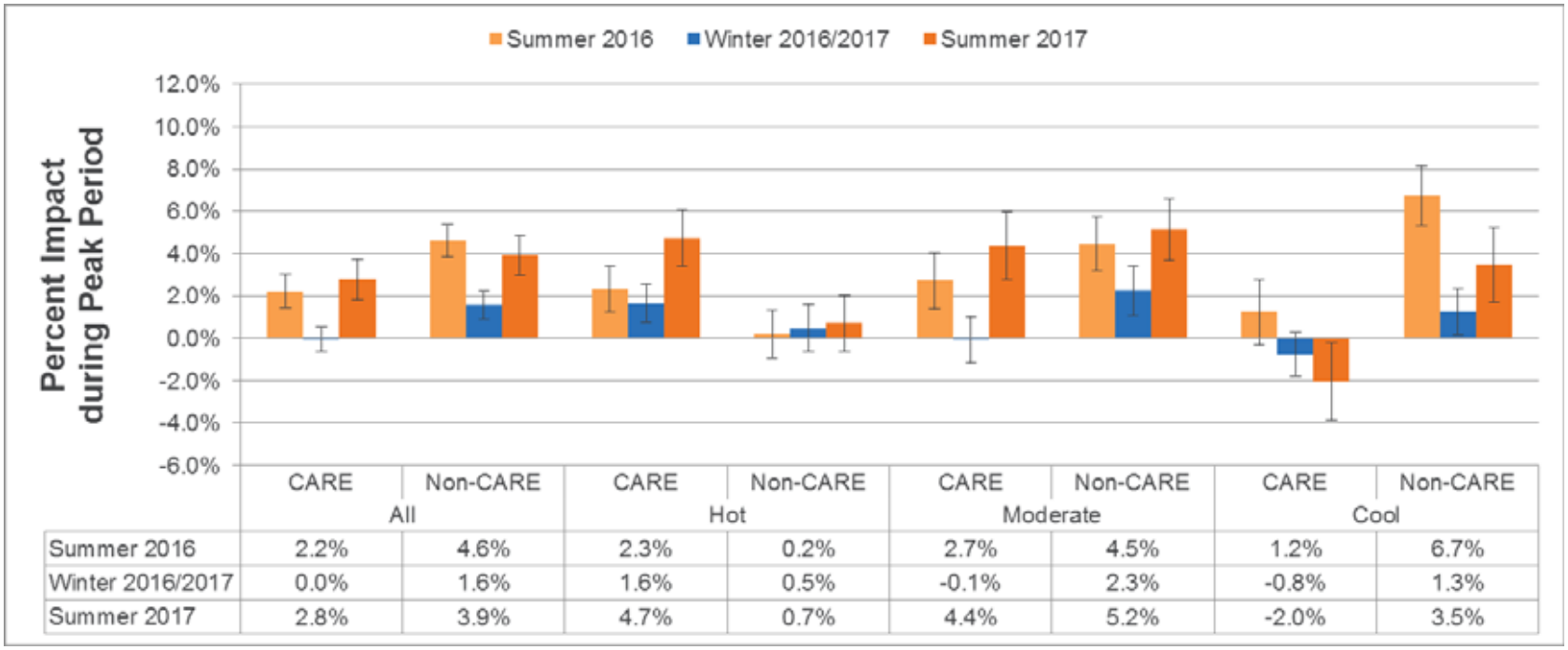
Figure 4.4-1: Percent Impacts for Peak Period for SCE Rate 1, by Season (Positive values represent load reductions)



	All	Hot	Moderate	Cool
Summer 2016	4.0%	0.9%	4.0%	5.6%
Winter 2016/2017	1.2%	0.9%	1.6%	0.8%
Summer 2017	3.6%	2.1%	4.9%	2.3%

Figure 4.4-2 presents average seasonal impacts for non-CARE/FERA and CARE/FERA customers on Rate 1. Except for the cool climate region, CARE/FERA customers increased their percent impacts between the first and second summer, but these increases were not statistically significant. Both CARE/FERA and non-CARE/FERA customers in the cool climate region showed smaller impacts in the second summer compared with the first, but the different was only statistically significant for non-CARE/FERA customers. In fact, CARE/FERA customers in the cool region increased their peak period usage by 2.0% in summer 2017. Winter impacts were generally smaller than summer impacts, and in many cases were not statistically significant.

Figure 4.4-2: Percent Impacts for Peak Period for SCE Rate 1, by Season for CARE/FERA and Non-CARE/FERA Customers (Positive values represent load reductions)

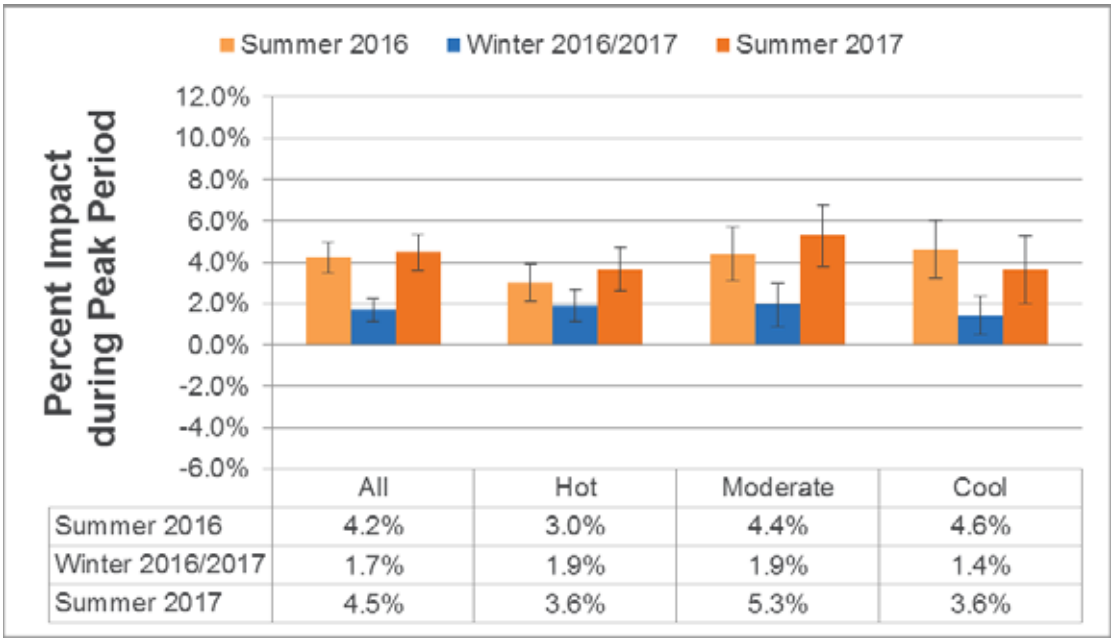


	All		Hot		Moderate		Cool	
	CARE	Non-CARE	CARE	Non-CARE	CARE	Non-CARE	CARE	Non-CARE
Summer 2016	2.2%	4.6%	2.3%	0.2%	2.7%	4.5%	1.2%	6.7%
Winter 2016/2017	0.0%	1.6%	1.6%	0.5%	-0.1%	2.3%	-0.8%	1.3%
Summer 2017	2.8%	3.9%	4.7%	0.7%	4.4%	5.2%	-2.0%	3.5%

4.4.2 Rate 2

Figure 4.4-3 presents seasonal load impacts for Rate 2 customers in SCE's territory as a whole and for each climate region. Recall that these load impacts only represent customers who remained on the pilot until the end of summer 2017. Customers on Rate 2 have a similar pattern to those on Rate 1. Winter impacts were between 1.4% and 1.9% while summer impacts were between 3.0% and 5.3% during each summer season. Unlike Rate 1, customers in SCE's service territory as a whole showed greater impacts during the second summer (compared with the first), though the difference is not statistically significant. This is true in the hot and moderate climate regions as well. Customers in the cool climate region had smaller summer impacts in 2017, a reduction from 4.6% to 3.6%. None of the differences are statistically significant, however.

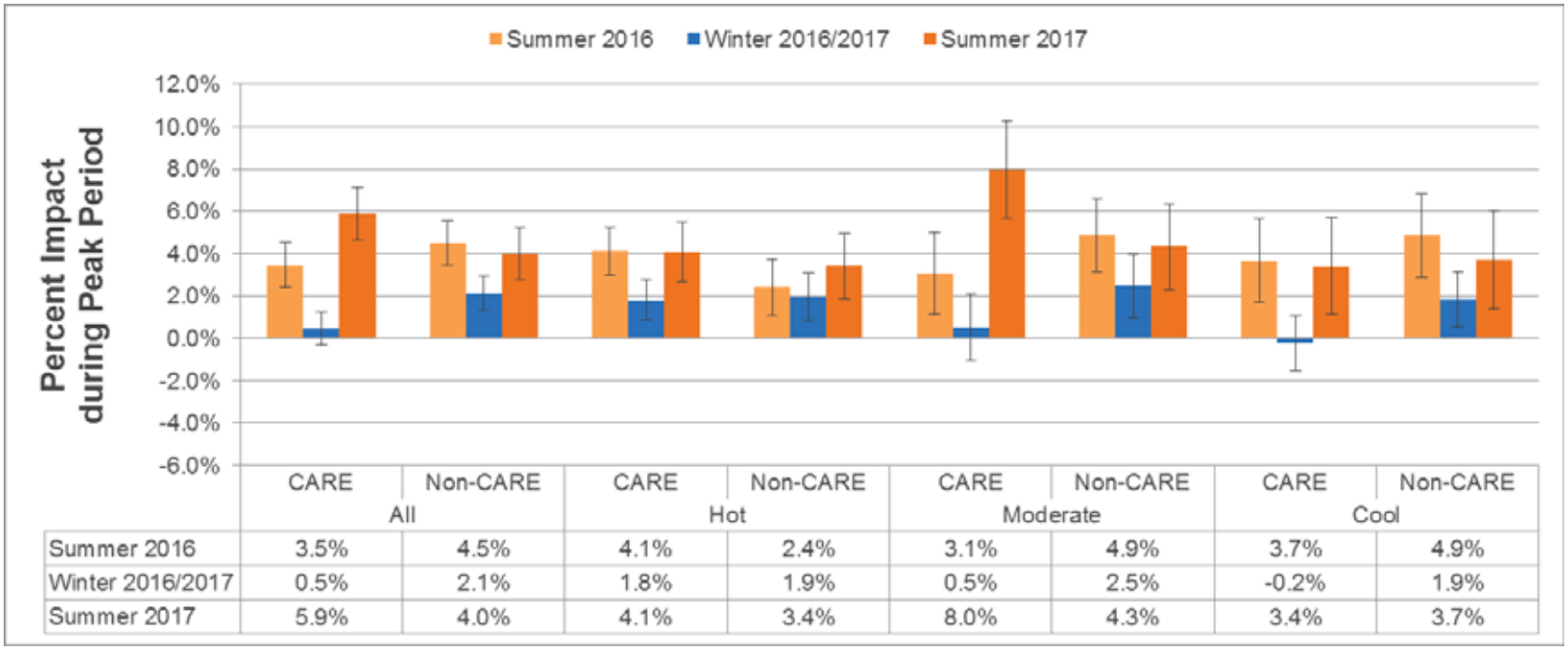
Figure 4.4-3: Percent Impacts for Peak Period for SCE Rate 2, by Season (Positive values represent load reductions)



	All	Hot	Moderate	Cool
Summer 2016	4.2%	3.0%	4.4%	4.6%
Winter 2016/2017	1.7%	1.9%	1.9%	1.4%
Summer 2017	4.5%	3.6%	5.3%	3.6%

Figure 4.4-4 summarizes the seasonal load impacts for CARE/FERA and non-CARE/FERA customers on SCE's Rate 2. In general, summer impacts did not change drastically between 2016 and 2017, except for CARE/FERA customers in the moderate climate region for which load impacts more than doubled across the two summers, from 3.1% to 8.0%. Except in the hot climate region, CARE/FERA customers did not have statistically significant impacts in the winter months. The difference in the percent impact from summer to summer for non-CARE/FERA customers were small and not statistically significant.

Figure 4.4-4: Percent Impacts for Peak Period for SCE Rate 2, by Season for CARE/FERA and Non-CARE/FERA Customers (Positive values represent load reductions)

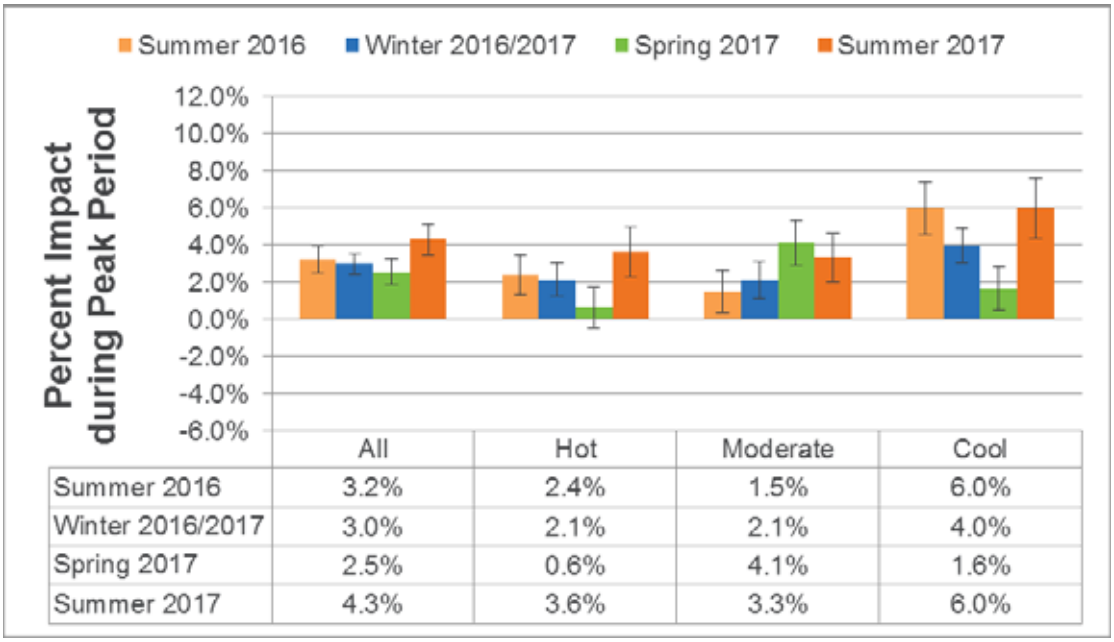


	All		Hot		Moderate		Cool	
	CARE	Non-CARE	CARE	Non-CARE	CARE	Non-CARE	CARE	Non-CARE
Summer 2016	3.5%	4.5%	4.1%	2.4%	3.1%	4.9%	3.7%	4.9%
Winter 2016/2017	0.5%	2.1%	1.8%	1.9%	0.5%	2.5%	-0.2%	1.9%
Summer 2017	5.9%	4.0%	4.1%	3.4%	8.0%	4.3%	3.4%	3.7%

4.4.3 Rate 3

Figure 4.4-5 presents average percent impacts for customers on Rate 3 for each season in the pilot. Recall that unlike the previous two rates, SCE's Rate 3 has three seasons: summer, winter, and spring. Summer impacts represent August and September only, due to the later launch of Rate 3. In the territory as a whole, summer impacts were greater than those in winter and spring. Between 2016 and 2017, customers increased their summer peak period impacts by about one percentage point, from 3.2% to 4.3%. Customers in the hot and moderate climate regions also increased their summer impacts from 2016 to 2017, while customers in the cool region had impacts equal to 6.0% in both years. This shows that customers continue to respond to peak period prices even after participating in the pilot for more than one year.

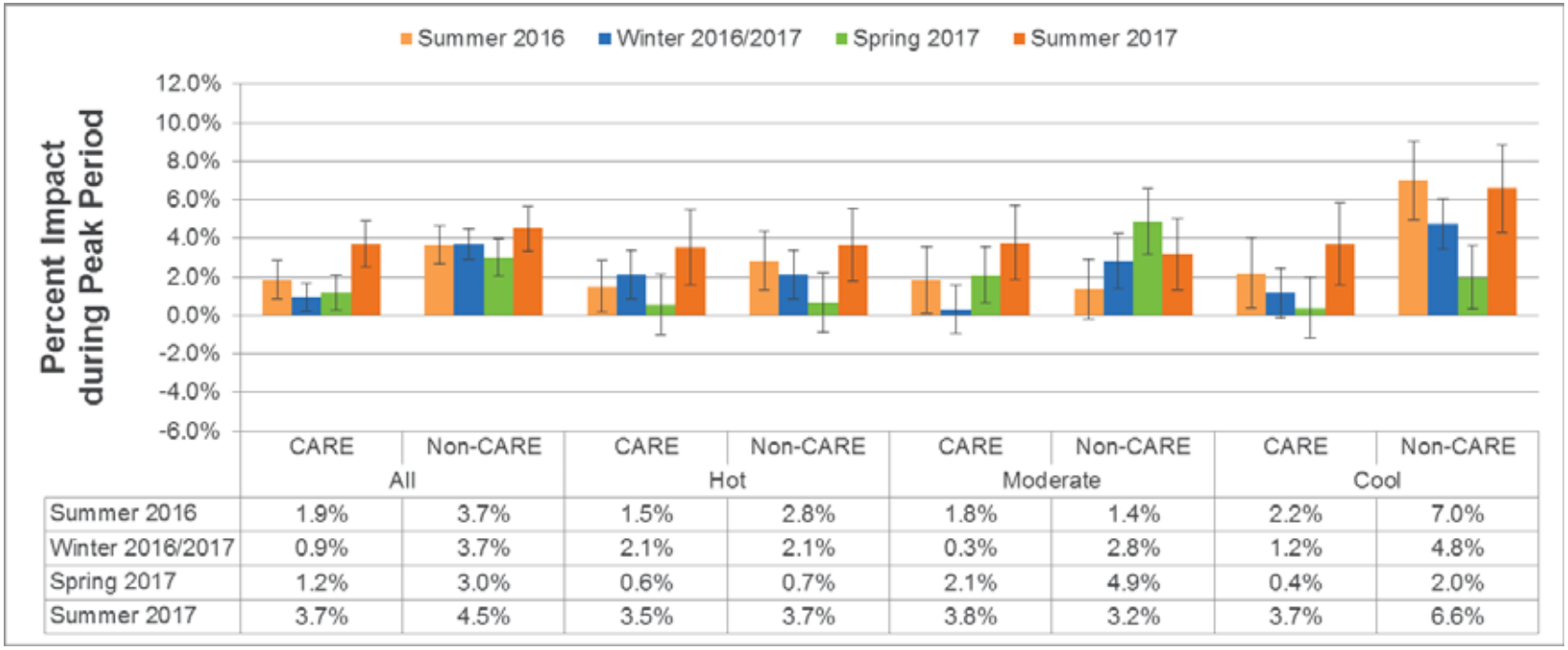
Figure 4.4-5: Percent Impacts for Peak Period for SCE Rate 3, by Season (Positive values represent load reductions)



	All	Hot	Moderate	Cool
Summer 2016	3.2%	2.4%	1.5%	6.0%
Winter 2016/2017	3.0%	2.1%	2.1%	4.0%
Spring 2017	2.5%	0.6%	4.1%	1.6%
Summer 2017	4.3%	3.6%	3.3%	6.0%

Figure 4.4-6 presents peak period impacts for each time period for CARE/FERA and non-CARE/FERA customers on Rate 3. In every climate region and for the territory as a whole, CARE/FERA customers showed greater impacts in the second summer of the pilot compared to the first – but the differences were not statistically significant. For example, customers in the moderate climate zone more than doubled their percent impact, from 1.8% to 3.8%. Non-CARE/FERA customers also increased their impacts, although to a lesser degree. The exception was non-CARE/FERA customers in the cool climate region, where impacts decreased by a statistically insignificant amount.

Figure 4.4-6: Percent Impacts for Peak Period for SCE Rate 3, by Season for CARE/FERA and Non-CARE/FERA Customers (Positive values represent load reductions)

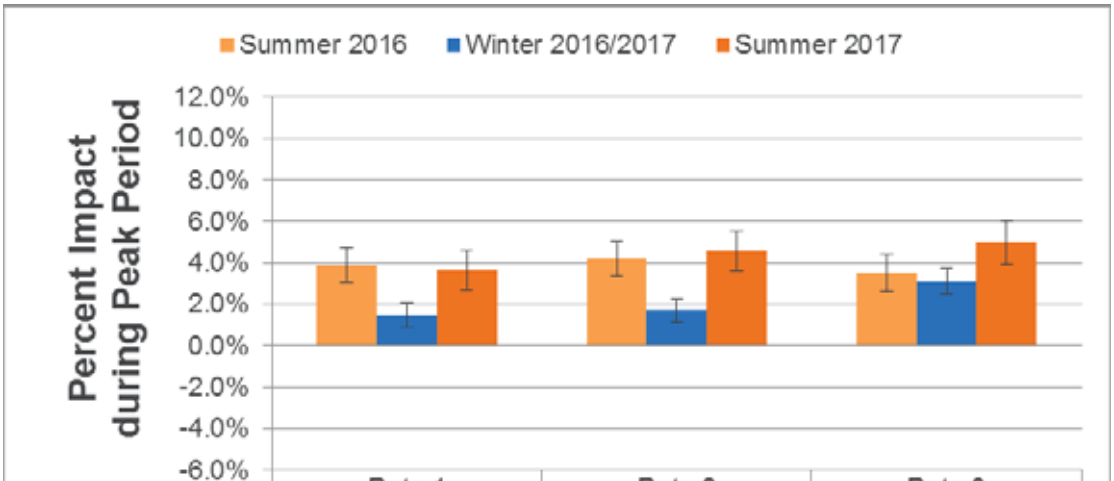


	All		Hot		Moderate		Cool	
	CARE	Non-CARE	CARE	Non-CARE	CARE	Non-CARE	CARE	Non-CARE
Summer 2016	1.9%	3.7%	1.5%	2.8%	1.8%	1.4%	2.2%	7.0%
Winter 2016/2017	0.9%	3.7%	2.1%	2.1%	0.3%	2.8%	1.2%	4.8%
Spring 2017	1.2%	3.0%	0.6%	0.7%	2.1%	4.9%	0.4%	2.0%
Summer 2017	3.7%	4.5%	3.5%	3.7%	3.8%	3.2%	3.7%	6.6%

4.4.4 Comparison Across Rates

Figure 4.4-7 compares the load impacts for the three rates tested by SCE for the common set of peak-period hours from 5 PM to 8 PM for the summer months of August and September and the winter months of October through May. For all three rates, summer impacts persist from 2016 to 2017. The difference in impacts between summers is not statistically significant, and winter impacts are smaller than summer impacts in every case.

Figure 4.4-7 Percent Impacts from 5 PM to 8 PM Across Rates, by Season



	Rate 1	Rate 2	Rate 3
Summer 2016	3.9%	4.2%	3.5%
Winter 2016/2017	1.5%	1.7%	3.1%
Summer 2017	3.6%	4.6%	5.0%

4.5 Synthesis for SCE Pilot

This section compares input from the load impact and persistence analysis, the bill impact analysis and the survey analysis. The objective of these comparisons, at least in part, is to determine if the information and conclusions observed for individual metrics are supported by findings from other metrics or, alternatively, findings for one metric contradict those for another metric. We also look for clues from the survey findings that might help explain why load or bill impacts for one rate differ from those for other rates.

Readers are referred to the beginning of Section 3.5 for an important caution when interpreting these results—namely that given the large samples underlying the survey analysis, statistically significant differences may not reflect meaningful differences from a policy perspective.

4.4.1 Synthesis

Table 4.5-1 through Table 4.5-3 summarize some of the relevant findings from the load impact, persistence, bill impact and survey analysis. No additional bill impact analysis or surveys were completed for this report. Results from the first and second interim report were carried forward to this synthesis section in order to provide a more complete overview of the pilot. Readers are directed to Section 3.5.1

for an explanation of the variables and symbols contained in the tables. As a reminder, unlike with PG&E where two pilot rates had two pricing periods and one had three, SCE's pilot Rates 1 and 2 had three pricing periods on weekdays and two on weekends. Rate 3 had two pricing periods on winter weekdays, and three pricing periods on spring weekdays and weekends in the winter and spring. The shoulder periods for all three-period rates were long, beginning at 8 AM for two of the rates and at 11 AM for the third. Also, Rate 3 has no baseline credit whereas Rates 1 and 2 do.

Non-CARE/FERA Customers

Unlike at PG&E, non-CARE/FERA customers in SCE's hot climate region tended to have smaller peak period reductions compared to customers in the moderate and cool climate regions in summer 2017. Indeed, load impacts for non-CARE/FERA customers on Rate 1 were statistically insignificant. This pattern of smaller impacts in the hot climate region is consistent with results from the first summer and winter as well. Average peak-period impacts for non-CARE/FERA customers ranged from not statistically significant in the hot climate region on Rate 1 to 5.8% in the cool climate region on Rate 3. As shown by the persistence variable in the tables, differences in load impacts across the two summers for this segment were positive for some climate zone/rate combinations and negative for others but none of these differences is statistically significant. The contrast in the magnitude of load impacts for non-CARE/FERA customers between PG&E and SCE may be due, in part, to the fact that SCE's hot climate region is much hotter than PG&E's. The average number of cooling degree days in SCE's hot climate region across the two summer periods was 569 whereas the same average for PG&E's hot climate region was 423, roughly 35% lower. It may be that customers with higher incomes in really hot regions are less responsive to modest TOU price signals than lower income customers or all customers in cooler regions.

Total annual bill impacts for non-CARE/FERA customers in the hot climate region ranged from a reduction of $4 on Rate 3 to an increase of $64 on Rate 1. Customers on Rates 1 and 2 were ineffective at making behavioral changes that offset the structural loss during the first year of the pilot. Rate 3 customers started out with the smallest structural loss, but ultimately made the largest behavioral changes.

Average annual bills decreased for non-CARE/FERA customers in the moderate and cool climate regions on Rates 1 and 3, and in the cool climate region on Rate 2. This could explain why summer impacts dropped by a statistically significant 3.3 percentage points for non-CARE/FERA customers in the cool region on Rate 1. These customers experienced average annual bill decreases equal to about $28 or 2.6%, which may have affected their motivation to respond to the rate. Conversely, the same segment in the hot climate region faced comparatively large annual bill increases ($64 or 3.8%) but only increased their summer impacts by 0.5 percentage points. This change was not statistically significant. In fact, all other non-CARE/FERA segments did not show statistically significant changes in summer impacts from 2016 to 2017 for the common set of customers enrolled for the full duration of the pilot. In other words, customers continue to respond to the rate at the same level as they did in the first summer.

Table 4.5-1: Load Impacts, Bill Impacts, and Selected Survey Findings for SCE Rate 1[41]

Climate	Segment	Load Impacts					Bill Impacts		Survey						
		Summer 2016 Peak Period Load Reduction* %	Winter Peak Period Load Reduction** %	Summer 2017 Peak Period Load Reduction %	Net Annual kWh Change** %	Persistence: Summer Impact Pct. Point Change	Annual Total Bill Impact** $	Annual Total Bill Impact** %	Health Index (Range 0-10)**	Bill Higher than Expected**	Difficulty Paying Bills**	Economic Index (Range 0-10)**	Understanding TOU Pricing (None-Correct)**	Satisfaction w/ Rate (11 pt. Scale)**	Satisfaction w/ Utility (11 pt. Scale)**
Hot	Non-CARE/FERA	1.1% ▼	-0.2% -	0.2% -	1.8% ▲	0.5 -	$54 ▲	3.8% ▲	1.9 ▼	23% -	22% -	2.2 -	11%	6.5 -	7.1 -
	CARE/FERA	1.8% ▼	0.5% -	5.1% ▼	0.3% ▼	2.4 -	$47 ▲	5.4% ▲	2.5 -	23% -	60% -	3.9 -	20%	7.3 -	7.9 -
Moderate	Non-CARE/FERA	5.5% ▼	3.3% ▼	5.1% ▼	2.2% ▼	0.7 -	-$16 ▼	-1.1% ▼	2.0 -	19% ▼	24% -	2.2 -	14%	6.9 ▲	7.2 -
	CARE/FERA	3.3% ▼	0.6% -	4.9% ▼	0.2% ▲	1.6 -	$24 ▲	3.4% ▲	2.5 -	24% -	57% -	3.7 -	23%	7.6 -	7.9 -
Cool	Non-CARE/FERA	5.8% ▼	1.1% ▼	3.2% ▼	0.6% ▼	-3.3 ▼	-$28 ▼	-2.6% ▼	2.2 -	22% -	20% -	2.1 -	12%	6.9 -	7.4 -
	CARE/FERA	2.4% ▼	-0.4% -	-1.4% -	1.1% ▲	-3.3 -	$10 ▲	1.8% ▲	2.2 ▼	18% -	60% -	3.7 -	18%	8.0 -	8.3 -

Table 4.5-2: Load Impacts, Bill Impacts, and Selected Survey Findings for SCE Rate 2

Climate	Segment	Load Impacts					Bill Impacts		Survey						
		Summer 2016 Peak Period Load Reduction* %	Winter Peak Period Load Reduction %	Summer 2017 Peak Period Load Reduction %	Net Annual kWh Change** %	Persistence: Summer Impact Pct. Point Change	Annual Total Bill Impact** $	Annual Total Bill Impact** %	Health Index (Range 0-10)**	Bill Higher than Expected**	Difficulty Paying Bills**	Economic Index (Range 0-10)**	Understanding TOU Pricing (None-Correct)**	Satisfaction w/ Rate (11 pt. Scale)**	Satisfaction w/ Utility (11 pt. Scale)**
Hot	Non-CARE/FERA	2.9% ▼	1.5% ▼	2.7% ▼	0.2% ▼	1.0 -	$42 ▲	2.6% ▲	2.1 -	24% -	24% -	2.3 -	27%	6.5 -	7.0 -
	CARE/FERA	3.5% ▼	1.4% ▼	3.4% ▼	1.2% ▼	0.0 -	$40 ▲	4.6% ▲	2.7 -	24% -	67% -	4.1 -	37%	7.2 -	7.8 -
	Senior	4.1% ▼	1.1% ▼	5.6% ▼	0.4% ▼	2.8 -	$57 ▲	4.1% ▲	2.6 -	23% -	36% -	2.9 -	34%	7.0 -	7.5 -
	HH < 100% FPG	3.1% ▼	2.7% ▼	4.9% ▼	1.9% ▼	2.0 -	$19 ▲	1.9% ▲	2.8 -	27% -	59% -	3.9 -	35%	7.3 -	7.8 -
	100% FPG < HH < 200% FPG	N/A	N/A	N/A	N/A	N/A	$38 ▲	3.4% ▲	2.7 -	24% -	58% -	3.5 -	33%	6.7 -	7.4 -
Moderate	Non-CARE/FERA	5.6% ▼	3.1% ▼	4.4% ▼	1.1% ▼	-0.5 -	$19 ▲	1.3% ▲	2.0 -	20% -	23% -	2.2 -	26%	6.9 ▲	7.4 ▲
	CARE/FERA	1.7% ▼	1.1% -	7.0% ▼	1.0% ▼	4.9 ▲	$16 ▲	2.2% ▲	2.5 -	22% -	58% -	3.6 ▼	44%	7.8 -	8.0 -
Cool	Non-CARE/FERA	4.2% ▼	2.2% ▼	3.4% ▼	1.2% ▼	-1.2 -	-$42 ▼	-3.6% ▼	2.0 -	20% -	19% -	2.0 -	28%	7.0 -	7.4 -
	CARE/FERA	4.6% ▼	-0.5% -	2.3% ▼	1.4% ▲	-0.2 -	$4 ▲	0.8% ▲	2.5 -	20% -	61% -	3.7 -	40%	8.0 -	8.4 -

Table 4.5-3: Load Impacts, Bill Impacts, and Selected Survey Findings for SCE Rate 3

Climate	Segment	Load Impacts					Bill Impacts		Survey						
		Summer 2016 Peak Period Load Reduction* %	Winter Peak Period Load Reduction %	Summer 2017 Peak Period Load Reduction %	Net Annual kWh Change** %	Persistence: Summer Impact Pct. Point Change	Annual Total Bill Impact** $	Annual Total Bill Impact** %	Health Index (Range 0-10)**	Bill Higher than Expected**	Difficulty Paying Bills**	Economic Index (Range 0-10)**	Understanding TOU Pricing (None-Correct)**	Satisfaction w/ Rate (11 pt. Scale)**	Satisfaction w/ Utility (11 pt. Scale)**
Hot	Non-CARE/FERA	3.0% ▼	2.3% ▼	2.1% ▼	0.8% ▼	0.8 -	-$4 -	-0.3% -	2.3 -	30% -	23% -	2.3 -	7%	6.4 -	7.0 -
	CARE/FERA	-0.1% ▼	1.9% ▼	1.8% ▼	0.8% ▼	2.0 -	$56 ▲	7.6% ▲	2.5 -	29% -	70% ▲	4.2 -	19%	7.4 -	7.9 -
Moderate	Non-CARE/FERA	1.4% -	3.8% ▼	3.7% ▼	0.3% ▼	1.8 -	-$18 ▼	-1.4% ▼	1.8 ▼	29% -	22% -	2.2 -	10%	6.5 -	7.1 -
	CARE/FERA	4.8% ▼	0.4% -	4.1% ▼	1.5% ▼	2.0 -	$39 ▲	6.4% ▲	2.9 -	25% -	60% -	3.9 -	20%	7.4 -	7.9 -
Cool	Non-CARE/FERA	4.3% ▼	4.7% ▼	5.8% ▼	1.7% ▼	-0.4 -	-$47 ▼	-4.4% ▼	2.1 -	30% ▲	18% -	2.0 -	6%	6.8 -	7.3 -
	CARE/FERA	2.0% ▼	0.5% -	3.3% ▼	-0.4% ▲	1.5 -	$35 ▲	7.3% ▲	2.5 -	24% -	62% -	3.7 -	18%	7.8 -	8.3 -

[41] In all three tables, a column with an (*) indicates the values are from the First Interim Report and a column with (**) indicates the values are from one of the two Second Interim Report volumes. A column with neither (*) or (**) means the values are found elsewhere in this report.

Non-CARE/FERA customers understood the rates better than nearly any other segment (as indicated by the very low percent that failed to identify at least one peak period hour on Rates 1 and 3). However, it is worth noting that on average, Rate 1 and 2 customers performed worse on being able to identify the highest price hours on the second survey compared to the first. Additionally, Rate 2 customers generally had much lower performance across all customer segments regarding identifying the highest price hours compared to Rates 1 and 3.

The non-CARE/FERA customers had a low percentage of customers having difficulty paying their bills compared to other segments, and also had the lowest satisfaction ratings for the rate plan and for SCE compared with any other segment. However, there were no cases in which the satisfaction levels were significantly lower relative to the control group. In some cases the satisfaction levels for both the rate and for SCE were actually higher for the treatment group compared to the control group in the moderate climate region.

CARE/FERA Customers

In summer 2017, there was no distinct pattern of load impacts between CARE/FERA and non-CARE/FERA customers. Summer 2017 peak period impacts for CARE customers ranged from not statistically significant for Rate 1 in the cool climate region to 7.0% in the moderate climate region on Rate 2.

The average CARE/FERA customer was an annual structural non-benefiter across all rates and climate regions, ultimately resulting in all CARE/FERA customers experiencing higher total annual electricity costs, ranging from a low of a $4 increase for Rate 2 CARE/FERA customers in the cool climate region to a high of $56 for Rate 3 customers in the hot climate region. Although they faced higher bills, CARE/FERA customers generally did not increase their load impacts from summer 2016 to summer 2017, except in the moderate climate region whose impacts grew by 4.9 percentage points from one summer to the next. This change was statistically significant. This group did not experience an especially high annual bill increase, so it is unclear what motivated them to respond to the rate in the second summer. Load impacts from this group were significantly below average during in the first summer, and were the highest the second summer. These customers also had the highest level of not understanding the correct TOU hours on the second survey. If customer understanding improved after that point, it may help to explain the sudden increase in customer performance.

Rate 3 hot climate region CARE/FERA customers were the only segment to have a statistically significantly higher percentage of TOU customers having difficulty paying their bill compared to control group customers. In all other segments and rates, a comparable percentage of treatment and control group customers expressed difficulty in paying bills. Generally speaking, CARE/FERA customers were not able to offset a significant portion of the structural bill increases, with the largest offset of 50% ($16) from Rate 2 customers in the moderate climate region.

The economic index for CARE/FERA customers was roughly twice as high as for non-CARE/FERA customers in all climate regions and for all rate options, including the control group. In short, CARE/FERA customers had higher economic index scores compared with non-CARE/FERA customers, but the increase in the economic index scores moving from the OAT to TOU rates is not statistically significant for any rate in any climate region.

Importantly, in spite of the above, CARE/FERA customers had higher satisfaction ratings for the TOU rates than non-CARE/FERA customers for all rates and climate regions. In all climate regions, none of the satisfaction ratings for CARE/FERA customers were statistically significantly lower than the control group ratings. CARE/FERA customers also had higher ratings for satisfaction with SCE than non-CARE/FERA customers in all climate regions for all rates.

Senior Households

Senior households in the hot climate region had summer 2017 load reductions in the peak period for the average weekday that were larger than average reductions for the overall population in the hot region, as reported for Rate 2 in Section 4.3.2. The average peak-period load impact of 5.6% is statistically significantly larger than the load impacts for the non-CARE/FERA group of 2.7% and for the CARE/FERA group (3.4%). The net annual kWh change of 0.4% was between the values for non-CARE/FERA and CARE/FERA. Customers in this group increased their summer impacts from 2016 by 2.8 percentage points, but this change was not statistically significant, indicating that their large annual bill impacts of $57 or 4.1% was not enough to motivate them to increase their response to the rate, but it was enough for them to maintain it.

Total annual bill impacts are similar between senior households and the hot general population in percentage terms, reflecting the split between non-CARE/FERA and CARE/FERA customers. On Rate 2, 23% of senior households, along with around a quarter of the customers from other segments, indicated that their bills were higher than expected. However, this percentage was not statistically significantly different for the customers on TOU rates compared to the OAT. There was no statistically significant difference in the percent of seniors reporting difficulty in paying bills, or in the economic index, compared with the control group.

Senior households had a higher percentage of participants that could not identify any peak period hours (34%) compared with non-CARE/FERA customers (27%) in the hot region. However, they performed slightly better than the CARE/FERA customers (37%). Performance on the second survey declined from the first survey where 30% of senior households couldn't identify any of the peak periods. The percentage of customers not identifying any correct peak period hours tended to be higher in general for Rate 2 compared to the other rates.

Finally, satisfaction ratings by senior households for the rate plan (7.0) and for SCE (7.5) were somewhat higher than the ratings for the hot climate zone population as a whole (as calculated by a weighted average for CARE/FERA and non-CARE/FERA households, whose ratings were 6.7 and 7.3 respectively). Seniors on TOU rates did not have statistically different satisfaction ratings for the rate plan or SCE compared with the control group.

Households with Incomes Below 100% of FPG

In summer 2017, households with incomes below 100% of FPG on Rate 2 in the hot climate region had load impacts equal to 4.9%, which is greater than the 3.4% impact achieved by CARE/FERA customers in the same region on Rate 2 (but this difference is not statistically significant). Compared to the winter months, summer 2017 impacts were nearly twice as large. This group had the largest decrease in net annual kWh electricity use in the hot climate region, equal to almost 2%. Annual structural bill impacts averaged $39, and these customers were able to offset around half of the increase, or around $20,

resulting in an average annual cost increase for this segment of $19 or 1.9%. Households with incomes below 100% of FPG did not increase their load impacts by a statistically significant amount between the first and second summer of the pilot, but they continue to respond to the rate. It appears that the bill impacts they faced in the first year were enough to keep them motivated to respond.

This segment had the highest score on the health index compared to other segments on Rate 2.[42] However, the score was not statistically different for the treatment group compared to the control group on this index.

59% of households with incomes below 100% of FPG reported that they had difficulty paying bills and this segment had the second highest economic index score (3.9) of any segment on Rate 2. However, the difference in the economic index for TOU customers compared with the control group was not statistically significant for customers on Rate 2. The percentage of treatment customers reporting difficulty paying bills was also not statistically different from the percent of control customers reporting difficulty. 27% of households with incomes below 100% of FPG stated they received bills higher than expected. However, this was not statistically significantly different from the control group.

Customers in this segment were among the highest percent of participants who could not identify any peak period hours among all segments on Rate 2. For Rate 2, this segment did not have statistically different levels of satisfaction with the rate or with SCE. Satisfaction was not measured for this segment on Rates 2 or 3.

4.4.2 Key Findings

Key findings pertaining to second summer load impacts from the SCE pilots include:

1. In the second summer, customers continued to respond to TOU rates with peak periods that extend well into the evening. During the second summer, customers achieved load reductions as high as 7% for CARE/FERA customers in the moderate climate region on Rate 2.
2. In general, customers achieved similar peak-period load reductions in the first and second summer. One exception was CARE/FERA customers in the moderate climate region on Rate 2, who increased their impacts by about 4.9 percentage points – a statistically significant change. These customers showed difficulty in understanding the peak period hours, and perhaps improved their understanding of the rate in the second summer.
3. For Rate 3, which has the same peak period prices in effect on weekends as on weekdays, the peak period load reductions were similar on the two day types– that is, customers continued to reduce loads on weekends in the second summer.
4. Unlike for PG&E's customers, where CARE/FERA customers generally had significantly lower peak period load reductions compared with non-CARE/FERA customers, the load impacts for CARE/FERA and non-CARE/FERA customers in SCE's service territory were not statistically significantly different in the hot climate region, except for Rate 1.
5. Senior households and households with incomes below 100% of FPG on Rate 2 in the hot climate region had summer 2017 load impacts of 5.6% and 4.9%, respectively. Both were

[42] This metric is not reported for Rates 1 or 3.

statistically significantly higher in percentage terms compared to the Rate 2 hot climate region population as a whole (2.9%).

6. Households who had previously purchased smart thermostats reduced summer 2017 peak period usage by approximately 6.7%, which was significantly higher compared to non-CARE/FERA population weighted load reductions of 3.7%. Nest offered its "Time of Savings" support service for the second summer, which significantly increased[43] the magnitude of peak load reductions relative to the first summer.
7. The pattern of summer 2017 load reductions across climate regions in both percentage and absolute terms was not consistent across rates and was quite different from the pattern seen in PG&E's service territory, which showed a significant decline in load reductions in both percentage and absolute terms moving from the hot to the cool climate regions. For SCE, summer 2017 peak-period load reductions for customers on Rate 1 were largest in the moderate region. For Rates 2 and 3, differences across climate regions were not always statistically significant.

Overall findings and conclusions for the pilot include:

- Customers continued to respond to the TOU price signals at the end of the pilot. As expected, the load impacts were lower during the winter compared to the summer months. Load impacts persisted in the second summer, with very few segments changing their percent reductions by a statistically significant amount.
- The population weighted majority of customers across all three rates experienced slight net annual total bill decreases. However, customers in the hot climate regions and CARE/FERA customers were more likely to experience net annual bill increases.
- For seniors and households with incomes below 100% of FPG, there was no statistically significant increase in economic or health index scores after a full year on Rate 2 (the only rate where measurements are reported for this segment).

[43] The "Time of Savings" service was not implemented via a controlled experiment, therefore the incremental effects of the service are not measurable with the same level of rigor as the rest of the pilot. Consequently, additional factors such as weather may explain part of the year over year performance difference observed.

5 SDG&E Evaluation

This report section summarizes the attrition and load impacts for the second summer of SDG&E's pilot. It also includes a discussion of load impact persistence over the entire pilot. Load and bill impacts from the first summer season can be found in the First Interim Report and for the winter season in the Second Interim Report.

5.1 Summary of Pilot Treatments

Figure 5.1-1 and Figure 5.1-2 summarize the two tariffs that were tested in the SDG&E service territory. Both tariffs have peak periods that include the evening hours from 4 PM to 9 PM. The rates have changed since the launch of the pilot, and the figures represent the tariffs that were in effect in March 2017 and do not reflect the baseline credit of 22 ¢/kWh in the summer and 20 ¢/kWh in the winter. Appendix B shows the prices that were in effect in each rate period for each tariff, including the OAT. Two sets of prices are shown in the appendix, one covering the period from pilot start through February 2017, and the other beginning on March 1, 2017. While several minor rate changes occurred over the course of the pilot, the rate adjustment that occurred on March 1, 2017 was more significant and, as such, it was factored into the estimation of bill impacts in the Second Interim Report. A third, hourly dynamic, pilot rate was included in the Pilot as a proof of concept, but due to low expected enrollment levels there was no plan to conduct a load impact evaluation.[44]

Figure 5.1-1: SDG&E Pilot Rate 1 (March 2017)[45]

Tariff	Season	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24:00
Weekday	Summer	Super Off-Peak (32¢)						Off-Peak (38¢)										Peak (62¢)							
	Winter	Super Off-Peak (39¢)						Off-Peak (40¢)										Peak (41¢)							
Weekend	Summer	Super Off-Peak (32¢)														Off-Peak (38¢)		Peak (62¢)							
	Winter	Super Off-Peak (39¢)														Off-Peak (40¢)		Peak (41¢)							

Figure 5.1-2: SDG&E Pilot Rate 2 (March 2017)

Tariff	Season	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24:00
Weekday	Summer	Off-Peak (36¢)																Peak (62¢)							
	Winter	Off-Peak (39¢)																Peak (41¢)							
Weekend	Summer	Off-Peak (36¢)																Peak (62¢)							
	Winter	Off-Peak (39¢)																Peak (41¢)							

Rate 1 has three rate periods in all seasons and all days of the week. The peak period, from 4 PM to 9 PM, is constant across all days of the week and seasons. The timing and length of the off-peak and super-off-peak periods are also constant across seasons but differ on weekdays and weekends. The peak to super-off-peak price ratio[18] (without the baseline credit) is roughly 1.9 to 1 in summer and a very modest 1.06 to 1 in winter. The summer peak to off-peak price ratio is roughly 1.6 to 1.

[44] Enrollment levels were too low to produce statistically significant impacts.

[45] See Appendix B for comparison of tariffs.

The primary difference between SDG&E's Rate 2 and Rate 1 is that Rate 2 has only two rate periods whereas Rate 1 has three. Rate 2 has the same peak period, from 4 PM to 9 PM, as Rate 1 and the peak period price is also the same as Rate 1. The timing of the peak period and peak period prices are the same between the two rates in each season. In winter, the peak-to-off-peak price ratio for Rate 2 is roughly 1.05 to 1, making the rate relatively flat.

Figure 5.1-3 presents the seasons for each rate. For both rates, the summer season covers the months of May through October, which is two months longer than the summer periods at PG&E and SCE, which run from June 1 through September 30. The winter season at SDG&E covers November through April.

Figure 5.1-3 Seasons by Rate

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rate 1	Winter				Summer						Winter	
Rate 2	Winter				Summer						Winter	

In addition to the above rate options, SDG&E's pilot tested the impact of weekly usage alerts, known as Weekly Alert Emails (WAE), on demand response under TOU rates. The WAE used in summer 2016 provided weekly emails to participants that report the prior week's electricity usage by rate period. A new WAE was launched in mid-October. This version includes a bill-to date forecast, an updated usage chart displaying usage by peak period, and a doughnut chart illustrating the total amount of usage by peak period for the billing period. A random sample of 2,500 Rate 2 customers were chosen to receive the WAEs on a default basis. SDG&E had email addresses on just over 70% of this sample, so WAE's actually were sent to roughly 1,775 customers out of the target group of 2,500. Another test conducted at SDG&E involved the offer of smart thermostats to TOU customers under different incentive levels, with detailed presented in Section 5.3.4.

The following section contains a summary of customer opt-out decisions and attrition over the first year of the pilot. Section 5.3 presents load impact estimates for summer 2017 for each rate, impacts from the WAE treatment, and details on the smart thermostat offering. Section 5.4 discusses the persistence of load impacts throughout the pilot.

5.2 Customer Attrition

Figure 5.2-1 through Figure 5.2-3 show the cumulative opt-out rates over time for each test cell and climate region. The cumulative number of opt-outs is low in the hot and moderate climate regions, between 2.0% and 3.9%. The most prominent reason cited for opting out was "Bill is too high" (48%) followed by "Other" (38%). No other reasons cited exceeded 5% of the total. Any customers installing rooftop solar were deemed ineligible for the pilot and included in the total attrition, but were not considered as a customer opting out of the pilot. For reasons discussed in the First Interim Report, the control group in the hot climate region is comprised of customers who were turned away from the pilot rather than those who enrolled and were assigned to the treatment conditions. As such, control customers in the hot zone cannot opt out because they never enrolled. The opt-out rate in the cool climate region is very low for all customer segments, only reaching about 2% by the end the second summer. In the moderate and cool climate regions, non-CARE/FERA customers had slightly higher opt-out rates than CARE/FERA customers. Opt-out rates appear to level off near the beginning of November,

when customers were transitioned to the winter rate period and they remain generally level through June 2017.

Figure 5.2-1: Cumulative SDG&E Opt Outs by Month – Hot Climate Region[46]

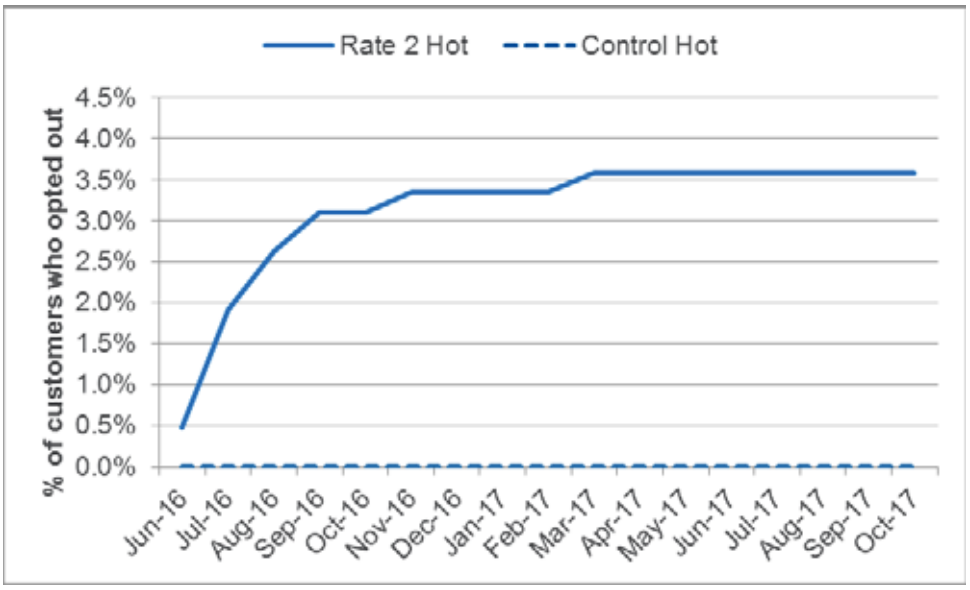
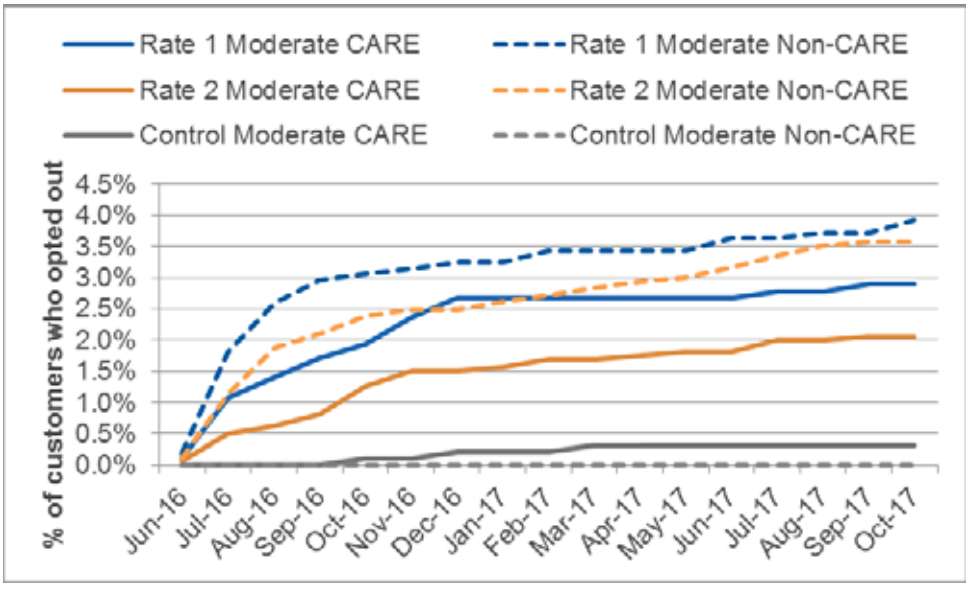


Figure 5.2-2: Cumulative SDG&E Opt Outs by Month – Moderate Climate Region



[46] Only Rate 2 was offered in the Hot Climate Region

Figure 5.2-3: Cumulative SDG&E Opt Outs by Month – Cool Climate Region

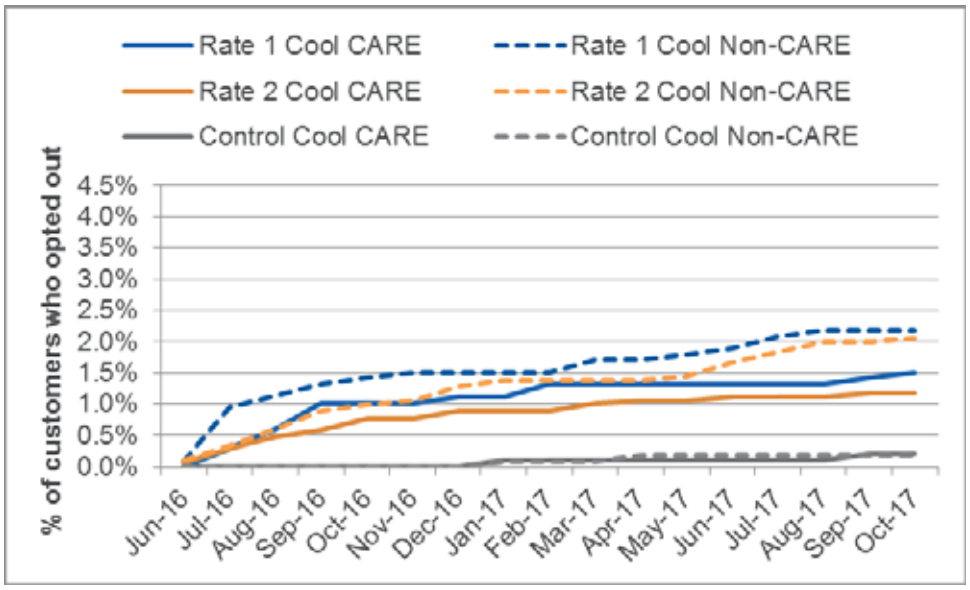


Figure 5.2-4 through Figure 5.2-6 show the overall attrition rate over time for each climate region, customer segment, and TOU rate. Generally, attrition rates are fairly steady in the time period between June 2016 and October 2017. Among treated customers, those in the moderate and cool climate region have similar attrition rates. Attrition rates are lowest in the hot climate region.

Figure 5.2-4: Cumulative SDG&E Attrition by Month – Hot Climate Region

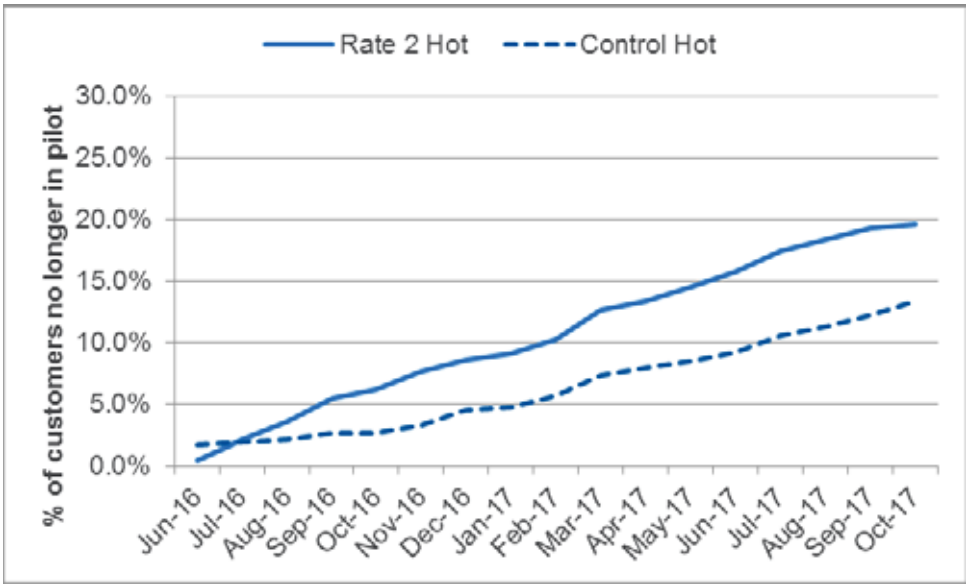


Figure 5.2-5: Cumulative SDG&E Attrition by Month – Moderate Climate Region

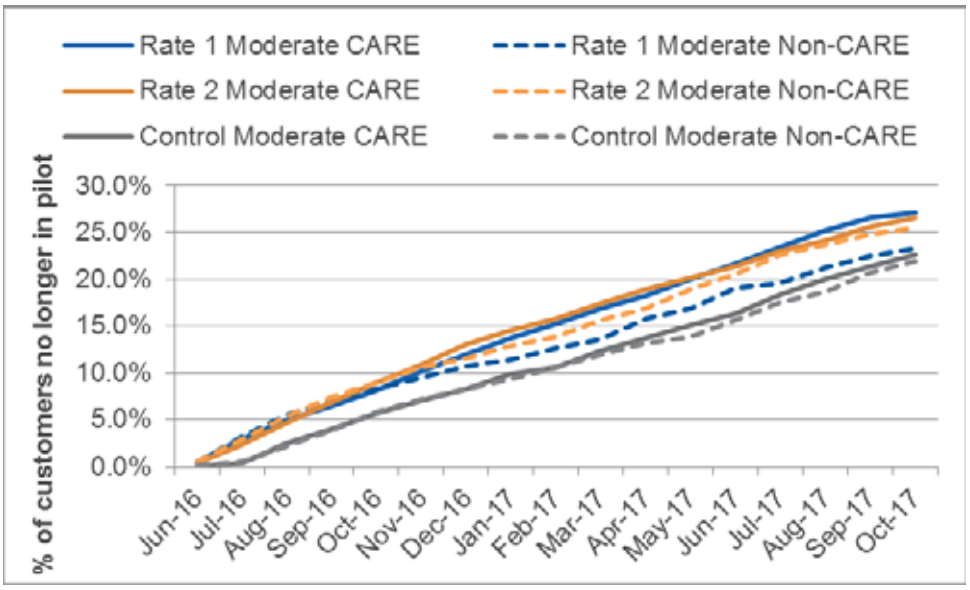
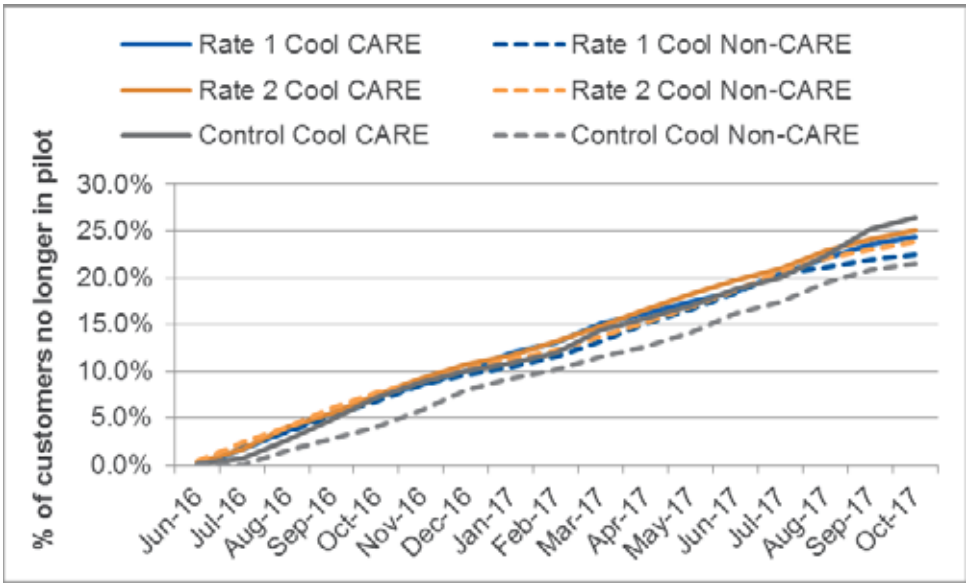


Figure 5.2-6: Cumulative SDG&E Attrition by Month – Cool Climate Region



5.3 Load Impacts

This section summarizes the load impact estimates for the two rate treatments tested by SDG&E. Load impacts are reported for each rate period for the average weekday, average weekend, and the average monthly peak day for the summer months of May through October 2017 for CARE/FERA and non-CARE/FERA customers in SDG&E's moderate and cool climate regions. As discussed previously, SDG&E's hot climate region is quite small and the sample of customers recruited into the pilot is not large enough to support estimation of load impacts separately for CARE/FERA and non-CARE/FERA customers nor to

support segmentation of the sample into seniors or various income groups as was done in the hot regions for PG&E and SCE. All customers in the hot region were placed on Rate 2 or were in the control group.

As with PG&E and SCE, electronic tables that contain estimates for each hour of the day for each day type and climate zone and for each month separately are also available upon request through the CPUC.

Figure 5.3-1 shows an example of the content of these tables for SDG&E Rate 2 for all eligible customers in the service territory. Pull down menus in the upper left hand corner allow users to select different climate regions, day types (e.g., weekdays, weekends, monthly peak day) and time periods (individual months or the average of the summer period).

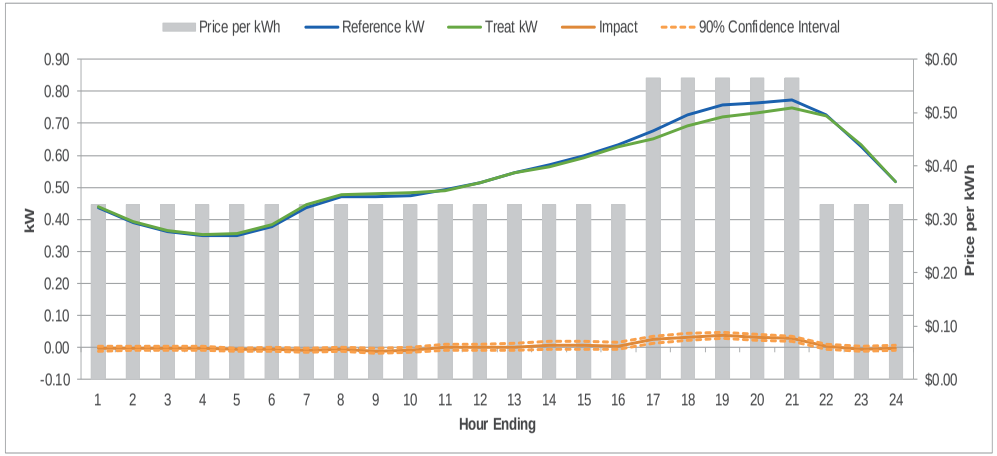
The remainder of this section is organized by rate treatment—that is, load impacts are presented for each relevant climate region and each customer segment for each of the two rates. Following the summary for each rate, load impacts are compared across rates.

As discussed in Section 6 of the First Interim Report, in addition to the two rate treatments, SDG&E tested the incremental impact of Weekly Alert Emails (WAEs) sent to customers on a default basis. Results of this analysis are presented in Section 5.3.3. The smart thermostat offering to pilot customers is covered in Section 5.3.4.

Figure 5.3-1: Example of Content of Electronic Tables Underlying Load Impacts Summarized in this Report (SDG&E Rate 2, Average Summer 2017 Weekday, All Customers)

Segment	All
Rate	Rate 2
Month	Summer 2017
Day Type	Average Weekday
Treated Customers	6,050

Period	Reference kW	Treat kW	Impact	Percent Impact	90% Confidence Interval	
Peak	0.74	0.71	0.030	4.1%	0.03	0.03
Partial Peak	N/A	N/A	N/A	N/A	N/A	N/A
Off-Peak	0.49	0.49	0.00	-0.6%	0.00	0.00
Super Off-Peak	N/A	N/A	N/A	N/A	N/A	N/A
Daily kWh	13.03	12.93	0.10	0.8%	0.06	0.14



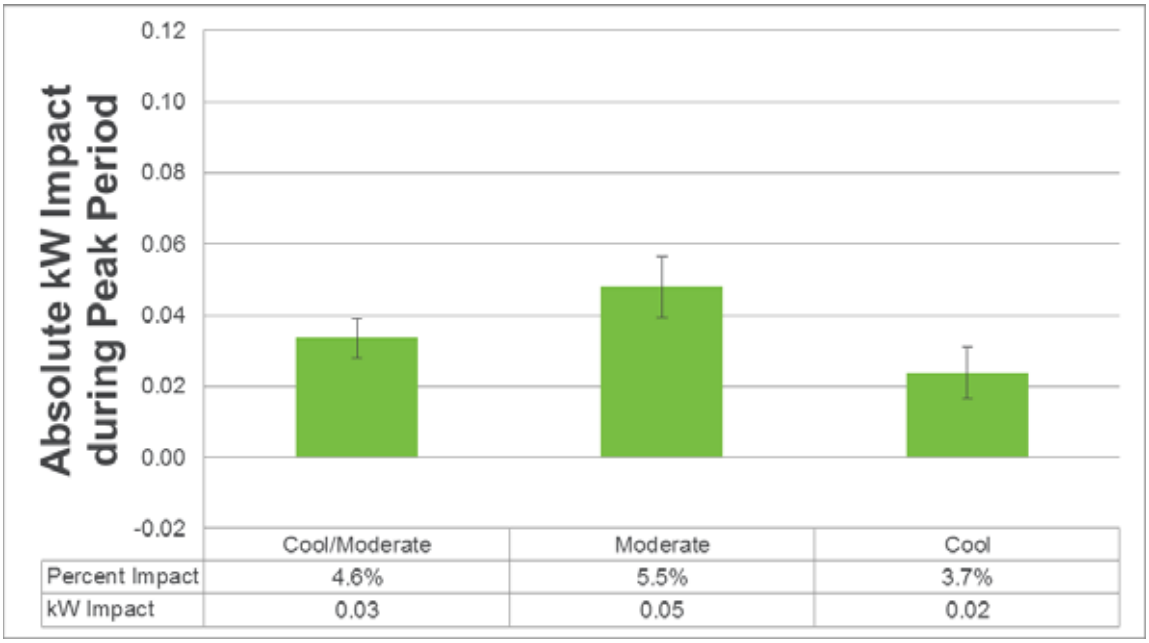
Hour Ending	Reference kW	Treat kW	Impact	Percent Impact	90% Confidence Interval		Price	Period
1	0.44	0.44	0.00	-1.0%	-0.01	0.00	$0.33	Off-Peak
2	0.39	0.39	0.00	-0.7%	-0.01	0.00	$0.33	Off-Peak
3	0.36	0.36	0.00	-0.7%	-0.01	0.00	$0.33	Off-Peak
4	0.35	0.35	0.00	-1.2%	-0.01	0.00	$0.33	Off-Peak
5	0.35	0.36	-0.01	-2.1%	-0.01	0.00	$0.33	Off-Peak
6	0.38	0.38	-0.01	-1.7%	-0.01	0.00	$0.33	Off-Peak
7	0.44	0.45	-0.01	-2.3%	-0.02	0.00	$0.33	Off-Peak
8	0.47	0.48	-0.01	-1.4%	-0.01	0.00	$0.33	Off-Peak
9	0.47	0.48	-0.01	-2.4%	-0.02	0.00	$0.33	Off-Peak
10	0.47	0.48	-0.01	-1.8%	-0.02	0.00	$0.33	Off-Peak
11	0.49	0.49	0.00	0.1%	-0.01	0.01	$0.33	Off-Peak
12	0.51	0.51	0.00	0.0%	-0.01	0.01	$0.33	Off-Peak
13	0.55	0.55	0.00	0.0%	-0.01	0.01	$0.33	Off-Peak
14	0.57	0.57	0.01	1.1%	-0.01	0.02	$0.33	Off-Peak
15	0.60	0.59	0.01	1.0%	-0.01	0.02	$0.33	Off-Peak
16	0.63	0.63	0.00	0.6%	-0.01	0.01	$0.33	Off-Peak
17	0.67	0.65	0.02	3.6%	0.01	0.04	$0.56	Peak
18	0.73	0.69	0.03	4.4%	0.02	0.04	$0.56	Peak
19	0.76	0.72	0.04	5.0%	0.03	0.05	$0.56	Peak
20	0.77	0.73	0.03	4.2%	0.02	0.04	$0.56	Peak
21	0.77	0.75	0.03	3.4%	0.02	0.04	$0.56	Peak
22	0.73	0.72	0.00	0.2%	-0.01	0.01	$0.33	Off-Peak
23	0.63	0.63	-0.01	-0.9%	-0.01	0.00	$0.33	Off-Peak
24	0.52	0.52	0.00	-0.5%	-0.01	0.00	$0.33	Off-Peak
Daily kWh	**13.03**	**12.93**	**0.10**	**0.8%**	**0.06**	**0.14**	**N/A**	**N/A**

5.3.1 Rate 1

SDG&E's Rate 1 is a three-period rate with a peak period from 4 PM to 9 PM on weekdays and weekends. On weekdays, the off-peak (or shoulder) period runs from 6 AM to 4 PM and 9 PM to midnight. On weekends, this period is much shorter, running from 2 PM to 4 PM and 9 PM to midnight. In summer, for electricity usage above 130% of the baseline quantity, prices equal roughly 62 ¢/kWh in the peak period, 38 ¢/kWh in the off-peak (or shoulder) period and 32 ¢/kWh in the super off-peak period. For usage below 130% the baseline quantity, a credit of 22 ¢/kWh is applied.

Figure 5.3-2 below shows the average peak-period load reduction in absolute terms for Rate 1 for customers in the moderate and cool climate regions, separately and combined.[47] As with the other IOUs, the lines bisecting the top of each bar in the figures show the 90% confidence band for each estimate.

Figure 5.3-2: Average Load Impacts For Peak Period for SDG&E Rate 1 (Positive values represent load reductions)



	Cool/Moderate	Moderate	Cool
Percent Impact	4.6%	5.5%	3.7%
kW Impact	0.03	0.05	0.02

As seen in the figure, the average peak load impacts for the cool and moderate climate regions, separately and combined, is statistically significant at the 90% level of confidence in both percentage and absolute terms. On average, pilot participants in both climate regions combined reduced electricity use by 4.6% or 0.03 kW across the five hour peak period from 4 PM to 9 PM. Customers in the moderate climate region reduced their usage by 5.5% or 0.05 kW, which is greater than the impact in the cool climate region (3.7% or 0.02 kW)

[47] Recall that Rate 1 was not offered in the hot climate region.

Table 5.3-1 shows the average percent and absolute load impacts for Rate 1 for each rate period for weekdays and weekends and for the average monthly system peak day for the cool and moderate climate regions. The percent reduction equals the load impact in absolute terms (kW) divided by the reference load. Shaded cells in the table contain load impact estimates that are not statistically significant at the 90% confidence level. The percentage and absolute values in the first row of Table 5.3-1 which represent the load impacts in the peak period on the average weekday, equal the values shown in Figure 5.3-2, discussed above.

The reference loads shown in Table 5.3-1 represent estimates of what customers on the TOU rate would have used if they had not responded to the price signals contained in the TOU tariff. As seen in the table, average hourly usage during the peak period is roughly 0.73 kW for the moderate and cool climate regions combined and around 0.54 kW for the 24 hour average weekday. In the moderate climate region, average usage in the peak period is larger at 0.86 kW than in the cool climate region (0.65 kW).

As seen in Table 5.3-1, peak-period load reductions were statistically significant for all climate regions and day types. In the moderate climate region, both the percent and absolute impacts were largest on the average monthly system peak day. Both percent and absolute peak-period load reductions were nearly identical on the average weekday and weekend. In the cool climate region, peak-period load reductions were statistically significant and very similar across all three day-types.

In the off-peak (or shoulder period), which varied in timing and length between weekdays and weekends, load reductions were quite modest in some climate regions and day types and statistically insignificant in others. In the super off-peak period, which runs from midnight to 6 AM, for the moderate and cool regions combined, there were statistically significant load increases on both the average weekday and average system peak day.

For the moderate and cool climate regions combined, there was a 1.2% reduction in daily electricity use on the average weekday. In the moderate climate region the daily savings was 2.5% and in the cool climate region it was 0.1% and not statistically significant. While the daily reduction in energy use for Rate 1 is small in percentage and absolute terms, this average is spread over 24 hours each day, so the average reduction in electricity use on weekdays equals roughly 0.15 kWh. Over six months, this adds up to about 28 kWh per customer.

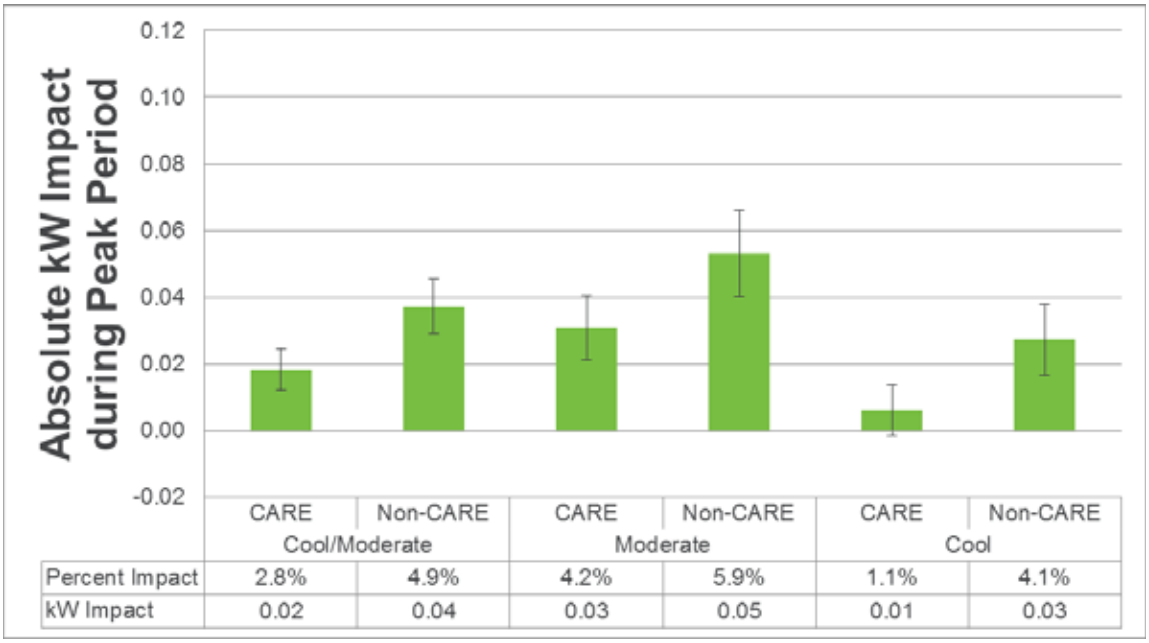
Table 5.3-1: Rate 1 Load Impacts by Rate Period and Day Type*
(Positive values represent load reductions, negative values represent load increases)

Rate 1											
Day Type	Period	Hours	Cool/Moderate			Moderate			Cool		
			Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact
Average Weekday	Peak	4 PM to 9 PM	0.73	0.03	4.6%	0.86	0.05	5.5%	0.65	0.02	3.7%
	Off-Peak	6 AM to 4 PM, 9 PM to 12 AM	0.54	0.01	1.3%	0.61	0.02	2.6%	0.50	0.00	0.3%
	Super Off-Peak	12 AM to 6 AM	0.37	-0.02	-4.8%	0.41	-0.01	-3.3%	0.35	-0.02	-6.0%
	Day	**All Hours**	0.54	0.01	1.2%	0.61	0.02	2.5%	0.49	0.00	0.1%
Average Weekend	Peak	4 PM to 9 PM	0.74	0.04	4.7%	0.87	0.05	5.3%	0.66	0.03	4.2%
	Off-Peak	2 PM to 4 PM, 9 PM to 12 AM	0.65	0.01	1.0%	0.74	0.01	1.0%	0.58	0.01	1.1%
	Super Off-Peak	12 AM to 2 PM	0.47	-0.01	-1.6%	0.52	0.00	0.4%	0.44	-0.01	-3.2%
	Day	**All Hours**	0.56	0.00	0.8%	0.64	0.01	1.9%	0.51	0.00	-0.2%
Monthly System Peak Day	Peak	4 PM to 9 PM	1.06	0.05	4.7%	1.34	0.08	6.3%	0.87	0.03	2.9%
	Off-Peak	6 AM to 4 PM, 9 PM to 12 AM	0.70	0.00	0.3%	0.85	0.01	1.5%	0.61	0.00	-0.8%
	Super Off-Peak	12 AM to 6 AM	0.43	-0.02	-4.2%	0.49	-0.01	-2.6%	0.39	-0.02	-5.5%
	Day	**All Hours**	0.71	0.01	1.0%	0.86	0.02	2.5%	0.61	0.00	-0.4%

* A shaded cell indicates estimate is not statistically significant

Figure 5.3-3 shows the absolute peak period load impacts for Rate 1 for CARE/FERA and non-CARE/FERA customers for the moderate and cool climate regions combined and separately. In the combined region and in each region separately, both the percent and absolute load impacts were greater for non-CARE/FERA customers than for CARE/FERA customers and the differences were statistically significant. The load reduction for CARE/FERA customers in the cool climate was not statistically significant. The greatest load reductions came from non-CARE/FERA customers in the moderate climate region, at 5.9% and 0.05 kW.

Figure 5.3-3: Average Load Impacts for Peak Period for SDG&E Rate 1 for CARE/FERA and non-CARE/FERA Customers
(Positive values represent load reductions)



	CARE	Non-CARE	CARE	Non-CARE	CARE	Non-CARE
	Cool/Moderate		Moderate		Cool	
Percent Impact	2.8%	4.9%	4.2%	5.9%	1.1%	4.1%
kW Impact	0.02	0.04	0.03	0.05	0.01	0.03

Table 5.3-2shows the estimated load impacts for each rate period and day type for the moderate and cool climate zones separately and combined for non-CARE/FERA customers.

Table 5.3-3 shows the same but for CARE/FERA customers. For both climate regions, non-CARE/FERA customers have greater peak period demand than CARE/FERA customers. For example, on the average weekday in the two climate zones combined, peak period demand is equal to 0.76 kW for non-CARE/FERA customers and 0.64 kW for CARE/FERA customers. Average hourly overall weekday consumption is also greater for non-CARE/FERA customers (0.55 kW versus 0.49 kW).

Customers in the non-CARE/FERA segments had load impacts of 1.4% during the off-peak period on average weekdays, and no significant changes during off-peak hours on the average weekend or the monthly system peak day. CARE/FERA customers also showed modest reductions in usage during the off-peak period on the average weekday and also on the monthly system peak day, but not on weekends when the off-peak period was longer.

Table 5.3-2: Rate 1 Load Impacts by Rate Period and Day Type – Non-CARE/FERA*
(Positive values represent load reductions, negative values represent load increases)

Rate 1											
Day Type	Period	Hours	Cool/Moderate, Non-CARE			Moderate, Non-CARE			Cool, Non-CARE		
			Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact
Average Weekday	Peak	4 PM to 9 PM	0.76	0.04	4.9%	0.90	0.05	5.9%	0.67	0.03	4.1%
	Off-Peak	6 AM to 4 PM, 9 PM to 12 AM	0.55	0.01	1.4%	0.63	0.02	3.0%	0.51	0.00	0.2%
	Super Off-Peak	12 AM to 6 AM	0.38	-0.02	-5.5%	0.42	-0.02	-3.7%	0.36	-0.02	-6.7%
	Day	**All Hours**	0.55	0.01	1.2%	0.63	0.02	2.8%	0.50	0.00	0.1%
Average Weekend	Peak	4 PM to 9 PM	0.77	0.04	5.3%	0.91	0.06	6.1%	0.68	0.03	4.6%
	Off-Peak	2 PM to 4 PM, 9 PM to 12 AM	0.66	0.01	1.2%	0.77	0.01	1.2%	0.60	0.01	1.2%
	Super Off-Peak	12 AM to 2 PM	0.48	-0.01	-1.8%	0.54	0.00	0.7%	0.45	-0.02	-3.5%
	Day	**All Hours**	0.58	0.01	0.9%	0.66	0.02	2.3%	0.53	0.00	-0.2%
Monthly System Peak Day	Peak	4 PM to 9 PM	1.10	0.05	4.8%	1.43	0.10	6.9%	0.90	0.03	2.9%
	Off-Peak	6 AM to 4 PM, 9 PM to 12 AM	0.72	0.00	0.2%	0.89	0.02	1.8%	0.62	-0.01	-1.3%
	Super Off-Peak	12 AM to 6 AM	0.44	-0.02	-4.6%	0.50	-0.01	-2.7%	0.40	-0.02	-6.1%
	Day	**All Hours**	0.73	0.01	0.9%	0.90	0.03	2.9%	0.63	-0.01	-0.8%

* A shaded cell indicates estimate is not statistically significant

Table 5.3-3: Rate 1 Load Impacts by Rate Period and Day Type – CARE/FERA*
(Positive values represent load reductions, negative values represent load increases)

Rate 1											
Day Type	Period	Hours	Cool/Moderate, CARE			Moderate, CARE			Cool, CARE		
			Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact
Average Weekday	Peak	4 PM to 9 PM	0.64	0.02	2.8%	0.74	0.03	4.2%	0.55	0.01	1.1%
	Off-Peak	6 AM to 4 PM, 9 PM to 12 AM	0.49	0.00	0.8%	0.55	0.00	0.9%	0.43	0.00	0.7%
	Super Off-Peak	12 AM to 6 AM	0.35	-0.01	-1.8%	0.39	-0.01	-1.9%	0.32	-0.01	-1.6%
	Day	**All Hours**	0.49	0.00	0.9%	0.55	0.01	1.3%	0.43	0.00	0.4%
Average Weekend	Peak	4 PM to 9 PM	0.63	0.01	2.0%	0.72	0.02	2.2%	0.55	0.01	1.8%
	Off-Peak	2 PM to 4 PM, 9 PM to 12 AM	0.57	0.00	0.2%	0.65	0.00	0.1%	0.50	0.00	0.4%
	Super Off-Peak	12 AM to 2 PM	0.43	0.00	-0.7%	0.47	0.00	-0.4%	0.39	0.00	-1.0%
	Day	**All Hours**	0.50	0.00	0.3%	0.56	0.00	0.4%	0.44	0.00	0.1%
Monthly System Peak Day	Peak	4 PM to 9 PM	0.86	0.03	3.7%	1.04	0.04	4.1%	0.69	0.02	3.2%
	Off-Peak	6 AM to 4 PM, 9 PM to 12 AM	0.61	0.01	1.1%	0.71	0.00	0.2%	0.52	0.01	2.3%
	Super Off-Peak	12 AM to 6 AM	0.41	-0.01	-2.2%	0.47	-0.01	-2.6%	0.35	-0.01	-1.8%
	Day	**All Hours**	0.61	0.01	1.3%	0.72	0.01	0.9%	0.51	0.01	1.9%

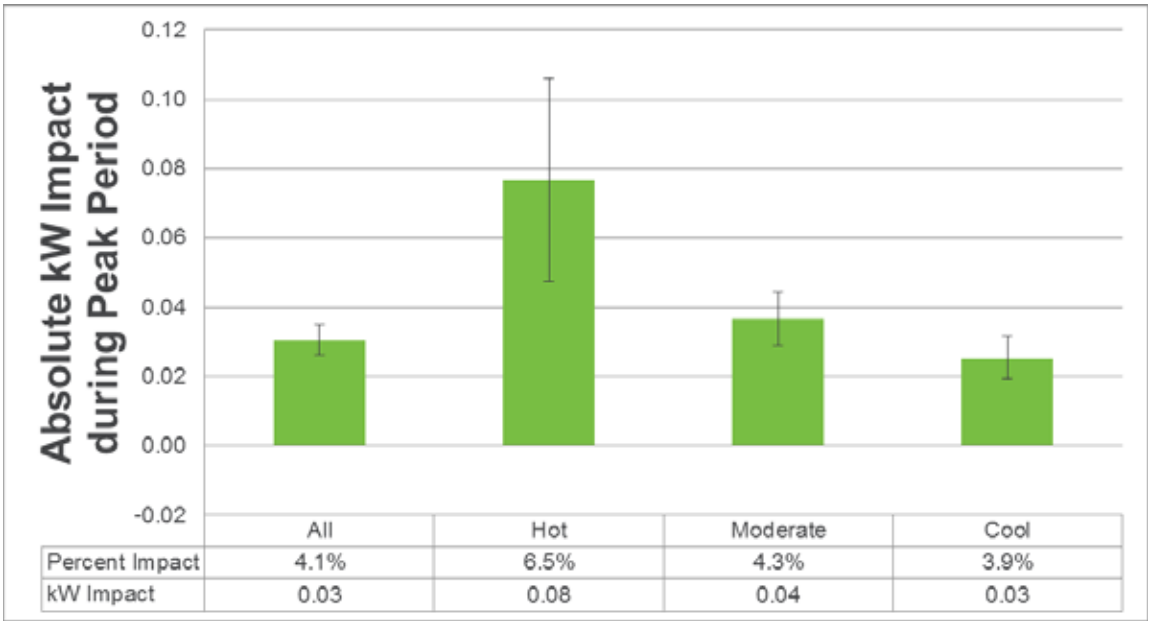
* A shaded cell indicates estimate is not statistically significant

5.3.2 Rate 2

SDG&E's Rate 2 differs from Rate 1 in that it is a two-period rate, rather than a three-period rate. Like Rate 1, the peak period is from 4 PM to 9 PM on weekdays and weekends. In summer, for electricity usage above 130% of the baseline quantity, prices equal roughly 62 ¢/kWh in the peak period and 36 ¢/kWh in the off-peak period. Like Rate 1, a credit of 22 ¢/kWh is applied to usage below 130% the baseline quantity.

Figure 5.3-4 shows the absolute load impacts for the weekday peak period for Rate 2 for SDG&E's service territory as a whole and for each climate region. For the service territory as a whole, load impacts were equal to 4.1% or 0.03 kW. Like Rate 1, customers in the moderate and cool climate regions had similar load impacts of 4.3% and 3.9% respectively. Customers in the hot climate zone had the greatest peak period impacts at 6.5% or 0.08 kW. Impacts in the hot climate zone are statistically significantly greater than those in the cool and moderate climate regions. It should be that, in addition to significant differences in climate, there may also be significant differences in the mix of customers by housing type, CARE/FERA and non-CARE/FERA segments and perhaps other characteristics.

Figure 5.3-4: Average Load Impacts For Peak Period for SDG&E Rate 2 (Positive values represent load reductions)



	All	Hot	Moderate	Cool
Percent Impact	4.1%	6.5%	4.3%	3.9%
kW Impact	0.03	0.08	0.04	0.03

Table 5.3-4 contains estimates of load impacts for all relevant rate periods and day types. Reference loads and load impacts in each rate period and over the course of the day were similar between weekends and weekdays for the service territory as a whole and also for each climate region. In the hot region, there were relatively large and statistically significant increases in electricity use in the off-peak period on all day types. On the average weekday and weekend, these increases more than offset the peak-period load reductions so that there was a small but statistically significant increase in usage across the day. This pattern is not evident in the moderate and cool climate regions where the increase in usage in the off-peak period was not large enough to offset the peak period reductions and there were small but statistically significant decreases in daily electricity use for most day types and climate regions.

Table 5.3-4: Rate 2 Load Impacts by Rate Period and Day Type*
(Positive values represent load reductions, negative values represent load increases)

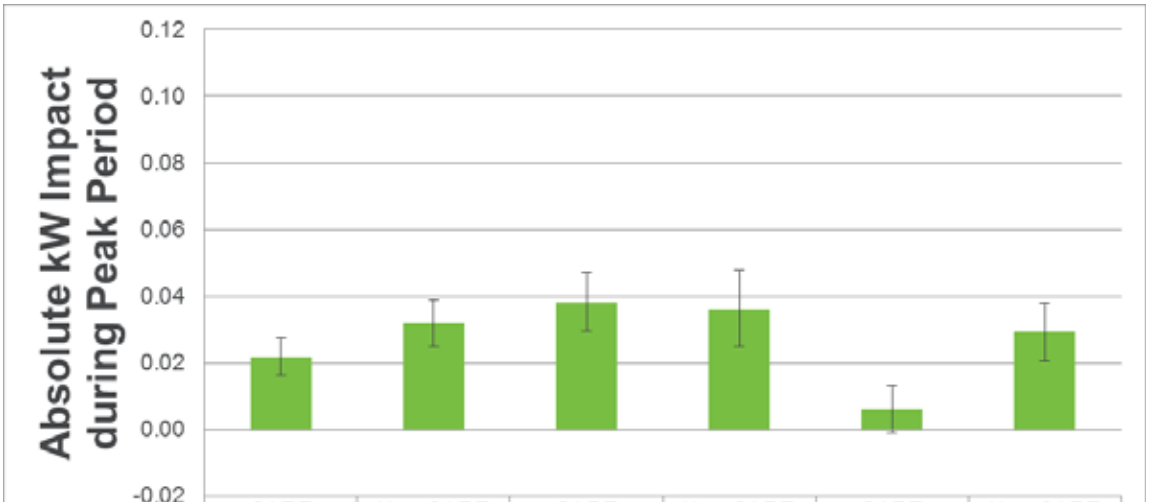
Rate 2														
Day Type	Period	Hours	All			Hot			Moderate			Cool		
			Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact
Average Weekday	Peak	4 PM to 9 PM	0.74	0.03	4.1%	1.18	0.08	6.5%	0.86	0.04	4.3%	0.65	0.03	3.9%
	Off-Peak	12 AM to 4 PM, 9 PM to 12 AM	0.49	0.00	-0.6%	0.73	-0.04	-5.9%	0.55	0.00	-0.3%	0.45	0.00	-0.7%
	Day	**All Hours**	0.54	0.00	0.8%	0.82	-0.02	-2.2%	0.61	0.01	1.1%	0.49	0.00	0.6%
Average Weekend	Peak	4 PM to 9 PM	0.75	0.03	4.5%	1.24	0.09	6.9%	0.87	0.04	4.6%	0.66	0.03	4.4%
	Off-Peak	12 AM to 4 PM, 9 PM to 12 AM	0.52	0.00	-0.3%	0.77	-0.04	-5.5%	0.58	0.00	-0.2%	0.48	0.00	-0.3%
	Day	**All Hours**	0.57	0.01	1.0%	0.87	-0.02	-1.8%	0.64	0.01	1.1%	0.51	0.00	1.0%
Monthly System Peak Day	Peak	4 PM to 9 PM	1.06	0.04	3.5%	1.64	0.14	8.5%	1.34	0.06	4.2%	0.87	0.02	2.7%
	Off-Peak	12 AM to 4 PM, 9 PM to 12 AM	0.62	-0.01	-0.9%	0.95	-0.03	-2.8%	0.73	-0.01	-0.8%	0.54	0.00	-0.8%
	Day	**All Hours**	0.71	0.00	0.5%	1.09	0.01	0.7%	0.86	0.01	0.8%	0.61	0.00	0.2%

* A shaded cell indicates estimate is not statistically significant

Figure 5.3-5 shows the peak period load reductions on weekdays for non-CARE/FERA and CARE/FERA customers and Table 5.3-5 and Table 5.3-6 show the load impacts for each rate period and day type for the two segments. There are not enough customers in the hot climate region to segment between CARE/FERA and non-CARE/FERA, so these tables only include customers in the moderate and cool climate regions, separately and combined.

Like Rate 1, non-CARE/FERA customers in the cool climate region had greater percent impacts (4.4% and 0.03 kW) than their CARE/FERA counterparts (1.1% and 0.01 kW) and these differences are statistically significant in both absolute and percentage terms. This is not the case in the moderate climate region, where load impacts for CARE/FERA and non-CARE/FERA customers were more similar and the observed difference is not statistically significant.

Figure 5.3-5: Average Load Impacts for Peak Period for SDG&E Rate 2 for CARE/FERA and non-CARE/FERA Customers
(Positive values represent load reductions)



	CARE	Non-CARE	CARE	Non-CARE	CARE	Non-CARE
	Cool/Moderate		Moderate		Cool	
Percent Impact	3.4%	4.2%	5.2%	4.0%	1.1%	4.4%
kW Impact	0.02	0.03	0.04	0.04	0.01	0.03

As seen in Table 5.3-5 and Table 5.3-6 non-CARE/FERA customers had greater on-peak and average weekday demand than CARE/FERA customers. Both groups reduced their overall consumption. For example, non-CARE/FERA customers in the moderate and cool climate regions combined reduced their average weekday electricity demand by 0.7% or less than 0.01 kW. CARE/FERA and non-CARE/FERA segments were not available in the hot climate region due to the small population of customers, resulting in insufficient sample size to allow for segmentation.

Table 5.3-5: Rate 2 Load Impacts by Rate Period and Day Type – Non-CARE/FERA*
(Positive values represent load reductions, negative values represent load increases)

Rate 2														
Day Type	Period	Hours	Cool/Moderate, Non-CARE			Hot			Moderate, Non-CARE			Cool, Non-CARE		
			Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact
Average Weekday	Peak	4 PM to 9 PM	0.76	0.03	4.2%	1.18	0.08	6.5%	0.90	0.04	4.0%	0.67	0.03	4.4%
	Off-Peak	12 AM to 4 PM, 9 PM to 12 AM	0.50	0.00	-0.8%	0.73	-0.04	-5.9%	0.56	0.00	-0.9%	0.46	0.00	-0.7%
	Day	**All Hours**	0.55	0.00	0.7%	0.82	-0.02	-2.2%	0.63	0.00	0.6%	0.50	0.00	0.7%
Average Weekend	Peak	4 PM to 9 PM	0.77	0.04	4.8%	1.24	0.09	6.9%	0.91	0.04	4.7%	0.68	0.03	4.9%
	Off-Peak	12 AM to 4 PM, 9 PM to 12 AM	0.53	0.00	-0.6%	0.77	-0.04	-5.5%	0.60	-0.01	-0.9%	0.49	0.00	-0.3%
	Day	**All Hours**	0.58	0.01	0.9%	0.87	-0.02	-1.8%	0.66	0.00	0.7%	0.53	0.01	1.1%
Monthly System Peak Day	Peak	4 PM to 9 PM	1.10	0.04	3.3%	1.64	0.14	8.5%	1.43	0.05	3.8%	0.90	0.03	2.8%
	Off-Peak	12 AM to 4 PM, 9 PM to 12 AM	0.63	-0.01	-1.0%	0.95	-0.03	-2.8%	0.77	-0.01	-1.0%	0.55	-0.01	-1.0%
	Day	**All Hours**	0.73	0.00	0.4%	1.09	0.01	0.7%	0.90	0.01	0.6%	0.63	0.00	0.2%

* A shaded cell indicates estimate is not statistically significant

Table 5.3-6: Rate 2 Load Impacts by Rate Period and Day Type –CARE/FERA*
(Positive values represent load reductions, negative values represent load increases)

Rate 2														
Day Type	Period	Hours	Cool/Moderate, CARE			Hot			Moderate, CARE			Cool, CARE		
			Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact	Ref. kW	Impact kW	% Impact
Average Weekday	Peak	4 PM to 9 PM	0.64	0.02	3.4%	1.18	0.08	6.5%	0.74	0.04	5.2%	0.55	0.01	1.1%
	Off-Peak	12 AM to 4 PM, 9 PM to 12 AM	0.45	0.00	0.8%	0.73	-0.04	-5.9%	0.50	0.01	1.9%	0.40	0.00	-0.5%
	Day	**All Hours**	0.49	0.01	1.5%	0.82	-0.02	-2.2%	0.55	0.02	2.8%	0.43	0.00	-0.1%
Average Weekend	Peak	4 PM to 9 PM	0.63	0.02	2.8%	1.24	0.09	6.9%	0.72	0.03	4.2%	0.55	0.01	1.1%
	Off-Peak	12 AM to 4 PM, 9 PM to 12 AM	0.46	0.01	1.2%	0.77	-0.04	-5.5%	0.52	0.01	2.3%	0.42	0.00	-0.1%
	Day	**All Hours**	0.50	0.01	1.6%	0.87	-0.02	-1.8%	0.56	0.02	2.8%	0.44	0.00	0.2%
Monthly System Peak Day	Peak	4 PM to 9 PM	0.86	0.04	4.1%	1.64	0.14	8.5%	1.04	0.06	5.8%	0.69	0.01	1.7%
	Off-Peak	12 AM to 4 PM, 9 PM to 12 AM	0.55	0.00	0.0%	0.95	-0.03	-2.8%	0.64	0.00	-0.2%	0.46	0.00	0.2%
	Day	**All Hours**	0.61	0.01	1.2%	1.09	0.01	0.7%	0.72	0.01	1.6%	0.51	0.00	0.6%

* A shaded cell indicates estimate is not statistically significant

5.3.3 Weekly Alert Emails

Table 5.3-7 shows peak period impacts for customers who are not receiving alerts ("controls") and those who are ("recipients") and Table 5.3-8 contains estimated impacts for all rate periods and day types. As seen, the incremental impacts during the peak period were very small and, as shown by the fact that the 90% confidence interval includes 0, incremental impacts for the territory as a whole were not statistically significant. It is worth noting that the incremental impact for the moderate climate region (0.02 kW) is statistically significant at the 90% confidence level. The incremental impact of 0.02 kW indicates that customer with the WAE treatment produced load impacts 0.02 kW greater than those customers without the treatment. It should also be noted that, although the % increase in the impact is large in percentage terms, this is a bit misleading since the estimated values are based on a very small impact to begin with. That is, the denominator in the calculation is quite small so that even very small incremental effects represent a reasonably large percent of the impact.

Table 5.3-7: Incremental Impacts of SDG&E Weekly Alert Emails

Climate Zone	Number of Customers		kW Impact during Peak Period					% Increase in Impact
	Controls	Recipients	Controls	Recipients	Incremental	90% Confidence Interval		
Cool	1,480	816	0.027	0.022	-0.004	-0.013	0.004	-16%
Moderate	1,336	732	0.029	0.051	0.023	0.011	0.035	80%
Cool/Moderate	2,816	1,548	0.028	0.034	0.007	-0.001	0.014	24%

Table 5.3-8: Incremental Impacts of SDG&E Weekly Alert Emails by Rate Period and Day Type*

Rate 2										
Day Type	Period	Hours	WAE - Cool/Moderate			WAE - Moderate			WAE - Cool		
			Non-WAE Impact	Inc. Impact	% Inc. Impact	Non-WAE Impact	Inc. Impact	% Inc. Impact	Non-WAE Impact	Inc. Impact	% Inc. Impact
Average Weekday	Peak	4 PM to 9 PM	0.028	0.007	23.5%	0.029	0.023	80.2%	0.027	-0.004	-16.5%
	Off-Peak	12 AM to 4 PM, 9 PM to 12 AM	-0.003	0.000	9.6%	-0.006	0.004	-64.3%	-0.001	-0.003	281.7%
	Day	**All Hours**	0.003	0.001	32.5%	0.002	0.008	506.9%	0.005	-0.003	-66.5%
Average Weekend	Peak	4 PM to 9 PM	0.031	0.011	36.2%	0.034	0.024	69.0%	0.028	0.003	9.3%
	Off-Peak	12 AM to 4 PM, 9 PM to 12 AM	-0.001	0.000	32.4%	-0.005	0.001	-28.7%	0.001	-0.002	-213.1%
	Day	**All Hours**	0.005	0.002	37.0%	0.004	0.006	167.0%	0.006	-0.001	-11.3%
Monthly System Peak Day	Peak	4 PM to 9 PM	0.033	0.005	13.9%	0.041	0.044	105.3%	0.027	-0.022	-79.5%
	Off-Peak	12 AM to 4 PM, 9 PM to 12 AM	-0.007	-0.001	10.1%	-0.011	0.011	-98.0%	-0.005	-0.008	173.5%
	Day	**All Hours**	0.001	0.000	33.2%	0.000	0.017	49532.5%	0.002	-0.011	-599.5%

* A shaded cell indicates estimate is not statistically significant

5.3.4 Smart Thermostat

SDG&E offered rebates for smart thermostats through a program named Whenergy. The primary focus of this treatment was to assess differential take rates for each rebate amount for both TOU rate and control customers. SDG&E offered two different rebates, $100 and $200, to customers who purchased a smart thermostat. The utility contacted 2,214 customers via direct mail and 4,889 customers via email for a $100 rebate offer. A similar number of customers were offered a $200 rebate. SDG&E received 349 applications for the rebates and 246 of those were deemed eligible and were ultimately accepted. Of the 246 applications accepted, 95 were for the $100 rebate offer and 151 were for the $200 rebate offer. Acceptance rates were not large enough to estimate load impacts for smart thermostat owners.

5.3.5 Comparison Across Rates

Figure 5.3-6 shows the average peak period impact for Rate 1 and Rate 2 in the summer months. The peak period covers the same hours for each rate (4 PM to 9 PM) and the peak-period prices are the same in both cases. As such, it is not very surprising that the differences in impacts between the two rates are not statistically significant. Recall that there are no customers in SDG&E's hot climate region on Rate 1, meaning that the "All" category is not an apples to apples comparison. Figure 5.3-7 shows the average daily kWh impact during the summer period for Rate 1 and Rate 2. Impacts are somewhat similar in the cool climate region, but not in the moderate climate region.

Figure 5.3-6: Average Peak Period Impacts Across Rates

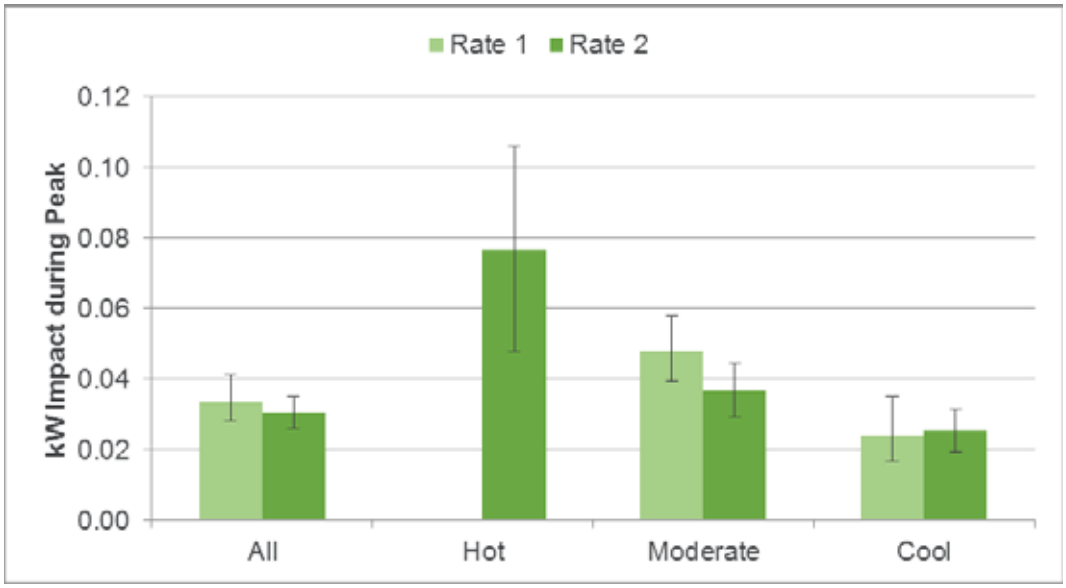
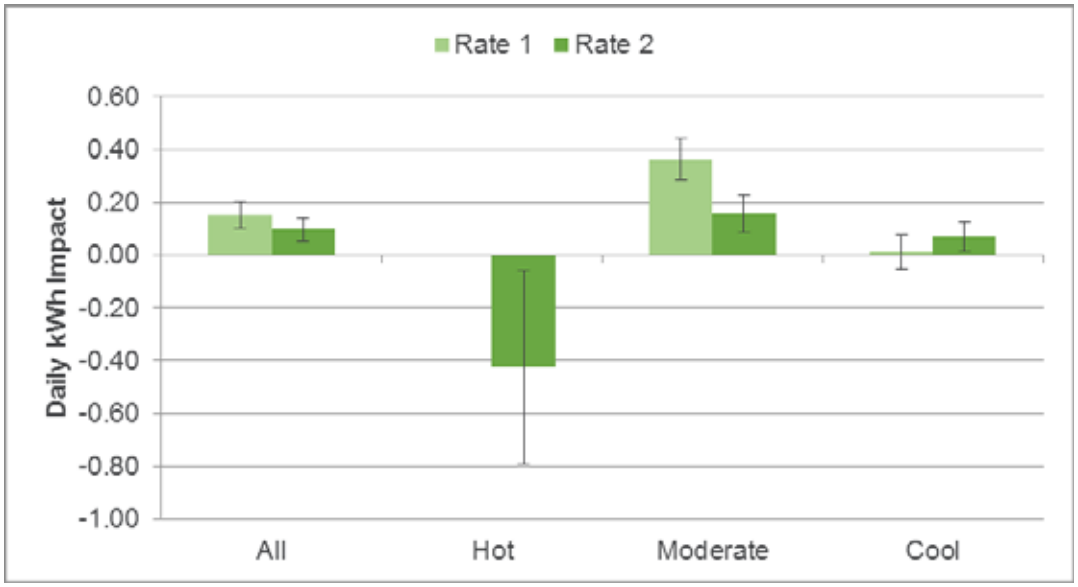


Figure 5.3-7: Average Daily kWh Impacts Across Rates



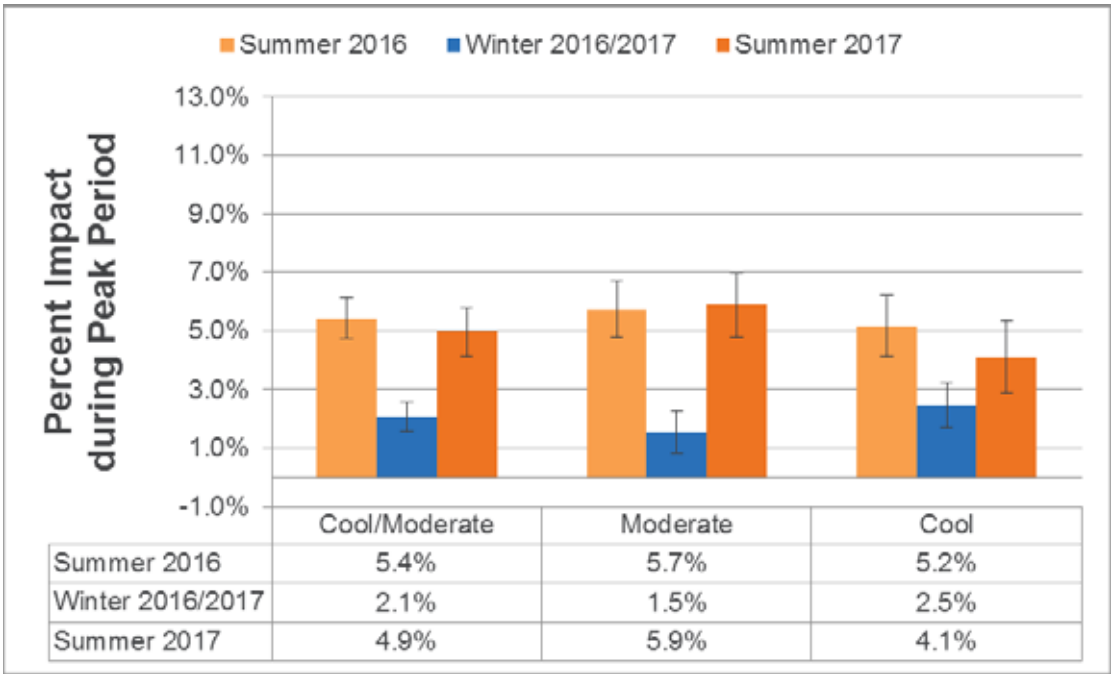
5.4 Persistence Analysis

This section examines the persistence of load impacts for each across the two summer periods for the same group of customers who remained enrolled over the entire course of the pilot. That is, the estimates eliminate any differences that might occur due to changes in the mix of participants over time. The graphs also contain winter period estimates for completeness although the focus is on whether summer impacts increased, decreased or stayed roughly the same over the two summers. In conducting this analysis, the summer period is reduced just to the months of July through October, since enrollment was not complete on both rates prior to July 2016. While there is not a second winter for persistence comparison, the winter impacts for the subset of customers who were enrolled for the full duration of the pilot are included with the two summer impacts to illustrate the relative differences in impacts between the summer and winter seasons for a common set of customers.

5.4.1 Rate 1

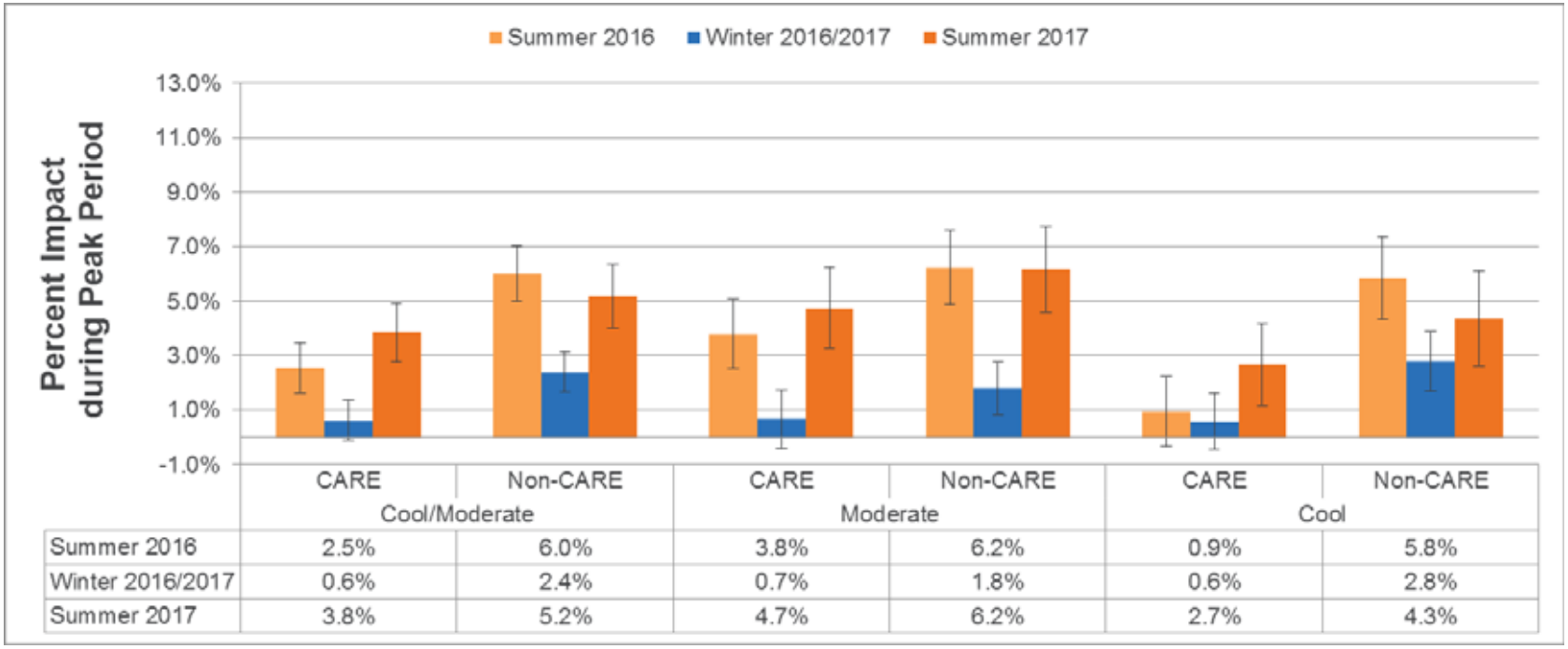
Figure 5.4-1 shows the peak period load reductions for a common group of customers who remained on Rate 1 for the entire pilot for each summer and for the winter period. Figure 5.4-2 contains the same comparison for CARE/FERA and non-CARE/FERA segments. As seen in Figure 5.4-1, there were no statistically significant differences in load impacts across the two summer periods in either climate region or in the two regions combined. This is generally true for both the CARE/FERA and non-CARE/FERA segments separately, as seen in Figure 5.4-2. It should be noted that the trends across the two summers seem to show an increase in load reductions for CARE/FERA customers and a small decrease for non-CARE/FERA customers, but the differences within each segment are not statistically significant for any region.

Figure 5.4-1: Percent Impacts for Peak Period for SDG&E Rate 1, by Season (Positive values represent load reductions)



	Cool/Moderate	Moderate	Cool
Summer 2016	5.4%	5.7%	5.2%
Winter 2016/2017	2.1%	1.5%	2.5%
Summer 2017	4.9%	5.9%	4.1%

Figure 5.4-2: Percent Impacts for Peak Period for SDG &E Rate 1, by Season for CARE/FERA and Non-CARE/FERA Customers (Positive values represent load reductions)

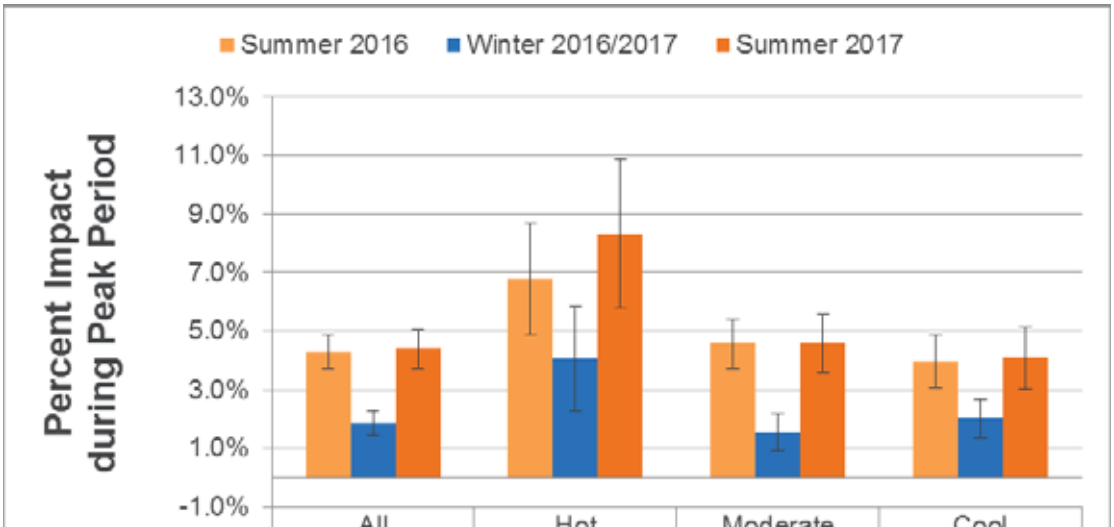


	CARE	Non-CARE	CARE	Non-CARE	CARE	Non-CARE
	Cool/Moderate		Moderate		Cool	
Summer 2016	2.5%	6.0%	3.8%	6.2%	0.9%	5.8%
Winter 2016/2017	0.6%	2.4%	0.7%	1.8%	0.6%	2.8%
Summer 2017	3.8%	5.2%	4.7%	6.2%	2.7%	4.3%

5.4.2 Rate 2

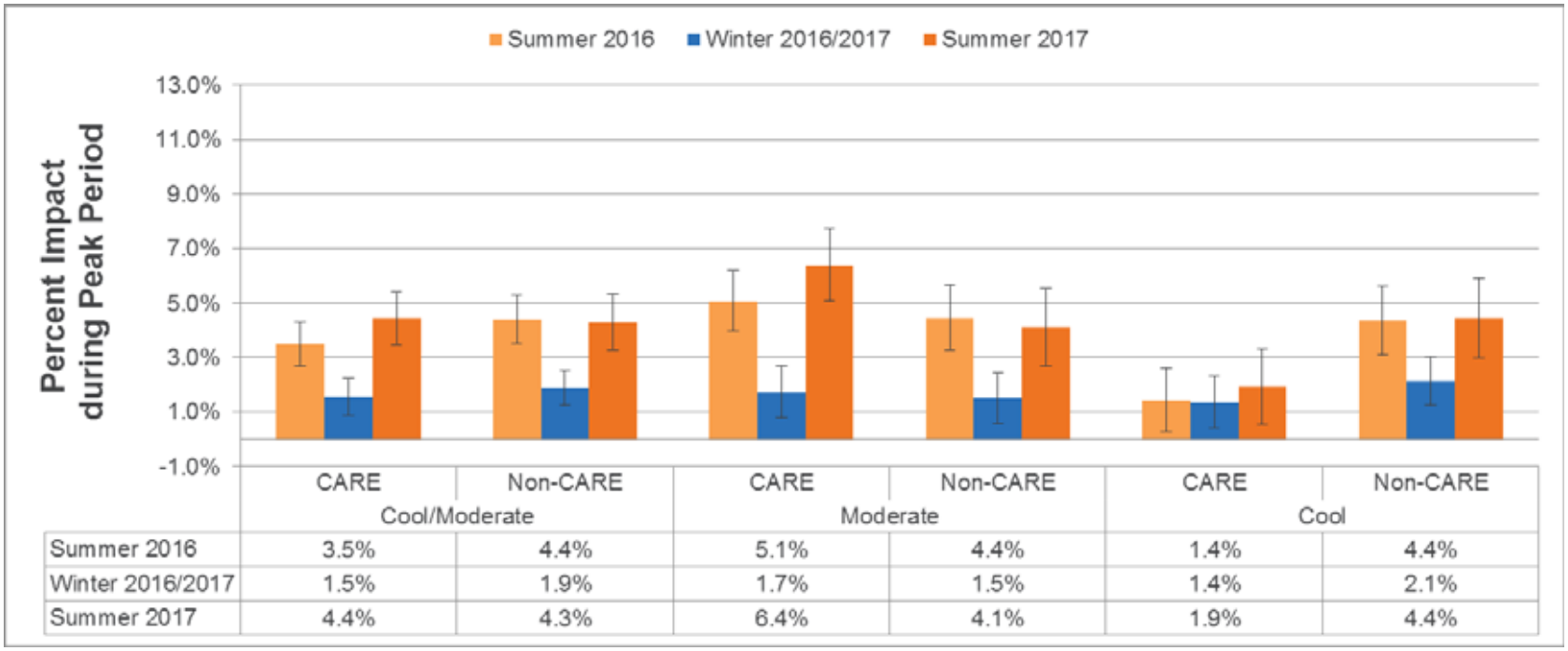
Figure 5.4-3 and Figure 5.4-4 show the peak-period load impacts for each summer and the winter period for Rate 2 for the group of customers that were enrolled on the rate for the entire pilot. As with rate 1, impacts persisted across the two summers in all climate regions and for both customer segments.

Figure 5.4-3: Percent Impacts for Peak Period for SDG &E Rate 2, by Season (Positive values represent load reductions)



	All	Hot	Moderate	Cool
Summer 2016	4.3%	6.8%	4.6%	3.9%
Winter 2016/2017	1.9%	4.0%	1.5%	2.0%
Summer 2017	4.4%	8.3%	4.6%	4.1%

Figure 5.4-4: Percent Impacts for Peak Period for SDG&E Rate 2, by Season for CARE/FERA and Non-CARE/FERA Customers (Positive values represent load reductions)

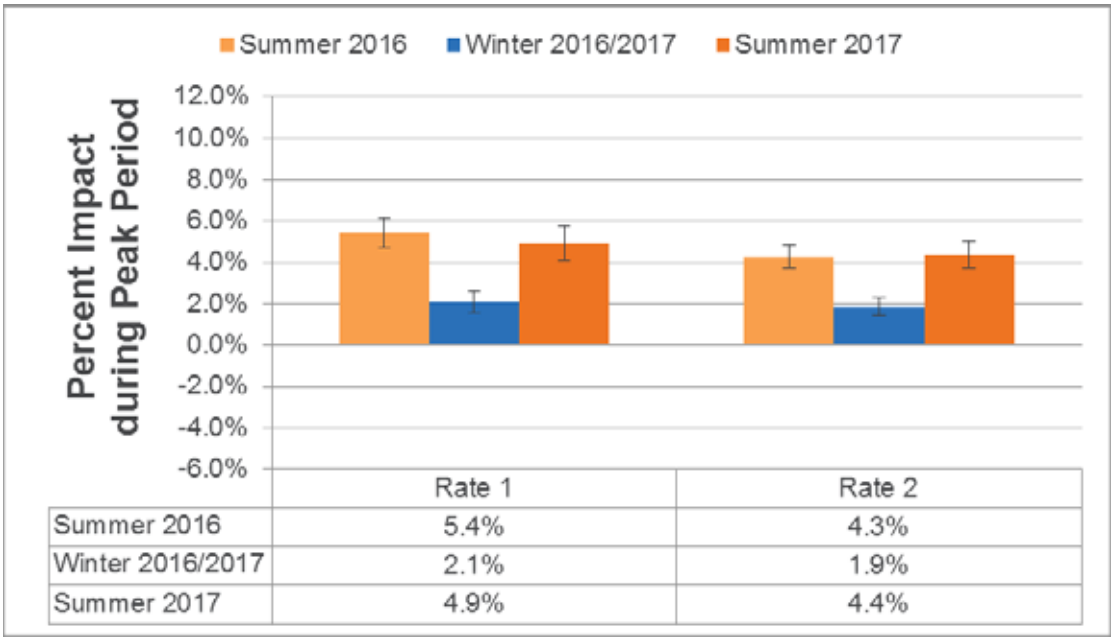


	CARE	Non-CARE	CARE	Non-CARE	CARE	Non-CARE
	Cool/Moderate		Moderate		Cool	
Summer 2016	3.5%	4.4%	5.1%	4.4%	1.4%	4.4%
Winter 2016/2017	1.5%	1.9%	1.7%	1.5%	1.4%	2.1%
Summer 2017	4.4%	4.3%	6.4%	4.1%	1.9%	4.4%

5.4.3 Comparison Across Rates

Figure 5.4-5 compares the load impacts for the two rates tested by SDG&E for the peak-period hours from 4 PM to 9 PM for the summer months of July through October and the winter months of November through April. Rate 1 had slightly higher first and second summer impacts, when the program was relatively new. The two rates have the same peak hours and prices, but Rate 1 has a super off-peak period in the early morning, which could influence customers to shift more of their usage out of the peak period, as seen in Table 5.3-1. For both rates, summer impacts did not decline or grow by a statistically significant amount. In fact, for Rate 2 the impacts are essentially identical in the two summers.

Figure 5.4-5 Percent Peak Period Impacts Across Rates, by Season



	Rate 1	Rate 2
Summer 2016	5.4%	4.3%
Winter 2016/2017	2.1%	1.9%
Summer 2017	4.9%	4.4%

5.5 Synthesis for SDG&E Pilot

This section compares input from the load impact and persistence analysis, the bill impact analysis, and the survey analysis. The objective of these comparisons, at least in part, is to determine if the information and conclusions observed for individual metrics are supported by findings from other metrics or, alternatively, findings for one metric contradict those for another metric. We also look for clues from the survey findings that might help explain why load or bill impacts for one rate differ from those for other rates. As in the other synthesis sections, readers are reminded once again that, given the large samples underlying the survey analysis, statistically significant differences may not reflect meaningful differences from a policy perspective.

5.5.1 Synthesis

Table 5.5-1 and Table 5.5-2 summarize some of the relevant findings from the load impact, bill impact and survey analysis. No additional bill impact analysis or surveys were completed for this report. Results from the first and second interim report were carried forward to this synthesis section in order to provide a more complete overview of the pilot. Readers are directed to Section 3.5.1 for an explanation of the variables and symbols contained in the tables. As a reminder, SDG&E had two pilot rates, one with two pricing periods during the winter and the other with three. The peak periods were the same for both rates and start at 4 PM and end at 9 PM. Each rate has the same number of periods on weekdays and weekends, but the shoulder period on weekends is much shorter for the three period rate (Rate 1). The weekday shoulder period for the three period rate is long, beginning at 6 AM, whereas on weekends, the shoulder period begins at 2 PM.

Looking across the various metrics for each customer segment, the load impact and bill impact findings are typically similar across rates. During both seasons, the weekday peak period prices are identical for the two rates, and the off-peak prices are within two cents of one another. This leaves the primary difference between the rates being the super off peak rate period for Rate 1.

Table 5.5-1: Load Impacts, Bill Impacts, and Selected Survey Findings for SDG&E Rate 1[48]

Climate	Segment	Load Impacts					Bill Impacts		Survey						
		Summer 2016 Peak Period Load Reduction* %	Winter Peak Period Load Reduction** %	Summer 2017 Peak Period Load Reduction %	Net Annual kWh Change** %	Persistence: Summer Impact Pct. Point Change	Annual Total Bill Impact** $	Annual Total Bill Impact** %	Health Index (Range 0-10)**	Bill Higher than Expected**	Difficulty Paying Bills**	Economic Index (Range 0-10)**	Understanding TOU Pricing (None-Correct)**	Satisfaction w/ Rate (11 pt. Scale)**	Satisfaction w/ Utility (11 pt. Scale)**
Hot	General Population	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Moderate	Non-CARE/FERA	6.3% ▼	2.6% ▼	5.9% ▼	1.3% ▼	-0.1 -	-$14 ▼	-1% ▼	2.2 -	26% -	26% -	2.4 -	6%	6.4 ▲	6.8 -
	CARE/FERA	5.2% ▼	0.4% -	4.2% ▼	0.1% ▼	1.0 -	-$1 -	0% -	2.7 -	26% -	68% -	4.2 ▲	13%	7.2 -	7.6 -
Cool	Non-CARE/FERA	5.2% ▼	2.9% ▼	4.1% ▼	1.3% ▼	-1.5 -	-$24 ▼	-2% ▼	2.0 -	29% -	18% ▼	2.0 ▼	5%	6.6 ▲	7.0 -
	CARE/FERA	1.7% ▼	-0.3% -	1.1% -	0.6% ▲	1.7 -	$2 -	0% -	2.6 -	21% ▼	60% -	3.8 -	12%	7.4 ▲	7.8 -

Table 5.5-2: Load Impacts, Bill Impacts, and Selected Survey Findings for SDG&E Rate 2

Climate	Segment	Load Impacts					Bill Impacts		Survey						
		Summer 2016 Peak Period Load Reduction* %	Winter Peak Period Load Reduction** %	Summer 2017 Peak Period Load Reduction %	Net Annual kWh Change** %	Persistence: Summer Impact Pct. Point Change	Annual Total Bill Impact** $	Annual Total Bill Impact** %	Health Index (Range 0-10)**	Bill Higher than Expected**	Difficulty Paying Bills**	Economic Index (Range 0-10)**	Understanding TOU Pricing (None-Correct)**	Satisfaction w/ Rate (11 pt. Scale)**	Satisfaction w/ Utility (11 pt. Scale)**
Hot	General Population	6.8% ▼	3.9% ▼	6.5% ▼	1.2% ▲	1.6 -	$20 ▲	1% ▲	N/A	N/A	35% N/A	N/A	14%	5.8 N/A	6.5 N/A
Moderate	Non-CARE/FERA	5.1% ▼	1.7% ▼	4.0% ▼	0.4% ▼	-0.3 -	$0 -	0% -	2.2 -	26% -	28% -	2.4 -	14%	6.4 ▲	6.8 -
	CARE/FERA	5.3% ▼	1.3% ▼	5.2% ▼	1.6% ▼	1.3 -	-$13 ▼	-2% ▼	3.0 ▲	26% -	64% -	4.1 -	28%	7.3 -	7.7 -
Cool	Non-CARE/FERA	4.3% ▼	1.9% ▼	4.4% ▼	1.2% ▼	0.1 -	-$28 ▼	-3% ▼	2.0 -	27% -	18% ▼	2.1 -	13%	6.5 ▲	7.1 -
	CARE/FERA	2.6% ▼	0.5% -	1.1% -	0.2% ▼	0.5 -	-$4 ▼	-1% ▼	2.5 -	23% ▼	63% -	3.8 -	25%	7.6 ▲	8.0 ▲

[48] In all three tables, a column with an (*) indicates the values are from the First Interim Report and a column with (**) indicates the values are from one of the two Second Interim Report volumes. A column with neither (*) or (**) means the values are found elsewhere in this report.

Non-CARE/FERA Customers

Non-CARE/FERA customers had larger load reductions in summer 2017 than CARE/FERA customers for both Rates 1 and 2 in both absolute and percentage terms for the cool/moderate climate regions combined and also in the cool climate region. In the moderate climate region, the non-CARE/FERA absolute and percentage load reductions were also greater for Rate 1, but were not statistically different from the impacts for Rate 2. The average peak-period load reduction for non-CARE/FERA customers in the cool/moderate regions combined equaled 4.9% and 0.04 kW for Rate 1 and 4.2% and 0.03 kW for Rate 2. The difference in load impacts across the two rates was not statistically significant. Absolute impacts were larger in the moderate region for Rate 1 compared with the cool climate region. For Rate 2, the absolute difference across climate regions was not statistically significant for Rate 2, non-CARE/FERA customers. Non-CARE/FERA customers did not display statistically significant changes in peak-load reductions between the first and second summer for a common group of customers that participated throughout the entire pilot.

Non-CARE/FERA customers in the moderate climate region on Rates 1 and 2 experienced the largest structural bill impacts, which were almost as large as the structural impacts of the general population in the hot climate region on Rate 2. Non-CARE/FERA customers on Rates 1 and 2 in both the moderate and cool climate regions were able to achieve either no total annual bill impact or annual bill reductions up to $28 for the cool climate region customers on Rate 2.

Non-CARE/FERA customers tended to have a low percentage of customers receiving bills higher than expected, and also had a low percentage of customers having difficulty paying bills. Neither of these metrics have statistically significant differences between the treatment and control groups. Similarly, there were no statistically significant difference in the economic index. In fact, there was actually a statistically significant decrease for the non-CARE/FERA customers in the cool climate region on Rate 1.

When excluding the hot climate region, non-CARE/FERA customers had the highest bill reduction due to behavior change in three out of the four segments. Non-CARE/FERA customers understood the rates better than CARE/FERA customers (as indicated by the low percent that couldn't identify at least some hours that fell into the peak period).

All non-CARE/FERA segments had statistically significantly higher satisfaction ratings for the rate plan compared to the control group. These metrics paint an internally consistent picture of a customer segment that understood the rate features relatively well, worked to reduce usage which resulted in bills similar or less than what they would have experienced on the OAT, and were ultimately more satisfied with their rate than control group customers.

CARE/FERA Customers

As discussed above, CARE/FERA customers tended to have load reductions that were smaller than non-CARE/FERA customers overall and in the cool climate region on both rates. In the moderate climate region, the difference in load impacts between the two segments was not statistically significant for Rate 2. CARE/FERA customers on average produced behavioral bill reductions significantly smaller than non-CARE/FERA customers in the cool climate region on both rates and produced a mix of higher and lower impacts in the moderate climate region. Similar to non-CARE/FERA customers, CARE/FERA customers did not provide any statistically significant changes in peak load reductions between the first

and second summer. In other words, CARE/FERA customers continue to respond to peak pricing in a similar manner during the second summer of the pilot.

One potentially important finding related to the rates that could affect performance of CARE/FERA customers is the lower understanding of the timing of the peak period, as evidenced by the much higher percent of customers who could not identify any hours that fell during the high priced period. Taking a simple average across climate regions and rates for this metric, only about 10% of non-CARE/FERA customers were unable to correctly identify any peak-period hours, whereas twice as many (20%) CARE/FERA customers fell into this category.

Turning to other metrics of interest, in stark contrast to the bill impacts at PG&E and SCE, the average structural bill increase for CARE/FERA customers at SDG&E was less than $4 per year in the moderate climate region, and customers in the cool climate region actually saw a bill reduction of a dollar or more on average. On average, customers experienced a $2 per year structural loss, but were able to offset this loss through behavioral change so that there was no statistically significant change in total annual cost.

Most CARE/FERA customers produced behavioral bill reductions, although only behavioral bill reductions from the moderate climate region segment on Rate 2 were statistically significant. This resulted in all CARE/FERA segments either experiencing total bill impacts that weren't statistically significant—on Rate 1— or were in the range of $4 to $13 savings per year on Rate 2.

CARE/FERA customers in both climate regions on both rates reported greater difficulty in paying bills compared to non-CARE/FERA customers, but the difference was not statistically different compared to the control group. CARE/FERA customers in the moderate climate region on Rate 1 had the highest economic index score of 4.2, and it was statistically significantly higher for the treatment group compared to the control group even though bill impacts were quite modest on average. This group also had the highest percentage of customers with difficulty paying bills at 68%. Interestingly, this segment produced among the largest impacts in the summer, but negligible impacts in the winter.

CARE/FERA customers tended to be more satisfied with the rate and with SDG&E compared to non-CARE/FERA customers. In the cool climate region, CARE/FERA customers had statistically significantly higher levels of satisfaction with the rate compared to the control group. On Rate 2, these customers also had a statistically significantly higher level of satisfaction with SDG&E compared to the control group as well.

Hot Climate Region General Population

General population households in the hot climate region on Rate 2 had summer 2017 load reductions in the peak period equal to 6.5%, which was greater than the load impacts for any other customer segment or climate region. The next closest comparable impact was from non-CARE/FERA customers on Rate 1 in the moderate climate region with peak-period reductions equal to 5.9%. Net annual kWh reductions for general population customers in the hot climate region, at negative 1.2%, were the largest increases in total energy use, and with the relatively large peak period reduction, suggest that these customers are shifting use to the off peak hours, or actually increasing off peak hour energy use.

Structural bill impacts for the hot region were slightly higher than those for non-CARE/FERA customers in the moderate region, and the highest across all segments. Due to the increase in net annual kWh,

customers weren't able to produce behavioral bill impacts large enough to offset these structural increases, resulting in total annual bill increases of approximately $20. Customers in this climate region had one of the greater increases in summer peak load reductions between 2016 and 2017 when evaluating impacts for a common set of customers enrolled for the full duration of the pilot (1.6 percentage points),[49] which could have been motivated by their relatively large bill increases. However, this change in load impacts was not statistically significant.

Customer surveys were not administered to the control group in the hot region due to implementation decisions made by SDG&E, so several of the survey related metrics that require comparisons between the treatment and control group (e.g., being uncomfortably hot or cold, higher bill than expected, difficulty of paying bills, and the economic index), could not be calculated. 14% of treatment households in the hot region could not correctly identify any of the peak period hours, which was similar to the other non-CARE/FERA segments on Rate 2. Finally, the satisfaction scores for Rate 2 customers in the hot climate region are the lowest across all other segments, at 5.8 and 6.5 for satisfaction with the rate and the utility, respectively. This is reasonable given these customers also have the highest structural bill impacts, and the highest overall bills. These scores are lower than the scores from the non-CARE/FERA customers on both rates in the moderate climate region, which were 6.4 and 6.8 for the rate and utility satisfaction, respectively.

5.5.2 Key Findings

Key findings pertaining to second summer load impacts from the SDG&E pilots include:

1. In the second summer, customers continued to respond to TOU rates with peak periods that extend well into the evening. During the second summer, customers achieved load reductions as high as 6.5% for the general population in the hot climate region on Rate 2.
2. Between the first and second summer, impacts persisted for each customer segment and for the territory as a whole. In other words, customers continued to provide statistically significant load reductions in the last few months of the pilot.
3. For Rate 2, which has the same prices in effect on weekends as on weekdays, the pattern of load impacts across rate periods on weekends was very similar to weekdays for all climate regions combined– that is, customers can and will reduce loads on weekends.
4. For Rate 2, load impacts, in both absolute and percentage terms, were largest in the hot climate region, and there was no statistically significant difference between the moderate and cool climate regions on a percentage basis.
5. CARE/FERA customers generally had lower peak period load reductions compared with non-CARE/FERA customers—although not all differences were statistically significant.
6. Load impacts are not available for senior households or households with incomes below 100% of FPG because the sample sizes (and population) in SDG&E's hot region are too small.

[49] The average impact between the first and second summer decreased for the second summer when all customers enrolled at the time are included. Limiting the analysis to customers enrolled for the entire pilot shows in increase between the first and second summer.

7. Customers who received Weekly Alert Emails in the moderate climate region had incremental load reduction improvements of approximately 0.02 kW, which was a statistically significant impact.

Overall findings and conclusions for the pilot include:

- Customers continued to respond to the TOU price signals at the end of the pilot. As expected, the load impacts were lower during the winter compared to the first summer. Load impacts persisted through the second summer, with no statistically significant change in percent load reductions in any segment.
- The majority of customers across both rates experienced slight net annual total bill decreases. However, customers in the hot climate were more likely to experience net annual bill increases.
- CARE/FERA customers in the moderate climate region on Rate 1 experienced a statistically significant increase in the Economic Index. The similar customer segment on Rate 2 experienced a statistically significant increase in the health index.
- Results are not available for senior households or households with incomes below 100% of FPG because the sample sizes (and population) in SDG&E's hot region are too small.

6 Cross Utility Comparison of Load Impacts and Summary of Key Findings

This section begins with a comparison of load impacts across utility service territories and rate options. Although the experiment was not designed to make cross-utility comparisons, such comparisons are likely to be made nonetheless and it is important that any observed differences be put into the proper perspectives so that they are not misinterpreted. Following that discussion is a very brief summary of the key conclusions from the analysis of load impacts from the second summer. The pattern of load impacts across customer segments and climate regions in the second summer was similar to that of the first summer, which was summarized in the First Interim Report. As such, the summary of key findings here is limited only to the issue of persistence of load impacts across the two summers.

6.1 Cross Utility Comparison of Load Impacts

When comparing rate impacts or bill impacts across utility service territories, it is very important to keep in mind that any observed differences could easily be due to differences in the populations or climate regions across the service territories rather than due to differences in the tariffs themselves. Another possible explanation for any observed differences is variation in the months included in the analysis – recall that average impacts for PG&E and SCE's Rate 1 and Rate 2 span June through September. SDG&E's summer period covers May through October. Finally, as discussed in each utility section, when comparing peak period load impacts across rates, even within a service territory, differences could be due to variation in the timing and length of the peak periods rather than to differences in price ratios, for example.

Some of the above factors can be controlled for by limiting the cross-utility comparisons to only the hours that all utility tariffs have in common and only the months that are common across all rates and service territories. As such, in the discussion below, peak period load impacts are presented only for the hours from 6 PM to 8 PM and peak period and daily load impacts and bill impacts are presented only for the months of June through September 2017.[50] For all of the figures below, the following legend applies:

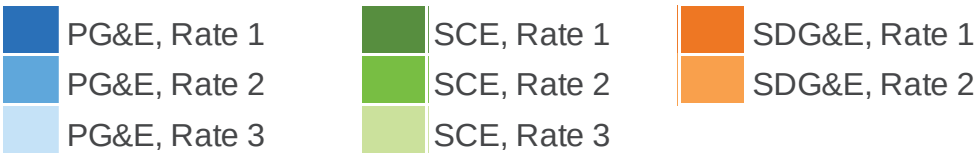


Figure 6.1-1 shows the load reduction from 6 PM to 8 PM on the average weekday in June, July, August, and September 2017 for each service territory as a whole for the eight different tariffs tested across the three utilities and for CARE/FERA and non-CARE/FERA customers within each service territory. The bar

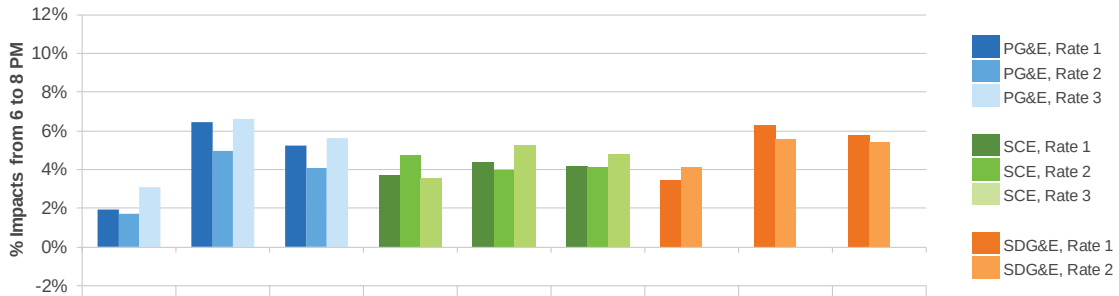
[50] Because the impacts presented here cover only the hours from 6 PM to 8 PM and are only for the months of June through September 2017, they will differ from the load reductions reported in prior sections of the report, which represent the average across the full peak period and different months for the summer period at SDG&E.

graphs show the percent reduction across these hours while absolute reductions are shown below the graph. [51]

All rates in all service territories show reductions for these early evening hours, ranging from a low of 4.1% for customers on PG&E's Rate 2 to a high of 5.8% for customers on SDG&E's Rate 1. The average percent load reduction across all three rates for PG&E was 5.0%, while SCE's average was 4.4%. SDG&E's average reduction across its two rates was 5.6%.

For non-CARE/FERA customers, the largest load reduction, 6.6%, occurred for PG&E's Rate 3 and the smallest, 4.0%, was for SCE's Rate 2. The average reduction across the multiple rate treatments in each service territory for non-CARE/FERA customers was 6.0% for PG&E, 4.5% for SCE and 6.0% for SDG&E. For CARE/FERA customers, the average reductions were 2.3%, 4.0%, and 3.8% for PG&E, SCE, and SDG&E, respectively. On average, CARE/FERA customers had lower percent reductions in peak period usage than non-CARE/FERA customers. This difference could explain, in part, why SCE's average reduction for all customers in its service territory is lower than PG&E as SCE has a greater percent of CARE/FERA customers among the pilot eligible population (31%) compared with PG&E (27%).

Figure 6.1-1: Load Reductions Between 6 PM and 8 PM by Rate and Service Territory, Average Summer 2017 Weekday



Rate 1	% Impact	2.0%	6.5%	5.2%	3.7%	4.4%	4.2%	3.4%	6.3%	5.8%
	kW Impact	0.02	0.07	0.06	0.04	0.06	0.05	0.02	0.05	0.05
Rate 2	% Impact	1.7%	5.0%	4.1%	4.7%	4.0%	4.2%	4.1%	5.6%	5.4%
	kW Impact	0.02	0.06	0.05	0.05	0.05	0.05	0.03	0.05	0.04
Rate 3	% Impact	3.1%	6.6%	5.6%	3.5%	5.2%	4.8%			
	kW Impact	0.03	0.07	0.06	0.04	0.07	0.06			

Table 6.1-1 shows the peak period prices for each pilot rate as well as the Tier 2 and 3 prices for the otherwise applicable tariff faced by the control group. As indicated in the title to the table, the treatment group prices represent the marginal price excluding the baseline discount. The most

[51] The comparisons are primarily described in percentage terms due to the level differences in average customer energy usage across utilities. The percentage results help to normalize the level differences and show the proportion of load being curtailed. The average kW impacts are provided; however, caution should be used when making any sort of direct comparison of average impacts.

comparable OAT price is the price that applies between 100% and 200% of the baseline quantity. As seen in the table, there is significant variation in the marginal price that applies to peak period hours across rates within a service territory as well as across service territories.

Table 6.1-1: Peak Period Price Above Baseline Quantity (¢/kWh)

Utility	Customer Segment	Rate 1	Rate 2	Rate 3	Control Group Tariff (OAT)	
					101 – 400% of Baseline	>400% of Baseline
PG&E	Non-CARE	41.0	43.5	55.6	27.6	40.1
	CARE	24.3	24.8	31.8	17.3	24.0
	Total	36.5	38.4	49.1	24.8	35.7
SCE	Non-CARE	34.8	55.2	37.0	24.9	31.4
	CARE	24.3	39.0	25.9	16.7	21.1
	Total	31.5	50.2	33.6	22.4	28.2
SDG&E	Non-CARE	62.0	62.0	n/a	43.0	n/a
	CARE	38.7	38.7	n/a	26.6	n/a
	Total	57.3	57.3	n/a	39.7	n/a

A useful way of comparing the change in usage caused by a change in price is what economists call price elasticity. The price elasticity is simply the percentage change in quantity demanded given a percentage change in price. While price elasticities are best estimated as coefficients on the price variable in a demand model, they can also be calculated by hand for a given set of prices and quantities. These are known as arc price elasticities. When there are tiered rates as there are here, where prices vary with quantity, a question arises as to what is the relevant price term to use in a demand model or when calculating price elasticities. Is it the price you pay for the next unit of electricity, which is known as the marginal price, or is it the average price? With tiered rates, both marginal and average prices vary with consumption, which means that the prices paid differ across customers, across months within seasons, and across seasons. For simplicity, we ignore all of these complexities and, in Table 6.1-2, show the arc price elasticities for each rate using prices above the baseline quantity for the TOU rates and prices between 100% and 200% of baseline for the OAT. Readers are reminded, once again, that the usage values pertain only to the two hours from 6 PM to 8 PM and only for the months of June through September.

As seen in the table, SDG&E's customers are the most price responsive of the three utilities, and PG&E and SCE show lower, similar, price responsiveness both overall as well as within the non-CARE/FERA customer segments. While SDG&E was the most price responsive in both the first and second summers, the average price elasticity dropped from 0.15 in the first summer to 0.13 in the second summer, indicating customers remaining on the pilot in the second summer were slightly less price responsive. The opposite was true for PG&E as SCE, with both utilities showing slightly higher elasticities in the second summer—an average value of 0.08 for both utilities compared to 0.07 and 0.05 for PG&E and SCE in the first summer, respectively. Even with the slight changes in the second summer, all of the arc price elasticities have values in the range that economists refer to as highly inelastic demand, which means that it takes a large percentage change in price to produce a significant change in demand

compared with products and services that are much more elastic. A price elasticity of 0.10 means that a 100% increase in price would produce a 10% reduction in demand for a good or service. If the price elasticity equaled 0.50, a 100% increase in price would produce a decrease in demand of 50%.

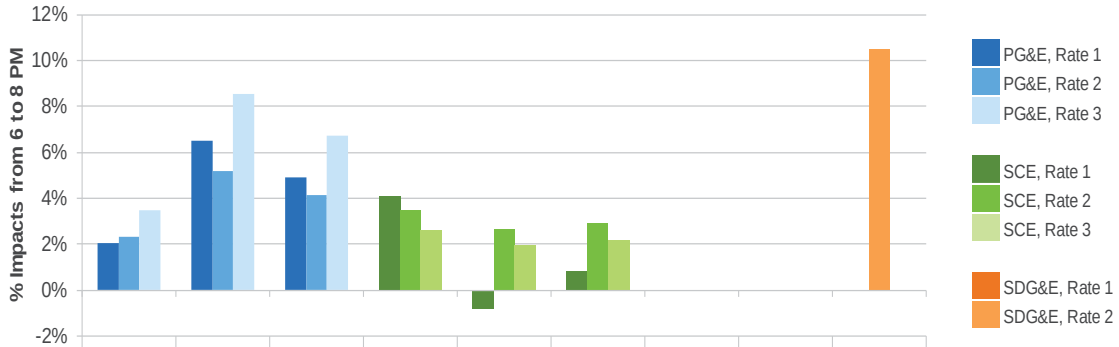
Table 6.1-2: Arc Price Elasticities Using Marginal Prices Above Baseline Quantities

Utility	Customer Segment	Rate 1	Rate 2	Rate 3
PG&E	Non-CARE	0.13	0.09	0.07
	CARE	0.05	0.04	0.04
	Total	0.11	0.07	0.06
SCE	Non-CARE	0.11	0.03	0.11
	CARE	0.08	0.04	0.06
	Total	0.10	0.03	0.11
SDG&E	Non-CARE	0.14	0.13	n/a
	CARE	0.07	0.09	n/a
	Total	0.13	0.12	n/a

Figure 6.1-2 shows the average load reduction for each rate for the hours from 6 PM to 8 PM in the hot climate region for the population as a whole as well as for CARE/FERA and non-CARE/FERA segments. Non-CARE/FERA customers in PG&E's hot climate region had larger load reductions than in SCE's service territory. In fact, Rate 1 non-CARE/FERA customers in SCE's hot climate region had load increases of 0.8%[52] during the common summer period. The greatest percent impacts came from customers in SDG&E's hot climate region on Rate 2 (10.5% or 0.14 kW).

[52] The load increase is not statistically significant, indicating there was essentially no load impact.

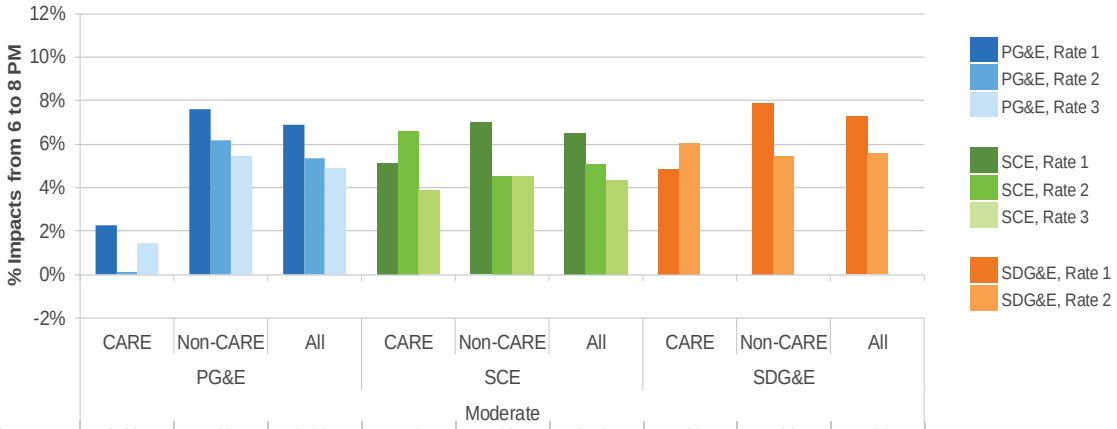
Figure 6.1-2: Load Reductions Between 6 PM and 8 PM for Hot Climate Regions by Customer Segment, Average Summer 2017 Weekday



		CARE	Non-CARE	All	CARE	Non-CARE	All	CARE	Non-CARE	All
Rate 1	% Impact	2.1%	6.5%	4.9%	4.1%	-0.8%	0.9%			
	kW Impact	0.03	0.12	0.08	0.07	-0.02	0.02			
Rate 2	% Impact	2.3%	5.2%	4.2%	3.5%	2.7%	2.9%			10.5%
	kW Impact	0.04	0.09	0.07	0.06	0.05	0.05			0.14
Rate 3	% Impact	3.5%	8.6%	6.7%	2.6%	2.0%	2.2%			
	kW Impact	0.05	0.15	0.11	0.04	0.04	0.04			

Figure 6.1-3 shows the average load reductions from 6 PM to 8 PM for CARE/FERA and non-CARE/FERA customers and for the population as a whole in the moderate climate regions in each service territory. As in the hot climate region, non-CARE/FERA PG&E customers had greater load impacts than their counterparts at SCE. CARE/FERA customers in PG&E's moderate climate region had the smallest load impacts, on average (about 1.3%) while their counterparts at SCE and SDG&E had load impacts of about 5.2% and 5.5%, respectively. Load impacts were generally over 5% for non-CARE/FERA customers across all rates within each utility; about 6.4% at PG&E, 5.4% at SCE, and 6.7% at SDG&E on average.

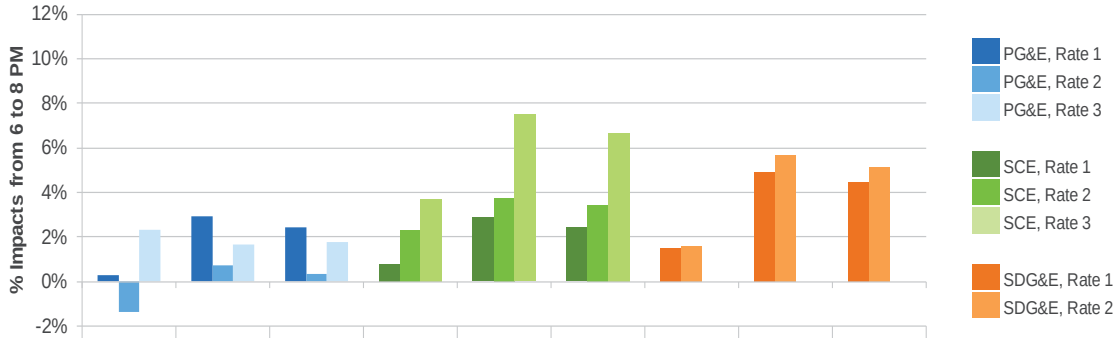
Figure 6.1-3: Load Reductions Between 6 PM and 8 PM for Moderate Climate Regions by Customer Segment, Average Summer 2017 Weekday



		CARE	Non-CARE	All	CARE	Non-CARE	All	CARE	Non-CARE	All
		PG&E			SCE			SDG&E		
Rate 1	% Impact	2.3%	7.6%	6.9%	5.1%	7.0%	6.5%	4.9%	7.9%	7.3%
	kW Impact	0.02	0.07	0.06	0.06	0.12	0.10	0.04	0.08	0.07
Rate 2	% Impact	0.1%	6.2%	5.4%	6.6%	4.5%	5.1%	6.1%	5.5%	5.6%
	kW Impact	0.00	0.06	0.05	0.08	0.08	0.08	0.05	0.05	0.05
Rate 3	% Impact	1.4%	5.5%	4.9%	3.8%	4.6%	4.4%			
	kW Impact	0.01	0.05	0.04	0.05	0.08	0.07			

Figure 6.1-4 shows the load reductions from 6 PM to 8 PM for CARE/FERA and non-CARE/FERA customers and for the population as a whole in the cool climate region for each service territory. The cool climate region is the only area where PG&E saw negative load impacts (load increases) during the common summer period,[53] with Rate 2 having the smallest impacts in general. Average impacts between 6 PM and 8 PM for PG&E, SCE, and SDG&E were 1.5%, 4.2%, and 4.8%, respectively. Non-CARE/FERA customers in SDG&E's cool climate region had the greatest load impacts, about 5.3% on average.

Figure 6.1-4: Load Reductions Between 6 PM and 8 PM for Cool Climate Regions by Customer Segment, Average Summer 2017 Weekday

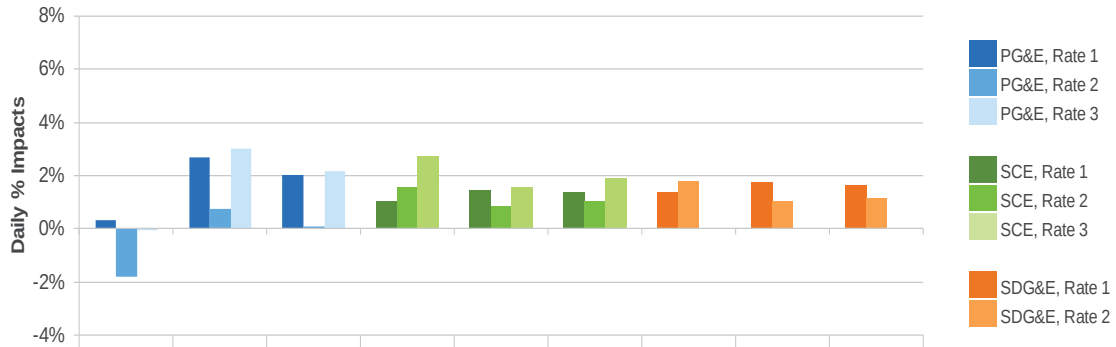


		CARE	Non-CARE	All	CARE	Non-CARE	All	CARE	Non-CARE	All
		PG&E			SCE			SDG&E		
		Cool								
Rate 1	% Impact	0.3%	2.9%	2.4%	0.8%	2.9%	2.4%	1.5%	4.9%	4.5%
	kW Impact	0.00	0.02	0.01	0.01	0.03	0.02	0.01	0.04	0.03
Rate 2	% Impact	-1.4%	0.8%	0.3%	2.3%	3.7%	3.4%	1.6%	5.7%	5.1%
	kW Impact	-0.01	0.00	0.00	0.02	0.04	0.03	0.01	0.04	0.04
Rate 3	% Impact	2.3%	1.7%	1.8%	3.7%	7.5%	6.7%			
	kW Impact	0.01	0.01	0.01	0.03	0.07	0.06			

[53] The load increase is not statistically significant, indicating there was essentially no load impact.

Figure 6.1-5 shows the average reduction in daily electricity use for each of the 8 rate treatments tested across the three utilities. At the utility level, daily electricity use fell between about 0.1% and 2.2%. In PG&E's service territory, CARE/FERA customers on Rate 2 increased their daily consumption by 1.8%.[54] All other customer segments reduced their daily consumption, though not all reductions were meaningful or statistically significant.

Figure 6.1-5: Daily Average Demand[55] Reductions by Rate and Service Territory, Average Summer 2017 Weekday



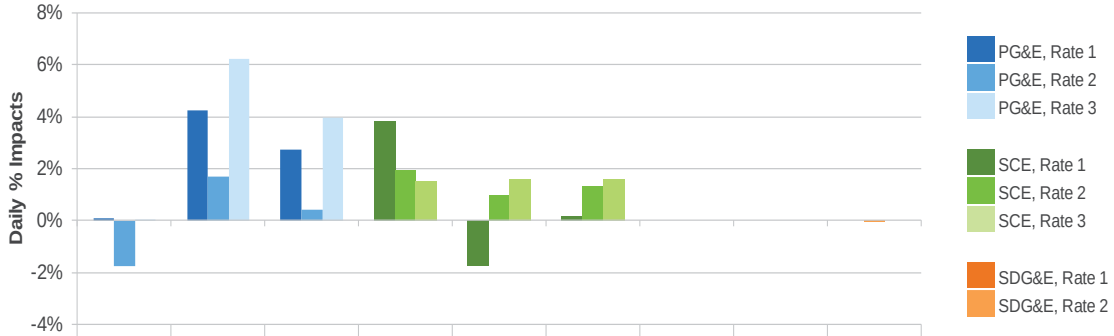
		CARE	Non-CARE	All	CARE	Non-CARE	All	CARE	Non-CARE	All
		PG&E			SCE			SDG&E		
		Territory Wide								
Rate 1	% Impact	0.3%	2.7%	2.0%	1.0%	1.5%	1.3%	1.4%	1.7%	1.7%
	kW Impact	0.00	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Rate 2	% Impact	-1.8%	0.8%	0.1%	1.6%	0.9%	1.0%	1.8%	1.0%	1.1%
	kW Impact	-0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01
Rate 3	% Impact	0.0%	3.0%	2.2%	2.7%	1.6%	1.9%			
	kW Impact	0.00	0.02	0.02	0.02	0.01	0.02			

[54] This increase in usage was statistically significant.

[55] The table reports impacts in average hourly kW. The total daily kWh can be calculated by multiplying the kW values by 24.

Figure 6.1-6 shows the variation in daily load impacts across tariffs, segments, and service territories for selected customer segments in the hot climate region. Recall that the participant sample in SDG&E's hot region is not large enough to support segmentation for reasons discussed previously. Like the service territory as whole, CARE/FERA customers on PG&E's Rate 2 increased their daily consumption by about 1.7%. Customers in SDG&E's hot climate region did not show any usage reductions or increases throughout the average summer weekday. Between PG&E and SCE's hot climate regions, there is no clear pattern between CARE/FERA and non-CARE/FERA customers.

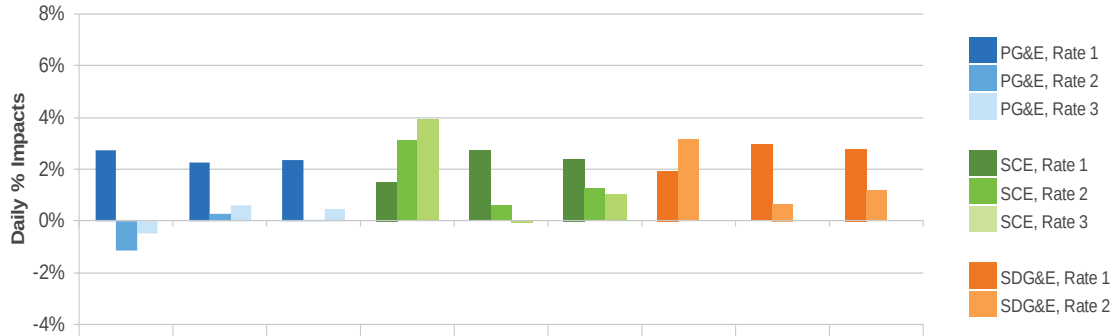
Figure 6.1-6: Daily Average Demand Reductions for Hot Climate Regions by Customer Segment, Average Summer 2017 Weekday



		CARE	Non-CARE	All	CARE	Non-CARE	All	CARE	Non-CARE	All
		PG&E			SCE			SDG&E		
		Hot								
Rate 1	% Impact	0.1%	4.2%	2.7%	3.8%	-1.7%	0.2%			
	kW Impact	0.00	0.05	0.03	0.04	-0.02	0.00			
Rate 2	% Impact	-1.7%	1.7%	0.4%	2.0%	1.0%	1.3%			0.0%
	kW Impact	-0.02	0.02	0.00	0.02	0.01	0.02			0.00
Rate 3	% Impact	0.0%	6.2%	3.9%	1.5%	1.6%	1.6%			
	kW Impact	0.00	0.07	0.04	0.02	0.02	0.02			

Figure 6.1-7 shows the variation in daily load impacts across tariffs, segments, and service territories for selected customer segments in the moderate climate region on the average summer weekday. CARE/FERA customers on Rate 3 in SCE's moderate climate region provided the greatest daily impacts, about 3.9%, while CARE/FERA customers on PG&E's Rate 2 increased their daily consumption by 1.1%. In the service territories as a whole, PG&E, SCE, and SDG&E demonstrated daily reductions of 1.0%, 1.6%, and 2.0%, respectively.

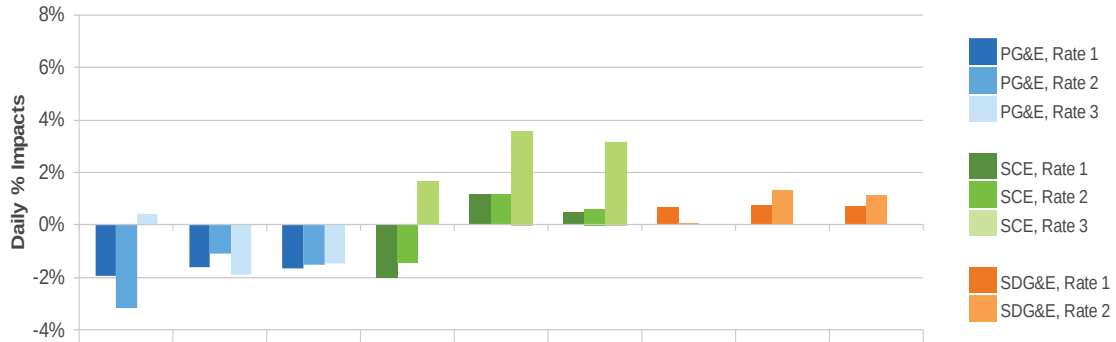
Figure 6.1-7: Daily Average Demand Reductions for Moderate Climate Regions by Customer Segment, Average Summer 2017 Weekday



		CARE	Non-CARE	All	CARE	Non-CARE	All	CARE	Non-CARE	All
		PG&E			SCE			SDG&E		
		Moderate								
Rate 1	% Impact	2.7%	2.3%	2.3%	1.5%	2.7%	2.4%	1.9%	3.0%	2.8%
	kW Impact	0.01	0.01	0.01	0.01	0.03	0.02	0.01	0.02	0.02
Rate 2	% Impact	-1.1%	0.3%	0.1%	3.1%	0.6%	1.3%	3.1%	0.7%	1.2%
	kW Impact	-0.01	0.00	0.00	0.03	0.01	0.01	0.02	0.00	0.01
Rate 3	% Impact	-0.5%	0.6%	0.5%	3.9%	0.0%	1.0%			
	kW Impact	0.00	0.00	0.00	0.03	0.00	0.01			

Finally, Figure 6.1-8 shows the average reduction in daily electricity use in the cool climate regions for each rate, segment, and service territory. The average reduction across the three rates for the population as a whole equaled negative 1.6% (increase in usage), positive 1.4% (reduction in usage), and 0.9% (reduction) for PG&E, SCE, and SDG&E respectively. CARE/FERA customers at PG&E and SCE had an average increase in daily electricity use while non-CARE/FERA customers did not follow a clear pattern.

Figure 6.1-8: Daily Average Demand Reductions for Cool Climate Regions by Customer Segment, Average Summer 2017 Weekday



		CARE	Non-CARE	All	CARE	Non-CARE	All	CARE	Non-CARE	All
		PG&E			SCE			SDG&E		
		Cool								
Rate 1	% Impact	-1.9%	-1.6%	-1.7%	-2.0%	1.2%	0.5%	0.7%	0.7%	0.7%
	kW Impact	-0.01	-0.01	-0.01	-0.01	0.01	0.00	0.00	0.00	0.00
Rate 2	% Impact	-3.1%	-1.1%	-1.5%	-1.4%	1.2%	0.6%	0.0%	1.3%	1.1%
	kW Impact	-0.01	0.00	-0.01	-0.01	0.01	0.00	0.00	0.01	0.01
Rate 3	% Impact	0.4%	-1.9%	-1.5%	1.6%	3.6%	3.2%			
	kW Impact	0.00	-0.01	-0.01	0.01	0.02	0.02			

6.2 Summary of Load Impact Persistence

As mentioned at the outset of this section, the variation in load impacts across climate regions, rates and customer segments were summarized in detail in prior reports for both summer and winter. These prior summaries also discussed bill impacts. Load impacts varied between the first and second summer periods but the variation across segments and regions was similar to what was reported previously. As such, in the remainder of this section, we focus exclusively on the issue of persistence of load impacts across the two summer periods. Keep in mind that the persistence analysis pertains to the group of customers who were enrolled over the entire duration of the pilot. Key findings concerning load impact persistence include the following:

- **At PG&E, summer load reductions either declined or remained the same between the first and second summer of the pilot.** Some of largest declines were seen in the non-CARE/FERA segments in the hot climate region on Rate 1 and Rate 2 and for both CARE/FERA and non-CARE/FERA customers in the cool climate region on Rate 1 (separately and combined). No customer segment increased their percent load reductions by a statistically significant amount. For nearly all customer segments, summer load impacts were greater than those in the winter months.
- **Most customer segments at SCE showed persistence in summer load reductions from the first summer to the second.** In general, the differences in load impacts between the two summers were not statistically significant. Notable exceptions include CARE/FERA customers in the moderate climate region on Rate 2 and Non-CARE/FERA customers in the cool climate region on Rate 1. CARE/FERA customers in the moderate climate region on Rate 2 more than doubled their percent load reductions, from 3.1% to 8.0%. They did not face especially high summer bill increases in 2016, so it is unclear what motivated these customers to raise their response to the rate. Load impacts for non-CARE/FERA customers in the cool climate region on Rate 1dropped by approximately one half. These customers also had net savings on their total annual bill impacts, indicating many customers were likely structural benefiters and not receiving a strong price signal.
- **At SDG&E, percent load reductions in the first and second summer were nearly identical.** For both rates and for all customer segments, there were no statistically significant differences in load reductions between the two summers. This was true for the territory as a whole as well. Customers in SDG&E's pilot continue to have load impacts over 4% for nearly all customer segments in the summer months.

Also of interest is whether load impacts are likely to changer over a longer period of time than the two summers studies in these pilots. Unfortunately, there is very limited empirical evidence from other TOU rate pilots on this issue since most rate pilots last only a year or two. There is substantial evidence, however, both theoretical and empirical, indicating that long run price elasticities for electricity are larger than short run price elasticities. This is because in the short run, price response is purely behavioral whereas in the long run, it reflects changes in the capital stock of energy using equipment. For example, in the short run, people can adjust their temperature settings for air conditioning to reduce usage whereas in the long run, they can purchase a more efficient air conditioner and/or install a smart thermostat to reduce usage in response to price increases. This difference in the factors at play underlying short run and long run price response in general logically applies to both peak-period energy use and load shifting behavior as well. It suggests that peak-period load reductions could easily be larger

in the long run compared with the short run impacts obtained from just the two summers of the TOU pilots where short run behavior dominates the observed reductions in peak period energy use.

The growing penetration of smart thermostats for reasons unrelated to price changes (e.g., remote accessibility and control), combined with the interest of thermostat providers in providing value added services such as those offered in SCE's service territory that showed evidence of substantial increases in price responsiveness, also suggests that load reductions could grow over time.

Finally, long run demand reductions could also increase in response to ongoing education and outreach (E&O). The default pilots that are now in the field in California will provide new evidence on the potential impact of ongoing E&O and useful insights that will help guide IOU strategies to improve response to TOU rates in the future. It is also expected that the IOUs will continue to experiment with and evolve ongoing E&O strategies to improve TOU rate response.

Appendix A Listing of Electronic Tables

The following Microsoft Excel files have been filed as electronic tables in conjunction with the primary report. Given the large volume of different rates and customer segments across utilities, electronic tables are the most efficient medium to present this data. Within these tables, users are able to select options such as the rate or customer segment of interest. The numbering of the tables corresponds to the section of the report containing the corresponding static figures and tables. In cases where more than one table corresponds to a section, each electronic table is labeled as X.X-1 and X.X-2. The file names for the electronic tables do not directly tie to any particular figure or table numbers, even though the naming convention is similar. These electronic tables allow the reader to access the underlying data that created the figures, and to determine actual values for data points within figures.

E-Table 3.3-1 - PG&E Load Impacts by Hour

E-Table 3.3-2 - PG&E Load Impact Tables & Figures

E-Table 4.3-1 - SCE Load Impacts by Hour

E-Table 4.3-2 - SCE Load Impact Tables & Figures

E-Table 5.3-1 - SDG&E Load Impacts by Hour

E-Table 5.3-2 - SDG&E Load Impact Tables & Figures

E-Table 6.1 - Cross Utility Comparison

Appendix B Comparison of Original and Updated Tariffs

Table B-1: PG&E Tariff Summary

Rate	Season	Period/Percent of Baseline	Non-CARE		CARE	
			June 2016	March 2017	June 2016	March 2017
Rate 1	Summer	Off Peak	31.7	30.7	17.8	17.8
		Peak	42.0	41.0	24.3	24.3
	Winter	Off Peak	27.1	26.1	14.9	14.8
		Peak	29.0	28.0	16.1	16.0
	Baseline Credit		-11.7	-8.8	-4.7	-4.8
Rate 2	Summer	Off Peak	29.6	28.6	16.5	16.5
		Partial Peak	39.3	38.3	21.9	21.9
		Peak	44.5	43.5	24.9	24.8
	Winter	Off Peak	27.0	26.0	15.0	15.0
		Peak	29.6	28.6	16.5	16.5
	Baseline Credit		-11.7	-8.8	-4.7	-4.8
Rate 3	Spring	Off Peak	26.7	25.8	14.9	14.8
		Peak	36.0	34.7	20.1	20.0
		Super Off Peak	18.0	17.4	10.0	10.0
	Summer	Off Peak	28.6	27.8	16.0	15.9
		Peak	57.2	55.6	31.9	31.8
	Winter	Off Peak	27.1	26.1	15.1	15.0
		Peak	29.0	28.0	16.1	16.1
	Baseline Credit		-11.7	-8.8	-4.7	-4.8
OAT	Spring	0%-100%	18.2	20.0	11.9	12.6
		101%-200%	24.1	27.6	14.7	17.3
		200-400%	40.0	27.6	21.7	17.3
		Over 400%	40.0	40.1	21.7	24.0
	Summer	0%-100%	18.2	20.0	11.9	12.6
		101%-200%	24.1	27.6	14.7	17.3
		200-400%	40.0	27.6	21.7	17.3
		Over 400%	40.0	40.1	21.7	24.0
	Winter	0%-100%	18.2	20.0	11.9	12.6
		101%-200%	24.1	27.6	14.7	17.3
		200-400%	40.0	27.6	21.7	17.3
		Over 400%	40.0	40.1	21.7	24.0
Delivery Minimum Bill Amount			32.9	32.9	16.4	16.4
FERA Discount			12% discount on bill			

Table B-2: SCE Tariff Summary

Rate	Season	Period/Percent of Baseline	Non-CARE		CARE	
			June 2016	January 2017	June 2016	January 2017
Rate 1	Summer	On Peak	34.5	34.8	24.2	24.3
		Off Peak	27.6	27.8	19.2	19.3
		Super Off Peak	23.0	23.2	15.9	16.0
	Winter	On Peak	27.5	27.3	19.1	18.9
		Off Peak	22.9	22.7	15.8	15.6
		Super Off Peak	22.9	22.7	15.8	15.6
	Baseline Credit		-9.9	-9.1	-6.9	-6.4
Rate 2	Summer	On Peak	53.3	55.2	37.8	39.0
		Off Peak	29.3	29.1	20.5	20.3
		Super Off Peak	17.3	17.6	11.8	12.0
	Winter	On Peak	27.9	27.6	19.4	19.1
		Off Peak	26.0	25.5	18.1	17.7
		Super Off Peak	17.4	17.7	11.9	12.0
	Baseline Credit		-9.9	-9.1	-6.9	-6.4
Rate 3	Spring	On Peak	24.9	25.0	17.2	17.3
		Mid Peak	21.0	21.1	14.4	14.4
		Off Peak	18.2	18.3	12.5	12.5
		Super Off Peak	9.9	10.0	6.5	6.5
	Summer	Super On Peak	37.0	37.0	26.0	25.9
		On Peak	22.6	22.6	15.6	15.5
		Mid Peak	18.8	18.7	12.8	12.7
		Off Peak	16.4	16.3	11.1	11.0
	Winter	Mid Peak	21.0	21.1	14.4	14.4
		Off Peak	18.2	18.3	12.5	12.5
		Super Off Peak	10.4	10.2	6.8	6.6
	All Seasons	0%-100%	15.7	16.3	10.2	11.0
		101%-200%	22.9	24.9	15.7	16.7
		200%- 400%	29.2	24.9	21.7	16.7
		400%+	29.2	31.4	21.7	21.1
Single Family Basic Charge/day			3.1	3.1	2.4	2.4
Multi Family Basic Charge/day			2.4	2.4	1.8	1.8
Min Charge/day			32.9	32.9	16.4	16.4
FERA Discount			12% discount on bill			

Table B-3: SDG&E Tariff Summary

Rate	Season	Period/Percent of Baseline	Non-CARE		CARE	
			August 2016	March 2017	August 2016	March 2017
Rate 1	Summer	Off Peak	34.9	38.0	22.1	23.5
		Peak	56.6	62.0	36.4	38.7
		Super Off Peak	29.7	32.0	18.9	20.3
		Baseline Credit	-20.3	-22.0	-13.0	-13.9
	Winter	Off Peak	36.2	40.0	22.8	24.7
		Peak	37.3	41.0	24.1	25.4
		Super Off Peak	35.1	39.0	22.1	24.1
		Baseline Credit	-18.6	-20.0	-12.4	-12.7
Rate 2	Summer	Off Peak	32.9	36.0	20.8	22.2
		Peak	56.6	62.0	36.4	38.7
		Baseline Credit	-20.3	-22.0	-13.0	-13.9
	Winter	Off Peak	35.8	39.0	22.8	24.7
		Peak	37.3	41.0	24.1	25.4
		Baseline Credit	-18.6	-20.0	-12.4	-12.7
OAT	Summer	130	19.1	21.0	11.7	12.7
		Over 130%	40.0	43.0	25.4	26.6
	Winter	130	17.5	20.0	11.1	12.0
		Over 130%	36.2	40.0	22.8	24.7
FERA Discount			12% discount on bill			

Attachment B
California Statewide Opt-In Time-Of-Use Pricing Pilot: 2017 Customer Survey Results Final Second Interim Evaluation

California Statewide Opt-In Time-Of-Use Pricing Pilot: 2017 Customer Survey Results

Final Second Interim Evaluation

November 1, 2017



Prepared by

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Final Second Interim Evaluation

California Statewide Opt-In Time-Of-Use Pricing Pilot: 2017 Customer Survey Results

November 1, 2017

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Table of Contents

Executive Summary

The Research Into Action team (the team) designed the second customer survey (2017 survey) of the TOU Opt-In Pilot study in collaboration with the Time of Use (TOU) Working Group, including the investor-owned utilities (IOUs) Pacific Gas and Electric (PG&E), Southern California Edison (SCE), and San Diego Gas and Electric (SDG&E), the Energy Division (ED) of the California Public Utilities Commission (CPUC), and a group of stakeholders.[1],[2] The team worked with Washington State University's (WSU) Social and Economic Sciences Research Center (SESRC) to implement and field the survey during June to August of 2017.

The 2017 survey was designed to be very similar the first customer survey (2016 survey) to address the study's research objectives, facilitate comparisons, and measure change over time. The survey included 57 questions that asked customers about their experiences in the Pilot during the winter, spring, and summer months, or since December 2016 till the time the customer responded to the survey in late-June to mid-August 2017. In contrast, the 2016 survey asked about the first summer of the Pilot and included the autumn months, from June 2016 till the customer responded in October to early-December 2016. The 2017 survey also included a few new questions about customers' health status, bill protection, understanding of rates, and enabling technologies to address research objectives not thoroughly addressed or unaddressed in the 2016 survey due to space constraints or the timing of the survey.

The 2017 survey was fielded using materials and methods similar to the first survey. Customers received email, letter, and/or phone call survey contacts, and had the opportunity to respond via the web, a mailed paper booklet, or a phone interview in five languages.

The 2017 survey achieved the same overall 82% response rate as the 2016 survey. Of the 47,633 customers who remained in the Pilot as of May 2017, 39,125 completed or partially completed the survey, about 95% of whom also completed the 2016 survey. Response rates across the IOUs, climate regions, customer segments, and rate groups ranged from 66% to 92%, which are sufficiently high to minimize non-response bias, produce reliable and valid results, and conduct statistical comparisons for most of the survey questions. (See Section 2 for more details about the survey methods and disposition results.)

The key research objectives for the second survey include:

- Whether customers experienced economic and/or health hardship due to the TOU rates, or had problems paying their bills

[1] Barkovich and Yap; Braun Blaising McLaughlin & Smith P.C.; California Energy Commission; California Independent Systems Operator; California Solar Energy Industries Association; Center for Accessible Technology; City of Lancaster; Commerce Energy; Comverge; Cross Border Energy; Distributed Energy Financial Group; Ellison Schneider & Harris; Enernoc; Enphase Energy; Environmental Defense Fund; Goodwin MacBride Squeri & Day; Greenlining Institute; Illume Advising; Marin Clean Energy; Natural Resources Defense Council; Nest; Nexant; Oracle; Office of Ratepayer Advocates; Peninsula Clean Power; Siemens; Sierra Club; Solar City; Sonoma Clean Power; Sunrun; Temix; Temple University; The Utility Reform Network; Utility Consumer Action Network; and, Vote Solar.

[2] For TOU Opt-in Pilot load and bill impact results, and summaries of overall findings and conclusions, see Nexant's report sections in the document "Statewide Opt-in TOU Evaluation Second Interim Report."

- Customers' satisfaction with their electricity rate and IOU
- Customers' understanding of their electricity rate and bill protection
- Actions customers took to reduce or shift their electricity usage, customers' level of ease of taking actions, and customers' barriers to and persistence of taking actions
- Customers' interest in and use of enabling technologies like smart thermostats, lighting, and appliances

To address the research objectives, the team analyzed the 2017 survey responses to provide point estimates (means and percentages) for each IOU's region/segment/rate groups and to compare results of customers in the Control group on the standard rate to the results of customers in the Treatment groups on the TOU rates. The team used bivariate statistical tests – t-tests for means, z-tests for proportions, and chi-squares for distributions – to conduct the statistical comparisons. The team also described any changes in overall trends in results for survey questions included in both the 2016 and 2017 surveys, and will conduct statistical comparisons of results between the two surveys to include in the final report due in the first quarter of 2018.

Summary of Key Findings by Research Question

Did TOU rates enhance customers' economic and/or health hardship, and did customers have difficulty paying their bills?

Results from the economic index provide evidence that scores are not significantly higher for Rate groups across most of the customer segments, indicating no difference in economic hardship compared to Control groups.[3] Three Rate group customer segments reported statistically significant higher economic index scores, or greater economic hardship, compared to Control group segments: PG&E's Rate 3 California Alternate Rates for Energy (CARE)/Family Electric Rate Assistance (FERA) customers in the hot region, and SDG&E's Rate 1 and 2 CARE/FERA customers in the moderate region. Three Rate groups, however, reported significantly lower economic index scores, or lower economic hardship, compared to Control groups, including PG&E's Rate 1 non-CARE/FERA customers in the moderate region, SCE's Rate 2 CARE/FERA customers in the moderate region, and SDG&E's Rate 1 non-CARE/FERA customers in the cool region. In addition, average economic index scores were slightly lower for most customer segments and rates across the IOUs compared to the 2016 survey results, but a few segments in the cool region reported slightly higher average scores vs. 2016 survey results.

Most of the comparisons between Rate and Control customer segments regarding worrying about affording bills, having difficulty paying bills, and using non-income methods to pay bills are not statistically significant. Across the three survey questions about difficulty paying bills, four Rate group segments reported significantly higher percentages and 11 Rate group segments reported significantly lower percentages compared to the Control group segments. In addition, slightly lower percentages of most customer segments reported concern about or difficulty paying bills compared to the 2016 survey

[3] Economic index scores range from 0 to 10, where 0 means very little economic hardship and 10 means very much economic hardship.

results. Percentages were slightly higher on two of the survey items for CARE/FERA customers and customers in the cool region compared to the 2016 survey results, but trends vary by IOU.

Health index and health metrics results also show that average health index scores and the percentages of respondents who reported a household member needed medical attention due to excessive heat and/or cold in their home are statistically similar for the majority of Rate group segments.[4] One of the Rate groups reported significantly higher health index scores, or greater health hardship, and three Rate groups reported greater hardship across other health-related questions compared to Control groups. In contrast, five Rate groups reported significantly lower health index scores, or lower health hardship, and 20 Rate groups reported lower health hardship across the other eight health-related questions compared to Control groups.

Trends in economic and health hardship results between non-CARE/FERA and low-income segments are the same as trends from the 2016 survey. Low-income segments reported higher economic and health index scores, or greater hardship, and higher percentages of low-income customers reported concern about or difficulty paying bills compared to non-CARE/FERA customers across all IOUs. Estimates for the senior segments tended to fall in between those for non-CARE/FERA and CARE/FERA segments.

Were customers satisfied with aspects of their electricity rate and their IOU?

Customers reported moderate to high average levels of satisfaction with their rate and IOU. Satisfaction ratings were slightly higher with the IOU, ranging from 6.5 to 8.4, than with the rate, ranging from 5.8 to 8.0.[5] There were a few significant differences between Rate and Control groups, in which Rate groups reported higher levels of satisfaction, a reversal of most of the trends from the 2016 survey results. In addition, satisfaction ratings for both the IOU and the rate were slightly higher for PG&E's and SCE's Rate segments, and SDG&E's Rate 2 segments, compared to 2016 survey results, indicating an improvement in satisfaction. Average Ratings were slightly lower, however, for Control segments and SDG&E's Rate 1 segments compared to 2016 survey results.

Customers' levels of agreement with 11 different aspects of their rate were also moderate to high, ranging from 5.1 to 8.1.[6] Several Rate group segments provided significantly higher levels of agreement compared to Control group segments regarding the rate being easy to understand, recommending the rate to family or friends, the rate providing opportunities to save money, and the rate being fair. Very few of the Control group segments provided significantly higher levels of agreement on any of the rate aspects. Across all IOUs, customers' level of agreement with the rate providing opportunities to save money increased slightly compared to 2016 survey results; levels of agreement also increased for other aspects but trends vary across the IOUs.

Comparisons between non-CARE/FERA and low-income customers were the same as the 2016 survey results. Low-income customers reported slightly higher average satisfaction with their rate and IOU, and

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4 Health index scores range from 0 to 10, where 0 means household members did not experience poor health during the previous six months and 10 means household members always experienced poor health and that their poor health always limited performing their usual activities during the previous six months.

5 All satisfaction ratings are on a 0 to 10 scale where 0 means 'not at all satisfied' and 10 means 'completely satisfied.'

6 All agreement ratings are on a 0 to 10 scale where 0 means 'do not agree at all' and 10 means 'completely agree.'

provided slightly higher levels of agreement with aspects of their rate, on average, compared to non-CARE/FERA customers.

In addition, between 21% and 44% of Control customers and between 18% and 35% of Rate group customers reported that their electricity bill was higher than expected since December 2016. Significantly lower percentages of several PG&E Rate group segments reported their bill was higher than expected compared to Control group segments; trends were similar for SCE and SDG&E customers but most comparisons were not significant. Differences between non-CARE/FERA and low-income customers are small and vary by rate and segment. Compared to 2016 survey results about summer bills, much lower percentages of customer segments in the hot and moderate regions and a few customer segments in the cool region reported higher than expected bills since December 2016.

Do customers understand TOU rates?

TOU Rates

When asked which factors influence the price of electricity, between 26% and 64% of Rate group customers and between 25% and 54% of Control group customers selected over half the correct answers.[7] However, significantly fewer PG&E Rate 1 customers, SCE low-income customers, and SDG&E Rate 1 CARE/FERA customers selected over half the correct answers compared to Control group customers across most segments. In contrast, significantly more SCE non-CARE/FERA customers selected over half the correct answers. Compared to the 2016 survey results, slightly higher percentages of SDG&E customers and SCE non-CARE/FERA customers, and slightly lower percentages of PG&E customers and SCE low-income customers, selected over half the correct answers.

When Rate group customers were asked which times of the day electricity prices are highest, between 3% and 44% did not select any correct times and between 23% and 71% selected over half the correct times. The percentage who selected over half the correct times varied substantially by Rate group for SCE (more Rate 3 customers vs. Rate 1 and 2 customers) but not for PG&E and SDG&E. Compared to 2016 survey results, slightly higher percentages of PG&E and SDG&E customers, and SCE Rate 3 customers selected over half the correct times, and slightly lower percentages of PG&E customers, SDG&E Rate 1 customers, and SCE Rate 3 customers selected none of the correct answers, indicating an improvement in understanding of peak hours for these groups. However, lower percentages of SCE Rate 1 and 2 customers selected over half the correct times, and higher percentages of customer SCE Rate 1 and 2 customers and SDG&E Rate 2 customers selected none of the correct answers compared to 2016 survey results.

Trends in customers' understanding of rates between non-CARE/FERA and low-income segments are the same as trends from the 2016 survey. On average, fewer low-income customers selected over half the correct answers compared to non-CARE/FERA customers.

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[7] Price influencing factors included in the survey question include: 1) time of day, 2) day of the week (weekday vs. weekend), 3) seasons, 4) weather or temperature, 5) total amount customers use, and 6) none of the above. The correct response for the Control group is option 5, the correct responses for the PG&E's and SDG&E's Rate 2 groups are options 1, 3, & 5, and the correct responses for the other Rate groups are 1, 2, 3, & 5.

In addition, customers were also asked if their rate is higher, lower, or the same in the summer than in the winter. Between 24% and 85% of Rate group customers and between 17% and 73% of Control group customers selected the correct answer, that rates are higher in the summer. Significantly higher percentages of most Rate group customer segments selected the correct answer vs. Control group segments, and percentages did not vary substantially between non-CARE/FERA and low-income customers across most segments.

Bill Protection

About one-third to two-thirds of customers reported receiving a letter from their IOU mentioning bill protection (34% to 64%) and nearly half to three-fourths reported they know that their bill protection ends in June/July 2017 (40% to 72%). On average, slightly lower percentages of low-income customers reported receiving a letter and knowing when bill protection ends compared to non-CARE/FERA customers and seniors.

Customers were also asked if they understand bill protection using two different types of survey questions. SCE and SDG&E customers were provided a brief explanation of bill protection and asked if they understand what it means in a 'yes-no' question, and most respondents (87% to 97%) reported they did understand bill protection. PG&E customers were provided the same brief explanation of bill protection but were asked to select what bill protection means from a list of three possible meanings.[8] Between 28% and 59% of PG&E customers selected the correct meaning, but nearly the same percentages (25% to 51%) reported they don't understand bill protection and a less than one-fourth selected one of the incorrect meanings (0% to 24%).

These results indicate that, net of differences in the IOUs' communications with their customers about bill protection, most customers understand bill protection when provided a brief, general explanation and asked if they understand it in a 'yes-no' question. However, many customers do not understand bill when provided a general explanation and are presented with multiple possible specific meanings of bill protection from which they must choose the correct meaning.

Did customers take actions to reduce or shift energy usage during peak hours, did these actions persist over time, what barriers prevented customers from taking actions, and how easy was it to take actions?

The most common actions taken 'often' by customers include turning off the lights (81% to 93%), avoiding doing laundry (34% to 82%), and avoiding running the dishwasher (33% to 86%). Many customers also reported that they 'often' turned off office equipment (40% to 66%), avoided running their pool/spa pump (21% to 70%), reduced using or turned off air conditioning on warm days (33% to 60%), reduced using or turned off heating on cold days (23% to 55%), and turned off entertainment equipment (22% to 50%). The least common actions reported by respondents, on average, are pre-cooling their home (13% to 51%) and avoiding cooking (8% to 39%).

[8] Bill protection meanings included: 1) customer does not have to pay for electricity during the first year, 2) PG&E will credit the customer the difference in their bills after the first year (correct answer), 3) PG&E will credit customer the difference in their bills every month during the first year, and 4) customer does not understand bill protection.

Significantly higher percentages of most Rate group segments reported avoiding doing laundry and avoiding running the dishwasher compared to Control group segments. A few Rate group segments reported significantly higher percentages for other actions but trends vary by IOU and the action taken. In contrast, Control group segments did not report significantly higher percentages for any of the actions. In addition, a higher percentage of low-income customers and customers in the hot region reported taking several of the actions compared to non-CARE/FERA customers and customers in the cool region, respectively.

There were few overall trends in the results regarding the persistence of customers taking actions. Compared to the 2016 survey results, most customer segments persisted in turning off the lights and pre-cooling their home across all the IOUs. Some customer segments persisted in avoiding the dishwasher and turning off office and entertainment equipment, but trends vary by IOU. Several customer segments did not persist in avoiding laundry, cooking, or running their pool/spa pump.

Most customer segments reported a lower average level of ease of taking actions compared to the 2016 survey results. Average ratings ranged from 5.8 to 6.8, and of the few significant differences between Rate and Control groups, most comparisons show higher average ratings for Rate group customers.[9]

The most common barriers to reducing or shifting electricity usage during the afternoons and evenings reported by customers include the respondent doing all they can (29% to 54%), the household already using very little electricity (21% to 41%), being home most of the day (14% to 30%), and the home getting uncomfortable if less electricity is used (6% to 31%). The least common barriers reported by customers include having old appliances (6% to 17%), not knowing what actions to take (2% to 12%), their schedule not allowing them to reduce usage (3% to 18%), and having children (3% to 20%), elderly (5% to 25%) or disabled member(s) in the household (2% to 16%).

Significantly lower percentages of many Rate group segments reported not knowing what actions to take compared to Control group segments. A few Rate group segments reported significantly different percentages for other barriers but trends vary by IOU and the barrier. On average, higher percentages of low-income and senior customers reported many of the barriers compared to non-CARE/FERA customers, except for those that involve the household's schedule. Compared to 2016 survey results, slightly lower percentages of customers reported most of the barriers, on average.

Do customers have or are interested in enabling technologies, and are the technologies useful for reducing or shifting electricity usage?

Trends in results show that small percentages of customers reported having enabling "smart" technologies in their home, or devices or appliances that connect to a home's Wi-Fi and have advance features like the ability to control it remotely, to automatically turn off and on, and to adjust settings based on whether someone is home and/or electricity price levels. The most common smart technologies customers reported having are smart thermostats (3% to 18%) and smart lighting (7% to 18%); less than 8% of customers reported having smart refrigerators, laundry machines, dishwashers, or

[9] Ease of taking actions is measured on a 0 to 10 scale where 0 means 'not easy at all' and 10 means 'extremelyeasy.'

water heaters.[10] Customers who reported having smart technologies reported moderate to high satisfaction ratings (6.1 to 10) and moderate to high ratings about how useful they are for reducing or shifting energy usage (5.0 to 10).[11,12] Trends in satisfaction and usefulness did not vary substantially across the technologies or customer segments.

Customers who do not have smart technologies in their home provided low to moderate levels of interest in the technologies (3.3 to 6.6).[13] Customers reported slightly lower interest in smart laundry machines and dishwashers compared to the other technologies, and CARE/FERA customers reported slightly higher levels of interest, on average, compared to non-CARE/FERA customers.

[10] Higher percentages of SCE Control and Rate 1 non-CARE/FERA customers in the hot region reported having a smart thermostat (34% and 45%) because many were offered a smart thermostat rebate during the Pilot.

[11] Satisfaction with smart technology ratings are on a 0 to 10 scale where 0 means 'not at all satisfied' and 10 means 'completely satisfied.'

[12] Usefulness of smart technology ratings are on a 0 to 10 scale where 0 means 'not useful at all' and 10 means 'extremely useful.'

[13] Interest in smart technology ratings are on a 0 to 10 scale where 0 means 'not interested at all' and 10 means 'extremely interested.'

1. Introduction

The following sections present the results from the second TOU Pilot customer survey (2017 survey), the survey implementation methods and disposition results, and the methods used to conduct analyses.[14] The sections are written, formatted, and ordered similarly to the survey sections in the first interim report to facilitate comparisons: Section 2 describes the survey and analytical methods, and survey disposition results, and Sections 3 to 5 present the survey results for PG&E, SCE, and SDG&E, respectively. In addition, attached Appendices provide additional and supplemental details about the research questions (Appendix A), analysis plan (Appendix B), survey materials (Appendix C), economic index dashboard (Appendix D), detailed statistics for key results (Appendix E), and results for each survey question (Appendix F).

The survey was conducted between June and August 2017 and achieved an 82% overall response rate, resulting in more than 39,000 respondents. The survey included up to 57 questions about customers' experiences in the Pilot, economic and health status, satisfaction, demographic and household characteristics, and other topics related to the research questions.[15] The survey asked customers about their experiences during the seven- to nine-month period "since December 2016", which included both cool and warm days for many customers.[16]

Several questions in the 2017 survey were also asked in the first customer survey (2016 survey), including the questions that comprise the economic index and health metrics, and questions about satisfaction, understanding rates, actions taken, and demographic and household characteristics. The team provides comments on overall trends in any changes in the results between the first and second surveys for the questions asked in both surveys, but readers can refer also to the first interim report to make detailed comparisons. It is important to note that some of the differences in results between the first and second surveys will not be statistically significant or meaningful, particularly those of one to two percentage points or those of less than one point on the 11-point scales. The team will include in the final report statistical comparisons of the differences in responses to the first and second customer surveys.

The 2017 survey also included a few new questions, including questions about customer's health status that comprise a new health index, about customers' understanding of bill protection and their summer vs. winter electricity rate, about general attitudes toward demand response activities, and about smart home technologies. Questions about the welcome packet, motivations to participate in the Pilot, and PG&E's smart phone app included in the first survey were excluded from the 2017 survey.

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14 For TOU Opt-in Pilot load and bill impact results, and summaries of overall findings and conclusions, see Nexant's report sections in the document "Statewide Opt-in TOU Evaluation Second Interim Report."

15 See Appendix A for the research questions and Appendix C for the survey questionnaire and other materials.

16 The 2016 survey asked customers about their experiences during the six- to eight-month period "since June 2016," which included mostly warm days for many customers.

The results focus on comparisons between Control and TOU Rate groups across the climate regions and customer segments within each IOU's service territory.[17] T-tests, z-tests, and chi-square tests are used to make the statistical comparisons.

[17] See Appendix B for the 2017 TOU customer survey analysis plan.

2. Methodology

Key objectives for the TOU pilots included research questions that could only be addressed through customer surveys.[18] An integral part of pilot design was to conduct two surveys, one at the end of the first summer and the other at the end of the first full year on the TOU rates, in the summer of 2017.[19] A substantial portion of the "pay-to-play" incentives used to recruit customers into the study were tied to completion of the surveys to obtain high response rates for both treatment and control customers, which is essential to obtaining valid insights regarding some of the key research issues of interest. The remainder of this section provides an overview of the key research questions being studied through the 2017 survey, survey design and implementation, analytical methods that were applied to obtain key research findings, and other implementation and methodological issues useful for understanding and interpreting the survey findings presented in Sections 3, 4 to 5.

Both TOU customer surveys were designed by Research Into Action, with assistance from the Working Group (WG). The surveys were fielded by Washington State University's (WSU) Social and Economic Sciences Research Center (SESRC), and the survey results were analyzed and reported by Research Into Action (RIA).

In addition, the team removed some customers from response rate calculations and all analyses, unless otherwise noted. These customers are the SCE (n=77) customers identified as part of a Community Choice Aggregation (CCA) program, and the oversampled customers in the non-CARE/FERA, CARE/FERA, and 100 to 200% of Federal Poverty Guidelines (FPG) segments in PG&E's Control and Rate 1 and SCE's Control and Rate 2 groups.[20]

2.1. Survey Methods

2.1.1. Survey Design

RIA, in collaboration with the TOU Working Group, developed a 57-question customer survey to answer the following key research questions:

- How satisfied are respondents with their study rate and their utility?
- Do respondents understand key elements of how their study rate works?
- Did customers experience issues with paying their bills because of their study rate?
- Did their study rate increase or enhance economic and/or health hardship?

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18 See Appendix A for the TOU customer survey research questions.

19 For results from the first survey, see the first interim evaluation report (Section 3.3).

20 The SCE CCA customers were removed upon request from SCE since these customers will not be eligible for TOU rates after the pilot. PG&E's 84 CCA customers were included in analyses upon request from PG&E.

- What actions did they take to shift or reduce use on their study rate, did they show persistence in taking action(s) over time, and what barriers prevented respondents from taking action(s)?
- Did respondents use study websites, apps, or tools help manage their electricity use?

The 2017 survey specifically assessed differences in responses between those customers on the control rate (Otherwise Applicable Tariff, OAT) and those on the TOU rates for winter and spring months of the pilot (December 2016 to June 2017). Several questions in the 2017 survey were also asked in the first customer survey (2016 survey), including the survey questions that address the key research questions listed above: the questions that comprise the economic index and health metrics, and questions about satisfaction, understanding rates, actions taken, and demographic and household characteristics.[21]

In addition to the survey questions addressing the key research questions listed above, the survey included most of the demographic and household characteristic questions from the first survey, and some new questions about:

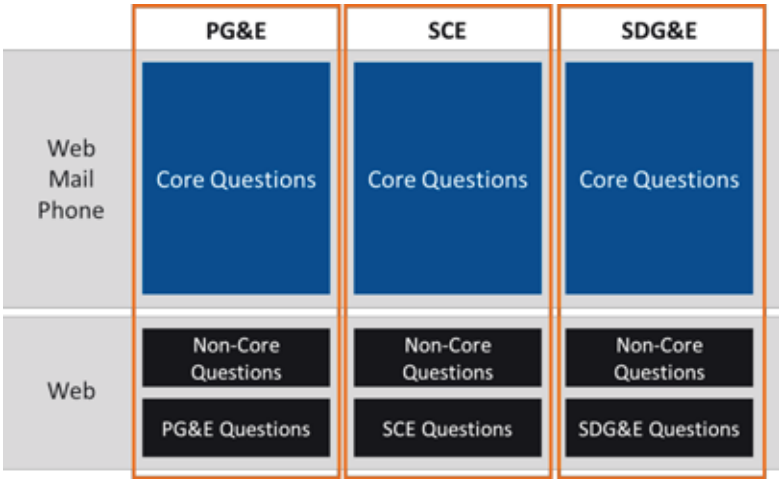
- attitudes toward and awareness of demand response activities,
- understanding bill protection and summer vs. winter electricity rates,
- interest in and use of enabling technologies (e.g. smart thermostat, lighting, appliances, etc.), and
- SDG&E's smart phone app.

A few questions in the first customer survey were not asked again in the second survey, including questions about motivations to participate in the Pilot, the welcome packet materials sent to customers at the start of the Pilot, and PG&E's smart phone app. See Appendices A and C for the mapping of survey questions to the key research questions and the survey instrument.

To manage survey length and respondent burden, the number of questions for mail and phone versions of the survey was limited compared to the web version (see Figure 2-1). To determine which 57 questions to leave out of the mail and phone survey, the survey questions were divided into "core" and "non-core" questions. The 35 core questions contained all questions necessary to address regulatory requirements, including all the questions about hardship, rate, and utility satisfaction, understanding of the rate, actions taken in response to the rate and barriers to taking action, and enabling technologies. The 22 non-core items included IOU-specific questions, like those pertaining to IOUs' websites, smartphone applications, and customer outreach letters, and a few questions about demographic characteristics. All core questions were included in each survey mode and non-core questions were added to the web survey only. Because 76% of survey responses were completed via the web, the majority of respondents answered the non-core questions.

[21] See Appendix C for the survey questionnaire and other materials.

Figure 2-1: Breakdown of Survey Questions by Survey Mode



2.1.2. Survey Implementation Methods and Disposition Results

The 2017 TOU survey was an attempted census of all 47,674 pilot participants who remained in the Pilot through May 2017.[22,23] The team designed a survey implementation strategy tailored to customers based on which of the three survey modes – web, mail, or phone - they used to respond to the 2016 TOU survey (Table 2-1). Those customers who did not respond to the 2016 survey or who responded via the web were placed in the "web group". Customers who responded in 2016 via the mailed paper booklet were placed in the "mail group," and customers who responded via a phone interview were placed in the "phone group." Customers in each of these groups were also divided into two groups based on if they had an email address.

For the web group, the team implemented the "email-mail-phone (EMP)" approach used for the 2016 survey. Web group customers received an invitation letter, followed by a reminder letter or email, a booklet and letter, and another reminder letter or email before receiving phone calls. The team then called a sample of nonrespondents and sent those with email addresses two more email reminders to boost response rates; the last email reminder was sent only to SCE and SDG&E customers with an email address.

For the mail group, the team mailed customers an invitation letter and booklet, followed by two reminder emails or letters before calling customers. The team then called a sample of nonrespondents and sent those with email addresses two more email reminders to boost response rates; the last email reminder was sent only to SCE and SDG&E customers.

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22 About 14% of pilot participants (n=~7,432) opted out of the Pilot between September 2016 and May 2017, the months during which the survey samples were compiled for the 2016 and 2017 surveys, respectively.

23 The reported total sample size excludes SCE (n=77) Community Choice Aggregation (CCA) program customers included in the sample the team received from the IOUs. The CCA customers were included in the survey implementation but were excluded from all analyses upon request.

The team made one phone call to a sample of 8,800 nonrespondents in the web and mail groups and in customers segments with lower response rates. The team made up to three calls to 1,200 nonrespondents in the web and mail groups and in segments with the lowest response rates. About 80% of all nonrespondents in the web and mail groups received at least one phone call.

For the phone group, the team mailed customers an invitation letter informing them to complete the survey via the web, wait for a phone call, or call to schedule an interview. This was followed by up to three phone calls to all customers in the phone group, and two reminder emails to those with an email address; the last email reminder was sent only to SCE and SDG&E customers.

All letters and emails contained the web survey address and passcode so that respondents could complete the survey online at any time. All survey materials, including phone interviews, except the booklet and the last two reminder emails for the web, mail, and phone groups, were available in five languages: English, Spanish, Chinese (Mandarin), Vietnamese, and Korean (SCE and SDG&E only). See Appendix C for examples of invitation letters and survey booklets.

Table 2-1: 2017 TOU Pilot Customer Survey Implementation Methods

Survey Group	% of Sample	First Contact	Second Contact	Third Contact	Fourth Contact	Fifth Contact	Sixth Contact
Web Group with Email	66%	Invitation Letter	Reminder Email	Booklet & Letter	Reminder Email	Reminder Email [a]	Reminder Email [b]
						Phone Calls [c]	
Web Group without Email	19%	Invitation Letter	Reminder Letter	Booklet and Letter	Reminder Letter	Phone Calls [c]	
Mail Group with Email	9%	Invitation Letter and Booklet	Reminder Email	Reminder Email	Reminder Email [a]	Reminder Email [b]	
					Phone Calls [c]		
Mail Group without Email	3%	Invitation Letter and Booklet	Reminder Letter	Reminder Letter	Phone Calls [c]		
Phone Group with Email	2%	Invitation Letter	Reminder Email	Reminder Email [a]	Reminder Email [b]		
			Phone Calls [d]				
Phone Group without Email	1%	Invitation Letter	Reminder Letter				
			Phone Calls [d]				

[a] Sent only to English-speaking nonrespondents.

[b] Sent only to SCE and SDG&E English-speaking nonrespondents.

[c] A total sample of 8,800 nonrespondents in the from the segments with low response rates in the web and mail groups received one phone call and a sample of 1,200 nonrespondents from the segments with the lowest response rates in the web and mail groups received up to three phone calls.

[d] All phone group customers received up to three phone calls.

WSU's SESRC fielded the survey between June and August 2017. An overall response rate of 82% and a 98% cooperation rate was obtained across the three IOUs. Table 2-2 shows a detailed disposition table with counts and rates for each IOU and for the three IOUs combined. The response rates were sufficiently high to minimize non-response bias.

Most respondents to the survey (92% to 98%) reported that their name is on the bill they receive from their IOU. This was similar to the percentages for the 2016 survey (88% to 95%), indicating that the same person completed both surveys for most responding households. In addition, most survey respondents (91% to 94%) also completed the first TOU survey in 2016.

Table 2-2: Disposition Table for 2017 Survey [a, b]

Disposition	PG&E	SCE	SDG&E	Total
Completes				
Phone completes	519	542	239	1,300
Mail completes	3,044	2,701	1,574	7,319
Web completes	10,543	10,221	9,202	29,966
Phone partial completes	35	39	8	82
Web partial completes	174	205	141	520
Eligible – not surveyed				
Refusal	68	86	22	176
Non-contact	1,395	1,605	1,176	4,164
Answering machine	1,210	1,250	296	2,756
Deceased respondent	5	4	2	11
Physically or mentally unable	6	1	2	9
Unknown eligibility - not surveyed				
Always busy	17	7	4	28
No answer	265	211	56	532
Call blocking	117	117	44	278
USPS: Returned to sender	183	65	155	403
Number not working, disconnected, changed	63	72	16	151
Not eligible - not surveyed				
No eligible respondent	4	5	5	14
Other	9	16	2	27

Disposition	PG&E	SCE	SDG&E	Total
Totals				
Total customers in sample (excludes not eligible)	17,644	17,126	12,937	47,707
Complete Interviews	14,106	13,464	11,015	38,585
Partial Interviews	209	244	149	602
Refusal and break off	68	86	22	176
Non-contact	2,605	2,855	1,472	6,932
Unknown household/other	645	472	275	1,392
Other	11	5	4	20
Response Rates				
Response Rate – Completes only	79.9%	78.6%	85.1%	80.9%
Response Rate – Full and partial completes	81.1%	80.0%	86.3%	82.1%
Cooperation rate – All respondents	99.5%	99.3%	99.8%	99.5%
Cooperation rate – All eligible	98.0%	97.6%	98.4%	98.0%

[a] The American Association for Public Opinion Research (AAPOR) standard disposition definitions was used for this disposition table. http://www.aapor.org/AAPOR_Main/media/publications/Standard-Definitions20169theditionfinal.pdf

[b] For consistency with the first interim report, this table does include the oversampled customers in the non-CARE/FERA, CARE/FERA, and 100 to 200% FPG segments in PG&E's Control and Rate 1 and SCE's Control and Rate 2 groups.

2.1.3. Survey Data Validation Checks

To ensure that the internal validity of the randomized control trial (RCT) remained intact, response rates between the control and TOU rate groups were compared for each customer segment. Segment response rates varied from a low of 66% to a high of 92%. Lower-income, hard to reach populations had lower response rates; however, all response rates were sufficiently high to minimize non-response bias. Further, there are few differences in the response rates between participants in the control condition and those in the treatment condition, with differences in response rates between RCT groups ranging from 1% to a maximum of 5%. Because of the large sample sizes in the segments, several comparisons between response rates across RCT groups are statistically significant;[24] however, these differences may not be meaningful.

2.1.3.1. Response Rates for the PG&E Pilot

Table 2-3 shows the survey response rates for PG&E. Response rates ranged from a low of 66% for respondents with incomes below 100% of the FPG in the hot climate region assigned to Control group to a high of 90% for Non-CARE/FERA Rate 2 customers in the cool climate region. When comparing response rates between control and TOU rate treatment groups in the cool region, two segments

[24] Chi-square tests were used to test the number of respondents versus nonrespondents across RCT groups by segment. Those flagged as significant indicate a chi-square significant at the 95% confidence level.

exhibited significant differences: all customers and CARE/FERA customers on Rate 3 in the cool climate region (vs. Control). Although these differences are statistically significant, the response rates for these segments are high – 72% and above - and differences between response rates are 4% or less.

Table 2-3: PG&E Response Rates by Segment and RCT Group [a, b]

PG&E	Control	Rate 1	Rate 2	Rate 3	Overall	Trendline	Largest p
Hot							
All	82%	82%	80%	81%	81%		2%
Non-CARE/FERA	88%	86%	86%	89%	87%		2%
CARE/FERA	72%	75%	74%	74%	74%		3%
Below 100% FPG	66%	67%	71%	70%	68%		5%
100 to 200% FPG	77%	78%	77%	76%	77%		1%
Seniors	82%	82%	83%	83%	82%		2%
Moderate							
All	80%	79%	80%	80%	80%		2%
Non-CARE/FERA	88%	85%	88%	87%	87%		3%
CARE/FERA	73%	72%	72%	73%	72%		1%
Cool							
All	83%	81%	81%	79%	81%		3%*
Non-CARE/FERA	89%	89%	90%	86%	88%		2%
CARE/FERA	77%	73%	72%	72%	74%		4%*
All Climate Zones							
Overall	82%	81%	80%	80%	81%		1%

[a] Asterisks (*) indicate a significant difference in the response rate across RCT groups for that segment.

[b] Response rates include full and partial completes, and exclude customers in the non-CARE/FERA, CARE/FERA, and 100 to 200% FPG segments in PG&E's Control and Rate 1 and SCE's Control and Rate 2 groups.

2.1.3.2. Response Rates for the SCE Pilot

Table 2-4 shows the survey response rates for SCE. Response rates ranged from a low of 67% for respondents with incomes below 100% of the FPG in the hot climate region assigned to Rate 2 to a high of 86% for non-CARE/FERA customers assigned to Rate 3 in the hot climate region, and Rate 2 in the moderate climate region. Two segments showed significant differences in response rates (below 100% FPG and seniors) in the hot region when comparing response rates between control and Rate 2 groups. While statistically significant, response rates for these segments are high (67% and above) and differences between response rates are 5% or less.

Table 2-4: SCE Response Rates by Segment and RCT Group [a, b]

SCE	Control	Rate 1	Rate 2	Rate 3	Overall	Trendline	Largest p
Hot							
All	81%	83%	79%	82%	81%		2%
Non-CARE/FERA	82%	85%	83%	86%	84%		3%
CARE/FERA	78%	79%	75%	78%	77%		3%
Below 100% FPG	72%	75%	67%	76%	72%		5%*
100 to 200% FPG	80%	80%	81%	77%	80%		4%
Seniors	81%	83%	78%	85%	81%		4%*
Moderate							
All	80%	79%	79%	81%	80%		1%
Non-CARE/FERA	84%	84%	86%	84%	85%		2%
CARE/FERA	76%	75%	72%	77%	75%		3%
Cool							
All	78%	79%	78%	78%	78%		1%
Non-CARE/FERA	84%	85%	84%	83%	84%		2%
CARE/FERA	72%	72%	72%	71%	72%		1%
All Climate Zones							
Overall	80%	80%	79%	80%	80%		1%

[a] Asterisks (*) indicate a significant difference in the response rate across RCT groups for that segment.

[b] Response rates include full and partial completes, and exclude customers in the non-CARE/FERA, CARE/FERA, and 100 to 200% FPG segments in PG&E's Control and Rate 1 and SCE's Control and Rate 2 groups.

2.1.3.3. Response Rates for the SDG&E Pilot

Table 2-5 shows the survey response rates for SDG&E. Response rates ranged from a low of 79% for CARE/FERA respondents in the cool region to a high of 92% for non-CARE/FERA respondents in the moderate and cool regions. Two segments showed a significant difference in response rates – non-CARE/FERA customers in the moderate and cool regions – when comparing response rates between control and rate groups. While statistically significant, response rates for these segments are high – 90% and above - and differences between response rates was 3% or less.

Table 2-5: SDG&E Response Rates by Segment and RCT Group [a, b]

SDG&E	Control	Rate 1	Rate 2	Overall	Trendline	Largest p
Hot						
All			87%	87%		0%
Moderate						
All	86%	87%	86%	86%		1%
Non-CARE/FERA	90%	92%	91%	91%		3%*
CARE/FERA	82%	80%	80%	81%		1%
Cool						
All	85%	86%	86%	86%		1%
Non-CARE/FERA	90%	92%	92%	92%		2%*
CARE/FERA	80%	79%	80%	80%		0%
All Climate Zones						
Overall	86%	86%	86%	86%		1%

[a] Asterisks (*) indicate a significant difference in the response rate across RCT groups for that segment.

[b] Response rates include full and partial completes, and exclude customers in the non-CARE/FERA, CARE/FERA, and 100 to 200% FPG segments in PG&E's Control and Rate 1 and SCE's Control and Rate 2 groups.

2.1.3.4. Survey Mode Analysis

For another survey validation check, response rates were compared across survey modes (i.e., web, mail, or phone) for each IOU sample. Three comparisons were made for each survey question (web vs. mail, web vs. phone, and mail vs. phone) using regression models controlling for RCT group, climate region, CARE/FERA enrollment, FPG, household income, level of education, race, and age. Across all IOUs, web and mail survey respondents were more likely to choose "Don't know" and to skip questions compared to phone respondents. Phone respondents were more likely to choose extreme answers on scale questions (i.e., choosing 9 or 10 on a 0-10 scale) compared to web and mail respondents. These findings align with previous research showing that respondents to interviewer-administered surveys (e.g., phone) are less likely to admit they don't know an answer to a question, are less likely to skip questions, and are likely to give higher or lower ratings on scale questions compared to respondents to self-administered surveys (e.g., web or mail).[25] The differences across survey mode are small and do not impact the overall validity of the survey results.

[25] Dillman, Smyth, & Christian (2014). *Internet, Phone, Mail, and Mixed-Mode Surveys: The Tailored Design Method, 4th ed.* Hoboken, NJ: John Wiley & Sons Inc.; Krosnick & Presser (2010). "Question and Questionnaire Design," in *Handbook of Survey Research*, Marsden & Wright (eds.). Bingley, UK: Emerald Group Publishing Ltd, pgs. 263-314.

2.1.4. Survey Data Cleaning

To clean the survey data, respondents who answered seven or fewer (6% or less) of the 118 survey items asked of all respondents were removed from the dataset (n=160 of 39,266, or 0.4%).

Also, removed from the analysis of specific questions were:

- Respondents who straight-lined a multi-item question with four or more items;
- Respondents who selected all items in a 'select-all-that-apply' question in which not all answer categories are mutually exclusive; and
- Outliers to the survey question about number of household members who reported 19 or more household members.

Finally, 'Don't Know' responses for many survey items were recoded using the following rules:

- 'Don't Know' responses were excluded from all the rating questions and some of the demographic questions, like race, housing type, number of bedrooms.
- 'Don't Know' responses were coded as 'No' for most of the recall questions, like recalling participation, and some of the characteristics questions, like type of cooling equipment in the home.
- 'Don't Know' responses were kept for questions in which it is a meaningful response, like the understanding rate questions, reasons IOUs are changing to TOU rates, and the economic and health hardship/status questions.

2.2. Analytical Methods

2.2.1. Measures of Economic and Health Hardship

2.2.1.1. Reasoning for Economic and Health Hardship Measures

The following sub-sections describe the economic hardship index, the health hardship index, and the health metrics that capture the complex concepts of economic and health hardship. Using psychometric theory, the most relevant metrics from the opt-in survey data were identified to inform what effect TOU rates might have on the economic or health outcomes of customers. Since both economic and health outcomes are complex and potentially incorporate multiple behaviors, the aim was to create indices and metrics that merge related questions reflecting economic and health outcomes. This process makes assessing differences between groups simpler and more valid since the goal is to evaluate the larger concepts of "economic difficulty" or "health difficulty".

1. The economic hardship index was formed using survey questions targeted at the underlying connections between multiple aspects of economic and financial issues, including a two-question financial well-being index created by the Consumer Financial Protection Bureau and three questions about paying bills that were modified from other research conducted in

California.[26] Using Exploratory and Confirmatory Factor Analyses (EFA and CFA), it was validated and confirmed that this scale measured economic difficulty, as discussed further in the first interim report and Section 2.2.1.2 below.

2. The health hardship index was formed using two modified questions from the Center for Disease Control's (CDC) Behavioral Risk Factor Surveillance System (BRFSS) survey[27] regarding how often the health of any members of their household was not good and how often the poor health of household members prevented them from performing basic activities since December 2016. Using EFA and CFA, it was validated and confirmed that this scale measured general health hardship, as discussed further in Section 2.2.1.4 below.

3. The first health metric measuring whether customers were too hot in the home on warm days was included in the first interim report and was formed using three survey questions: whether or not the customer sought medical attention because it was too hot in their home, whether the household has air conditioning equipment, and whether there is a household member(s) with a disability or medical condition that required the home to be cooled.[28] A second, similar health metric measuring whether customers were too cold in their home on cold days was also formed using three survey questions (but was not included in the first survey due to a lack of cold days during the survey fielding): whether or not the customer sought medical attention because it was too cold in their home, whether customers have electric heating equipment in the home, and whether there is a household member(s) with a disability or medical condition that requires the home to be heated.[29]

The next two sub-sections describe, in more detail, the process used to create the economic index, and health index and metrics. In the results sections below, the team presents results from economic index and the health index, as well as from health metrics and other individual economic- and health-related questions included in the 2017 survey. Since the health index and metrics measure different (but related) dimensions of health, readers should analyze trends across all the reported health measures and use caution when interpreting results from a single measure in isolation.

2.2.1.2. Developing the Economic Index

One of the primary purposes of this study is to assess whether TOU rates cause unreasonable economic hardship for particularly vulnerable households, such as seniors or low-income customers living in hot climate regions. To do this, it was necessary to create a valid and reliable economic index metric using established methods. The economic index used in the 2017 study mirrored the index developed for the

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[26] These questions were extensively developed and discussed in close collaboration with the TOU Working Group to ensure they would adequately measure economic hardship.

[27] The CDC's BRFSS questions were modified and tailored to the 2017 TOU Pilot survey in close collaboration with the TOU Working Group to ensure they would adequately measure health status without being overly sensitive or invading privacy.

[28] This survey question was similarly developed in collaboration with the TOU Working Group to ensure that it would generate the information necessary to evaluate the impact of TOU rates on health and safety during warm days since December 2016.

[29] This survey question was similarly developed in collaboration with the TOU Working Group to ensure that it would generate the information necessary to evaluate the impact of TOU rates on health and safety during cold days since December 2016.

first interim TOU Pilot report. Table 2-6 lists the steps generally used to develop an index and the methods used here for developing the economic index.

Table 2-6: Steps to Create a Valid and Reliable Economic Index[a]

Established Method	Methods Used
Step 1: Generate Items	Combination of new and established items in survey
Step 2: Gather Data	Survey implementation (October to December)
Step 3: Reduce Data to a Model and Choose Factor[b]	Conduct exploratory factor analysis on relevant survey items, interpret results, and retain the factor with the best fit
Step 4: Confirm Model	Conduct confirmatory factor analysis
Step 5: Assess Validity and Reliability	Composite Reliability and Cronbach's alpha testing on underlying variables in chosen factor
Step 6: Generate Index and Replicate Findings	Compute index using component variables in chosen factor and rerun steps 3, 4, and 5 with random samples of the data

a Adapted from Hinkin, T. R. (1998). A brief tutorial on the development of measures for use in survey questionnaires. Organizational Research Methods, 2(1), 104-121. DOI: 10.1177/109442819800100106.

b Step 3 was performed with the 2016 survey data and, since it is an 'exploratory' step, did not need to be repeated with the 2017 survey data.

Steps 1, 2, and 3: Generate items, gather data, and reduce the data to a model and choose the factor

First, during development of the 2016 survey, the team designed survey questions to assess multiple aspects of economic difficulty. These included questions about a customers' concern for being able to pay their bills, the methods customers used to pay bills, and the difficulty customers had paying their bills, as well as questions from previously validated metrics of financial well-being, such as the Consumer Financial Protection Bureau's (CFPB) Financial Well-Being Scale.[30] Using newly developed questions in concert with previously validated ones helped ensure that both traditional views on financial well-being and elements of financial hardship specific to rate design were covered. The same survey questions used in the 2016 survey were also used in the 2017 survey, but were updated to ask about the previous six months (e.g. since December 2016) in the TOU pilot.

The second step involved collecting the data through the 2017 survey with TOU Pilot customers. Most respondents (80%) provided responses to all questions necessary to calculate the economic index. Non-CARE/FERA customers had higher response rates than CARE/FERA or other targeted segments, but overall the question-level response rates were very high across all segments (Table 2-7).

30 The Consumer Financial Protection Bureau's methods for the abbreviated version of their Financial Well-Being Scale were followed. See the following documentation for full methodological details: http://files.consumerfinance.gov/f/201512_cfpb_financial-well-being-user-guide-scale.pdf

Table 2-7: Response Rates for Economic Index Score Questions by Segment

Climate Region	Segment	% Responding to All Economic Hardship Questions
Total		80%
Hot	Non-CARE/FERA	86%
	CARE/FERA	72%
	CARE/FERA - on or eligible	73%
	Below 100% FPG	69%
	100 to 200% FPG	75%
	Seniors	82%
Moderate	Non-CARE/FERA	87%
	CARE/FERA	70%
	CARE/FERA - on or eligible	72%
Cool	Non-CARE/FERA	89%
	CARE/FERA	72%
	CARE/FERA - on or eligible	74%

The third step involved conducting an exploratory factor analysis (EFA) with the economic-related questions in the survey to identify the strongly correlated items that load together into factors.[31,32] The EFA was conducted with the 2016 survey data for the first interim report as an exploratory step to identify survey questions load into factors and to choose the factor with the best model fit to measure economic hardship. Since this is an exploratory step, it was unnecessary to repeat it with the 2017 survey. More details about this step, including results from the EFA, is provided in the first interim report in Section 3.3.6.

Through the EFA with the 2016 survey data the team identified four survey questions that load into a factor, explain 67% of the variance in answer choices, and have a strong model fit:[33]

- Concern for bill payment (0 to 10 scale where 0 means customers do not at all agree and 10 means they completely agree with the following statement: "I often worry whether there is enough money to pay my electricity bill")
- Problems paying bills (0 to 6 scale measuring how many times customers reported they had difficulty paying their electricity and other important household bills, where a 6 equals six or more times)

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31 To create a metric useful across California, survey responses were pooled across IOUs, climate zones, segments, and RCT groups.

32 EFA methods serve two purposes: 1) as a data reduction method to identify items that are not useful; and 2) as a tool to reveal underlying, or "latent", patterns in the survey data. EFAs are ideal for exploring potential metrics because the method groups ("loads") related items together into "factors".

33 67% of the variance explained means that these four items explain 67% of the variability in answer choices used in the model. Typically, the variance explained from models using survey results range from 20% to 40%. A model that explains 67% of the variability in answer choices suggests a very good fitting model. In addition, a goodness of fit test resulted in a significant chi-square of 50.8 ($p \leq 0.001$; significance = good fit), and a Kaiser-Meyer-Olken (KMO) statistic of 0.8 (a KMO greater than 0.6 is acceptable).

- CFPB Financial Well-Being (19 to 90 scale developed from five items, where lower values mean lower financial well-being and higher values mean greater financial well-being)
- Number of alternative ways customers used to pay bills: (0 to 10 scale where 0 means customers used only their current income to pay bills and 1 to 10 indicate the number of alternative, non-income methods customers used to pay bills).

Steps 4, 5, and 6: Confirm the model, assess validity and reliability, and generate the index and replicate findings

For the last three steps, the team confirmed, validated, and generated the index with the 2017 survey data, and replicated the findings using random samples of the data collected. Overall, the resulting statistics confirmed that the model fit the data well. To assess convergent validity, the Average Variance Extracted (AVE) was calculated, by averaging the squared factor loadings. The model results in an AVE score of 0.58 and a value above .5 is acceptable. To assess reliability of the items in the model, Cronbach's alpha and Composite Reliability (CR) scores were calculated. The resulting Cronbach's alpha of .84 and CR of .84 indicate a good measure of internal consistency between the four items the EFA identified as potential inputs to the economic index metric.[34] Reliability analysis on the 2017 data confirmed that the metric continued to provide a reliable indicator of economic hardship for the 2017 survey data (Cronbach's alpha=.83; CR=.84).

To generate the final economic index and calculate the index scores, the four items were combined into one metric. For this multi-step process, the z-scored values from the financial well-being index were inverted to match the direction of the other three variables to be included in the index (where higher scores mean higher economic difficulty). Values from these four items were then added into an initial score. To make the metric more transparent, the metric was normalized such that a score of zero means the absence of economic difficulty and 10 means complete economic difficulty as measured by the survey. The following formula was used for normalizing the economic index metric:

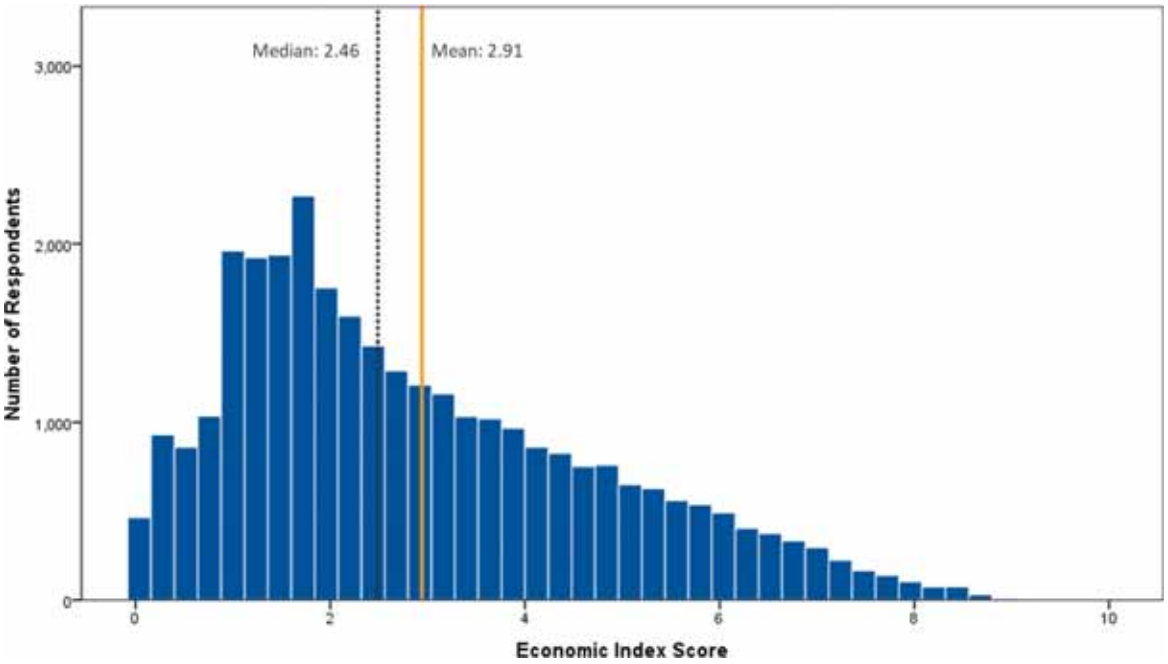
$$Economic\ Harship\ Score = \frac{(Initial\ Index\ Score + Min\ Observed\ Index\ Score)}{(Max\ Observed\ Index\ Score + Min\ Observed\ Index\ Score)} * 10$$

For the last step, throughout steps 4 and 5, models were re-ran using random samples of the data to replicate findings in real time (Step 6). This was possible because the sample of data collected for this evaluation was large enough to allow for partitioning the data while still maintaining a sufficient amount of statistical power. The replication across the random samples did not result in any anomalies, indicating strong consistency in the index.

Figure 2-2 shows the distribution of economic index scores for all 2017 survey respondents. The economic index has a mean of 2.46 and median of 2.91 on a scale of 0 to 10, where a higher score means greater economic hardship. The mean and median in the figure below are slightly lower than the mean of 2.57 and median of 2.98 from the first survey results.

[34] Cronbach's alpha and CR values exceeding 0.7 indicate reliability (Nunnally 1978; Nunnally and Bernstein 1994).

Figure 2-2: Histogram of Economic Index Scores for All 2017 Survey Respondents



2.2.1.3. Understanding the Economic Index Metric

Refer to Section 3.3.9 in the first interim report for two Classification and Regression Tree (CART) analyses of the economic index. The CART analyses show the average index scores by the index's component items and by key demographic and household characteristics. Also, the attached Appendix E includes an interactive dashboard for show how the economic index scores are calculated.

2.2.1.4. Developing the Health Index

Another of the primary purposes of this study is to assess whether TOU rates cause unreasonable health hardship for particularly vulnerable households, such as seniors or low-income customers living in hot climate regions. The health index development and analyses were guided by the following two questions in accordance with P.U. Code 745(c)(2):

- Do senior citizens in hot climate regions experience unreasonable hardship related to health and safety?
- Do customers eligible for CARE/FERA (economically vulnerable customers) in hot climate regions experience unreasonable hardship related to health and safety?

To answer these questions, it was necessary to create a valid, reliable health index using established methods, much like what was done for the economic index. Table 2-8 lists the steps generally used to develop an index and the methods used here for developing the health index.

Table 2-8: Steps to Create a Valid and Reliable Health Index*

Established Method	Methods Used
Step 1: Generate Items	Combination of new and established items in survey
Step 2: Gather Data	Survey implementation (October to December)
Step 3: Reduce Data to a Model and Choose Factor	Conduct exploratory factor analysis on relevant survey items, interpret results, and retain the factor with the best fit
Step 4: Confirm Model	Conduct confirmatory factor analysis
Step 5: Assess Validity and Reliability	Composite Reliability and Cronbach's alpha testing on underlying variables in chosen factor
Step 6: Generate Index and Replicate Findings	Compute index using component variables in chosen factor and rerun steps 3, 4, and 5 with random samples of the data

* Adapted from Hinkin, T. R. (1998). A brief tutorial on the development of measures for use in survey questionnaires. Organizational Research Methods, 2(1), 104-121. DOI: 10.1177/109442819800100106.

Steps 1 and 2: Generate items and gather data

To generate items for measuring health hardship, survey questions were designed to assess multiple aspects of health status and health-related characteristics and incidents. These include:

- two questions about how often someone was uncomfortably hot or cold in their home from trying to save money, on a five-point Likert scale from 'Never' to 'All the time'
- two questions about how often someone needed medical attention due to excessive heat or cold in their home, on an 11-point scale from '0 times' to 'more than 10 times'
- two questions how often customers experienced poor health and how often their poor health prevented them from performing daily activities, on a five-point Likert scale from 'Never' to 'All the time'.

The two questions about how often customers were uncomfortably hot and how many times they had to seek medical attention due to excessive heat were used in the 2016 customer survey, and the latter formed the health metric reported in the first interim report. The two questions about how often customers were uncomfortably cold and how many times they had to seek medical attention due to excessive cold are similar to those about heat-related events and were added to the 2017 customer survey since it asked about a time period that included colder-weather months.

The last two questions about frequency of poor health were added in the 2017 survey from previously validated metrics of health status – specifically, the Center for Disease Control's health status questions in the Behavioral Risk Factor Survey System survey (CDC BRFSS). [35] These questions were added to form the basis of a health index since a health index could not be created from the questions included in the

[35] The Center for Disease Control's 2015 Behavioral Risk Factor Surveillance System survey questionnaire is located here (see questions 2.1 to 2.3: https://www.cdc.gov/brfss/questionnaires/pdf-ques/2015-brfss-questionnaire-12-29-14.pdf

2016 survey (see Section 3.3.6 in the first report for more details). The wording of the CDC-based questions was modified and tailored for the needs of the TOU customer survey.

The second step for developing the health index involved collecting data through the 2017 survey with TOU Pilot customers. Nearly all respondents (95%) provided responses to all questions necessary to calculate the health index. Non-CARE/FERA customers had slightly higher response rates than CARE/FERA or other targeted segments, but overall the question-level response rates were very high across all segments (Table 2-9).

Table 2-9: Response Rates for Health Index Score Questions by Segment

Climate Region	Segment	% Responding to All Health Index Questions
Total		95%
Hot	Non-CARE/FERA	96%
	CARE/FERA	94%
	CARE/FERA - on or eligible	94%
	Below 100% FPG	93%
	100 to 200% FPG	95%
	Seniors	95%
Moderate	Non-CARE/FERA	96%
	CARE/FERA	93%
	CARE/FERA - on or eligible	93%
Cool	Non-CARE/FERA	96%
	CARE/FERA	93%
	CARE/FERA - on or eligible	94%

Steps 3, 4, 5, and 6: Reduce data to a model and choose a factor, confirm model, assess validity and reliability, and generate the index and replicate findings

In the third step, all questions in the survey related to health status, incidents, and characteristics were analyzed using exploratory factor analysis (EFA).[36,37] The seven items included in the model loaded onto three factors that measure different, mostly independent dimensions of health hardship.

- Factor 1: two CDC items about the frequency of household members experiencing poor health, measuring general health hardship.[38]

[36] To create a metric useful across California, survey responses were pooled across IOUs, climate zones, segments, and RCT groups.

[37] EFA methods serve two purposes: 1) as a data reduction method to identify items that are not useful; and 2) as a tool to reveal underlying, or "latent", patterns in the survey data. EFAs are ideal for exploring potential metrics because the method groups ("loads") related items together into "factors".

[38] Cronbach's alpha = 0.91; values exceeding 0.7 indicate reliability (Nunnally 1978; Nunnally and Bernstein 1994).

- Factor 2: two items about how often household members needed medical attention due to excessive heat and/or cold in their home, measuring health hardship related specifically to heating and cooling.[39]
- Factor 3: two items about how often household members were uncomfortably hot and/or cold in their home from trying to save money and one item about how many times the respondent had difficulty paying medical bills, measuring health hardship related specifically to affording to take health-related economic actions.[40]

The team chose Factor 1, comprised of the two CDC questions, in the final model of the health hardship index since it provides the best fit for measuring general health hardship (Table 2-10). The model explains 40% of the variance in answer choices and has a strong model fit.[41] This Factor was based on a valid and reliable metric used in previous research, has the highest alpha level and the least missing data, and a distribution closer to normal, compared to Factors 2 and 3. In addition, one of the items in Factor 2 (household member needed medical attention due to excessive heat) and in Factor 3 (frequency of being uncomfortably hot in the home) were reported individually in the first interim report and, to facilitate comparisons, are reported individually in the sections below as health metrics.

Table 2-10: EFA Results*

Item	Factor Loading	% Variance Explained
How often health was not good	0.886	40%
How often poor health limited usual activities	0.873	
Model	**Goodness of Fit**	**Kaiser-Meyer-Olkin Statistic**
Health Index Model	χ^2=82,651.1, df=21, p<0.001	0.644

* A Principal Axis extraction method was used.

For the last three steps, the team confirmed, validated, and generated the index with the 2017 survey data, and replicated the findings using random samples of the data collected. Overall, the resulting statistics confirmed that the model fit the data well. To assess convergent validity, the Average Variance Extracted (AVE) was calculated, by averaging the squared factor loadings. The model results in an AVE score of 0.64 and a value above .5 is acceptable. To assess reliability of the items in the model, Cronbach's alpha and Composite Reliability (CR) scores were calculated. The resulting Cronbach's alpha of 0.91 and CR of 0.87 indicate a good measure of internal consistency between the two CDC items the

39 Cronbach's alpha = 0.84; values exceeding 0.7 indicate reliability (Nunnally 1978; Nunnally and Bernstein 1994).

40 Cronbach's alpha = 0.63; values exceeding 0.7 indicate reliability (Nunnally 1978; Nunnally and Bernstein 1994).

41 40% of the variance explained means that these two items explain 40% of the variability in answer choices used in the model. Typically, the variance explained from models using survey results range from 20% to 40%. In addition, a goodness of fit test resulted in a significant chi-square of 82,578 (p≤0.001; significance = good fit), and a Kaiser-Meyer-Olken (KMO) statistic of 0.64 (a KMO greater than 0.6 is acceptable).

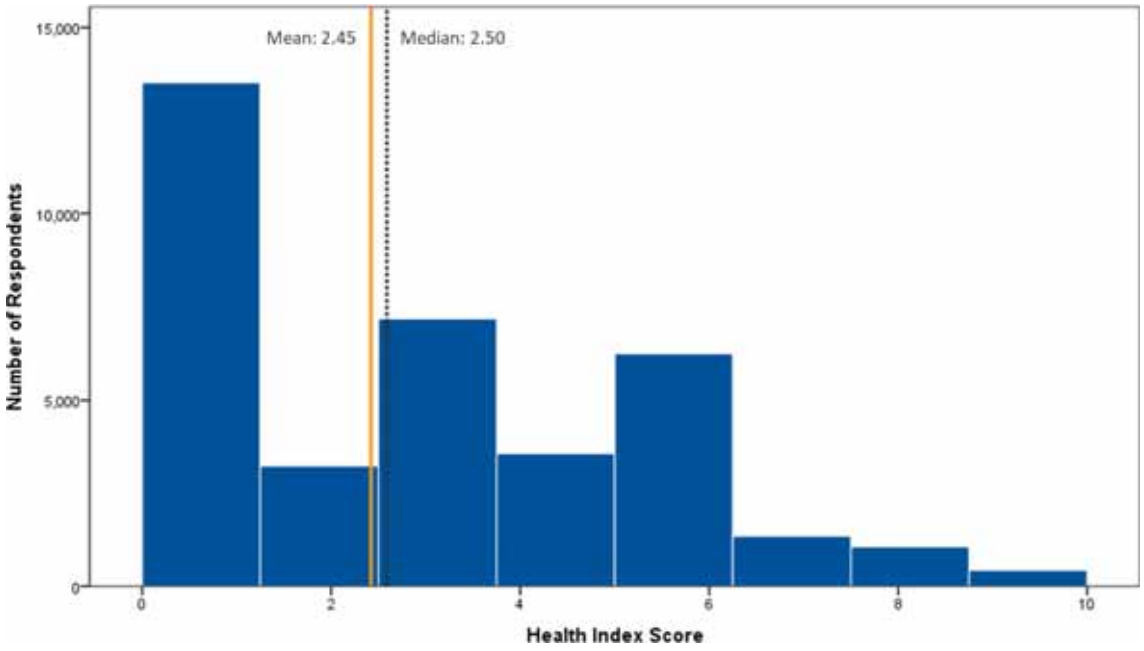
EFA identified as potential inputs to the health index metric. [42] Reliability analysis on the 2017 data confirmed that the metric continued to provide a reliable indicator of health hardship for the 2017 survey data (Cronbach's alpha=.90; CR=.88).

To generate the final health index and calculate the index scores, the two CDC-based survey questions, each comprised of five categories, were summed into one index to form a 0 to 8 scale.[43] To make the health index easier to interpret and similar to the economic index scale, the health index was re-scaled on a 0 to 10 scale, such that a score of zero means the absence of health hardship and 10 means complete health hardship as measured by the survey.

For the last step, throughout steps 4 and 5, models were re-ran using random samples of the data to replicate findings in real time (Step 6). This was possible because the sample of data collected for this evaluation was large enough to allow for partitioning the data while still maintaining a sufficient amount of statistical power. The replication across the random samples did not result in any anomalies, indicating strong consistency in the index.

Figure 2-3 shows the distribution of health index scores for all 2017 survey respondents. The health index has a mean of 2.45 and median of 2.50 on a scale of 0 to 10, where a higher score means greater health hardship.

Figure 2-3: Histogram of Health Index Scores for All 2017 Survey Respondents



[42] Cronbach's alpha and CR values exceeding 0.7 indicate reliability (Nunnally 1978; Nunnally and Bernstein 1994).

[43] The five answers categories in both the CDC-based survey questions were coded 0 to 4, where 0 means 'never' and 4 means 'all the time'. Summing the two questions thus results in a nine-point scale (0 to 8) instead of a 10-point scale.

2.2.1.5. Understanding the Health Index

The health index measures the frequency that customers experienced poor health and that poor health limited their abilities to perform their usual activities. The index was designed to measure a dimension of customers' health status that was not captured by the health metrics in the first survey (i.e. how often customers needed medical attention because it was too hot in their home, discussed in the next section). Although the health index is not as directly related to heating and cooling in the home compared to the health metrics, it does include other health-related effects that could be partially caused by managing electricity usage and/or bills, such as mental health issues, stress-related issues, and physical health issues that require electrical medical equipment but are not related to heating and cooling. Overall, the combined trends across the health index, metrics, and other health-related questions provide robust measures of health hardship.

To facilitate understanding of the health index scores, a series of Classification and Regression Tree (CART) analyses were done to show how the health index metric corresponds with respondents' health and demographic characteristics.[44] Because the health index is a new metric, CART analysis can be used to show average scores broken down by more concrete questions like whether someone in the home has a disability and their disability requirements. Respondent scores ranged from a low of zero to a high of 10, which are the minimum and maximum scores anyone can get with this metric.

Figure 2-4 shows the relationship between key health and demographic questions, and the health index metric.[45] Customers who have a medical condition, require someone at home most of the day, and who have a requirement that their home be cooled on warm days are more likely to have higher health index scores than respondents who do not have a medical condition, do not require someone at home most of the day, and who do not have a requirement that their home be cooled on warm days. Other demographic characteristics, such as household income, household size, and race, did not load in the CART analysis since there is greater variability in health index scores across these characteristics compared to the health-related characteristics.

[44] A CART analysis of the health index's components was not conducted since the health index is comprised of two components.

[45] The table is descriptive only. Statistical comparisons for TOU rate and control groups for each IOU are provided in Sections 3, 4, and 5.

Figure 2-4: CART Breakdown of Health Index by Key Demographics

Medical Condition	Variable	Avg. Health Score	Graph
Grand Mean		2.44	
Yes	--	4.67	
	Someone at home most of the day	5.25	
	Home required to be cooled on warm days	5.46	
	Home not required to be cooled on warm days	4.82	
	Someone not at home most of the day	3.80	
	Home required to be heated on cool days	4.23	
	Home not required to be heated on cool days	3.62	
No	--	1.84	
	Someone at home most of the day	2.61	
	Home required to be cooled on warm days	3.05	
	Home not required to be cooled on warm days	2.36	
	Someone not at home most of the day	1.70	
	Home required to be cooled on warm days	2.46	
	Home not required to be cooled on warm days	1.66	
	Not Provided	2.38	
	Home required to be cooled on warm days	3.25	
	Home not required to be cooled on warm days	2.20	
Not Provided	--	3.25	
	Someone at home most of the day	3.97	
	Someone not at home most of the day	2.96	
	Someone in home receives disability payments	2.67	
	No one in home receives disability payments	3.45	

2.2.1.6. Developing the Health Metrics

The team also developed health metrics to assess whether TOU rates increase health-related incidents resulting specifically from reduced air conditioning and/or electric heating use, particularly for vulnerable households such as seniors or low-income customers living in hot climate regions. Information on health-related incidents was gathered by asking respondents to report the number of times since December 2016 that they sought medical attention because it was either too hot or too cold in their homes. Table 2-11 summarizes the responses to this question for the full survey sample.

Table 2-11: Number of Times Needed Medical Attention Due to Extreme Temperatures

Response Option	Too Hot in Home*		Too Cold in Home**	
	Count	Percent	Count	Percent
Never	34,523	92.4%	35,237	93.5%
One	950	2.5%	633	1.7%
Two	494	1.3%	495	1.3%
Three	274	0.7%	328	0.9%
Four	175	0.5%	168	0.4%
Five	226	0.6%	211	0.6%
Six	161	0.4%	167	0.4%
Seven	174	0.5%	134	0.4%
Eight	128	0.3%	110	0.3%
Nine	76	0.2%	74	0.2%
Ten	72	0.2%	62	0.2%
More than ten times	110	0.3%	74	0.2%
Total	**37,363**	**100.0%**	**37,693**	**100.0%**

* On warm days since December 2016, about how many times, if ever, did you or any members of your household need medical attention because it was too hot inside your home?

** On cold days since December 2016, about how many times, if ever, did you or any members of your household need medical attention because it was too cold inside your home?

Given the small number of respondents that chose an option other than "never," a metric was constructed indicating whether the respondent's household had at least one medical event due to extreme temperatures, which served as the dependent variable for the analysis of temperature-related health issues (Table 2-12).

Table 2-12: Proportion of Sample with at least One Heat or Cold-Induced Medical Event, by IOU

Medical Event		PG&E		SCE		SDG&E	
		Count	Percent	Count	Percent	Count	Percent
Too Hot in Home	No medical events	14,968	93%	12,150	93%	9,737	92%
	At least one medical event	945	7%	991	8%	904	9%
	Total	13,581	100%	13,141	100%	10,641	100%
Too Cold in Home*	No medical events	12,848	93%	12,388	94%	10,001	93%
	At least one medical event	938	7%	771	6%	747	7%
	Total	13,786	100%	13,159	100%	10,748	100%

* Includes only respondents who reported having electric heating in the home.

The health metrics development and analyses were guided by the following two questions in accordance with P.U. Code 745(c)(2):

- Do senior citizens in hot climate regions experience unreasonable hardship related to health and safety resulting from reduced air conditioning and/or heating use?
- Do customers eligible for CARE/FERA (economically vulnerable customers) in hot climate regions experience unreasonable hardship related to health and safety resulting from reduced air conditioning and/or heating use?

To answer these research questions, responses to the health metrics for customers that met the following criteria were analyzed:

- Heat-Induced Medical Event:
  - Reported having some type of air conditioning at home[46]
  - Reported they had a disability that required their home to be cooled
- Cold-Induced Medical Event:
  - Reported having some type of electric heating at home[47]
  - Reported they had a disability that required their home to be heated

By limiting the analysis of the health metrics to customers with air conditioning or electric heating, and those who noted they had a disability that required their home to be cooled or heated, the ability to observe health effects caused by TOU rates is maximized. For example, Table 2-13 and Table 2-14 show the number and percent of customers citing they had at least one medical event since December 2016. The orange shading indicates the group of customers identified as most relevant to assess health effects due to TOU rates. While customers without air conditioning or electric heating in their home but with a disability that requires cooling or heating also have a higher proportion of medical events across RCT groups, they are less likely to be affected by TOU rates.

[46] These included ducted air conditioning, room air conditioning, or other cooling equipment.

[47] These included electric furnace, baseboard heating, wall or cadet heaters, or portable or space heaters.

Table 2-13: Health Index by AC in Home and Whether Customer Has Disability Requiring Cooling

IOU	Health Metric	No AC in Home				AC in Home			
		No Disability that Reqs Cooling		Has Disability that Reqs Cooling		No Disability that Reqs Cooling		Has Disability that Reqs Cooling	
		N	%	N	%	N	%	N	%
PG&E	No Medical events	3,360	97%	224	74%	6,674	97%	1,582	81%
	At least one medical event	136	4%	77	26%	222	3%	375	19%
	Total	3,496	100%	301	100%	6,896	100%	1,957	100%
SCE	No Medical events	1,266	94%	123	75%	8,279	96%	1,821	82%
	At least one medical event	76	6%	41	25%	340	4%	403	18%
	Total	1,342	100%	164	100%	8,619	100%	2,224	100%
SDG&E	No Medical events	2,500	95%	157	66%	5,854	96%	814	74%
	At least one medical event	142	5%	81	34%	266	4%	286	26%
	Total	2,642	100%	238	100%	6,120	100%	1,100	100%

Table 2-14: Health Index by Electric Heating in Home and Whether Customer Has Disability Requiring Heating

IOU	Health Metric	No Heat in Home				Heating in Home			
		No Disability that Reqs Heating		Has Disability that Reqs Heating		No Disability that Reqs Heating		Has Disability that Reqs Heating	
		N	%	N	%	N	%	N	%
PG&E	No Medical events	4,257	96%	701	87%	5,092	95%	1,025	80%
	At least one medical event	171	4%	107	13%	240	5%	258	20%
	Total	4,428	100%	808	100%	5,294	100%	1,283	100%
SCE	No Medical events	4,938	97%	718	87%	4,215	96%	819	84%
	At least one medical event	153	3%	106	13%	182	4%	153	16%
	Total	5,091	100%	824	100%	4,397	100%	972	100%
SDG&E	No Medical events	3,856	96%	330	79%	4,385	95%	511	79%
	At least one medical event	170	4%	88	21%	208	5%	139	21%
	Total	4,026	100%	418	100%	4,593	100%	650	100%

In addition, due to the small sample sizes of customers with air conditioning or electric heating, and a disability that requires cooling or heating, the team also reported the percentages of customers needing medical attention who have air conditioning or electric heating, regardless of whether they have a disabled household member. This group of customers would also likely be more affected by TOU rates than those without air conditioning or electric heating, but are likely not as vulnerable as customers with a disabled household member.

2.2.2. Statistical Tests Used for Control and Treatment Comparisons

Different statistical tests were used to analyze different types of survey questions.[48] For the health metrics and "yes-no" questions, a z-test for proportions was used to determine differences between Control and Rate groups. T-tests were used to determine differences for 0-to-10 Likert scale questions and the economic and health indices. For Likert questions that used fewer levels of rating, such as "never", "sometimes", "always", chi-square statistics were used to compare the number of respondents in each "level" between Control and Rate groups. For all analyses, table notes are provided to indicate the statistical test and alpha level that applies. Statistical details are provided in Appendices E.1 to E.3, and question-level results are provided in Appendices F.1 to F.3.

In addition, many of the survey questions are about the respondent who completed the survey (respondent-specific) while other questions are about the whole household (household-specific).[49] For example, the satisfaction rating questions are respondent-specific and the health index questions are household-specific. In the discussion of the survey results, it is noted if the results are reported for the whole household or only the respondent. Respondent-specific results do not provide the ability to infer if the results apply to the whole household. For example, the questions about understanding TOU rates are respondent-specific and it cannot be determined if other household members have a different level of understanding than the respondent.

2.3. Caution on Sample Sizes and Statistical Significance

Interpret statistically significant results from the analyses with caution. There are many respondents in each cell of this study, which results in high statistical power, confidence/precision, and representativeness but also means that some questions yielded statistically significant results that are not very meaningful or may not be significant in the population (i.e. Type II errors). For example, statistically significant differences were found between average ratings of 6.7 and 6.1 for a control versus rate group t-test. A difference of 0.6 on an 11-point rating scale is not very meaningful.

Further, in the analysis across IOUs, climate region, and segments, more than 5,500 tables were generated and over 13,500 statistical tests were conducted. An alpha level of 0.05 was used to assess statistical significance, and results in about a five percent Type II error rate when "differences" are identified between groups. So many statistical tests and so many respondents mean some reported differences that, while statistically significant in the sample, are due to random chance, not significant in the population, and thus should not be attributed to being caused by TOU rates. It is recommended to look at overall patterns across rate groups and segments to identify meaningful differences that are caused by TOU rates.

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[48] See Appendix B for the 2017 TOU customer survey analysis plan.

[49] Between 88% and 95% of respondents reported that their name is on the bill they receive from their IOU.

2.4. Estimating CARE/FERA Eligibility

This section describes the steps taken to estimate customers who are currently not participating in IOU CARE/FERA programs, but are still eligible to participate based upon their income and household size. The following steps were taken to identify additional CARE/FERA eligible participants:

1. Gathered income data for as many 2017 survey respondents as possible
2. Imputed income data using prior enrollment survey data and third-party data purchased by the IOUs
3. Used household size responses from the 2017 survey paired with income data from the survey or the imputed income data to identify respondents eligible but not currently participating in the CARE/FERA program.

2.4.1. Household Income Data Collection, Imputation, and Results

Table 2-15 shows the frequency of responses for customers 2016 annual household income from the 2017 survey. Ninety-two percent of respondents provided a viable answer. Of the 8% who did not provide a viable answer, 6% reported "don't know" and 2% did not answer the question. Values were imputed for these customers, as described below.

Table 2-15: Household Income Categories from 2017 Survey

Household Income Categories	Count	Percent
Less than $12,000	3,087	8%
$12,000 to less than $17,000	3,093	8%
$17,000 to less than $21,000	2,327	6%
$21,000 to less than $25,000	2,544	7%
$25,000 to less than $29,000	1,987	5%
$29,000 to less than $33,000	2,038	5%
$33,000 to less than $37,000	1,517	4%
$37,000 to less than $41,000	1,568	4%
$41,000 to less than $50,000	2,774	7%
$50,000 to less than $100,000	7,629	20%
$100,000 or more	7,330	19%
Total survey responses to income question	*35,894*	*92%*
Don't know	2,287	6%
No answer	859	2%
Total left to impute	*3,146*	*8%*
Grand total survey responses in dataset	**39,040**	**100%**

To minimize the number of missing and don't know responses in the analyses, income data was imputed from either the customer enrollment survey or customer data IOUs purchased from third parties. Both supplementary data sources included two types of income question scales: one containing six income categories and one containing eleven categories. Table 2-16 displays the improvements in missing income data following each imputation step.

Table 2-16: Improvements in Missing Income Data Following Imputation

Steps	Percent missing
2017 customer pilot survey responses	8.06%
Following first imputation using the 11-category enrollment survey data	4.42%
Following second imputation using the 11-category IOU third party data	3.17%
Following third imputation the 6-category enrollment survey data	3.14%
Following final imputation, the 6-category IOU third party data	3.12%

For the first and second imputation steps, data with the 11-category income variable were used since the income categories were the same as those used in the 2016 and 2017 TOU pilot customer surveys (shown in Table 2-17). After imputation using these data, the percentage of missing data declined from 8% to 3%

For the remaining 3% of respondents with missing income data, the data from the six-category income variable were used to impute household income. However, three of the income categories in the six-category income variable did not perfectly match with any of the 11 income categories used in the 2017 survey, as follows:[50]

- The $12,000 to less than $25,000 category used in the six-category income question overlapped three categories used in the 11-category income question: $12,000 to less than $17,000, $17,000 to less than $21,000, and $21,000 to less than $25,000.
- The $25,000 to less than $37,000 category used in the six-category income question overlapped three categories used in the 11-category income question: $25,000 to less than $29,000, $29,000 to less than $33,000, and $33,000 to less than $37,000.
- The $37,000 to less than $50,000 category used in the six-category income question overlapped two categories used in the 11-category income question: $37,000 to less than $41,000 and $41,000 to less than $50,000.

To use the supplementary data from the three unmatched income categories for imputation, they needed to match one of the categories in the 11-category income variable. The midpoint value of each of the three income categories fit within one of the categories in the 11-category variable, as shown in Table 2-17. These midpoint values were used as a proxy and matched to the corresponding categories in the 11-category income question. The imputation steps using the supplementary six-category income

[50] Three categories in the six-category income question – Less than $12,000, $50,000 to less than $100,000, and $100,000 or more– matched categories used in the 11-category income question.

data resulted in an additional 0.05% of respondents with viable data, for a total of about 97% of survey respondents with income data (Table 2-16).

Table 2-17: Matching Six-Category Household Income Items to 11-Category Items Using the Midpoint Value

Six-Category Household Income Items that Did Not Align With the 11-Category Items	Midpoint Value	Matching 11-Category Household Income
$12,000 to < $25,000	$18,500	$17,000 to < $21,000
$25,000 to < $37,000	$31,000	$29,000 to < $33,000
$37,000 to < $50,000	$43,500	$41,000 to < $50,000

2.4.2. CARE/FERA Eligibility Estimation Methods and Results

CARE/FERA eligibility is based on both household size and income, as shown in Table 2-18. The maximum household income to household size requirements publicly available on each IOU's website were used.

Table 2-18: CARE/FERA Eligibility Requirements

Number of Persons in Household	Maximum Household Income	
	CARE	FERA
1 to 2	Up to $32,040	Not Eligible
3	Up to $40,320	$40,321 - $50,400
4	Up to $48,600	$48,601 - $60,750
5	Up to $56,880	$56,881 - $71,100
6	Up to $65,160	$65,161 - $81,450
7	Up to $73,460	$73,461 - $91,825
8	Up to $81,780	$81,781 - $102,225
Each additional person	$8,320	$8,320 - $10,400

Source: https://www.sce.com/wps/portal/home/residential/assistance/care-fera/

Using household size survey data, and income data described above, CARE and FERA eligibility was estimated by mapping the respective income qualification guidelines to the closest corresponding income bracket from the survey options, as summarized in Table 2-19.

Table 2-19: CARE and FERA Eligibility

Number in Household	CARE Income Requirement	FERA Income Requirement
1 to 2	Up to $33,000	--
3	Up to $41,000	Up to $50,000
4	Up to $50,000	Up to $100,000
5+	Up to $100,000	

The results indicate an estimated 54% of respondents were eligible for CARE or FERA. Due to missing income or household size survey data, CARE/FERA eligibility for 3% of the sample could not be estimated. To identify the number of non-participating but eligible CARE/FERA respondents present in the data, the overlap between those currently participating in CARE/FERA programs and those estimated to be eligible to do so was calculated. As shown in Table 2-20, 21% of non-CARE/FERA customers in the sample were eligible for CARE/FERA. To test the validity of the eligibility estimates, the ratio of those determined to be eligible to participate to those currently participating in CARE/FERA was calculated. Ideally, 100% of current CARE/FERA participants would be determined to be eligible. In fact, 91% of respondents flagged as CARE/FERA participants by the IOUs were also flagged as CARE/FERA eligible using survey data, a substantial amount of overlap. Possible explanations for the 9% error rate include:

- CARE/FERA income qualification guidelines slightly differed from the income brackets used in the survey.[51]
- The status of some CARE/FERA customers may have changed over the eight-month period between pilot enrollment and when customers took the survey.

Table 2-20: CARE/FERA Enrollment vs Eligibility*

Current CARE/FERA Status	Eligible for CARE/FERA	
	Count	Percent
Not participating	4,377	21%
Participating	16,106	79%
Total	**20,483**	**100%**

* Reported values are unweighted and aggregated across all IOUs.

[51] The maximum income data is "$100,000 or more" and CARE eligibility for 11 household members is $106,740. This limits the ability accurately compute eligibility for CARE/FERA households with more than 10 members.

5. SDG&E Survey Findings

This section summarizes the survey findings for the three rate treatments tested by SDG&E. The CPUC resolution approving SDG&E's pilot requires that survey findings be reported for CARE/FERA and non-CARE/FERA customers for each rate for moderate and cool climate regions.

5.1. Findings Relevant to 745c Decision

To assess whether any of the pilot TOU rates caused economic or health hardship, difference in average economic and health indices scores and health metrics were compared between the Rate treatment and Control groups for the segments shown in Table 5-1. Comparisons of results between the first the first (2016) and second (2017) customer surveys are reported to highlight general trends and may not be statistically significant. Statistical comparisons will be provided in the final report.

Table 5-1: Segments Tested by Rate

Climate	Segment	Control vs. Rate 1	Control vs. Rate 2
Moderate	Non-CARE/FERA	X	X
	CARE/FERA	X	X
	CARE/FERA – on or eligible	Economic Index and Health Index/Metric Only	
Cool	Non-CARE/FERA	X	X
	CARE/FERA	X	X
	CARE/FERA – on or eligible	Economic Index and Health Index/Metric Only	

5.1.1. Descriptive Statistics of Economic/Health Scores

Table 5-2 provides the mean, median and the 25th and 75th percentile economic index scores for all SDG&E respondents and Figure 5-1 shows the histogram of economic index scores. The dotted line on the histogram shows the median, while the orange line shows the mean. Economic index scores can range from a low of zero to a high of 10. The higher the score the more economic difficulty a respondent has. SDG&E pilot participants had a mean economic index score of 2.91 and median score of 2.46, which is slightly lower than the mean of 3.00 and median of 2.58 from the first survey results. The distribution of economic index scores is positively skewed.

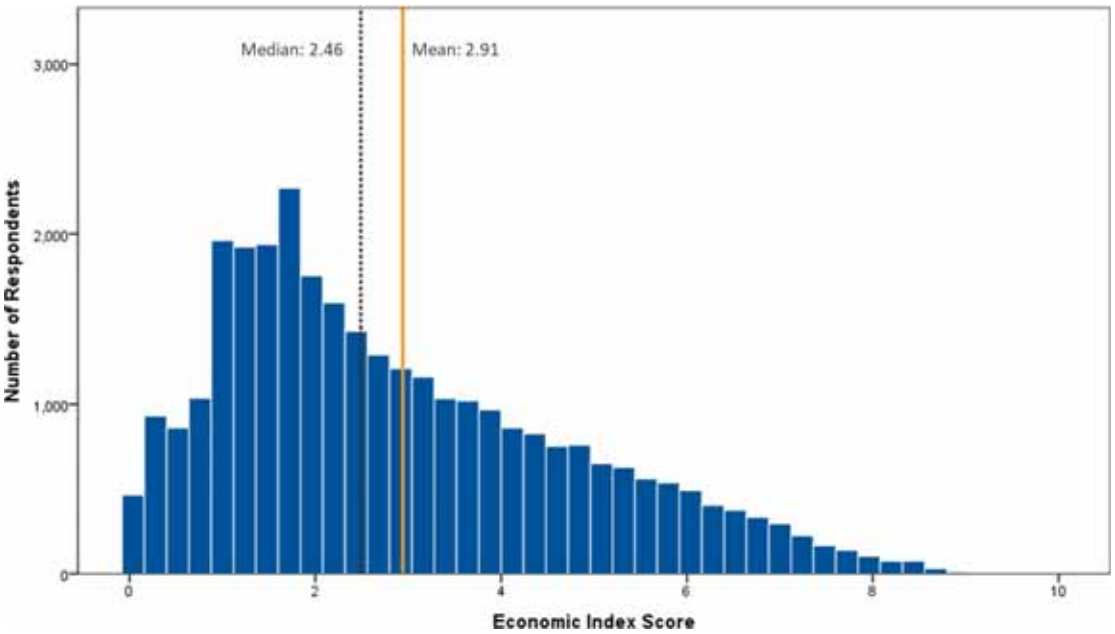
Table 5-2: Measures of Central Tendency for Economic Index [a, b]

Statistic	All SDG&E Sample	Non-CARE/FERA	CARE/FERA	Seniors
Mean	2.91	2.27	3.91	2.60
25th Percentile	1.44	1.16	2.45	1.27
Median	2.46	1.82	3.74	2.18
75th Percentile	4.14	3.05	5.27	3.71

[a] Higher mean index scores = more economic difficulty.

[b] Values are shown for all respondents combined, including control and treatment customers.

Figure 5-1: Histogram of Economic Index Scores [a, b]

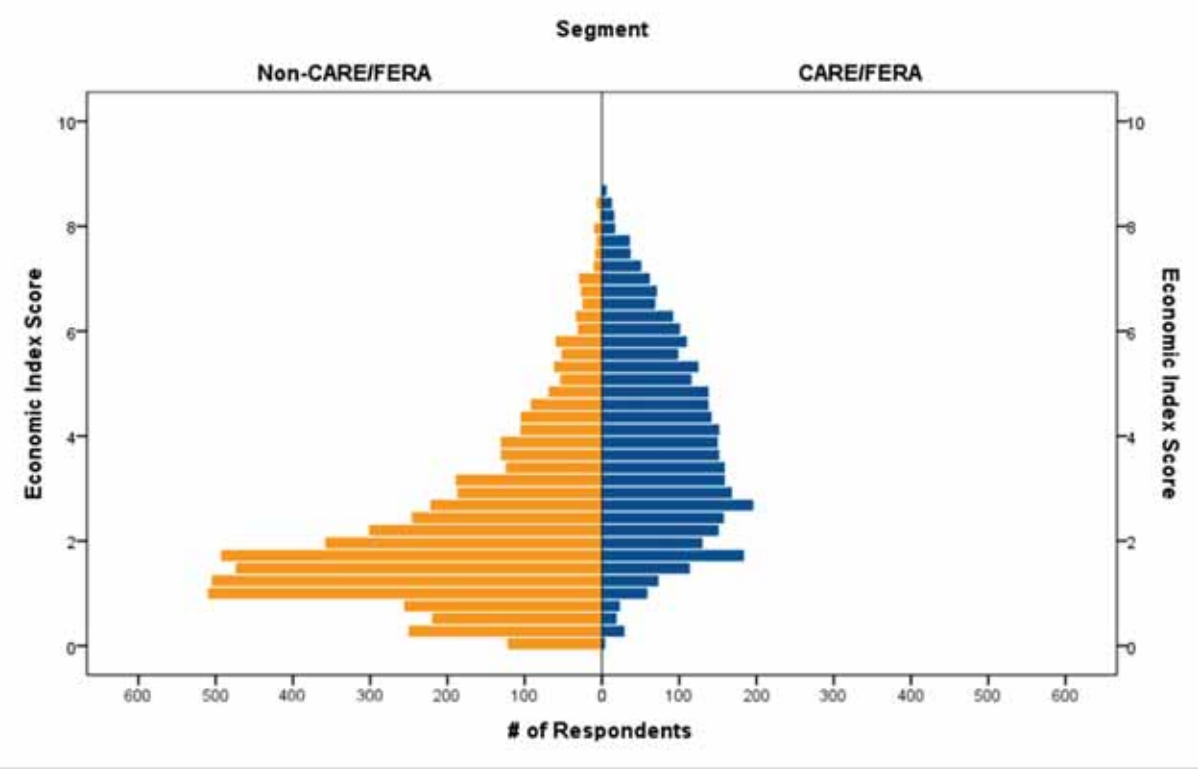


[a] Higher index scores = more economic difficulty.

[b] Values are shown for all respondents combined, including control and treatment customers.

As shown in Figure 5-2, the distribution of economic index scores is different for CARE/FERA and non-CARE/FERA groups. Both groups show a large spread of economic index scores, but the distribution of CARE/FERA scores is normally distributed, with equal distribution around the average score of 3.91.

Figure 5-2: Histogram of Economic Index Scores For CARE/FERA And Non-CARE/FERA Segments [a, b]

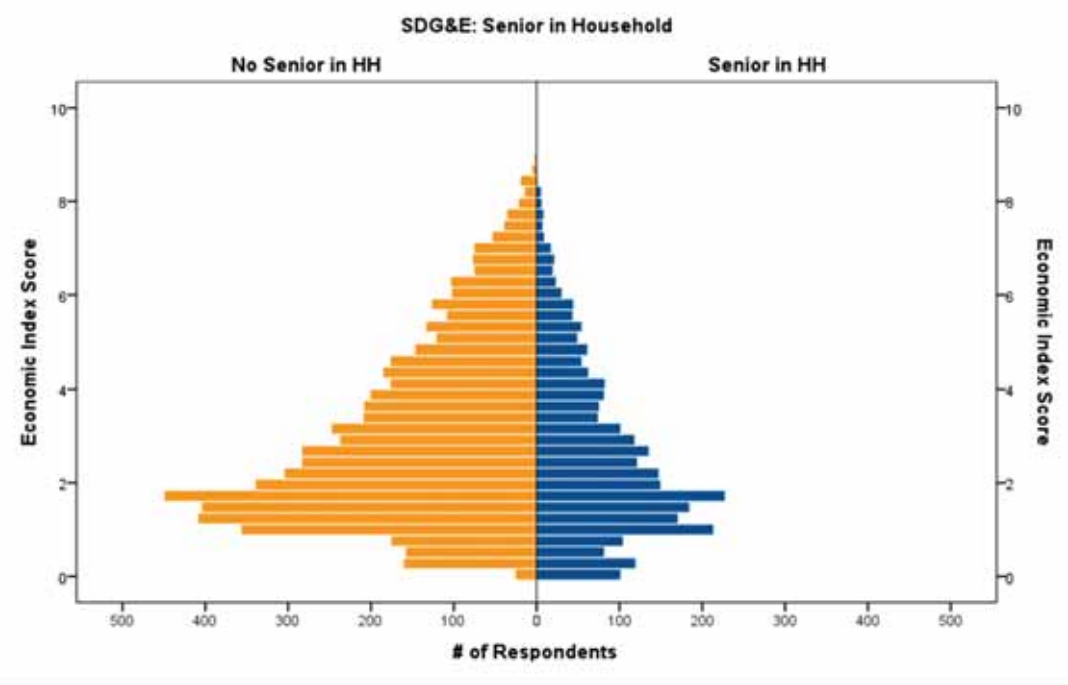


[a] Higher index scores = more economic difficulty.

[b] Values are shown for all respondents combined, including control and treatment customers.

As shown in Figure 5-3, the distribution of economic index scores is very similar for households with a senior as a head of household versus a non-senior as a head of household. Both groups show a large spread of economic index scores and the distributions are both positively skewed.

Figure 5-3: Histogram of Economic Index Scores for Seniors and Non-Seniors [a, b]



[a] Higher index scores = more economic difficulty.

[b] Values are shown for all respondents combined, including control and treatment customers.

5.1.2. Descriptive Statistics of Health Index Scores and Health Metrics

5.1.2.1. Health Index

Table 5-3 provides the mean, median and the 25th and 75th percentile health index scores for all SDG&E respondents and Figure 5-4 shows the histogram of health index scores. The dotted line on the histogram shows the median, while the orange line shows the mean. Health index scores can range from a low of zero to a high of 10. A higher the score means that household members more frequently experienced health related issues. SDG&E pilot participants had a mean health index score of 2.39 and median score of 2.5. The distribution of health index scores is positively skewed.

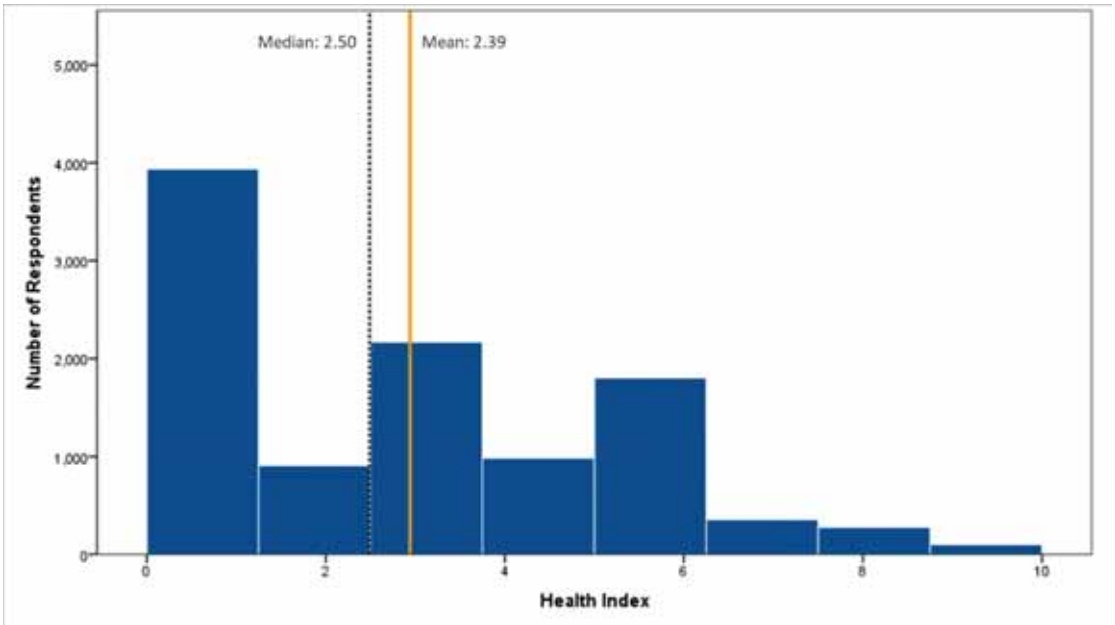
Table 5-3: Measures of Central Tendency for Health Index [a, b]

Statistic	All SDG&E Sample	Non-CARE/FERA	CARE/FERA	Seniors
Mean	2.39	2.14	2.71	2.61
25th Percentile	0.00	0.00	0.00	0.00
Median	2.50	2.50	2.50	2.50
75th Percentile	3.75	3.75	5.00	5.00

[a] Higher mean index scores = more frequent health-related issues.

[b] Values are shown for all respondents combined, including control and treatment customers.

Figure 5-4: Histogram of Health Index Scores [a, b]

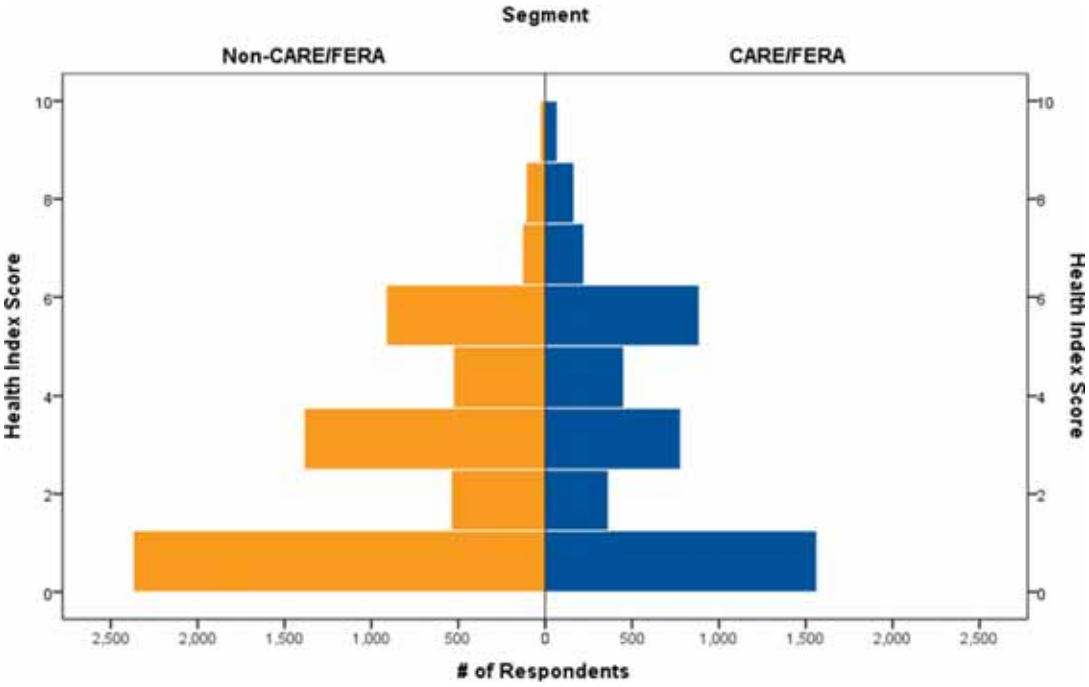


[a] Higher index scores = more frequent health-related issues.

[b] Values are shown for all respondents combined, including control and treatment customers.

As shown in Figure 5-5, the distribution of health index scores is similar for CARE/FERA and non-CARE/FERA groups. Both groups show a large spread of health index scores and the distributions are both positively skewed.

Figure 5-5: Histogram of Health Index Scores For CARE/FERA And Non-CARE/FERA Segments [a, b]

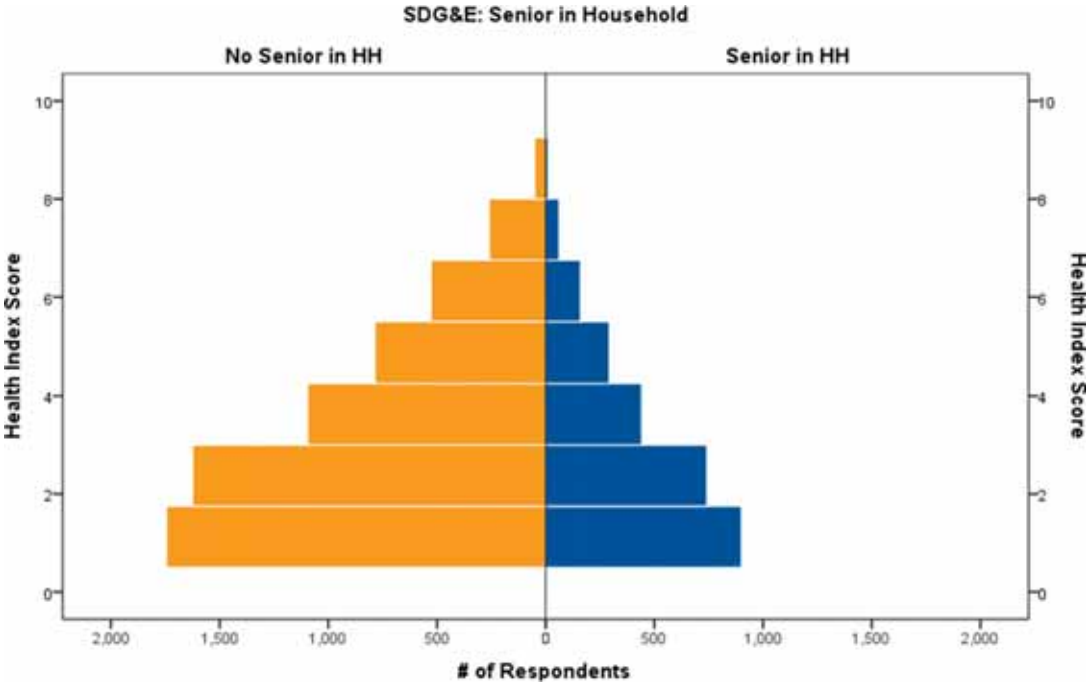


[a] Higher index scores = more frequent health-related issues.

[b] Values are shown for all respondents combined, including control and treatment customers.

As shown in Figure 5-6, the distribution of health index scores is very similar for households with a senior as a head of household versus a non-senior as a head of household. Both groups show a large spread of health index scores and the distributions are both positively skewed.

Figure 5-6: Histogram of Health Index Scores for Seniors and Non-Seniors [a, b]



[a] Higher index scores = more frequent health-related issues.

[b] Values are shown for all respondents combined, including control and treatment customers.

Table 5-4 shows the number and percentage of respondents who reported a household member who sought medical attention due to excess heat from among the small minority of respondents who indicated that a household member had a medical condition that required keeping their house cool since December 2016. All respondents in each segment also indicated that their home has some form of air conditioning. CARE/FERA customers were more likely to report a household member who sought medical attention because of excess heat than other segments.

Table 5-4: Distribution of Health Index Responses from Customers with AC and a Disability that Requires Cooling by Segment*

Climate Region	Segment	Total in segment	Total seeking medical attention	% seeking medical attention
Moderate	Non-CARE/FERA	266	47	18%
	CARE/FERA	401	136	34%
	CARE/FERA - on or eligible	502	162	32%
Cool	Non-CARE/FERA	168	25	15%
	CARE/FERA	222	71	32%
	CARE/FERA - on or eligible	271	83	31%

* Table includes all respondents who indicated someone in their household had a disability that required they keep their home cool since December 2016 and had a form of air conditioning in their home. Totals include all control and treatment respondents by segment.

Table 5-5 shows the number and percentage of respondents who reported a household member who sought medical attention due to cold temperatures from among the small minority of respondents who indicated that a household member had a medical condition that required keeping their house warm since December 2016. All respondents in each segment also indicated that their home has some form electric heating. CARE/FERA customers were more likely to report a household member who sought medical attention because of cold temperatures than other segments.

Table 5-5: Distribution of Health Index Responses from Customers with Electric Heating and a Disability that Requires Heating by Segment*

Climate Region	Segment	Total in segment	Total seeking medical attention	% seeking medical attention
Moderate	Non-CARE/FERA	62	11	18%
	CARE/FERA	161	50	31%
	CARE/FERA - on or eligible	181	56	31%
Cool	Non-CARE/FERA	63	17	27%
	CARE/FERA	141	34	24%
	CARE/FERA - on or eligible	163	40	25%

* Table includes all respondents who indicated someone in their household had a disability that required they keep their home warm since December 2016 and had a form of electric heating in their home. Totals include all control and treatment respondents by segment.

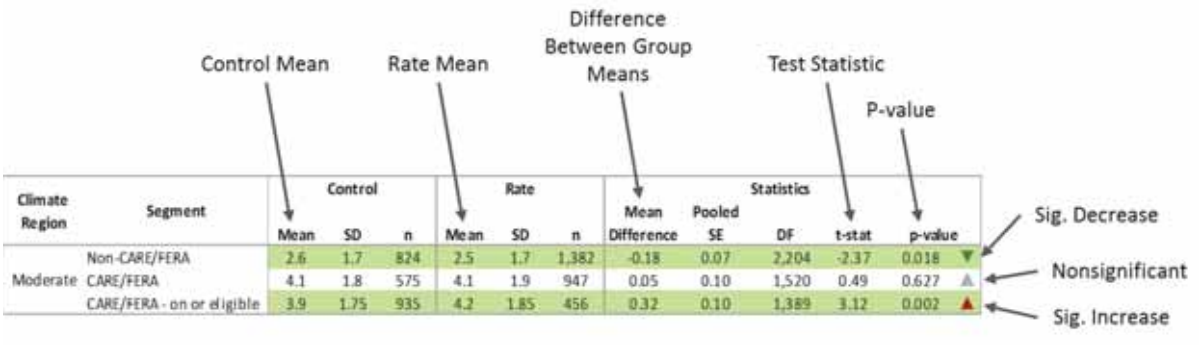
5.1.3. Economic and Health Changes – Control versus Rate Comparisons

This section compares the average values for the economic and health indices for control and TOU treatment customers for each customer segment, rate, and climate region. Given the RCT design, any statistically significant differences between control and treatment customers can be attributed to the TOU rates (or random chance). [86] In addition, given that the health-related questions measure different dimensions of health, readers should look at trends across all the health questions in the sections below and use caution when interpreting results from individual questions in isolation.

Statistically significant differences between control and rate groups are highlighted in green. Red triangles signify a statistically significant negative outcome for Rate groups and green arrows indicate a statistically significant positive outcome for Rate groups, as shown in Figure 5-7. Comparisons of results between the first the first (2016) and second (2017) customer surveys are reported to highlight general trends and may not be statistically significant. Statistical comparisons will be provided in the final report.

[52] The large sample sizes for most comparisons provide high statistical power, confidence/precision, and representativeness, but can also result in Type II errors, in which survey results are statistically significant but may not be meaningful or significant in the population. The chances of Type II errors are small (less than 5%) but possible. See Section 2.3 for more details.

Figure 5-7: Example of Results Table with Color Coding



Climate Region	Segment	Control			Rate			Statistics				
		Mean	SD	n	Mean	SD	n	Mean Difference	Pooled SE	DF	t-stat	p-value
Moderate	Non-CARE/FERA	2.6	1.7	824	2.5	1.7	1,382	-0.18	0.07	2,204	-2.37	0.018
	CARE/FERA	4.1	1.8	575	4.1	1.9	947	0.05	0.10	1,520	0.49	0.627
	CARE/FERA - on or eligible	3.9	1.75	935	4.2	1.85	456	0.32	0.10	1,389	3.12	0.002

5.1.3.1. Rate 1

Economic Index

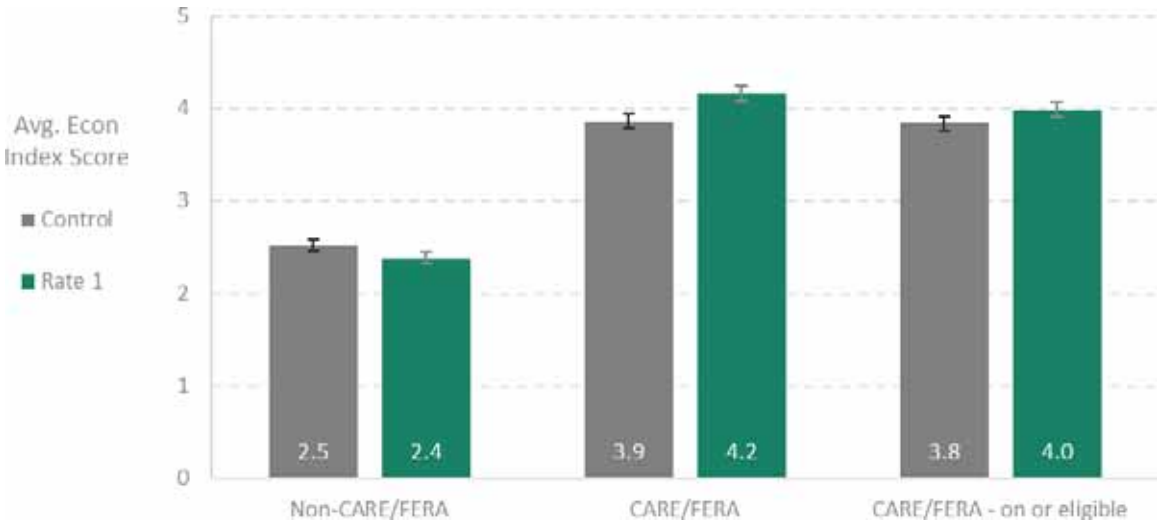
Table 5-6 shows the economic index values for Control and Rate customers for SDG&E's Rate 1; higher economic index scores means greater economic hardship. CARE/FERA customers in the moderate region reported a significantly higher average economic index score, or greater economic hardship, compared to Control customers, while non-CARE/FERA customers in the cool region reported a significantly lower economic index score, or lower economic hardship. As shown in the table and in Figure 5-8, the index value is substantially higher for CARE/FERA customers and CARE/FERA eligible customers compared to non-CARE/FERA customers. In addition, average economic index scores were slightly lower or the same for most customer segments, except the Rate 1 customers on or eligible for CARE/FERA in the moderate region, compared to results from the 2016 survey. The differences, however, are less than 0.3 points.

Table 5-6: Comparison of Economic Index Means, Control vs. Rate 1*

Climate Region	Segment	Control			Rate 1			Statistics				
		Mean	SD	n	Mean	SD	n	Mean Difference	Pooled SE	DF	t-stat	p-value
Moderate	Non-CARE/FERA	2.5	1.7	714	2.4	1.6	718	-0.14	0.09	1,430	-1.58	0.115 q
	CARE/FERA	3.9	1.8	477	4.2	1.8	450	0.30	0.12	925	2.53	0.012 p
	CARE/FERA - on or eligible	3.8	1.8	641	4.0	1.8	579	0.15	0.10	1,218	1.39	0.164 p
Cool	Non-CARE/FERA	2.2	1.50	748	2.0	1.43	734	-0.16	0.08	1,480	-2.06	0.039 q
	CARE/FERA	3.8	1.90	504	3.8	1.85	494	-0.07	0.12	996	-0.57	0.566 q
	CARE/FERA - on or eligible	3.8	1.90	623	3.7	1.84	598	-0.09	0.11	1,219	-0.86	0.390 q

* Higher mean index scores = more economic difficulty.

Figure 5-8: Mean Economic Index Scores, Control vs. Rate 1 for Targeted Segments in Moderate Region*



* Higher mean index scores = more economic difficulty.

Health Index

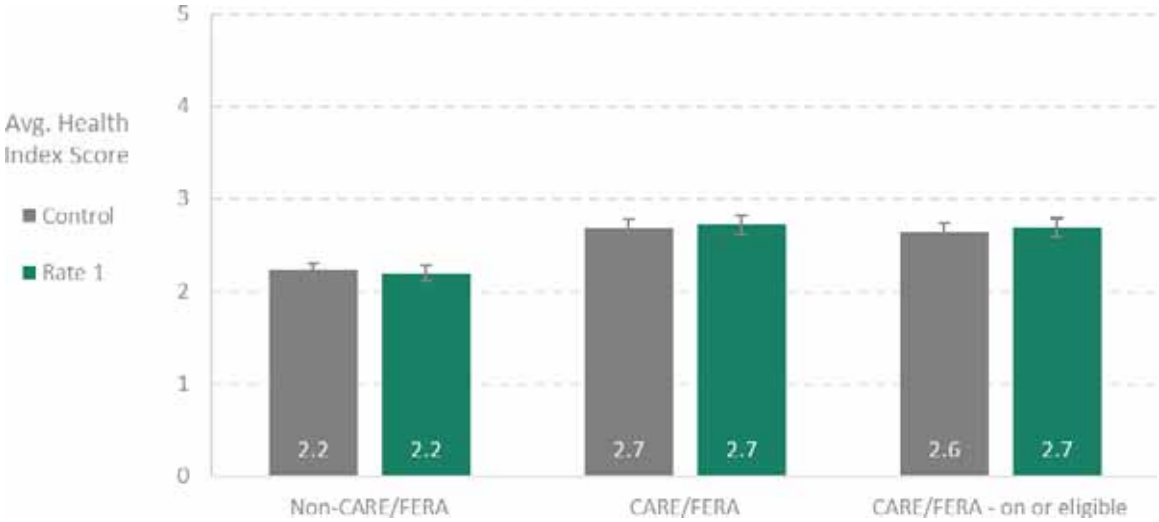
Table 5-7 shows the health index values for Control and Rate customers for SDG&E's Rate 1; higher health index scores means more frequent health issues. There were not significant differences between Rate and Control customers for any segment. As shown in the table and in Figure 5-9, the index value is slightly higher for CARE/FERA customers and CARE/FERA eligible customers compared to non-CARE/FERA customers.

Table 5-7: Comparison of Health Index Means, Control vs. Rate 1*

Climate Region	Segment	Control			Rate 1			Statistics					
		Mean	SD	n	Mean	SD	n	Mean Difference	Pooled SE	DF	t-stat	p-value	
Moderate	Non-CARE/FERA	2.2	2.2	774	2.2	2.3	791	-0.03	0.11	1,563	-0.27	0.790	q
	CARE/FERA	2.7	2.5	622	2.7	2.6	575	0.04	0.15	1,195	0.28	0.776	p
	CARE/FERA - on or eligible	2.6	2.5	820	2.7	2.5	735	0.05	0.13	1,553	0.38	0.705	p
Cool	Non-CARE/FERA	2.2	2.25	795	2.0	2.22	802	-0.20	0.11	1,595	-1.81	0.071	q
	CARE/FERA	2.8	2.59	635	2.6	2.49	630	-0.16	0.14	1,263	-1.13	0.257	q
	CARE/FERA - on or eligible	2.8	2.59	776	2.7	2.50	757	-0.17	0.13	1,531	-1.30	0.193	q

* Higher mean index scores = more frequent health-related issues.

Figure 5-9: Mean Health Index Scores, Control vs. Rate 1 for Targeted Segments in Moderate Region*



* Higher mean index scores = more frequent health-related issues.

Health Metrics

Table 5-8 shows the "too hot" health metric, or the proportion of respondents reporting at least one medical event due to excessive heat in the home on warm days since December 2016. The data show no statistically significant increases in respondents reporting a household member who sought medical attention due to Rate 1. In addition, the health metric is higher for low-income segments compared to non-CARE/FERA segments. However, the samples sizes for all non-CARE/FERA and all cool region segments are too small to provide highly representative, reliable, and accurate percentages or statistical comparison results.

Table 5-8: Comparison of Proportions of Customers with Air Conditioning and a Disability that Requires Cooling Who Reported Heat-Related Medical Events, Control vs. Rate 1 [a, b]

Climate Region	Segment	Control % with Event	Control Total N	Rate 1 % with Event	Rate 1 Total N	Statistics % Difference	SE	Z-stat	p-value	
Moderate	Non-CARE/FERA	25%	77	18%	73	-7%	0.07	1.03	0.30	q
	CARE/FERA	28%	102	38%	117	10%	0.06	1.57	0.12	p
	CARE/FERA - on or eligible	32%	130	37%	139	5%	0.06	0.89	0.37	p
Cool	Non-CARE/FERA	23%	52	9%	45	-14%	0.08	1.88	0.06	q
	CARE/FERA	26%	72	31%	64	5%	0.08	0.63	0.53	p
	CARE/FERA - on or eligible	27%	88	29%	75	2%	0.07	0.29	0.77	p

[a] Table shows respondents who indicated someone in their household had a disability that required they keep their home cool since December 2016 and had air conditioning in their home.

[b] The number of total customers that require cooling for a disability and have air conditioning in all the non-CARE/FERA segments and the moderate and cool climate region segments are very small. The results are included here for completeness, but the statistical outcomes are not reliable due to small sample sizes.

Table 5-9 shows the "too hot" health metric proportions for control and treatment customers on Rate 1 who have air conditioning but includes those who have and do not have a disability that requires cooling. The trends are similar to the results in the table above, except the percentages are smaller across segments, and the differences between Control and CARE/FERA customers in the moderate region and between Control and non-CARE/FERA customers in the cool region are significant. The analysis includes much larger sample sizes that improve the representativeness, reliability, and accuracy of the results and statistical comparisons.

Table 5-9: Comparison of Proportions of Customers with Air Conditioning Who Reported Heat-Related Medical Events, Control vs. Rate 1*

Climate Region	Segment	Control		Rate 1		Statistics				
		% with Event	Total N	% with Event	Total N	% Difference	SE	Z-stat	p-value	
Moderate	Non-CARE/FERA	6%	683	5%	699	-1%	0.01	0.71	0.48	q
	CARE/FERA	13%	468	19%	452	6%	0.02	2.65	0.01	p
	CARE/FERA - on or eligible	13%	631	17%	584	5%	0.02	2.26	0.02	p
Cool	Non-CARE/FERA	5%	483	2%	500	-2%	0.01	2.05	0.04	q
	CARE/FERA	11%	334	12%	341	1%	0.02	0.50	0.62	p
	CARE/FERA - on or eligible	11%	409	11%	410	0%	0.02	0.21	0.83	p

* Table shows respondents who indicated they had air conditioning in their home, and includes customers with and without a disabled household member who requires cooling in the home.

Table 5-10 shows the "too cold" health metric, or the proportion of respondents reporting at least one medical event due to excessive cold in the home on cold days since December 2016. The data show no statistically significant increases in respondents reporting a household member who sought medical attention due to Rate 1. In addition, the health metric is higher, on average, for low-income segments compared to non-CARE/FERA segments. However, the samples sizes for all customer segments are too small to provide highly representative, reliable, and accurate percentages or statistical comparison results.

Table 5-10: Comparison of Proportions of Customers with Electric Heat and a Disability that Requires Heating Who Reported Cold-Related Medical Events, Control vs. Rate 1 [a, b]

Climate Region	Segment	Control		Rate 1		Statistics				
		% with Event	Total N	% with Event	Total N	% Difference	SE	Z-stat	p-value	
Moderate	Non-CARE/FERA	21%	29	11%	28	-10%	0.10	1.03	0.30	q
	CARE/FERA	26%	62	34%	56	8%	0.08	0.96	0.33	p
	CARE/FERA - on or eligible	28%	72	32%	65	5%	0.08	0.58	0.56	p
Cool	Non-CARE/FERA	17%	29	13%	23	-4%	0.10	0.42	0.68	q
	CARE/FERA	27%	60	21%	47	-5%	0.08	0.65	0.52	q
	CARE/FERA - on or eligible	25%	67	21%	57	-4%	0.08	0.57	0.57	q

[a] Table shows respondents who indicated someone in their household had a disability that required they keep their home warm since December 2016 and had electric heating in their home.

[b] The number of total customers that require heating for a disability and have electric heating in all customer segments are small. The results are included here for completeness, but the statistical outcomes are not reliable due to small sample sizes.

Table 5-11 shows the "too cold" health metric proportions for control and treatment customers on Rate 1 who have electric heating but includes those who have and do not have a disability that requires heating. The trends are similar to the results in the table above, except the percentages are smaller across segments, and the analysis includes much larger sample sizes that improve the representativeness, reliability, and accuracy of the results and statistical comparisons.

Table 5-11: Comparison of Proportions of Customers with Electric Heat Who Reported Cold-Related Medical Events, Control vs. Rate 1*

Climate Region	Segment	Control		Rate 1		Statistics				
		% with Event	Total N	% with Event	Total N	% Difference	SE	Z-stat	p-value	
Moderate	Non-CARE/FERA	3%	364	4%	362	1%	0.01	0.41	0.68	p
	CARE/FERA	12%	335	14%	298	2%	0.03	0.81	0.42	p
	CARE/FERA - on or eligible	10%	439	13%	378	3%	0.02	1.33	0.18	p
Cool	Non-CARE/FERA	3%	378	2%	372	-1%	0.01	0.83	0.41	q
	CARE/FERA	10%	373	8%	352	-2%	0.02	0.93	0.35	q
	CARE/FERA - on or eligible	9%	447	7%	418	-2.0%	0.02	1.05	0.30	q

* Table shows respondents who indicated they had electric heating in their home and includes customers with and without a disabled household member who requires heating in the home.

5.1.3.2. Rate 2

Economic Index

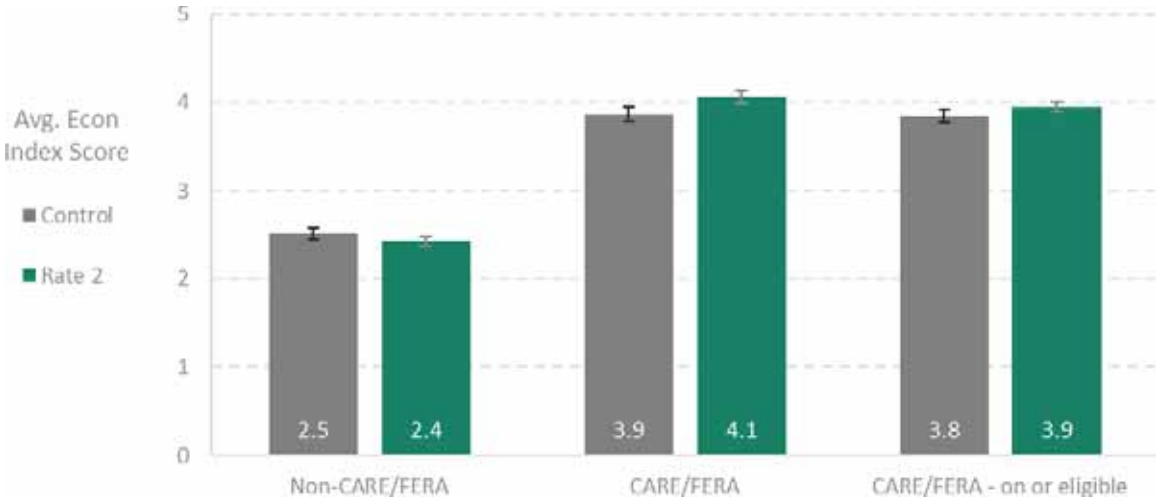
Table 5-12 shows the economic index values for Control and Rate customers for SDG&E's Rate 2; higher economic index scores means greater economic hardship. There were no statistically significant differences in the index for any customer segments in any climate region. As shown in the table and in Figure 5-10, the index value is nearly twice as high for CARE/FERA customers and CARE/FERA eligible customers compared to non-CARE/FERA customers. In addition, average economic index scores were slightly lower or the same for most customer segments, except the Rate 1 customers on or eligible for CARE/FERA in the cool region, compared to results from the 2016 survey. The differences, however, are less than 0.3 points.

Table 5-12: Comparison of Economic Index Means, Control vs. Rate 2*

Climate Region	Segment	Control			Rate 2			Statistics				
		Mean	SD	n	Mean	SD	n	Mean Difference	Pooled SE	DF	t-stat	p-value
Moderate	Non-CARE/FERA	2.5	1.7	714	2.4	1.7	1,173	-0.09	0.08	1,885	-1.11	0.268 q
	CARE/FERA	3.9	1.8	477	4.1	1.9	753	0.20	0.11	1,228	1.84	0.067 p
	CARE/FERA - on or eligible	3.8	1.8	641	3.9	1.9	1,011	0.10	0.09	1,650	1.07	0.284 p
Cool	Non-CARE/FERA	2.2	1.50	748	2.1	1.55	1,250	-0.08	0.07	1,996	-1.19	0.236 q
	CARE/FERA	3.8	1.90	504	3.8	1.82	826	0.01	0.10	1,328	0.12	0.901 p
	CARE/FERA - on or eligible	3.8	1.90	623	3.8	1.82	1,019	0.00	0.09	1,640	-0.01	0.992 q

* Higher mean index scores = more economic difficulty.

Figure 5-10: Mean Economic Index Scores, Control vs. Rate 2 for Key Segments in Moderate Region*



* Higher mean index scores = more economic difficulty.

Health Index

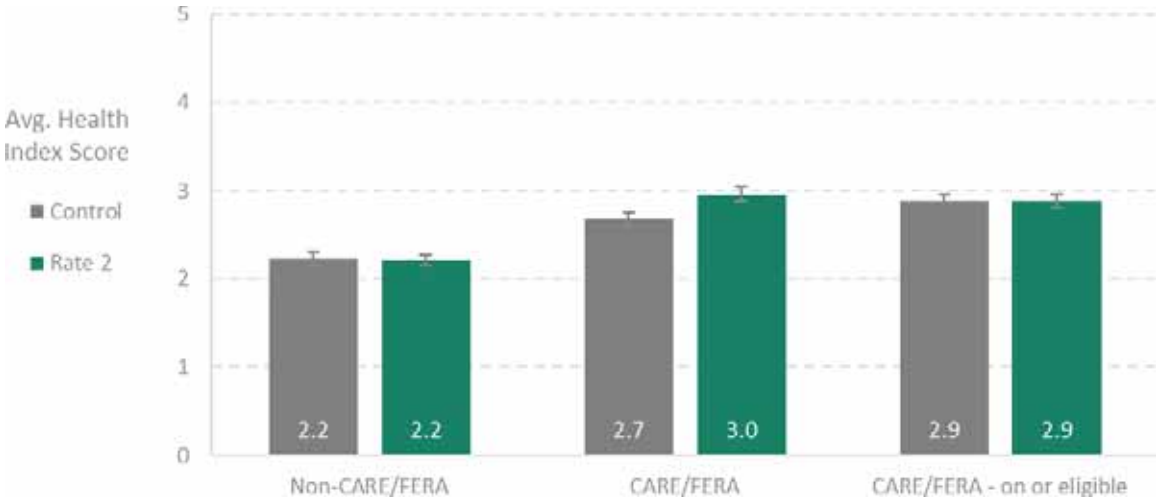
Table 5-13 shows the health index values for Control and Rate customers for SDG&E's Rate 2; higher health index scores means more frequent health issues. CARE/FERA Rate 2 customers in the moderate region reported a significantly higher average health index score, or more frequent health issues, compared to Control customers. As shown in the table and in Figure 5-11, the index value is slightly higher for CARE/FERA customers and CARE/FERA eligible customers compared to non-CARE/FERA customers.

Table 5-13: Comparison of Health Index Means, Control vs. Rate 2*

Climate Region	Segment	Control			Rate 2			Statistics				
		Mean	SD	n	Mean	SD	n	Mean Difference	Pooled SE	DF	t-stat	p-value
Moderate	Non-CARE/FERA	2.2	2.2	774	2.2	2.2	1,290	-0.01	0.10	2,062	-0.11	0.912 q
	CARE/FERA	2.7	1.8	575	3.0	2.6	987	0.29	0.12	1,560	2.35	0.019 p
	CARE/FERA - on or eligible	2.9	2.6	1,284	2.9	2.6	1,284	0.00	0.10	2,566	0.00	1.000 p
Cool	Non-CARE/FERA	2.0	2.14	1,362	2.0	2.14	1,362	0.00	0.08	2,722	0.00	1.000 p
	CARE/FERA	2.5	2.48	1,056	2.5	2.48	1,056	0.00	0.11	2,110	0.00	1.000 p
	CARE/FERA - on or eligible	2.5	2.44	1,291	2.5	2.44	1,291	0.00	0.10	2,580	0.00	1.000 p

* Higher mean index scores = more frequent health-related issues.

Figure 5-11: Mean Health Index Scores, Control vs. Rate 2 for Targeted Segments in Moderate Region*



* Higher mean index scores = more frequent health-related issues.

Health Metrics

Table 5-14 shows the "too hot" health metric, or the proportion of respondents reporting at least one medical event due to excessive heat in the home on warm days since December 2016. A significantly lower percentage of non-CARE/FERA customers in the moderate region reported a household member who sought medical attention due to Rate 2. In addition, the health metric is higher for low-income segments compared to non-CARE/FERA segments. However, the samples sizes for non-CARE/FERA and CARE/FERA customers in the cool region are too small to provide highly representative, reliable, and accurate percentages or statistical comparison results.

Table 5-14: Comparison of Proportions of Customers with Air Conditioning and a Disability that Requires Cooling Who Reported Heat-Related Medical Events, Control vs. Rate 2 [a, b]

Climate Region	Segment	Control % with Event	Control Total N	Rate 2 % with Event	Rate 2 Total N	Statistics % Difference	SE	Z-stat	p-value	
Moderate	Non-CARE/FERA	25%	77	13%	116	-12%	0.06	2.10	0.04	q
	CARE/FERA	28%	102	34%	182	6%	0.06	0.98	0.33	p
	CARE/FERA - on or eligible	32%	130	30%	233	-1%	0.05	0.30	0.77	q
Cool	Non-CARE/FERA	23%	52	13%	71	-10%	0.07	1.51	0.13	q
	CARE/FERA	26%	72	37%	86	11%	0.07	1.45	0.15	p
	CARE/FERA - on or eligible	27%	88	34%	108	7%	0.07	1.05	0.29	p

[a] Table shows respondents who indicated someone in their household had a disability that required they keep their home cool since December 2016 and had air conditioning in their home.

[b] The number of total customers that require cooling for a disability and have air conditioning in all the non-CARE/FERA segments and the moderate and cool climate region segments are very small. The results are included here for completeness, but the statistical outcomes are not reliable due to small sample sizes.

Table 5-15 shows the "too hot" health metric proportions for control and treatment customers on Rate 2 who have air conditioning but includes those who have and do not have a disability that requires cooling. The trends are similar to the results in the table above, except the percentages are smaller across segments and the differences between Control and CARE/FERA customers in the moderate region are significant. The analysis includes much larger sample sizes that improve the representativeness, reliability, and accuracy of the results and statistical comparisons.

Table 5-15: Comparison of Proportions of Customers with Air Conditioning Who Reported Heat-Related Medical Events, Control vs. Rate 2*

Climate Region	Segment	Control % with Event	Control Total N	Rate 2 % with Event	Rate 2 Total N	Statistics % Difference	SE	Z-stat	p-value	
Moderate	Non-CARE/FERA	6%	683	3%	1140	-2%	0.01	2.20	0.03	q
	CARE/FERA	13%	468	18%	770	5%	0.02	2.38	0.02	p
	CARE/FERA - on or eligible	13%	631	16%	1023	3%	0.02	1.70	0.09	p
Cool	Non-CARE/FERA	5%	483	4%	828	-1%	0.01	0.72	0.47	q
	CARE/FERA	11%	334	11%	526	0%	0.02	0.15	0.88	p
	CARE/FERA - on or eligible	11%	409	11%	664	0%	0.02	0.15	0.88	p

* Table shows respondents who indicated they had air conditioning in their home, and includes customers with and without a disabled household member who requires cooling in the home.

Table 5-16 shows the "too cold" health metric, or the proportion of respondents reporting at least one medical event due to excessive cold in the home on cold days since December 2016 A significantly lower percentage of non-CARE/FERA customers in the moderate region reported a household member who sought medical attention due to Rate 2, but the samples sizes for Control group customer segments are too small to provide highly representative, reliable, and accurate percentages or statistical comparison results. In addition, the health metric is higher, on average, for low-income segments compared to non-CARE/FERA segments.

Table 5-16: Comparison of Proportions of Customers with Electric Heat and a Disability that Requires Heating Who Reported Cold-Related Medical Events, Control vs. Rate 2*

Climate Region	Segment	Control % with Event	Control Total N	Rate 2 % with Event	Rate 2 Total N	Statistics % Difference	SE	Z-stat	p-value	
Moderate	Non-CARE/FERA	21%	29	5%	55	-15%	0.07	2.15	0.03	q
	CARE/FERA	26%	62	28%	101	2%	0.07	0.27	0.79	p
	CARE/FERA - on or eligible	28%	72	23%	128	-5%	0.06	0.81	0.42	q
Cool	Non-CARE/FERA	17%	29	4%	46	-13%	0.07	1.87	0.06	q
	CARE/FERA	27%	60	29%	91	2%	0.07	0.26	0.80	p
	CARE/FERA - on or eligible	25%	67	26%	107	1%	0.07	0.12	0.91	p

[a] Table shows respondents who indicated someone in their household had a disability that required they keep their home warm since December 2016 and had electric heating in their home.

[b] The number of total customers that require heating for a disability and have electric heating in all Control group customer segments are small. The results are included here for completeness, but the statistical outcomes are not reliable due to small sample sizes.

Table 5-17 shows the "too cold" health metric proportions for control and treatment customers on Rate 2 who have electric heating but includes those who have and do not have a disability that requires heating. The trends are similar to the results in the table above, except the percentages are smaller across segments and the differences between Control and non-CARE/FERA customers in the moderate region are smaller and not significant. The analysis includes much larger sample sizes that improve the representativeness, reliability, and accuracy of the results and statistical comparisons.

Table 5-17: Comparison of Proportions of Customers with Electric Heat Who Reported Cold-Related Medical Events, Control vs. Rate 2*

		Control		Rate 2		Statistics				
Climate Region	Segment	% with Event	Total N	% with Event	Total N	% Difference	SE	Z-stat	p-value	
Moderate	Non-CARE/FERA	3%	364	4%	631	1%	0.01	0.41	0.68	p
	CARE/FERA	12%	335	14%	579	2%	0.02	1.02	0.31	p
	CARE/FERA - on or eligible	10%	439	13%	760	2%	0.02	1.05	0.30	p
Cool	Non-CARE/FERA	3%	378	2%	645	-1%	0.01	1.05	0.29	q
	CARE/FERA	10%	373	11%	598	1%	0.02	0.55	0.58	p
	CARE/FERA - on or eligible	9%	447	10%	712	1%	0.02	0.40	0.69	p

* Table shows respondents who indicated they had electric heating in their home and includes customers with and without a disabled household member who requires heating in the home.

5.1.4. Economic- and Health-Related Question-Level Findings

The following sections compare responses between treatment and control customers for individual questions that underlie the economic and health indices and additional economic and health-related questions in the survey. Results are presented for all three rates to enable cross-rate comparisons and facilitate identification of patterns in the results. Because of the random assignment of customers to treatment and control conditions, statistically significant differences in values between the two groups can be attributed to the TOU rates (or random chance). [87] Statistically significant differences between the control and rate groups are shaded in grey, red arrows signify significant negative outcomes for Rate groups, and green arrows indicate significant positive outcomes for Rate groups, as shown in example Table 5-18.

[53] The large sample sizes for most comparisons provide high statistical power, confidence/precision, and representativeness, but can also result in Type II errors, in which survey results are statistically significant but may not be meaningful or significant in the population. The chances of Type II errors are small (less than 5%) but possible. See Section 2.3 for more details.

Table 5-18: Example of Question-Level Results Table

Climate Region	Segment	C	R1		R2	
Moderate	Non-CARE/FERA	6%	4%	▼	4%	▼
	CARE-FERA	16%	17%	▲	17%	▲
Cool	Non-CARE/FERA	4%	3%	▼	4%	▼
	CARE-FERA	13%	14%	▲	11%	▼

Grey shading = statistical significance

5.1.4.1. Economic Index Questions

Customers Worried about Having Enough Money to Pay Electricity Bill

Respondents rated their agreement with five statements designed to measure respondents' attitudes towards adopting energy saving behaviors using an 11-point scale with 0 meaning "do not agree at all" and 10 meaning "completely agree". One of these statements, ""I often worry whether there is enough money to pay my electricity bill" is used to create the economic index (Table 5-19).[88]

Respondents provided low to moderate ratings, 1.6 to 5.1, to this statement. When comparing responses between Control and Rate treatment groups, the Rate 1 CARE/FERA segment in the moderate climate region rated this statement higher than the Control group, but the difference is substantively small (less than a point on the 11-point rating scale). Respondents in the CARE/FARE segments provided higher agreement ratings to the statement compared to those in the non-CARE/FERA segments. Average agreement ratings are slightly lower or the same for most non-CARE/FERA customer segments and slightly higher for most CARE/FERA segments compared to results from the 2016 survey.

Table 5-19: Percentage of Respondents Reporting They Often Worry About Having Enough Money to Pay Their Electricity Bill*

Climate Region	Segment	I often worry whether there is enough money to pay my electricity bill C	R1		R2	
Hot	General	-	-		2.9	
Moderate	Non-CARE/FERA	2.3	2.2	q	2.2	q
	CARE/FERA	4.7	5.1	p	5.0	p
Cool	Non-CARE/FERA	1.7	1.6	q	1.6	q
	CARE/FERA	4.5	4.2	q	4.4	q

* Used t-test, highlighted averages indicate statistically significant difference versus Control group at p≤.05.

[54] See Section 4.2.6 for results for the other four statements.

Customers Experiencing Issues with Paying Their Bills

SDG&E respondents reported the number of times – since participating in the pilot – that their household struggled to pay: a) electricity bills, and b) bills for other basic needs such as food, housing, medicine, and other important bills. Respondents answered on a 4-point scale ranging from "none" to "3 or more times."

Table 5-20 shows the percent of respondents who reported having difficulty paying either their electricity bill or some other bill at least once since December 2016. As shown, there is substantial variability across segments (18% to 68% reporting difficulty paying their bills). A significantly lower percentage of non-CARE/FERA customers in the cool region reported difficulty paying bills compared to corresponding Control customers. In addition, a higher percentage of respondents in the low-income segments reported bill payment difficulty than non-CARE/FERA customers. The percentages of customers reporting difficulty paying bills are slightly lower for all the customer segments compared to the 2016 survey results.

Table 5-20: Percentage of Respondents Reporting Difficulty Paying Bills Since December 2016 [a, b]

Climate Region	Segment	Difficulty Paying Electricity and Other Important Non-Medical Bills				
		C	R1		R2	
Hot	General	-	-		35%	
Moderate	Non-CARE/FERA	30%	26%	q	28%	q
	CARE/FERA	64%	68%	p	64%	q
Cool	Non-CARE/FERA	23%	18%	q	18%	q
	CARE/FERA	62%	60%	q	63%	p

[a] Table shows the percent of respondents who either had difficulty paying their electricity bill or other bills at least one time during the summer.

[b] Grey shading indicates a significant difference in the responses between control and rate group for that segment (using z-test for proportions and an alpha level of .05)

Financial Well-Being (CFPB)

To gauge respondents' financial health, respondents were asked about five items sourced from the Consumer Financial Protection Bureau (CFPB). For the first three items, respondents are asked how each describes their situation using a scale including "not at all," "very little," "somewhat," "very well," and "completely." For the last two items, respondents are asked how often each applies to them using a scale including "never," "rarely," "sometimes," "often," and "always." The CFPB items are:

- Because of my money situation, I feel like I will never that the things I want in life.
- I am just getting by financially.
- I am concerned that the money I have won't last.
- I have money left over at the end of the month.

- My finances control my life.

Using answers to these five items, each respondent's financial well-being score was calculated, with values ranging from 19 (low financial well-being) to 90 (high financial well-being).[89]

As shown in Table 5-21, SDG&E respondents demonstrated a relatively tight range of financial well-being scores, with average scores ranging from 48 to 61 (higher scores indicate higher financial well-being). Customers on TOU rates did not have significantly lower CFPB scores, or lower financial well-being, than control rate customers. Rate 1 non-CARE/FERA customers in the cool region had higher CFPB scores, or greater financial well-being, when compared to the Control group, but the difference was less than 3 points out of roughly 49 points. Compared to other segments, non-CARE/FERA customers had the highest financial well-being scores. In addition, customers reported slightly higher financial well-being scores across all the customer segments compared to the 2016 survey results.

Table 5-21: Average Financial Well-Being Scores*

Climate Region	Segment	CFPB C	CFPB R1		CFPB R2	
Hot	General	.	.	p	55.7	q
Moderate	Non-CARE/FERA	56.9	57.8	p	57.8	p
	CARE/FERA	48.9	47.5	q	48.1	q
Cool	Non-CARE/FERA	58.5	60.1	p	59.5	p
	CARE/FERA	48.4	49.2	p	49.0	p

* Grey shading indicates a significant difference in the responses between control and rate group for that segment (using t-test and an alpha level of .05).

Number of Alternative Methods Used to Pay Bills

Respondents reported how they afforded to pay electricity bills and/or other basic needs since December 2016. Respondents selected as many of the following options that applied to their household:

- Use your household's current income
- Use your household's savings or other investments
- Cut back on non-essential spending for things your household wants
- Reduce your household energy usage
- Borrow money from family, friends, or peers
- Borrow money using a short-term loan
- Use a credit card that you can't pay off right away

[55] The financial well-being score is a methodologically rigorous scale from the Consumer Financial Protection Bureau that measures a customer's financial well-being. The Consumer Financial Protection Bureau's methods for the abbreviated version of their "Financial Well-Being Scale" was followed. See the following documentation for full methodological details: http://files.consumerfinance.gov/f/201512_cfpb_financial-well-being-user-guide-scale.pdf

- Leave rent/mortgage unpaid
- Leave some household bills unpaid past the due date
- Received emergency assistance from [IOU NAME]
- Received emergency assistance from other city or regional programs

Reducing household energy usage and cutting back on non-essential spending are included in the percent of respondents (by rate and segment) that reported using any of the options other than 'current income.' [90] This metric, therefore, measured the maximum number of customers in each segment, by rate that took some type of action, however small, to help pay their bills.

As shown in Table 5-22, nearly half or more of each segment on each rate plan reported using non-income strategies to afford bill payments. There were no statistically significant differences between the Control and Rate groups. Within each climate region, CARE/FERA customers were the most likely to report non-income strategies for making bill payments. A slightly higher percentage of customers in most customer segments in the moderate and a slightly lower percentage of most customer segments in the cool region reported using alternative sources for paying bills compared to results from the 2016 survey.

Table 5-22: Percentage of Respondents Reporting Affording Summer Bill Payments Using Sources Other than Current Income*

Climate Region	Segment	C	R1		R2	
Hot	General	-	-		66%	
Moderate	Non-CARE/FERA	58%	58%	q	59%	p
	CARE/FERA	76%	76%	p	74%	q
Cool	Non-CARE/FERA	49%	47%	q	48%	q
	CARE/FERA	73%	74%	p	75%	p

* Used z-test for proportions and an alpha level of 0.05.

5.1.4.2. Health Index and Health-Related Question-Level Findings

Frequency of Poor Health and Its Effects

SDG&E customers were asked two health status questions added to the 2017 survey and based on survey questions from the CDC's BRFSS survey. These questions form the health index discussed above. The first question asked respondents how often their health and/or the health of any household member was not good since December 2016. The second question asked how often their and/or their household member's poor health prevented them from performing everyday tasks. Respondents could choose answers on a five-point scale including 'Never,' 'Rarely,' 'Sometimes,' 'Most the time,' or 'All the

[56] Reducing household energy usage was included because this action could result in hardship for some customers. However, the team conducted the analysis excluding "reducing household energy usage" and the percentages of customers using non-income sources declined across all customer segments but overall trends in the results remained the same.

time'. Customers who responded 'Never' to the first question were not asked the second question but were included in the analysis of the second question as reporting 'Never'.

Table 5-23 shows the percentage of respondents who reported poor health, and that poor health prevented them from doing usual activities, at least 'Rarely" since December 2016. There were no significant differences between Control and Rate customers regarding the frequency of experiencing poor health or whether poor health prevented performing usual activities. In addition, the percentages do not vary substantially across low-income and non-CARE/FERA segments.

Table 5-23: Percentage of Respondents Reporting Poor Health and that Poor Health Prevented Doing Usual Activities At Least 'Rarely' Since December 2016 [a, b]

Climate Region	Segment	Health Not Good During Past Six Months					Poor Health Prevented Doing Usual Activities				
		C	R1		R2		C	R1		R2	
Hot	General	-	-		63%	q	-	-		51%	q
Moderate	Non-CARE/FERA	62%	61%	q	63%	p	50%	51%	p	51%	p
	CARE/FERA	66%	67%	p	69%	p	54%	51%	q	57%	p
Cool	Non-CARE/FERA	62%	58%	q	60%	q	51%	46%	q	49%	q
	CARE/FERA	67%	66%	q	63%	q	56%	55%	q	52%	q

[a] Percentage of customers reporting 'rarely,' 'sometimes,' 'most the time,' or 'all the time'.

[b] Used z-test for proportions and an alpha level of 0.05.

Poor Health Due At Least Partially to Managing Electricity Usage/Bill

SDG&E customers were also asked how often their poor health or the poor health of their household members was due at least partially to their managing their electricity usage or bill. Customers could respond on a five-point scale including 'Never,' 'Rarely,' 'Sometimes,' 'Most the time,' or 'All the time'. Customers who reported they 'Never' experienced poor health since December 2016 were not asked this question but were included in the analysis as 'Never'.

Table 5-24 shows the percentage of respondents reporting that poor health was partly due to their management of electricity usage or bills at least 'rarely' since December 2016. There were no significant differences between Control and Rate customers, but a substantially higher percentage of low-income and senior customers reported poor health due, in part, to management of electricity usage or bills compared to non-CARE/FERA customers.

Table 5-24: Percentage of Respondents Reporting that Poor Health was Due in Part to Managing Electricity Usage or Bills At Least 'Rarely' Since December 2016 [a, b]

Climate Region	Segment	Poor Health Due to Managing Electricity Usage/Bills				
		C	R1		R2	
Hot	General	-	-		18%	q
Moderate	Non-CARE/FERA	18%	14%	q	14%	q
	CARE/FERA	31%	31%	p	33%	p
Cool	Non-CARE/FERA	12%	10%	q	11%	q
	CARE/FERA	28%	24%	q	26%	q

[a] Percentage of customers reporting 'rarely,' 'sometimes,' 'most the time,' or 'all the time'.

[b] Used z-test for proportions and an alpha level of 0.05.

5.1.4.3. Question-Level Findings Involving Both Economic and Health Effects

The 2017 survey included three questions that involve both economic- and health-related events that customers may have experienced.

Frequency of Being Uncomfortably Hot and/or Cold in the Home Due to Trying to Save Money on Electricity Bills

SDG&E respondents reported how frequently they had been uncomfortably hot in their home on warm days since December 2016 due to trying to save money on electricity bills. Respondents chose from the following options: never, rarely, sometimes, most of the time, always, or not applicable due to lack of warm days. Table 5-25 shows the percent of customers that responded either most of the time or always (summarized as "most to all of the time"). Respondents who selected "not applicable" were excluded from analyses.

About one-third or less of each segment reported being uncomfortably hot most to all the time. Fewer Rate 1 non-CARE/FERA customers in the cool region (9%) reported being uncomfortably hot than the Control group (14%); other differences are not significant. CARE/FERA segments reported higher frequency of being uncomfortably hot compared to non-CARE/FERA customers. In addition, a slightly lower percentage of customers across most customer segments, except the non-CARE/FERA customers in the moderate region, reported being uncomfortably hot in their home compared to results from the 2016 survey.

Table 5-25: Percentage of Respondents Reporting Being Uncomfortably Hot 'Most to All of the Time' Since December 2016 Due to Trying to Save on Electricity Bills [a, b]

Climate Region	Segment	Uncomfortably Hot Most or All the Time				
		C	R1		R2	
Moderate	Non-CARE/FERA	22%	18%	q	21%	q
	CARE-FERA	32%	33%	p	30%	q
Cool	Non-CARE/FERA	14%	9%	q	11%	q
	CARE-FERA	25%	25%	q	23%	q

[a] Z-test for proportions used, grey shading indicates statistically significant difference versus Control group at p≤.05.

[b] Respondents who selected "Not applicable, no hot days" were excluded from the analysis.

SDG&E respondents also reported how frequently they had been uncomfortably cold in their home on cold days since December 2016 due to trying to save money on electricity bills. Respondents chose from the following options: never, rarely, sometimes, most of the time, always, or not applicable due to lack of cold days. Table 5-26 shows the percent of customers that responded either most of the time or always (summarized as "most to all of the time"). Respondents who selected "not applicable" were excluded from analyses.

Eighteen percent or less of customers reported being uncomfortably cold most to all the time. A significantly lower percentage of Rate 2 non-CARE/FERA customers in the moderate climate region (6%) and CARE/FERA customers in the cool region (11%) reported being uncomfortably cold compared to Control customers (9% and 14% respectively). Trends show that a slightly lower percentage of Rate group customers in most of the other segments reported being uncomfortably cold compared to Control customers, although these differences are not significant. In addition, more CARE/FERA respondents reported being uncomfortably cold compared to non-CARE/FERA respondents.

Table 5-26: Percentage of Respondents Reporting Being Uncomfortably Cold 'Most to All of the Time' Since December 2016 Due to Trying to Save on Electricity Bills [a, b]

Climate Region	Segment	Uncomfortably Cold Most or All the Time				
		C	R1		R2	
Moderate	Non-CARE/FERA	9%	8%	q	6%	q
	CARE-FERA	16%	18%	p	14%	q
Cool	Non-CARE/FERA	6%	5%	q	6%	p
	CARE-FERA	14%	13%	q	11%	q

[a] Z-test for proportions used, grey shading indicates statistically significant difference versus Control group at p≤.05.

[b] Respondents who selected "Not applicable, no cold days" were excluded from the analysis.

Difficulty Paying Medical-Related Bills

A question was added to the 2017 survey that asked SDG&E customers how often they had difficulty paying medical-related bills since December 2016. Customers could choose '0 times,' '1 time,' '2 times,'

or '3 or more times'. Table 5-27 shows the percentage of customers who reported difficulty paying medical bills at least one time. Between 19% and 51% of respondents reported difficulty paying their medical bills. A significantly lower percentage of non-CARE/FERA Rate 1 customers in the cool region reported difficulty paying medical bills compared to corresponding Control customers. In addition, substantially more low-income and senior customers reported difficulty paying medical bills compared to non-CARE/FERA customers.

Table 5-27: Percentage of Respondents Reporting Difficulty Paying Medical Bills One or More Times Since December 2016*

Climate Region	Segment	Difficulty Paying Medical-Related Bills				
		C	R1		R2	
Hot	General	-	-		27%	
Moderate	Non-CARE/FERA	26%	23%	q	25%	q
	CARE/FERA	47%	51%	p	50%	p
Cool	Non-CARE/FERA	24%	19%	q	21%	q
	CARE/FERA	47%	48%	p	50%	p

* Z-test for proportions used, grey shading indicates statistically significant difference versus Control group at p≤.05.

5.1.5. Summary of Economic and Health Results

Looking across all the economic-related questions, including the economic index, few Rate group segments showed a statistically significant increase in specific aspects of economic hardship compared to Control group segments. Rate 1 CARE/FERA customers in the moderate region reported a significantly higher economic index score (Table 5-6) and higher concern about affording bills (Table 5-19), but comparisons to the Control group on the other economic questions are not significant.

Similar trends are found for the health index and health-related questions. Rate 2 CARE/FERA customers in the moderate region reported a significantly higher health index score (Table 5-13) and a higher percentage of customers with air-conditioning who reported needing medical attention due to excessive heat in the home (Table 5-15), but comparisons to the Control group on all other health-related questions are not significant.

5.1.5.1. Cross-Group Analysis

Overall, TOU rates did not consistently increase economic or health hardship for customer segments in PG&E's service territory. In fact, of the five significant differences in economic or health hardship, only two revealed increased hardship for a customer segment on a TOU rate. Instead, control group segments were most likely to experience increased hardship when compared to customer segments assigned to a TOU rate. In the aggregate however, SDG&E customers on the Control rate experienced

insignificantly different economic ($\bar{x}_{control}$=2.9, $\bar{x}_{treatment}$=2.9, t=.94, p=.35) and health hardship ($\bar{x}_{control}$=2.5, $\bar{x}_{t\ reatment}$=2.4, t=1.6, p=.11) from those assigned to a TOU rate.[91]

Across all segments and climate zones, customers on a TOU rate reported taking significantly (p<.001) more actions to reduce their electricity usage in the afternoons and evenings compared to those on a standard rate,[92] and Rate group customers reported it was significantly easier to do so (0-10 scale, $\bar{x}_{control}$=6.2, $\bar{x}_{treatment}$=6.4, t=-3.1, p=.002). Those on a TOU rate also gave significantly higher ratings to "the rate provides me with opportunities to save money" (0-10 scale, $\bar{x}_{c\ ontrol}$=6.4, $\bar{x}_{t\ reatment}$=7.1, t=-12.2, p<.001). These findings may point to increased energy management knowledge among those on a TOU rate: control group members were significantly more likely to report not knowing what actions they could take to lower their electric bill (8% vs. 5%, Chi-square=45.5, p<.001). Accordingly, customers on the TOU rate demonstrated greater determination and confidence in their ability to manage their energy use, with those on a TOU rate giving significantly higher ratings to all items in Table 5-28.

Table 5-28: Comparison of Mean Values to Q24 Series, Control vs. Treatment

Using a scale of 0 to 10 where 0 means do not agree at all, and 10 means completely agree, please tell me how much you agree with each statement:	Control		Treatment		p-value
	Mean	n	Mean	n	
I can better manage my electricity bill by changing when I use electricity	5.34	2,875	6.31	7,933	0.00
I can consistently plan my electricity use based on the time of day	4.91	2,879	5.75	7,970	0.00
I conserved electricity in my home the past six months	6.63	2,885	7.13	7,967	0.00

The finding that TOU rate participants were better able to manage their electricity use may also help explain why TOU group members were significantly less likely to be uncomfortably cold (Mann-Whitney U, p=.008) due to trying to save on electricity bills, and why poor health in the Control group was significantly more likely to be attributed to trying to manage household electricity usage (Mann-Whitney U, p=.03).

5.2. Other Research Topics

The remainder of this section summarizes findings from the other research topics that were covered by the survey. Statistically significant differences between the Control and Rate groups are shaded in grey, significant negative outcomes for Rate groups are represented by red upward arrows, and significant positive outcomes for Rate groups are represented by green downward arrows, as shown in example Table 5-29. Comparisons of results between the first the first (2016) and second (2017) customer surveys are reported to highlight general trends and may not be statistically significant. Statistical comparisons will be provided in the final report.

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57 As measured by the economic and health indices.

58 We constructed an index that measured variety and frequency of actions taken to reduce household electricity usage in the afternoon and evenings using the Q22 series in 2017 survey. Chronbach's alpha=0.76. Index values range from 0 (no actions taken) to 40 (all 10 actions from Q22 reported, all reported to be taken "always"). $\bar{x}_{control}$=17.6, $x_{treatment}$=18.8, t=-7.3, p<.001

Table 5-29: Example of Question-Level Results Table

Climate Region	Segment	C	R1	R2
Moderate	Non-CARE/FERA	6%	4% ▼	4% ▼
	CARE-FERA	16%	17% ▲	17% ▲
Cool	Non-CARE/FERA	4%	3% ▼	4% ▼
	CARE-FERA	13%	14% ▲	11% ▼

Grey shading = statistical significance

5.2.1. Participation Recall Rate

When asked about their participation status in the TOU Pilot study, most surveyed SDG&E customers (between 82% and 92%) reported that they are currently participating in the study (Table 5-30). Results from comparing responses between Control and Rate groups show that a significantly higher percentage of five Rate segments reported they are currently participating compared to Control customers. In addition, slightly fewer respondents in the CARE/FERA segments reported currently participating in the study compared to those in the non-CARE/FERA segments (differences ranging between 3% and 8%).

Very few customers reported that they recently unenrolled (1% to 2%) or don't recall participating (0% to 5%). A significantly lower percentage of Non-CARE/FERA customers in the moderate region and Rate 2 customers in the cool region reported they don't recall participating. In addition, more CARE/FERA customers don't recall participating compared to non-CARE/FERA customers. These differences and the count of respondents, however, are small.

Between 7% and 14% of surveyed customers reported that they don't know if they are still participating in the study. A significantly lower percentage of the non-CARE/FERA customers in the cool region, non-CARE/FERA Rate 2 customers in the moderate region, and Rate 1 CARE/FERA customers in the moderate region did not know if they are still participating compared to the corresponding Control customers. Slightly more CARE/FERA customers did not know if they are still participating compared to non-CARE/FERA customers.

Table 5-30: TOU Study Participation Recall Rates*

Climate Region	Segment	Currently participating			Recently unenrolled			Don't know if still participating			Don't recall participating		
		C	R1	R2	C	R1	R2	C	R1	R2	C	R1	R2
Hot	General	-	-	92%	-	-	1%	-	-	7%	-	-	0%
Moderate	Non-CARE/FERA	86%	88% p	91% p	1%	1% p	1% q	11%	9% q	7% q	2%	1% q	1% q
	CARE/FERA	80%	85% p	83% p	1%	1% q	2% p	14%	10% q	12% q	5%	4% q	4% q
Cool	Non-CARE/FERA	86%	92% p	92% p	1%	1% p	1% p	12%	7% q	7% q	1%	1% q	0% q
	CARE/FERA	82%	87% p	85% p	1%	1% p	1% p	14%	10% q	12% q	4%	2% q	3% q

* Chi-square used, highlighted percentages indicate statistically significant difference versus Control group at p≤.05.

5.2.2. Customer Outreach: Bill Protection Letter

SDG&E web survey respondents in the Rate groups were provided a brief description of bill protection and asked if they understand it (Table 5-31).[93] Most respondents, between 87% and 96%, reported that they do understand bill protection. Surveyed customers in the Rate groups who responded to the web survey were also asked if they received a letter from SDG&E in the past few weeks that mentions their bill protection and if they know their bill protection ended in June or July 2017. Overall, about between 34% and 47% of respondents reported they received the letter and about half reported they know that bill protection ends in June or July (41% to 55%).

Table 5-31: Percentage of Respondents Who Reported Understanding Bill Protection, Receiving a Bill Protection Letter, and Knowing When Bill Protection Ends*

Climate Region	Segment	Understand bill protection		Received letter mentioning bill protection		Know when bill protection ends	
		R1	R2	R1	R2	R1	R2
Hot	General		94%		47%		55%
Moderate	Non-CARE/FERA	93%	93%	44%	44%	53%	52%
	CARE/FERA	89%	89%	37%	34%	45%	41%
Cool	Non-CARE/FERA	95%	96%	43%	41%	50%	49%
	CARE/FERA	87%	92%	35%	42%	42%	48%

* Asked only to web respondents in the Rate groups.

5.2.3. Satisfaction

5.2.3.1. Satisfaction with SDG&E and Rate Plan

Overall, surveyed customers reported being somewhat to mostly satisfied with SDG&E and their rate plan. Ratings were on an 11-point scale, where 0 means 'not at all satisfied' and 10 means 'extremely satisfied'. As shown in Table 5-32, customers were slightly more satisfied with SDG&E (6.5 to 8.0) than with their rate plan (5.8 to 7.6). CARE/FERA Rate 2 customers in the moderate region were slightly but significantly more satisfied with SDG&E than Control customers. All non-CARE/FERA customers, and CARE/FERA customers in the cool region, are significantly more satisfied with their rate, on average, compared to Control customers (less than one point on an 11-point scale). The trends in satisfaction are a reversal of overall trends from the first survey, which showed most Rate group customers had slightly lower satisfaction ratings. In addition, CARE/FERA and senior customers reported slightly higher average satisfaction ratings for SDG&E and the rate plan compared to non-CARE/FERA customers.

Satisfaction ratings with SDG&E were slightly lower or the same for most Control and Rate 1 group customers, and slightly higher or the same for most Rate 2 group customers, compared to 2016 survey results. Satisfaction ratings with the electricity rate is slightly higher for most customer segments compared to 2016 survey results.

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[59] SDG&E's (and SCE's) results are not comparable to the results for PG&E (Section 3.2.2) because the PG&E customers were asked a different survey question about what bill protection means.

Table 5-32: Average Level of Satisfaction with SDG&E and Their Rate Plan[a, b]

Climate Region	Segment	Satisfaction with SDG&E C	R1		R2		Satisfaction with rate C	R1		R2	
Hot	General	-	-		6.5		-	-		5.8	
Moderate	Non-CARE/FERA	6.7	6.8	p	6.8	p	6.1	6.4	p	6.4	p
	CARE/FERA	7.6	7.6	q	7.7	p	7.2	7.2	p	7.3	p
Cool	Non-CARE/FERA	6.9	7.0	p	7.1	p	6.3	6.6	p	6.5	p
	CARE/FERA	7.7	7.8	p	8.0	p	7.2	7.4	p	7.6	p

[a] Satisfaction ratings based on 11-point scale where 0 means 'not at all satisfied' and 10 means 'extremely satisfied'.

[b] T-test used, highlighted averages indicate statistically significant difference versus Control group at p≤.05.

Table 5-33 and Table 5-34 show additional statistics for Control vs. Rate group comparisons of average satisfaction with SDG&E. Table 5-35 and Table 5-36 show additional statistics for Control vs. Rate group comparisons of average satisfaction with the rate.

Table 5-33: Average Level of Satisfaction with SDG&E, Control vs. Rate 1 [a, b]

Climate Region	Segment	Control Mean	SD	n	Rate 1 Mean	SD	n	Statistics Mean Difference	Pooled SE	DF	t-stat	p-value	
Moderate	Non-CARE/FERA	6.7	2.4	765	6.8	2.4	781	0.02	0.12	1,544	0.18	0.857	p
	CARE/FERA	7.6	2.6	611	7.6	2.6	563	-0.01	0.15	1,172	-0.06	0.953	q
Cool	Non-CARE/FERA	6.9	2.2	795	7.0	2.3	773	0.05	0.11	1,566	0.45	0.655	p
	CARE/FERA	7.7	2.4	621	7.8	2.3	608	0.11	0.13	1,227	0.84	0.399	p

[a] Satisfaction ratings based on 11-point scale where 0 means 'not at all satisfied' and 10 means 'extremely satisfied'.

[b] T-test used, highlighted averages indicate statistically significant difference versus Control group at p≤.05.

Table 5-34: Average Level of Satisfaction with SDG&E, Control vs. Rate 2 [a, b]

Climate Region	Segment	Control Mean	SD	n	Rate 2 Mean	SD	n	Statistics Mean Difference	Pooled SE	DF	t-stat	p-value	
Hot	General				6.5	2.8	302						
Moderate	Non-CARE/FERA	6.7	2.4	765	6.8	2.4	1,284	0.03	0.11	2,047	0.31	0.759	p
	CARE/FERA	7.6	2.6	611	7.7	2.4	957	0.12	0.13	1,566	0.90	0.370	p
Cool	Non-CARE/FERA	6.9	2.2	795	7.1	2.2	1,345	0.17	0.10	2,138	1.73	0.083	p
	CARE/FERA	7.7	2.4	621	8.0	2.2	1,045	0.33	0.12	1,664	2.84	0.005	p

[a] Satisfaction ratings based on 11-point scale where 0 means 'not at all satisfied' and 10 means 'extremely satisfied'.

[b] T-test used, highlighted averages indicate statistically significant difference versus Control group at p≤.05.

Table 5-35: Average Level of Satisfaction with Rate, Control vs. Rate 1 [a, b]

Climate Region	Segment	Control			Rate 1			Statistics					
		Mean	SD	n	Mean	SD	n	Mean Difference	Pooled SE	DF	t-stat	p-value	
Moderate	Non-CARE/FERA	6.1	2.5	795	6.4	2.5	796	0.25	0.13	1,589	2.01	0.044	p
	CARE/FERA	7.2	2.7	643	7.2	2.7	602	0.04	0.15	1,243	0.28	0.776	p
Cool	Non-CARE/FERA	6.3	2.4	810	6.6	2.4	804	0.26	0.12	1,612	2.17	0.030	p
	CARE/FERA	7.2	2.5	641	7.4	2.5	648	0.27	0.14	1,287	1.97	0.049	p

[a] Satisfaction ratings based on 11-point scale where 0 means 'not at all satisfied' and 10 means 'extremely satisfied'.

[b] T-test used, highlighted averages indicate statistically significant difference versus Control group at p≤.05.

Table 5-36: Average Level of Satisfaction with Rate, Control vs. Rate 2 [a, b]

Climate Region	Segment	Control			Rate 2			Statistics					
		Mean	SD	n	Mean	SD	n	Mean Difference	Pooled SE	DF	t-stat	p-value	
Hot	General				5.8	2.7	313						
Moderate	Non-CARE/FERA	6.1	2.5	795	6.4	2.5	1,300	0.26	0.11	2,093	2.28	0.023	p
	CARE/FERA	7.2	2.7	643	7.3	2.5	1,008	0.12	0.13	1,649	0.93	0.355	p
Cool	Non-CARE/FERA	6.3	2.4	810	6.5	2.3	1,387	0.23	0.10	2,195	2.23	0.026	p
	CARE/FERA	7.2	2.5	641	7.6	2.4	1,096	0.42	0.12	1,735	3.43	0.001	p

[a] Satisfaction ratings based on 11-point scale where 0 means 'not at all satisfied' and 10 means 'extremely satisfied'.

[b] T-test used, highlighted averages indicate statistically significant difference versus Control group at p≤.05.

Surveyed customers were asked to rate their level of agreement with eleven aspects about their rate plan, using an 11-point scale, where 0 means 'do not agree at all' and 10 means 'completely agree'. Table 5-37 & Table 5-38 summarize the average scores for each segment, rate, and climate region.

Overall, customers reported highest average agreement that the peak and off-peak time periods are easy to remember (7.2 to 8.1), and that their electricity bill helps them understand the time of day they are spending the most on electricity (7.2 to 7.8) (Table 5-37). Customers also somewhat to mostly agreed that the rate (6.5 to 7.4) and electricity bill (6.6 to 7.4) are easy to understand, they would recommend the rate plan to friends or family (5.4 to 7.4), the rate provided opportunities to save money (5.5 to 7.2), and they want to stay on the rate plan after the study ends (6.3 to 7.4). Customers somewhat agreed that the rate is fair (5.4 to 6.8) or affordable (5.3 to 6.8), the new rate is better than their old rate (5.6 to 6.8), and the rate works with their household schedule (5.1 to 6.6). However, the differences between average ratings across the statements is less than two points on the 11-point scale.

Rate group customers in most segments reported significantly higher average agreement compared to the respective Control group customers in regards the rate is easy to understand, recommending the rate to friends/family, the rate provides opportunities to save money, and the rate is fair. Customers in three of the segments reported significantly higher average agreement regarding the rate is affordable compared to Control customers. The statistically significant differences, however, are substantively small for most comparisons (one point or less on an 11-point scale). In addition, CARE/FERA customers reported higher average agreement ratings across most of the aspects of their rate plan compared to non-CARE/FERA customers.

In addition, average agreement levels changed slightly for each statement between the first and second surveys. Average levels of agreement increased slightly for Rate group customers and decreased slightly for Control group customers across most customer segments regarding the rate giving opportunities to save money. Rate 1 customers reported slightly higher average ratings, and Control and Rate 2 customers reported slightly lower average ratings regarding the rate being affordable. Average ratings also were slightly higher for Rate group customers in the moderate region and lower for Control customers and or Rate group customers in the cool region, on average, regarding the rate being fair. Moderate region customers reported higher average ratings and cool region customers reported higher average ratings regarding wanting to stay on the rate after the study ends. On average, most customer segments reported slightly higher average ratings regarding the bill helping customers understand the time of day they're spending the most, the rate and bill being easy to understand and the new rate being better than the old rate, and reported lower average ratings regarding the peak and off-peak times being easy to remember, recommending the rate to family or friends, and the rate working with the household schedule.

Table 5-37: Average Level of Agreement with Aspects About Their Rate Plan (Aspects 1-6)[a, b, c]

Climate Region	Segment	The peak and off-peak times are easy to remember[c]			Bill hleps me understand time of day when spending most[c]			Rate is easy to understand			Bill is easy to understand			Recommend to friends or family			Rate gave opp. to save money		
		C	R1	R2	C	R1	R2	C	R1	R2	C	R1	R2	C	R1	R2	C	R1	R2
Hot	General		-	8.1		-	7.4	-	-	7.1	-	-	6.7	-	-	5.6	-	-	6.3
Moderate	Non-CARE/FERA		7.2	7.8		7.4	7.3	6.5	7.1	7.0	6.7	6.7	6.6	5.4	6.0	6.0	5.5	6.8	6.5
	CARE/FERA		7.3	7.6		7.5	7.5	6.9	7.1	7.1	7.1	7.1	7.1	6.8	7.0	7.0	6.6	7.0	7.0
Cool	Non-CARE/FERA		7.2	7.6		7.5	7.2	6.6	7.0	7.2	6.7	6.6	6.7	5.6	6.3	6.0	5.5	6.8	6.5
	CARE/FERA		7.3	7.9		7.7	7.8	6.9	7.3	7.4	7.1	7.3	7.4	6.7	7.0	7.4	6.5	7.1	7.2

[a] Agreement ratings are based on an 11-point scale where 0 means 'do not agree at all' and 10 means 'completely agree'.

[b] T-test used, highlighted averages indicate statistically significant difference versus Control group at p≤.05.

[c] Asked only to Rate groups.

Table 5-38: Average Level of Agreement with Aspects About Their Rate Plan (Aspects 7-11)[a, b, c]

Climate Region	Segment	Want to stay on rate after study ends[c]			Rate is fair			Rate is affordable			New rate is better than old rate[c]			Rate works with HH Schedule		
		C	R1	R2	C	R1	R2	C	R1	R2	C	R1	R2	C	R1	R2
Hot	General		-	6.3	-	-	5.4	-	-	5.3		-	5.6	-	-	5.1
Moderate	Non-CARE/FERA		6.6	6.5	5.6	5.9	5.8	5.4	5.7	5.6		5.9	5.9	5.7	5.6	5.5
	CARE/FERA		7.3	7.2	6.4	6.4	6.5	6.2	6.3	6.4		6.6	6.7	6.4	6.3	6.2
Cool	Non-CARE/FERA		6.6	6.3	5.7	6.1	6.0	5.7	6.0	5.8		6.0	5.7	5.8	5.8	5.6
	CARE/FERA		7.3	7.4	6.4	6.7	6.8	6.3	6.6	6.8		6.6	6.8	6.5	6.3	6.6

[a] Agreement ratings are based on an 11-point scale where 0 means 'do not agree at all' and 10 means 'completely agree'.

[b] T-test used, highlighted averages indicate statistically significant difference versus Control group at p≤.05.

[c] Asked only to Rate groups.

5.2.3.2. Perception of Bill Amount

Surveyed customers were asked to indicate how well the amount of their electricity bill aligned with their expectations during the previous six months (since December 2016). Respondents chose from the following options: higher than you expected; about the same as you expected; lower than you expected; or did not have any expectation.

Table 5-39 shows the percent of respondents reporting that their bill was higher than expected. Less than one-third customers in each segment and Rate group reported that their bills had been higher than expected. Significantly fewer CARE/FERA customers in the cool climate region reported their bills had been higher than expected compared to the Control group. There were no significant differences between other rate and control groups. In addition, the percentages of customers in the moderate region reporting higher than expected bills is lower or the same compared to the 2016 survey results. In contrast, the percentages of customer segments in the cool region is higher or the same compared to 2016 survey results.

Table 5-39: Percentage of Respondents Reporting That Their Electricity Bills Since June 2016 Have Been Higher Than They Expected*

Climate Region	Segment	Electricity Bills Higher Than Expected				
		C	R1		R2	
Moderate	Non-CARE/FERA	28%	26%	q	26%	q
	CARE/FERA	30%	26%	q	26%	q
Cool	Non-CARE/FERA	31%	29%	q	27%	q
	CARE/FERA	29%	21%	q	23%	q

* Z-test for proportions used, grey shading indicates statistically significant difference versus Control group at p≤.05.

5.2.3.3. Reason for Rate Change

When asked why SDG&E is changing rates, respondents overwhelmingly selected “to give customers an incentive to reduce electricity at times when use is high” (88% to 95%), and “to improve the reliability of the power grid and avoid power outages” (92% to 96%) (Table 5-40). Respondents chose other reasons less frequently. The least likely reason selected was “to help SDG&E make more money” (27% to 43%). Generally, more Rate group customers selected “help customer save money,” “help reduce need to build new power plants,” and “give customers an incentive to reduce usage” as a reason than the corresponding Control group, with a few significant differences. Fewer Rate customers selected “help SDG&E make more money” as a reason compared to Control customers, with two significant differences.

Table 5-40: Reasons for Why CA Utilities are Changing to TOU Rates (Reasons 1-4)[a, b]

Climate Region	Segment	Help customers save money on electricity bills			Improve reliability of the electricity power grid and avoid power outages			Better align the price customers pay for electricity to the actual cost to produce and deliver it			Help reduce the need to build new power plants		
		C	R1	R2	C	R1	R2	C	R1	R2	C	R1	R2
Hot	Non-CARE/FERA	-	-	55%	-	-	88%	-	-	56%	-	-	48%
Moderate	Non-CARE/FERA	58%	59%	57%	89%	93%	91%	65%	65%	64%	52%	54%	51%
	CARE/FERA	76%	81%	80%	91%	91%	92%	69%	75%	72%	57%	57%	60%
Cool	Non-CARE/FERA	57%	59%	56%	91%	92%	92%	65%	71%	67%	54%	62%	58%
	CARE/FERA	72%	78%	78%	93%	95%	93%	69%	72%	74%	55%	58%	59%

Climate Region	Segment	Balance the electric grid due to the growing amount of renewable energy			Give customers an incentive to reduce use at times when electricity use is high			Help utility make more money			Help utility keep energy costs down		
		C	R1	R2	C	R1	R2	C	R1	R2	C	R1	R2
Hot	Non-CARE/FERA	-	-	56%	-	-	92%	-	-	37%	-	-	57%
Moderate	Non-CARE/FERA	59%	64%	57%	94%	95%	95%	43%	41%	39%	61%	66%	64%
	CARE/FERA	67%	66%	66%	94%	94%	96%	38%	35%	35%	74%	70%	79%
Cool	Non-CARE/FERA	60%	62%	59%	95%	96%	96%	41%	36%	36%	64%	68%	66%
	CARE/FERA	66%	68%	67%	92%	96%	96%	37%	33%	27%	75%	75%	75%

[a] Z-test for proportions used, highlighted percentages indicate statistically significant difference versus Control group at p≤.05.

[b] Asked only to web respondents.

5.2.3.4. Frequency of Being Uncomfortably Hot and/or Cold in Home

This section, included in the first interim report, was moved to Section 5.1.4.3, with other health-related questions, in this second interim report.

5.2.4. Understanding How Rates Work

As a test to determine the extent to which respondents understood what influences the price of electricity on their rate, respondents were asked to identify which of five factors influences their electricity price. The correct answers varied among Control and Rate groups. The list of factors and the groups for whom the factors are correct included:

- Time of day: a correct answer for both Rate groups,
- Day of week (weekends vs. weekdays): a correct answer for Rate 1,
- Seasons: a correct answer for both Rate groups,
- Weather or temperature: an incorrect answer for all Rate and Control groups, and
- Total amount of electricity used: a correct answer for all Rate and Control groups.

Table 5-41 reports the percentage of customers that selected over half of the correct answers for their rate plan. Overall, between 33% and 58% of customers understood over half of the factors that influence their electricity rate (Table 5-25). Significantly fewer Rate 1 CARE/FERA customers selected over half the correct answers compared to the Control groups. On average, respondents in the CARE/FERA segments were least likely to select over half the correct answer(s) compared to the

corresponding non-CARE/FERA segments. In addition, more Rate 2 CARE/FERA customers selected over half the correct answers than Rate 1 CARE/FERA customers. Slightly higher percentages of customers across most customer segments selected over half the correct answers compared to results from the 2016 survey, indicating that more customers know which factors influence the price of electricity.

Table 5-41: Percentage of Respondents Who Selected Over Half of the Correct Factors that Influence the Price of Electricity on their Rate Plan[a, b]

Climate Region	Segment	% Selected Over Half the Correct Answers				
		C	R1		R2	
Hot	General	-	-		58%	
Moderate	Non-CARE/FERA	52%	49%	q	50%	q
	CARE/FERA	44%	33%	q	43%	q
Cool	Non-CARE/FERA	50%	51%	p	52%	p
	CARE/FERA	45%	36%	q	44%	q

[a] Z-test for proportions used, shading indicates statistically significant difference versus Control group at p≤.05.

[b] Factors include: Time of day, day of week, season, weather/temperature, total amount of electricity used

Rate group customers were also asked to select the hours of the day, from 12 am to 11 pm, when electricity is most expensive on their rate plan to determine the extent they know the peak hours of their rate. For both Rates groups, the correct hours are 4 pm to 9 pm.

Table 5-42 shows the percent of customers in each segment who on average, got none of the hours correct and who got over half of the hours correct. As shown, between 39% and 63% of customers selected over half of the correct hours for their rate plan, which is slightly better, on average, than their understanding of the general factors that influence the price of their electricity (Table 5-42). A much lower percentage of customers, 5% to 28%, did not select any of the correct hours. On average, respondents in the CARE/FERA segments were most likely to not select any of the correct hours of the day when electricity is most expensive, compared to the corresponding non-CARE/FERA customers.

In addition, slightly higher percentages of customers selected over half the correct answers compared to 2016 survey results. Slightly lower percentages of Rate 1 customers and higher percentages of Rate 2 customers selected no correct answers compared to the 2016 survey results. Overall, results indicate a slight improvement in most customers' understanding of peak hours, although some Rate 2 customers' understanding of rates declined.

Table 5-42: Percentage of Respondents Who Selected None or Over Half of the Correct Times of the Day When the Price of Electricity is Most Expensive on their Rate Plan*

Climate Region	Segment	% Selected No Correct Answers		% Selected Over 50% Correct Answers	
		R1	R2	R1	R2
Hot	General	-	14%	-	57%
Moderate	Non-CARE/FERA	6%	14%	61%	60%
	CARE/FERA	13%	28%	40%	39%
Cool	Non-CARE/FERA	5%	13%	61%	63%
	CARE/FERA	12%	25%	43%	39%

* Asked only to Rate groups since Control group customers' rate does not vary by time of day.

The team included a third 'understanding rates' test question in the survey about whether electricity rates are higher, lower, or the same in the summer compared to in the winter. The correct answer across all climate regions/segments/rates is electricity rates are higher in the summer.

As shown in Table 5-43, between 50% and 72% of customers selected the correct answer, that rates are higher in the summer. Significantly higher percentages of Rate group customers in all customer segments selected the correct answer compared Control customers. The second most common answer reported by customers is that rates are the same in the summer and winter (13% to 24%). Significantly fewer non-CARE/FERA Rate 1 CARE/FERA customers in the moderate region and non-CARE/FERA customers in the cool region selected this answer compared to Control customers. Slightly lower percentages of customers (4% to 16%) reported that rates are lower in the summer. A significantly lower percentage of customers in all the Rate groups selected this answer compared to respective Control customers.

Table 5-43: Percentage of Respondents Who Reported Electricity Rates Are Higher, Lower, or the Same in the Summer Compared to in the Winter [a, b]

Climate Region	Segment	Higher in summer[b]				Lower in summer				Same in summer and winter			
		C	R1	R2		C	R1	R2		C	R1	R2	
Hot	General	-	-	65%		-	-	4%		-	-	19%	
Moderate	Non-CARE/FERA	53%	63% p	61% p		9%	6% q	5% q		24%	20% q	21% q	
	CARE/FERA	61%	72% p	68% p		11%	5% q	6% q		20%	13% q	16% q	
Cool	Non-CARE/FERA	46%	63% p	57% p		15%	6% q	7% q		23%	19% q	23% q	
	CARE/FERA	50%	61% p	61% p		16%	9% q	9% q		21%	20% q	18% q	

[a] Z-test for proportions used, grey shading indicates statistically significant difference versus Control group at p≤.05.

[b] Correct answer.

5.2.5. Actions Taken

Customers were asked how frequently they took ten different actions in the afternoons and evenings to reduce or shift their electricity usage. Customers could choose always, usually, sometimes, rarely, never, or not applicable. Table 5-44 through Table 5-46 report the percentage of respondents who reported

taking the actions 'often,' which is a combination of 'always' and 'usually'. Customers who reported 'not applicable' were excluded from the analysis.

Overall, surveyed customers reported that turning off lights not in use (84% to 92%), avoiding doing laundry (42% to 75%), and/or avoiding running the dishwasher (45% to 79%) were the most common actions they took to reduce electricity usage in the afternoons and evenings. Many customers also reported that they 'often' turned off office equipment (40% to 64%), reduced using or turned off air conditioning on warm days (50% to 60%), reduced using or turned off heating on cold days (37% to 55%), and avoided running their pool/spa pump (35% to 67%). The least common actions customers reported taking were avoiding cooking (12% to 34%), turning off entertainment equipment (25% to 47%), and pre-cooling their home (17% to 39%).

Half or more of the Rate group customer segments (vs. Control group customers) reported more frequently taking all the actions, although not all comparisons are statistically significant. Trends and significant differences between rates/segments/regions were mostly unique for each action, as follows:

- *Turned off lights not in use:* no significant differences between Rate and Control groups (Table 5-44).
- *Avoided doing laundry:* significantly more customers in all Rate group segments reported taking action vs. Control group customers; on average, more Non-CARE/FERA customers (vs. CARE/FERA customers), and more moderate climate region customers (vs. cool region customers), reported taking action (Table 5-44).
- *Avoided running the dishwasher*: significantly more customers in all but one Rate group segment reported taking action (vs. Control group customers); on average, more Non-CARE/FERA customers reported taking action (vs. CARE/FERA customers) (Table 5-44).

Table 5-44: Percentage of Respondents Who Reported Taking Actions 'Often' to Reduce or Shift Their Electricity Usage in the Afternoons and Evenings (Actions 1-3)[a, b]

Climate Region	Segment	Turned off lights					Avoided laundry					Avoided dishwasher				
		C	R1		R2		C	R1		R2		C	R1		R2	
Hot	General	-	-		92%		-	-		75%		-	-		79%	
Moderate	Non-CARE/FERA	90%	91%	p	89%	q	49%	70%	p	72%	p	54%	75%	p	75%	p
	CARE/FERA	86%	88%	p	84%	q	54%	62%	p	64%	p	61%	63%	p	68%	p
Cool	Non-CARE/FERA	85%	86%	p	86%	p	42%	62%	p	65%	p	45%	67%	p	71%	p
	CARE/FERA	86%	89%	p	85%	q	49%	59%	p	59%	p	55%	66%	p	64%	p

[a] Chi-square used, highlighted percentages indicate statistically significant difference versus Control group at p≤.05.

[b] Survey responses 'usually' and 'always' combined into 'often'.

- *Turned off office equipment*: no significant differences between Rate and Control groups; on average, more CARE/FERA customers reported taking action (vs. Non-CARE/FERA customers) (Table 5-45).
- *Turned off entertainment equipment:* no significant differences between Rate and Control groups except more Rate 2 CARE/FERA customers in the cool region reported taking action (vs.

Control group customers); on average, more CARE/FERA customers reported taking action (vs. non-CARE/FERA customers) (Table 5-45).

- *Avoided cooking*: no significant differences between Rate and Control groups except more Rate 1 CARE/FERA customers in the moderate region reported taking action (vs. Control group customers); on average, more CARE/FERA customers reported taking action (vs. non-CARE/FERA customers) (Table 5-45).

Table 5-45: Percentage of Respondents Who Reported Taking Actions 'Often' to Reduce or Shift Their Electricity Usage in the Afternoons and Evenings (Actions 4-6)[a, b]

Climate Region	Segment	Turned off office equipment						Turned off entertainment equipment						Avoided cooking					
		C	R1		R2			C	R1		R2			C	R1		R2		
Hot	General	-	-		53%			-	-		30%			-	-		28%		
Moderate	Non-CARE/FERA	46%	46%	p	46%	p		31%	31%	p	29%	q		17%	18%	p	21%	p	
	CARE/FERA	61%	64%	p	61%	p		43%	47%	p	47%	p		25%	34%	p	30%	p	
Cool	Non-CARE/FERA	41%	41%	p	40%	q		28%	26%	q	25%	q		12%	14%	p	14%	p	
	CARE/FERA	56%	57%	p	61%	p		41%	44%	p	47%	p		23%	26%	p	28%	p	

[a] Chi-square used, highlighted percentages indicate statistically significant difference versus Control group at p≤.05.

[b] Survey responses 'usually' and 'always' combined into 'often'.

- *Reduced using or turned off AC in warm afternoons/evenings:* no significant differences between Rate and Control groups; slightly more moderate region customers reported taking action, on average (vs. cool region customers) (Table 5-46).

- *Reduced using or turned off heating in hold afternoons/evenings*: no significant differences between Rate and Control groups; on average, more non-CARE/FERA customers (vs. non-CARE/FERA customers) and more moderate region customers (vs. cool region customers) reported taking action (Table 5-46).

- *Pre-cooled home earlier in the day*: significantly more Rate 2 Non-CARE/FERA customers reported taking action (vs. Control group customers); on average, more CARE/FERA customers (vs. non-CARE/FERA customers), and more moderate region customers (vs. cool region customers) reported taking action (Table 5-46).

- *Avoided running pool or spa pump*: significantly more Rate 1 and 2 non-CARE/FERA customers in the moderate climate region and Rate 2 non-CARE/FERA customers in the cool region reported taking action (vs. Control group customers); on average, more non-CARE/FERA customers (vs. CARE/FERA customers), and more moderate region customers (vs. cool region customers) reported taking action (Table 5-46).

Table 5-46: Percentage of Respondents Who Reported Taking Actions 'Often' to Reduce or Shift Their Electricity Usage in the Afternoons and Evenings (Actions 7-10)[a, b]

Climate Region	Segment	Reduced using or turned off AC in warm afternoons/evenings				Reduced using or turned off heating in cold afternoons/evenings				Pre-cooled home				Avoided pool/spa pump			
		C	R1		R2	C	R1		R2	C	R1		R2	C	R1		R2
Hot	General	-	-		52%	-	-		44%	-	-		39%	-	-		66%
Moderate	Non-CARE/FERA	55%	57%	p	58% p	47%	47%	q	46% q	21%	26%	p	27% p	46%	66%	p	67% p
	CARE/FERA	55%	60%	p	56% p	54%	55%	p	53% q	31%	36%	p	36% p	46%	42%	q	53% p
Cool	Non-CARE/FERA	50%	53%	p	51% p	37%	39%	p	38% p	21%	17%	q	19% q	43%	47%	p	58% p
	CARE/FERA	50%	53%	p	54% p	49%	50%	p	49% q	27%	28%	p	33% p	35%	47%	p	45% p

[a] Chi-square used, highlighted percentages indicate statistically significant difference versus Control group at p≤.05.

[b] Survey responses 'usually' and 'always' combined into 'often'.

Respondents had the option provide a 'Not Applicable' (NA) response to all the actions taken asked in the survey. These NA responses can serve as a rough proxy measure of whether respondents have air conditioning, laundry, or dishwashers in their home. While not a perfect measure of availability in the home, these responses indicate that, when compared to non-CARE/FERA households, more CARE/FERA households indicated NA for avoiding laundry use, avoiding dishwasher use, turning off office equipment, reducing using or turning off heating, and pre-cooling the home (Table 5-47). A similar proportion of CARE/FERA and non-CARE/FERA households indicated NA to their ability to turn off lights and entertainment equipment, avoid cooking, reduce using or turn off air conditioning, and avoid using pool/spa pump.

Table 5-47: Not Applicable Responses for Key Actions Taken by Segment

Climate Region	Segment	Turned off lights	Avoided laundry	Avoided dishwasher	Turned off office equipment	Turned off entertainment equipment	Avoided cooking	Reduced using/turned off AC on warm days	Reduced using/turned off heating on cold days	Pre-cooled home	Avoided pool/spa pump
Hot	General	1%	4%	28%	10%	4%	4%	18%	9%	24%	72%
Moderate	Non-CARE/FERA	1%	5%	17%	7%	5%	2%	15%	6%	19%	79%
	CARE/FERA	1%	19%	37%	17%	7%	3%	17%	10%	25%	77%
Cool	Non-CARE/FERA	1%	7%	18%	7%	5%	2%	41%	9%	46%	82%
	CARE/FERA	1%	22%	44%	18%	7%	3%	40%	15%	49%	83%

5.2.5.1. Persistence of Taking Action(s)

To measure whether customers persisted in taking actions between the first and second surveys, the team performed a simple comparison by subtracting the percentage in the first survey from the percentage in the second survey. The results in Table 5-48 to Table 5-50 show the differences in percentages, in which positive numbers indicate respondents persisted in taking actions and negative numbers indicate respondents took actions less frequently after the first survey.[94] In addition, two actions in the first survey – "increased thermostat temperature" and "turned off air conditioning" – were replaced by "reduced using or turned off air conditioning" and "reduced using or turned off heating," and are not directly comparable.

[60] The tables show descriptive results only and do not include tests for statistical significance. The team will report significance tests in the final report.

There are few overall trends in the results and differences vary substantially for most actions across climate regions/segments/rate groups. Half or more customer segments persisted in turning off the lights, office equipment, and entertainment equipment, and pre-cooling the home, and half or more of the customer segments did not persist in avoiding laundry, dishwasher, cooking and pool/spa pump. Overall, Rate group customers showed more or the same persistence of taking actions compared to Control customers, with a few exceptions.

Table 5-48: Differences in the Percentage of Respondents Who Reported Taking Action in between the First and Second Surveys (Actions 1-3) [a, b]

Climate Region	Segment	Turned off lights			Avoided laundry			Avoided dishwasher		
		C	R1	R2	C	R1	R2	C	R1	R2
Hot	General	-	-	-2%	-	-	-2%	-	-	1%
Moderate	Non-CARE/FERA	2%	0%	1%	-6%	-2%	0%	-5%	0%	-3%
	CARE/FERA	-2%	0%	-3%	-4%	-5%	-3%	-3%	-6%	-4%
Cool	Non-CARE/FERA	-1%	1%	0%	-7%	-7%	-4%	-6%	-4%	-3%
	CARE/FERA	-2%	2%	-4%	-9%	-7%	-7%	-1%	-5%	-6%

[a] Results are from subtracting the percentage in the first survey from the percentage in the second survey, in which positive numbers indicate persistence of taking action.

[b] Descriptive results only, does not include test for statistical significance.

Table 5-49: Differences in the Percentage of Respondents Who Reported Taking Action in between the First and Second Surveys (Actions 4-6) [a, b]

Climate Region	Segment	Turned off office equipment			Turned off entertainment equipment			Avoided cooking		
		C	R1	R2	C	R1	R2	C	R1	R2
Hot	General	-	-	3%	-	-	2%	-	-	0%
Moderate	Non-CARE/FERA	-1%	0%	0%	0%	0%	0%	-3%	-7%	-3%
	CARE/FERA	-4%	5%	1%	-4%	5%	2%	-8%	2%	-3%
Cool	Non-CARE/FERA	0%	3%	0%	-4%	-3%	-1%	-3%	-4%	-5%
	CARE/FERA	1%	-3%	0%	-2%	-1%	0%	-8%	-9%	-4%

[a] Results are from subtracting the percentage in the first survey from the percentage in the second survey, in which positive numbers indicate persistence of taking action.

[b] Descriptive results only, does not include test for statistical significance.

Table 5-50: Differences in the Percentage of Respondents Who Reported Taking Action in between the First and Second Surveys (Actions 7-8) [a, b, c]

Climate Region	Segment	Pre-cooled home			Avoided pool/spa pump		
		C	R1	R2	C	R1	R2
Hot	General	-	-	3%	-	-	3%
Moderate	Non-CARE/FERA	-4%	-1%	-1%	-2%	3%	0%
	CARE/FERA	1%	0%	0%	-2%	-8%	1%
Cool	Non-CARE/FERA	4%	-3%	-5%	-1%	-9%	5%
	CARE/FERA	0%	-5%	0%	-12%	8%	-5%

[a] Results are from subtracting the percentage in the first survey from the percentage in the second survey, in which positive numbers indicate persistence of taking action.

[b] The actions "reduced or turned off AC" and "reduced or turned off heating" were not included in the first survey; they replaced the actions "increased temperature on thermostat" and "turned off air conditioning" and are not directly comparable.

[c] Descriptive results only, does not include test for statistical significance.

5.2.5.2. Ease of Taking Action(s)

Overall, customers reported that taking actions to reduce or shift their electricity usage in the afternoons and evenings were somewhat easy (Table 5-51). On a scale of 0 to 10, where 0 means 'not at all easy' and 10 means 'extremely easy', customers reported an average rating between 6.0 and 6.8 across the groups and segments. CARE/FERA customers in the cool region reported significantly greater ease to taking actions, on average, compared to the Control group. CARE/FERA customers also reported slightly greater ease to taking actions than non-CARE/FERA customers. These differences, however, are substantively small (less than one point on an 11-point scale). In addition, most customer segments, except non-CARE/FERA Rate 1 and 2 customers in the moderate region reported slightly lower or the same average level of ease of taking actions compared to the 2016 survey results.

Table 5-51: Respondents' Average Level of Ease of Taking Energy Saving Actions in the Afternoons and Evenings [a, b]

Climate Region	Segment	Ease of taking action				
		C	R1		R2	
Hot	General	-	-		6.2	
Moderate	Non-CARE/FERA	6.0	6.2	p	6.2	p
	CARE/FERA	6.4	6.4	p	6.3	q
Cool	Non-CARE/FERA	6.0	6.2	p	6.2	p
	CARE/FERA	6.4	6.8	p	6.8	p

[a] Level of ease ratings are based on an 11-point scale where 0 means 'not at all easy' and 10 means 'extremely easy'.

[b] T-test used, highlighted averages indicate statistically significant difference versus Control group at p≤.05.

5.2.5.3. Barriers to Taking Action(s)

Respondents were also asked which of 10 barriers keep them from reducing or shifting their electricity usage in the afternoons and evenings (Table 5-52 to Table 5-54).[95] Across the climate regions and segments, the most common barriers to reducing or shifting electricity usage during the afternoons and evenings reported by customers include the respondent doing all they can (31% to 49%), the household already using very little electricity (28% to 37%), the respondent being home most of the day (15% to 27%), and the home gets uncomfortable if less electricity is used (12% to 25%). The least common barriers reported by customers include having old appliances (9% to 16%), not knowing what actions to take (3% to 9%), their schedule not allowing them to reduce usage (8% to 16%), and the presence of children (11% to 20%), elderly (5% to 10%), or disabled member(s) in the household (3% to 9%).

There is some variation between rates/segments/regions but trends were mostly unique for each barrier, as follows:

- *Respondent has done all they can do*: significantly more non-CARE/FERA customers in the cool region reported the barrier (vs. Control group customers); slightly more CARE/FERA customers (vs. non-CARE/FERA customers) and moderate region customers (vs. cool region customers) reported the barrier, on average (Table 5-52).
- *Household already uses little electricity*: significantly fewer Rate 2 non-CARE/FERA and CARE/FERA customers in the moderate region reported the barrier (vs. Control group customers); more CARE/FERA customers (vs. non-CARE/FERA customers) and more cool region customers (vs. moderate region customers) reported the barrier, on average (Table 5-52). A lower percentage of respondents reported this barrier across most customer segments compared to the 2016 survey results.
- *Home gets uncomfortable*: no significant differences between Rate and Control groups; fewer customers in the cool region (vs. moderate climate region customers) reported the barrier, on average (Table 5-52). A slightly lower percentage of customers across most customer segments reported this barrier compared to the 2016 survey results.

[61] The original list of barriers includes 11 barriers but one was excluded from the report. 'Nothing prevents customers from reducing/shifting usage' is not a 'barrier' but provides respondents an answer option.

Table 5-52: Percentage of Respondents Who Reported Barriers to Reducing or Shifting Their Electricity Use During Afternoons and Evenings (Barriers 1-3)[a, b]

Climate Region	Segment	I have done all I can do			My household already uses very little electricity			My home gets uncomfortable if I try to reduce electricity usage		
		C	R1	R2	C	R1	R2	C	R1	R2
Hot	General	-	-	41%	-	-	28%	-	-	25%
Moderate	Non-CARE/FERA	38%	42%	40%	32%	28%	28%	20%	20%	19%
	CARE/FERA	45%	48%	49%	35%	32%	31%	16%	20%	18%
Cool	Non-CARE/FERA	31%	39%	37%	36%	33%	34%	14%	12%	13%
	CARE/FERA	41%	44%	44%	37%	37%	34%	15%	12%	12%

[a] Used chi-square, highlighted percentages indicate statistically significant difference versus Control group at p≤.05.

[b] Respondents could select more than one item, and respondents who selected all items or items mutually exclusive are excluded from the results.

- *Respondent at home or works from home most of the day*: no significant differences between Rate and Control groups except more Rate 2 CARE/FERA customers in the moderate region reported the barrier (vs. Control group customers); more non-CARE/FERA customers (vs. CARE/FERA customers) reported the barrier, on average (Table 5-53). Lower percentages of respondents across all customer segments reported this barrier compared to the 2016 survey results for "I am at home most of the day" but lower percentages reported this barrier compared to the 2016 survey results for "working from home makes it difficult to use less electricity."
- *Presence of elderly household member(s)*: no significant differences between Rate and Control groups; more customers in the moderate climate region reported the barrier, on average (vs. cool region customers) (Table 5-53). Slightly higher percentages some customer segments and slightly lower percentages of others reported this barrier compared to the 2016 survey results, with no clear trends between regions/segments/rates.
- *Children in household:* no significant differences between Rate and Control groups except more Rate 1 non-CARE/FERA customers in the cool region reported the barrier (vs. Control group customers); more CARE/FERA customers reported the barrier, on average (vs. non-CARE/FERA customers) (Table 5-53). Slightly lower or the same percentages of respondents across most customer segments reported this barrier compared to the 2016 survey results.

Table 5-53: Percentage of Respondents Who Reported Barriers to Reducing or Shifting Their Electricity Use During Afternoons and Evenings (Barriers 4-6)[a, b]

Climate Region	Segment	I am at home or work from home most of the day			Elderly household member makes it difficult to change our routines			Child(ren) in household make it difficult to change our routines		
		C	R1	R2	C	R1	R2	C	R1	R2
Hot	General	-	-	23%	-	-	10%	-	-	14%
Moderate	Non-CARE/FERA	24%	24%	24%	7%	9%	8%	15%	16%	15%
	CARE/FERA	15%	19%	19%	8%	10%	10%	20%	20%	19%
Cool	Non-CARE/FERA	24%	27%	26%	6%	5%	6%	11%	14%	13%
	CARE/FERA	20%	22%	18%	10%	8%	8%	15%	15%	16%

[a] Used chi-square, highlighted percentages indicate statistically significant difference versus Control group at p≤.05.

[b] Respondents could select more than one item, and respondents who selected all items or items mutually exclusive are excluded from the results.

- *Old appliances use lots of energy*: no significant differences between Rate and Control groups; more CARE/FERA customers reported the barrier, on average (vs. non-CARE/FERA customers) (Table 5-54). Slightly higher percentages some customer segments and slightly lower percentages of others reported this barrier compared to the 2016 survey results, with no clear trends between regions/segments/rates.
- *Doesn't know what actions to take*: significantly fewer non-CARE/FERA customers in the moderate region and all customers in the cool region reported the barrier (vs. Control group customers); more CARE/FERA customers reported the barrier, on average (vs. non-CARE/FERA customers) (Table 5-54). Slightly lower percentages of respondents across most customer segments reported this barrier compared to the 2016 survey results for "I can't think of anything else to do."
- *Schedule doesn't allow it*: significantly more non-CARE/FERA customers in the moderate region reported the barrier (vs. Control groups); more non-CARE/FERA customers reported the barrier, on average (vs. CARE/FERA customers) (Table 5-54). Slightly lower percentages of respondents across most customer segments reported this barrier compared to the 2016 survey results.
- *Presence of disabled household member(s)*: no significant differences between Rate and Control groups; more CARE/FERA customers reported the barrier, on average (vs. non-CARE/FERA customers) (Table 5-54). Slightly higher percentages some customer segments and slightly lower percentages of others reported this barrier compared to the 2016 survey results, with no clear trends between regions/segments/rates.

Table 5-54: Percentage of Respondents Who Reported Barriers to Reducing or Shifting Their Electricity Use During Afternoons and Evenings (Barriers 7-10)[a, b]

Climate Region	Segment	I have old appliances that use a lot of energy			I don't know what actions to take			My schedule doesn't allow me to reduce my usage			Disabled household member makes it difficult to change our routines		
		C	R1	R2	C	R1	R2	C	R1	R2	C	R1	R2
Hot	General	-	-	15%	-	-	3%	-	-	11%	-	-	7%
Moderate	Non-CARE/FERA	11%	10%	11%	8%	3%	4%	12%	15%	15%	3%	3%	4%
	CARE/FERA	13%	16%	13%	9%	9%	7%	8%	11%	10%	9%	8%	9%
Cool	Non-CARE/FERA	10%	9%	9%	6%	3%	3%	13%	15%	16%	4%	3%	3%
	CARE/FERA	14%	15%	14%	9%	5%	7%	10%	11%	12%	9%	7%	7%

[a] Used chi-square, highlighted percentages indicate statistically significant difference versus Control group at p≤.05.

[b] Respondents could select more than one item, and respondents who selected all items or items mutually exclusive are excluded from the results.

5.2.6. General Attitudes and Awareness Towards Demand Response-related Actions

SDG&E respondents rated their agreement with five statements designed to measure respondents' attitudes towards shifting or reducing their energy usage using an 11-point scale with 0 meaning "do not agree at all" and 10 meaning "completely agree" (Table 5-55).[96] The statements were designed to capture respondents' ability to manage and plan their usage, intention to conserve, responsibility to conserve, and concern about their electricity bill.

Surveyed customers provided moderate ratings, 5.0 to 6.5, to the statement "I can better manage my electricity bill by changing when I use electricity" (Table 5-55). When comparing responses between Control and Rate groups, all Rate group customer segments reported statistically significantly higher ratings than the Control groups. CARE/FERA customers provided slightly higher agreement ratings to the statement compared to those in the non-CARE/FERA customers.

Respondents also provided moderate ratings, 4.5 to 6.2, to the statement "I can consistently plan my electricity use based on the time of day" (Table 5-55). When comparing responses between Control and Rate groups, all Rate group customer segments reported statistically significantly higher ratings than the Control groups. CARE/FERA customers provided slightly higher agreement ratings to the statement compared to non-CARE/FERA customers.

Survey respondents provided moderate to high ratings, 6.4 to 7.6, to the statement "I conserved electricity in my home this summer" (Table 5-55). When comparing responses between Control and Rate treatment groups, all Rate group customer segments rated their agreement significantly higher than their corresponding Control groups. In addition, average levels of agreement were slightly lower across most customer segments compared to results from the 2016 survey.

62 The first statement, "I often worry whether there is enough money to pay my electricity bill," was used in the economic index and is reported in Section 5.1.4.1.

Respondents provided moderate to high ratings, 6.8 to 8.1, to the statement "if my electricity bill goes up, I feel I must do something to reduce it" (Table 5-55). CARE/FERA customers on Rate 1 in the moderate region reported a significantly higher average rating compared to Control customers. Respondents in the CARE/FERA segments provided slightly higher agreement ratings to the statement compared to those in the non-CARE/FERA segments. In addition, average levels of agreement were slightly lower across most customer segments compared to 2016 survey results.

Table 5-55: Average Level of Agreement with Attitudinal Statements Related to Adopting Energy Saving Behaviors*

Climate Region	Segment	I can better manage my electricity bill by changing when I use electricity			I can consistently plan my electricity use based on the time of day			I conserved electricity in my home the past six months			If my electricity bill goes up, I feel I must do something to reduce it		
		C	R1	R2	C	R1	R2	C	R1	R2	C	R1	R2
Hot	General	-	-	6.0	-	-	5.8	-	-	7.6	-	-	7.4
Moderate	Non-CARE/FERA	5.0	6.3	6.2	4.6	5.6	5.7	6.7	7.2	7.1	7.2	7.3	7.3
	CARE/FERA	5.8	6.4	6.5	5.4	6.1	6.1	6.6	7.2	7.2	7.8	8.1	7.9
Cool	Non-CARE/FERA	5.1	6.2	6.0	4.5	5.5	5.3	6.4	7.1	6.8	6.8	6.9	6.8
	CARE/FERA	5.7	6.5	6.5	5.4	5.9	6.2	6.9	7.3	7.2	7.8	7.8	7.8

* Used t-test, highlighted averages indicate statistically significant difference versus Control group at p≤.05.

5.2.7. Demographic Characteristics

This section summarizes the responses to demographic characteristics questions contained in the survey and trends in differences between segments.[97]

5.2.7.1. Respondent Age

The team did not include a question about age on the second survey. Please refer to the first interim report for age characteristics (Table 6.5-37), and add one to the results to update the current respondent age for 2017.

5.2.7.2. Respondent Educational Attainment (Table 5-56)

- A tech degree or less was the most commonly reported level of education for low income segments and a two-year degree or more was most common among non-CARE/FERA segments. Non-CARE/FERA customers in the moderate and cool climate regions were the most highly educated group, with around three-fifths to three-quarters reporting that they had a four-year or graduate/professional degree (66% and 76%, respectively).
- CARE/FERA customers were under-representative of California households with a high school diploma or less (22 & 27% vs. 38% for ACS 2015 5-year estimates) while non-CARE/FERA customers were over-representative of Californians with a graduate degree (35 & 43% vs. 11% for ACS 5-year estimates).

63 Trend analyses did not include tests for statistical significance and are based on observation of the differences in values.

Table 5-56: Respondents' Educational Attainment*

Climate Region	Segment	Some HS	HS Diploma	Some College	Tech. College	Two-year Degree	Four-year Degree	Grad Degree
Hot	General	1%	11%	25%	9%	8%	21%	25%
Moderate	Non-CARE/FERA	1%	4%	16%	5%	7%	31%	35%
	CARE/FERA	10%	17%	25%	9%	10%	18%	11%
Cool	Non-CARE/FERA	1%	3%	12%	4%	5%	33%	43%
	CARE/FERA	10%	12%	23%	8%	9%	23%	15%

* Asked only to web respondents in 2017.

5.2.7.3. Annual Household Income (Table 5-57)

- CARE/FERA surveyed customers had lower annual household incomes compared to non-CARE/FERA and other customers: in both the moderate and cool climate regions, more than half reported earning less than $25,000 per year, compared to five percent of non-CARE/FERA customers.
- On average, most non-CARE/FERA customers made more than $50,000/year across all Rate groups. Conversely, nearly all CARE/FERA customers made less than $50,000/year across all Rate groups.

Table 5-57: Annual Household Income

Climate Region	Segment	Less than $12k	$12k to < $17k	$17k to < $21k	$21k to < $25k	$25k to < $29k	$29k to < $33k	$33k to < $37k	$37k to < $41k	$41k to < $50k	$50k to < $100k	$100k or more
Hot	General	3%	4%	4%	6%	5%	7%	6%	3%	10%	32%	21%
Moderate	Non-CARE/FERA	1%	1%	1%	2%	2%	3%	4%	4%	10%	37%	34%
	CARE/FERA	17%	15%	11%	12%	9%	8%	6%	5%	7%	9%	2%
Cool	Non-CARE/FERA	1%	1%	1%	2%	2%	3%	2%	4%	8%	33%	43%
	CARE/FERA	14%	14%	11%	12%	10%	9%	5%	5%	8%	10%	1%

5.2.7.4. Respondent Employment Status (Table 5-58)

- Most surveyed customers were either employed full or part time, or were retired.
- Non-CARE/FERA customers in the moderate and cool climate regions were most likely to be employed full-time.
- CARE/FERA customers were most likely be unable to work due to a disability or unemployed, compared to non-CARE/FERA segments.

Table 5-58: Respondents' Employment Status*

Climate Region	Segment	Employed full-time	Employed part-time	Seasonally Employed	Employed in non-daytime shifts	Unemployed, looking for work	Unemployed, not looking for work	Homemaker	Student	Retired	Can't work (disability)
Hot	General	36%	10%	3%	0%	4%	1%	7%	2%	47%	4%
Moderate	Non-CARE/FERA	54%	10%	1%	1%	1%	1%	5%	2%	33%	2%
	CARE/FERA	36%	17%	2%	2%	6%	3%	7%	6%	27%	15%
Cool	Non-CARE/FERA	57%	8%	1%	1%	2%	1%	4%	2%	31%	2%
	CARE/FERA	38%	18%	3%	1%	5%	2%	7%	5%	27%	13%

* Allows for multiple responses, rows may not add to 100%.

5.2.7.5. Major Life Changes Since December 2016 (Table 5-59)

- Most surveyed customers across all Rate groups and segments reported not experiencing any of the four "life changes" items on the survey.
- On average, the most commonly reported "life change" was having work hours or pay reduced.
- CARE/FERA customers were more likely to report having experienced one of the four "life changes" items on the survey when compared to the corresponding non-CARE/FERA segments.

Table 5-59: Life Changes Since December 2016

Climate Region	Segment	Became unemployed	Hours or pay reduced	Cared for elderly or disabled	Became disabled or seriously ill	None of the above
Hot	General	7%	8%	8%	9%	76%
Moderate	Non-CARE/FERA	9%	10%	7%	6%	74%
	CARE/FERA	13%	16%	10%	14%	57%
Cool	Non-CARE/FERA	9%	10%	7%	5%	75%
	CARE/FERA	14%	19%	11%	12%	56%

5.2.7.6. Households with Members Who are Disabled (Table 5-60)

- 25% or less of surveyed customers reported a household member who receives disability payments or has a serious medical condition.
- A higher proportion of respondents reported a household member having a serious disability than reported a household member receiving disability payments.
- CARE/FERA customers were more likely to report a household member having a serious disability or who received disability payments than non-CARE/FERA customers.

Table 5-60: Household Member(s) with Serious Medical Condition and/or Disability Payments

Climate Region	Segment	Has serious medical condition	Receives disability payments
Hot	General	18%	9%
Moderate	Non-CARE/FERA	14%	7%
	CARE/FERA	25%	20%
Cool	Non-CARE/FERA	12%	5%
	CARE/FERA	23%	16%

5.2.7.7. Disability Requirements (Table 5-61)

- The most commonly reported disability requirement was the need for someone in the household to stay home for most the day, followed by the need to cool the home on warm days; few (3%-7%) of respondents reported that they needed to use more energy for medical equipment.
- CARE/FERA customers were most likely to report having disability requirements across both climate regions.
- CARE/FERA customers in the moderate climate region were most likely to state that they need their home to be cooled on warm days, but also reported that they use electricity for medical equipment and have a member of the household who needs to stay home for most the day.

Table 5-61: Requirements for Households with Disabled Residents

Climate Region	Segment	Need home cooled on warm days	Need home heated on cools days	Need more energy for medical equip	Need to be home most of the day
Hot	General	14%	12%	5%	19%
Moderate	Non-CARE/FERA	10%	9%	4%	17%
	CARE/FERA	24%	19%	8%	31%
Cool	Non-CARE/FERA	7%	8%	3%	14%
	CARE/FERA	15%	14%	6%	26%

5.2.7.8. Household Size (Table 5-62 and Table 5-63)

- On average, most surveyed customers reported a household size of around three people or less across all segments and climate regions.
- CARE/FERA customers in the moderate region reported the largest household size of 3.01 and an inter-quartile range from 1 to 4.
- CARE/FERA customers had slightly more people in their households compared to non-CARE/FERA customers.

Table 5-62: Average Household Size*

Climate Region	Segment	Mean	Inter-Quartile Range		
			Percentile 25	Median	Percentile 75
Hot	General	2.47	2	2	3
Moderate	Non-CARE/FERA	2.61	2	2	3
	CARE/FERA	3.01	1	3	4
Cool	Non-CARE/FERA	2.38	2	2	3
	CARE/FERA	2.66	1	2	4

* Results are based on weighted averages across all four RCT groups (Control, Rate 1, and Rate 2).

- At least half of respondents in all climate regions and segments reported having at least one senior (over 64) in their household.
- Across all climate regions, a higher percentage of low-income respondents, compared to non-CARE/FERA and senior respondents, reported having children in their household.

Table 5-63: Percentage of Respondents with Children and/or Seniors in the Household*

Climate Region	Segment	Children under 6	Children under 18	Seniors over 64
Hot	General	18%	31%	71%
Moderate	Non-CARE/FERA	22%	31%	55%
	CARE/FERA	31%	45%	50%
Cool	Non-CARE/FERA	17%	22%	49%
	CARE/FERA	25%	36%	48%

* Allows for multiple responses, may not add up to 100%.

5.2.7.9. Respondent Race & Ethnicity (Table 5-64)

- Overall, web respondents were most to least likely to report being White, Hispanic, Asian, and African American, respectively.
- CARE/FERA customers were less likely to report being White.
- There were fewer Asian respondents in the hot climate region compared to moderate and cool climate regions.

Table 5-64: Respondents' Race and Ethnicity*

Climate Region	Segment	American Indian or Alaska Native	Asian	African American	Hispanic	Native Hawaiian or Pacific Islander	Middle Eastern or North African	White	Some other race-ethnicity
Hot	General	5%	2%	3%	6%	0%	0%	89%	2%
Moderate	Non-CARE/FERA	3%	25%	7%	23%	2%	3%	81%	3%
	CARE/FERA	4%	24%	19%	42%	3%	11%	57%	4%
Cool	Non-CARE/FERA	2%	25%	4%	16%	1%	4%	85%	3%
	CARE/FERA	5%	20%	14%	49%	2%	4%	67%	5%

* Allows for multiple responses, may not add up to 100%.

5.2.8. Household Characteristics

This section summarizes the responses to household characteristics questions contained in the survey and trends in differences between segments.[98]

5.2.8.1. Times Home is Occupied on Weekends & Weekdays (Table 5-65)

- Nearly all respondents reported that there was someone home during the evening and night throughout the week.
- Fewer respondents reported their home being occupied in the mornings and afternoons on both the weekends and weekdays compared to evening and nights.
- Morning and afternoon occupancy is higher on weekends than on weekdays.
- Customers in cool and moderate climate region reported the lowest level of occupancy throughout the morning and afternoons compared to hot region customers.

Table 5-65: Times of the Day When Home is Occupied on Weekdays and Weekends During the Past Six Months

Climate Region	Segment	Weekday				Weekend			
		Morning	Afternoon	Evening	Night	Morning	Afternoon	Evening	Night
Hot	General	86%	84%	96%	97%	94%	93%	98%	98%
Moderate	Non-CARE/FERA	81%	76%	97%	99%	97%	92%	96%	99%
	CARE/FERA	83%	82%	95%	97%	94%	90%	93%	97%
Cool	Non-CARE/FERA	82%	74%	96%	99%	96%	90%	95%	98%
	CARE/FERA	83%	79%	94%	97%	94%	87%	92%	96%

5.2.8.2. Own or Rent Home (Table 5-66)

- Most non-CARE/FERA surveyed customers reported owning their home.
- CARE/FERA customers were more likely to report renting their home and receiving subsidized housing assistance, such as Section 8, compared to non-CARE/FERA customers.
- Customers in the hot climate region were more likely to report owning their home compared to moderate or cool climate region customers.

64 Trend analyses did not include tests for statistical significance and are based on observation of the differences in values.

Table 5-66: Home Ownership Status

Climate Region	Segment	Own	Rent without subsidies	Rent with subsidies
Hot	General	85%	14%	1%
Moderate	Non-CARE/FERA	77%	23%	0%
	CARE/FERA	34%	53%	13%
Cool	Non-CARE/FERA	70%	29%	0%
	CARE/FERA	31%	56%	13%

5.2.8.3. Type of Housing (Table 5-67)

- Most surveyed customers reported living in a single-family detached home, followed by apartments or condominiums.
- CARE/FERA customers in the moderate and cool regions were most likely to report living in an apartment or condominium than non-CARE/FERA customers.
- Customers in the hot region were more likely to report living in a manufactured or mobile home compared to the customers in the moderate or cool climate regions.

Table 5-67: Housing Type

Climate Region	Segment	Single-Family Detached	2 to 4 plex	Apt or condo	Townhome	Man. or mobile home, or mobile unit
Hot	General	85%	0%	4%	0%	11%
Moderate	Non-CARE/FERA	64%	3%	23%	8%	1%
	CARE/FERA	35%	6%	50%	6%	3%
Cool	Non-CARE/FERA	54%	6%	31%	8%	1%
	CARE/FERA	31%	10%	53%	5%	1%

5.2.8.4. Number of Bedrooms in Home

The team did not include a question about the number of bedrooms in the respondents' home. Please refer to the first interim report for number of bedrooms in the respondents' home (Table 6.5-49).

5.2.8.5. Cooling Equipment in Home (Table 5-68)

- A large majority of surveyed customers reported having and using ceiling or portable fans in their home.
- Non-CARE/FERA customers in hot and moderate regions were more likely to report having central air-conditioning unit in their home, and report using it more frequently compared to cool climate region customers.
- More CARE/FERA customers reported having a room air conditioning unit or other cooling equipment and fewer reported central air conditioning or fans compared to non-CARE/FERA customers.

Table 5-68: Cooling Equipment in Home and Frequency of Use*

Item	Install & Use	Hot	Moderate		Cool	
		General	Non-CARE/FERA	CARE/FERA	Non-CARE/FERA	CARE/FERA
Central air-conditioning	Have in home	67%	72%	42%	42%	22%
	Daily	19%	12%	14%	10%	8%
	Several days a week	25%	22%	22%	13%	14%
	Several days a month	34%	41%	27%	36%	20%
	Never	18%	18%	22%	24%	30%
	Not applicable	5%	7%	15%	18%	28%
Room air conditioning unit	Have in home	25%	20%	38%	19%	27%
	Daily	11%	8%	14%	6%	11%
	Several days a week	24%	12%	24%	12%	18%
	Several days a month	20%	24%	26%	24%	24%
	Never	31%	24%	20%	28%	25%
	Not applicable	15%	32%	16%	30%	22%
Ceiling or portable fans	Have in home	96%	89%	82%	86%	80%
	Daily	62%	48%	49%	37%	41%
	Several days a week	22%	29%	28%	27%	28%
	Several days a month	14%	18%	15%	26%	20%
	Never	1%	2%	5%	6%	6%
	Not applicable	1%	2%	3%	3%	5%
Other cooling equipment	Have in home	20%	11%	14%	8%	11%
	Daily	26%	12%	17%	11%	14%
	Several days a week	11%	11%	15%	10%	13%
	Several days a month	12%	10%	10%	9%	8%
	Never	23%	23%	25%	26%	26%
	Not applicable	28%	44%	33%	44%	39%

* Allows for multiple responses, columns may not add to 100%.

5.2.8.6. Heating Equipment in Home (Table 5-69)

- Overall, most respondents were likely to have a gas furnace in their home, while few respondents indicated they had baseboard heating.
- In comparison to non-CARE/FERA customers, CARE/FERA customers were less likely to have a gas furnace in their home.
- CARE/FERA customers were more likely than non-CARE/FERA customers to have a wall/cadet heater in their home.

Table 5-69: Heating Equipment in Home and Frequency of Use*

Item	Install & Use	Hot	Moderate		Cool	
		General	Non-CARE/FERA	CARE/FERA	Non-CARE/FERA	CARE/FERA
Electric furnace	Have in home	30%	19%	20%	14%	14%
	Daily	8%	6%	9%	5%	7%
	Several days a week	21%	12%	13%	8%	9%
	Several days a month	27%	25%	21%	20%	15%
	Never	28%	30%	31%	33%	37%
	Not applicable	16%	28%	26%	33%	32%
Gas furnace	Have in home	53%	67%	36%	66%	40%
	Daily	15%	15%	11%	18%	10%
	Several days a week	22%	24%	17%	22%	15%
	Several days a month	36%	37%	28%	37%	28%
	Never	18%	14%	27%	14%	32%
	Not applicable	10%	9%	17%	9%	15%
Baseboard heating	Have in home	2%	1%	2%	1%	2%
	Daily	2%	1%	3%	2%	2%
	Several days a week	4%	3%	3%	3%	3%
	Several days a month	10%	6%	6%	6%	6%
	Never	45%	32%	44%	34%	40%
	Not applicable	39%	57%	44%	55%	49%
Wall/cadet heater	Have in home	10%	8%	23%	11%	27%
	Daily	2%	3%	5%	4%	6%
	Several days a week	10%	7%	12%	9%	11%
	Several days a month	15%	15%	20%	18%	21%
	Never	40%	31%	38%	33%	41%
	Not applicable	33%	44%	25%	35%	22%
Portable/space heater	Have in home	52%	34%	30%	33%	33%
	Daily	17%	7%	7%	8%	9%
	Several days a week	32%	23%	19%	20%	20%
	Several days a month	37%	36%	32%	39%	30%
	Never	10%	16%	21%	17%	23%
	Not applicable	5%	18%	21%	16%	17%
Other heating equipment	Have in home	31%	9%	9%	8%	9%
	Daily	29%	7%	5%	4%	6%
	Several days a week	26%	9%	7%	7%	7%
	Several days a month	15%	15%	13%	18%	13%
	Never	14%	25%	37%	30%	37%
	Not applicable	16%	43%	38%	41%	37%

* Allows for multiple responses, columns may not add to 100%.

5.2.8.7. Thermostat for Heating and/or Cooling (Table 5-70)

〉 Surveyed customers in the hot and moderate climate regions were more likely to report having a thermostat for both heating *and* cooling compared to cool climate region customers.

- In the moderate climate region, CARE/FERA customers were more likely to report having a thermostat for heating only or not having a thermostat in their home compared to non-CARE/FERA customers.
- Few respondents reported having a thermostat for cooling only.

Table 5-70: Thermostat in Home for Heating and/or Cooling

Climate Region	Segment	Thermostat for heating only	Thermostat for cooling only	Thermostat for both heating & cooling	No thermostat
Hot	General	16%	2%	64%	18%
Moderate	Non-CARE/FERA	17%	2%	71%	10%
	CARE/FERA	25%	4%	37%	34%
Cool	Non-CARE/FERA	42%	1%	42%	15%
	CARE/FERA	41%	2%	21%	37%

5.2.8.8. Thermostat Type (Table 5-71)

- Customers in the moderate climate region were more likely than those in the cool climate region to have a programmable or smart thermostat.
- Non-CARE/FERA customers were in both climate regions were more likely to report having a programmable or smart thermostat compared to CARE/FERA customers.

Table 5-71: Thermostat Type in Home

Climate Region	Segment	Has programmable or smart thermostat	Does not have programmable or smart thermostat
Hot	General	64%	36%
Moderate	Non-CARE/FERA	70%	30%
	CARE/FERA	51%	49%
Cool	Non-CARE/FERA	63%	37%
	CARE/FERA	42%	58%

5.2.8.9. Thermostat Temperature Settings (Table 5-72)

- Surveyed customers in the cool climate region were more likely to report turning their thermostat off on weekdays and weekends compared to customers in the hot or moderate regions.
- CARE/FERA customers were more likely to report setting their thermostat to “off” compared to non-CARE/FERA customers.

- There was little variation between customers' reported thermostat settings on weekdays versus weekends.

Table 5-72: Thermostat Settings in Late Afternoons and Evenings on Weekdays and Weekends Since December 2016

Weekday / Weekend	Temperature	Hot	Moderate		Cool	
		General	Non-CARE/FERA	CARE/FERA	Non-CARE/FERA	CARE/FERA
Weekday	Off	18%	19%	26%	21%	33%
	Below 66 F	14%	6%	6%	9%	5%
	66 F to 68 F	23%	22%	13%	21%	16%
	69 F to 71 F	18%	21%	18%	25%	20%
	72 F to 74 F	13%	17%	18%	16%	15%
	75 F to 76 F	5%	8%	10%	5%	5%
	77 F or higher	9%	7%	8%	3%	5%
Weekend	Off	16%	19%	26%	21%	34%
	Below 66 F	12%	6%	6%	8%	5%
	66 F to 68 F	22%	22%	13%	21%	15%
	69 F to 71 F	20%	21%	19%	27%	21%
	72 F to 74 F	14%	17%	18%	16%	15%
	75 F to 76 F	5%	9%	11%	5%	5%
	77 F or higher	10%	7%	8%	3%	5%

5.2.9. Smart Technologies

In the web version of the survey, customers were asked if they had six smart appliances and devices in their home, their overall satisfaction with the technologies, and the usefulness of the technologies in reducing or shifting their energy usage. The survey also asked respondents who reported not having smart technologies their level of interest in having the technologies in their home. Due to small sample sizes and resulting lower statistical power of the findings for customers who reported having smart technologies, the findings are not highly representative, reliable, and accurate.

Overall, few respondents reported having smart technologies in their home, with smart lighting and smart thermostats being most commonly reported devices (Table 5-73). Responses did not differ substantially between rate groups or customer segments.

Table 5-73: Percentage of Respondents Who Have Smart Technologies in Home [a, b]

Climate Region	Segment	Smart Thermostat N	C	R1	R2	Smart Lighting N	C	R1	R2	Smart Refrigerator N	C	R1	R2
Hot	General	27	--	--	12%	21	--	--	8%	5	--	--	2%
Moderate	Non-CARE/FERA	112-165	18%	18%	16%	66-95	9%	10%	8%	19-28	4%	3%	2%
	CARE/FERA	26-112	8%	11%	9%	48-82	10%	11%	11%	19-26	4%	4%	3%
Cool	Non-CARE/FERA	80-159	15%	13%	15%	72-131	10%	10%	10%	17-32	4%	2%	3%
	CARE/FERA	15-112	5%	8%	7%	58-130	11%	14%	15%	14-42	3%	4%	5%

Climate Region	Segment	Smart Laundry Machines N	C	R1	R2	Smart Dishwasher N	C	R1	R2	Smart Water Heater/Controller N	C	R1	R2
Hot	General	8	--	--	3%	4	--	--	2%	4	--	--	2%
Moderate	Non-CARE/FERA	19-35	4%	3%	3%	19-35	3%	2%	2%	10-14	2%	1%	1%
	CARE/FERA	14-26	3%	5%	4%	14-26	3%	3%	3%	11-14	2%	3%	2%
Cool	Non-CARE/FERA	19-44	4%	3%	4%	19-44	3%	3%	3%	11-19	2%	2%	2%
	CARE/FERA	15-34	4%	5%	5%	15-34	4%	2%	4%	8-18	2%	2%	2%

[a] Asked to web survey respondents only.

[b] Chi-square used for completeness but due to small sample sizes the results are not reliable; the highlighted percentages indicate statistically significant difference versus Control group at p≤.05.

Respondents who reported having smart technologies in their home provided moderate to high satisfaction ratings (6.6 to 9.3) with those technologies (using a 11-point scale with 0 meaning "not satisfied at all" and 10 meaning "extremely satisfied;" Table 5-74). Satisfaction ratings were generally consistent across the six smart technologies and did not differ substantially between customer segments. The few significant differences between Rate and Control groups are noted in the table below.

Table 5-74: Average Level of Satisfaction with Smart Technology [a, b, c]

Climate Region	Segment	Smart Thermostat C	R1	R2	Smart Lighting C	R1	R2	Smart Refrigerator C	R1	R2
Hot	General	--	--	8.2	--	--	8.5	--	--	8.6
Moderate	Non-CARE/FERA	8.5	8.5	7.9	7.6	8.3	8.0	7.6	8.3	8.3
	CARE/FERA	7.4	8.6	8.5	7.6	7.4	8.1	8.0	6.9	7.7
Cool	Non-CARE/FERA	8.2	7.8	8.1	7.6	7.9	7.9	7.0	7.3	7.7
	CARE/FERA	7.2	7.6	8.6	7.7	7.7	8.1	6.8	8.0	8.8

Climate Region	Segment	Smart Laundry Machines C	R1	R2	Smart Dishwasher C	R1	R2	Smart Water Heater/Controller C	R1	R2
Hot	General	--	--	7.6	--	--	5.3	--	--	7.8
Moderate	Non-CARE/FERA	7.4	8.2	8.1	7.2	9.0	8.5	7.9	9.0	8.3
	CARE/FERA	7.3	7.1	8.2	7.6	7.9	8.4	8.2	7.7	8.4
Cool	Non-CARE/FERA	7.3	7.5	7.5	7.1	7.8	7.9	8.3	8.3	7.9
	CARE/FERA	7.7	8.1	9.1	6.7	9.1	9.3	6.6	9.1	8.8

[a] Asked to web survey respondents only.

[b] Satisfaction ratings based on 11-point scale where 0 means 'not at all satisfied' and 10 means 'extremely satisfied'.

[c] T-test used for completeness but due to small sample sizes the results are not reliable; the highlighted averages indicate statistically significant difference versus Control group at p≤.05.

Respondents who reported having smart technologies in their home found the technologies to be moderately useful (6.7 to 9.0) in reducing or shifting their energy usage (using a 11-point scale with 0 meaning "not useful at all" and 10 meaning "extremely useful";" Table 5-75). Usefulness ratings were generally consistent across the six smart technologies and did not differ substantially between customer segments. The few significant differences between Rate and Control groups are noted in the table below.

Table 5-75: Average Usefulness Rating for Smart Technologies Reducing or Shifting Energy Use [a, b, c]

Climate Region	Segment	Smart Thermostat			Smart Lighting			Smart Refrigerator		
		C	R1	R2	C	R1	R2	C	R1	R2
Hot	General	--	--	7.6	--	--	7.6	--	--	8.0
Moderate	Non-CARE/FERA	8.1	7.6	7.5	7.3	7.6	7.3	7.1	8.0	8.3
	CARE/FERA	7.0	8.6	8.2	7.3	7.2	7.5	7.9	6.5	7.3
Cool	Non-CARE/FERA	7.5	7.4	7.1	7.0	7.3	7.2	7.0	6.2	7.0
	CARE/FERA	7.3	7.2	8.3	7.4	7.7	8.0	7.5	7.4	8.4

Climate Region	Segment	Smart Laundry Machines			Smart Dishwasher			Smart Water Heater/Controller		
		C	R1	R2	C	R1	R2	C	R1	R2
Hot	General	--	--	7.6	--	--	6.3	--	--	8.0
Moderate	Non-CARE/FERA	7.3	7.9	7.9	7.0	8.5	8.3	7.4	8.1	8.1
	CARE/FERA	6.9	6.5	7.5	6.6	7.6	7.9	7.2	7.3	8.4
Cool	Non-CARE/FERA	6.7	6.7	7.0	6.9	6.2	7.3	7.5	7.9	7.7
	CARE/FERA	6.8	7.7	8.9	6.3	8.1	8.8	6.3	8.7	8.6

[a] Asked to web survey respondents only.

[b] Usefulness ratings are based on an 11-point scale where 0 means 'not at all useful' and 10 means 'extremely useful'.

[c] T-test used for completeness but due to small sample sizes the results are not reliable; the highlighted averages indicate statistically significant difference versus Control group at p≤.05.

Respondents who reported not having smart technologies in their home expressed low to moderate interest (3.6 to 6.6) in the appliances and devices (using a 11-point scale with 0 meaning "not at all interested" and 10 meaning "extremely interested";" Table 5-76). Interest ratings were generally consistent across the six smart technologies. Overall, CARE/FARE customers were more interested in the smart technologies than corresponding Control group customers and non-CARE/FERA customers. Significant differences between Rate treatment groups are noted in the table below.

Table 5-76: Average Level of Interest in Smart Technologies [a, b]

Climate Region	Segment	Smart Thermostat C	Smart Thermostat R1	Smart Thermostat R2	Smart Lighting C	Smart Lighting R1	Smart Lighting R2	Smart Refrigerator C	Smart Refrigerator R1	Smart Refrigerator R2
Hot	General	--	--	4.2	--	--	4.7	--	--	4.3
Moderate	Non-CARE/FERA	4.8	5.2	5.2	5.0	5.3	5.2	4.8	4.8	4.7
	CARE/FERA	5.0	5.4	5.4	5.9	6.6	6.4	5.7	6.1	6.0
Cool	Non-CARE/FERA	5.0	4.7	4.7	5.3	5.2	5.0	4.9	4.6	4.5
	CARE/FERA	5.0	5.2	5.4	5.9	6.3	6.5	5.5	5.9	6.1

Climate Region	Segment	Smart Laundry Machines C	Smart Laundry Machines R1	Smart Laundry Machines R2	Smart Dishwasher C	Smart Dishwasher R1	Smart Dishwasher R2	Smart Water Heater/Controller C	Smart Water Heater/Controller R1	Smart Water Heater/Controller R2
Hot	General	--	--	4.3	--	--	3.6	--	--	4.8
Moderate	Non-CARE/FERA	4.6	4.8	4.5	4.4	4.5	4.3	4.9	5.2	5.1
	CARE/FERA	4.8	5.4	5.2	4.5	5.0	5.0	5.2	5.6	5.6
Cool	Non-CARE/FERA	4.5	4.6	4.2	4.3	4.4	4.1	5.0	4.8	4.6
	CARE/FERA	4.7	5.1	5.3	4.1	4.7	4.7	4.9	5.1	5.5

[a] Asked to web survey respondents only.

[b] Interest ratings are based on an 11-point scale where 0 means 'not at all interested' and 10 means 'extremely interested'.

[c] T-test used, highlighted averages indicate statistically significant difference versus Control group at p≤.05.

5.2.10. Newsletters and Websites

Nearly all web survey respondents (between 91% and 81%) reported receiving the TOU study newsletters since December 2016 (Table 5-77). Between 60% and 65% of web survey respondents reported visiting the SDG&E My Account website since December 2016. Substantially fewer SDG&E respondents reported visiting the rate plan study website since December 2016 (between 29% and 35%). Overall, fewer respondents in the CARE/FERA segments reported receiving TOU study newsletters compared to those in the non-CARE/FERA segments.

Table 5-77: Percentage of Respondents Who Received TOU Study Newsletters and Visited IOU and TOU Study Websites*

Climate Zone	Segment	Newsletters R1	Newsletters R2	SDG&E My Account website R1	SDG&E My Account website R2	Rate plan study website R1	Rate plan study website R2
Moderate	Non-CARE/FERA	91%	89%	63%	65%	33%	35%
	CARE/FERA	81%	82%	60%	61%	29%	32%
Cool	Non-CARE/FERA	91%	91%	61%	62%	33%	34%
	CARE/FERA	86%	90%	61%	61%	29%	33%

* Asked to web survey respondents in the Rate groups; Control group not asked.

Respondents who reported receiving the TOU newsletters or who reported visiting the SDG&E My Account or TOU rate plan study websites found the newsletters and websites to be moderately useful (using a 11-point scale with 0 meaning "not useful at all" and 10 meaning "extremely useful";" Table 5-78). Respondents in the non-CARE/FARE segments found newsletters and websites slightly less useful

compared to those in the CARE/FERA segments. Usefulness ratings did not vary substantially between Rate treatment groups.

Table 5-78: Average Usefulness Rating for TOU Study Newsletters and IOU and TOU Study Websites [a, b]

Climate Zone	Segment	Newsletters		SDG&E My Account website		Rate plan study website	
		R1	R2	R1	R2	R1	R2
Moderate	Non-CARE/FERA	6.0	5.9	7.4	7.6	6.8	7.0
	CARE/FERA	6.8	6.7	7.8	7.9	7.6	7.6
Cool	Non-CARE/FERA	5.9	5.7	7.3	7.3	6.8	6.8
	CARE/FERA	6.7	6.8	7.9	8.1	7.9	7.6

[a] Usefulness ratings are based on an 11-point scale where 0 means 'not at all useful and 10 means 'extremely useful'.

[b] Asked to web survey respondents in the Rate groups who reported visiting the website(s); Control group not asked.

Overall, SDG&E web survey respondents provided moderate to high satisfaction ratings with TOU study outreach (using a 11-point scale with 0 meaning "not satisfied at all" and 10 meaning "extremely satisfied;" Table 5-79). Respondents in the non-CARE/FARE segments reported being slightly less satisfied with TOU study outreach compared to those in the CARE/FERA segments.

Table 5-79: Average Satisfaction Rating for All TOU Study Outreach [a, b]

Climate Zone	Segment	Satisfaction with Communications	
		Rate 1	Rate 2
Moderate	Non-CARE/FERA	7.5	7.6
	CARE/FERA	7.8	7.9
Cool	Non-CARE/FERA	7.5	7.5
	CARE/FERA	8.1	8.3

[a] Satisfaction ratings are based on an 11-point scale where 0 means 'not at all satisfied' and 10 means 'extremely satisfied'.

[b] Asked to web survey respondents in the Rate groups who reported receiving any outreach item; Control group not asked.

5.2.11. Smartphone App

Web survey respondents were asked if they were aware of and downloaded SDG&E's smartphone app for the TOU study and, of those that downloaded, if they used the app. Due to small sample sizes in some of the segments, customers were combined across the Rate groups; Control group customers were not asked the smartphone app questions.

About half of survey customers (48% to 58%) reported hearing about SDG&E's smartphone app (Table 5-80). Between 9% and 12% of customers reported hearing about the app and downloading it, and of those, between 46% and 72% used the app. Fewer non-CARE/FERA customers reported hearing about the app and using the app compared to those in the CARE/FERA segments.

Table 5-80: Percentage of Respondents Who are Aware, Downloaded, and Used SDG&E's TOU Study Smartphone App [a, b]

Climate Region	Segment	Used app[b] N	Used app[b] %	Heard about and downloaded app N	Heard about and downloaded app %	Heard about and tried to download app but it didn't work N	Heard about and tried to download app but it didn't work %	Heard about but didn't download app N	Heard about but didn't download app %	Have not heard about or downloaded app N	Have not heard about or downloaded app %
Hot	General	12	46%	24	9%	16	6%	113	43%	110	42%
Moderate	Non-CARE/FERA	138	72%	184	10%	69	4%	750	40%	858	46%
	CARE/FERA	91	61%	140	12%	68	6%	394	33%	600	50%
Cool	Non-CARE/FERA	131	66%	190	10%	62	3%	869	44%	859	43%
	CARE/FERA	82	64%	126	9%	57	4%	474	35%	713	52%

[a] Asked to web survey respondents in the Rate groups; Control group not asked.

[b] Asked only to those who reported downloading the app.

Respondents who downloaded the smartphone app reported their level of agreement with five aspects about SDG&E's TOU study smartphone app, using a scale of 0 to 11 where 0 means 'do not agree at all' and 10 means 'completely agree' (Table 5-81). Respondents reported the highest to lowest average agreement with the following aspects: the app is easy to use (6.9-7.9), recommend app to friends/family (6.4-7.2), app's feedback on electricity use helps customer reduce use during peak periods (5.0-6.7), the app does not provide enough information about the customer's usage to take action (4.1-4.5), and the app has too many alerts (3.5-4.4).

Table 5-81: Average Level of Agreement with Aspects About SDG&E's TOU Study Smartphone App [a, b]

Climate Region	Segment	The app is easy to use N	The app is easy to use Average	Would recommend app to family/friends N	Would recommend app to family/friends Average	The alerts helped me reduce my electricity usage during peak periods N	The alerts helped me reduce my electricity usage during peak periods Average	App does not provide enough info about my household's usage for me to take action N	App does not provide enough info about my household's usage for me to take action Average	There are too many alerts N	There are too many alerts Average
Hot	General	12	6.9	12	6.8	12	5.0	12	4.3	12	3.5
Moderate	Non-CARE/FERA	135	7.4	136	6.4	137	5.9	134	4.5	133	3.9
	CARE/FERA	89	7.9	90	7.2	90	6.7	87	4.5	87	4.4
Cool	Non-CARE/FERA	126	7.1	126	6.4	123	5.4	127	4.1	125	3.9
	CARE/FERA	81	7.7	80	7.0	80	6.2	81	4.4	81	4.1

[a] Agreement ratings are based on an 11-point scale where 0 means 'do not agree at all' and 10 means 'completely agree'.

[b] Asked to web survey respondents in the Rate groups who reported downloading the app; Control group not asked.

Surveyed customers who downloaded and used SDG&E's TOU study smartphone app also reported the extent to which four app features were helpful, using a scale of 0 to 10 where 0 means 'not at all helpful' and 10 means 'extremely helpful' (Table 5-82). Customers rated each feature as somewhat to mostly helpful (5.8-8.3). On average, CARE/FERA customers found the features more helpful compared to those in the non-CARE/FERA segments. Results should be interpreted carefully, however, due to small sample sizes in some segments.

Table 5-82: Average Helpfulness Ratings for SDG&E's TOU Study Smartphone App Features [a, b]

Climate Region	Segment	Alerts that electricity rates have changed		Access to monthly projected bill amount		Summary of monthly usage by peak period		Access to detailed info about household energy use patters	
		N	Average	N	Average	N	Average	N	Average
Hot	General	8	6.5	10	6.5	10	6.8	10	5.8
Moderate	Non-CARE/FERA	96	6.4	108	7.7	111	7.5	93	7.2
	CARE/FERA	57	7.5	80	8.3	68	8.3	55	8.2
Cool	Non-CARE/FERA	76	6.0	92	7.1	94	7.4	85	7.2
	CARE/FERA	59	7.0	67	7.7	67	7.3	59	7.2

[a] Helpfulness ratings are based on an 11-point scale where 0 means 'not at all helpful' and 10 means 'extremely helpful'.

[b] Asked to web survey respondents in the Rate groups who reported downloading and using the app; Control group not asked.