



# 2023 Load Impact Evaluation for Pacific Gas & Electric Company's Smart Rate™ Program

Ex-Post and Ex-Ante Load Impacts

CALMAC ID PGE0492

DRAFT

March 25, 2024



Public Version. Redactions in 2023 Load Impact Evaluation for Pacific Gas & Electric Company's Smart Rate™ Program and appendices.

Confidential content removed and blacked out [REDACTED].

---

This work was performed by

Applied Energy Group, Inc.  
2300 Clayton Road, Suite 1370  
Concord, CA 94520

Project Manager: M. Buffum

Project Team: L. Tang

in consultation with Pacific Gas & Electric Company.

# Abstract

---

This report documents the load impact evaluation of the residential SmartRate™ program operated by Pacific Gas and Electric (PG&E) for Program Year 2023 (PY2023). The primary goals of this evaluation study include 1) estimating the ex-post load impacts for PY2023 and 2) estimating ex-ante load impacts for the programs for years 2024–2034.

SmartRate™ is a voluntary critical peak pricing program that overlays a customer's electric rate designed to lower summer electricity costs for customers and conserve California's power grid. On SmartDays™, participants are charged \$0.60/kWh in addition to their regular rate charges during the peak period (4–9 PM). Participants also receive energy credits for usage other than the peak period during SmartDays™ and all usage on those days within a billing period that is not declared as SmartDays™. During their first full summer season of program enrollment (and any preceding partial season), customers are backed by PG&E's Bill Protection Guarantee that refunds customers if their SmartRate™ costs exceed their regular residential pricing plan. The program dispatches between nine and 15 SmartDays™ a year. SmartDays™ can be dispatched year-round but are typically dispatched on summer weekdays. PG&E provides customers with day-ahead notification of SmartDays™ via text or email to allow customers to plan for reducing their energy use or shifting their load during event hours.

AEG estimated hourly ex-post load impacts for each event during 2023 using regression analysis of segment-level hourly load, weather, and event data. The estimated load impacts are reported for each event and the average event day. Load impacts are also reported by CAISO local capacity area (LCA), program enrollment, bill protection status, CARE enrollment, billing rate, and high fire-threat district status. In PY2023, PG&E dispatched the minimum number of events (nine) between June and September. The estimated aggregate ex-post load impact for an average event day was 5.2 MW.

AEG developed ex-ante load impact forecasts by combining enrollment forecasts provided by PG&E and per-customer load impacts generated from the analysis of current ex-post load impact estimates. The forecast of enrolled service accounts and aggregate ex-ante load impacts presented in the report reflect several program changes expected to occur beginning in 2024. The estimated aggregate ex-ante load impacts for a typical event day in 2024 for a PG&E 1-in-2 weather scenario is 4.4 MW during the resource adequacy (RA) window (4 to 9 PM).

# EXECUTIVE SUMMARY

---

This report documents the program year 2023 (PY2023) load impact evaluation of the residential SmartRate™ program offered by Pacific Gas & Electric (PG&E), completed by the Applied Energy Group (AEG). The study's key objectives include estimating ex-post and ex-ante load impacts for the residential SmartRate™ program using methods and assumptions consistent with the California Demand Response (DR) Load Impact Protocols (LIP),<sup>1</sup> as follows:

- **Estimate Ex-post load impacts** for the average customer and all customers in aggregate for each hour of each event day and the average event day. We present all estimates at the program level<sup>2</sup> and separately for key customer segments.
- **Estimate Ex-ante load impacts** for the average customer and all customers in aggregate for the resource adequacy (RA) window.<sup>3</sup> We provide estimates for each year over an 11-year<sup>4</sup> time horizon based on PG&E and CAISO's 1-in-2 and 1-in-10 weather conditions for a typical event day and each monthly system peak day. We provide estimates for both program-specific and portfolio-adjusted<sup>5</sup> scenarios. We also provide estimates by dual program enrollment.

The following sections provide:

- An [overview of the SmartRate™ program](#),
- A review of [participation in the PY2023 program](#),
- Results of the [ex-post load impact analysis](#),
- Results of the [ex-ante load impact analysis](#), and
- Key evaluation [findings and recommendations](#).

## Overview of SmartRate

SmartRate™ is a voluntary critical peak pricing program that overlays a customer's electric rate. It is designed to lower summer electricity costs while conserving California's power grid. Key aspects of the SmartRate™ program design follow.<sup>6</sup>

**Eligibility.** Residential customers with a SmartMeter on the standard rate (E1) or one of five time-of-use (TOU) rates (TOU-B, TOU-C, TOU-D, EV2-A, and E-ELEC) are eligible to participate in SmartRate™. Participants may be dually enrolled in SmartAC™ or Emergency Load Reduction Program (ELRP) A6. All participants dually enrolled to SmartAC™ enrolled in both programs before October 26th, 2018. Participants dually enrolled in ELRP A6 are residential customers on CARE and FERA rates defaulted onto the ELRP pilot and other customers that may have optionally enrolled.

**Price Incentives.** The SmartRate™ programs charges customers more for their consumption from 4 PM to 9 PM on SmartDays™ (\$0.60/kWh) and rewards participants for shifting their consumption away from those hours through the SmartRate Non-High Price credit (\$0.00636/kWh) and the SmartRate Participation Credit (\$0.00167/kWh). The credits apply to non-SmartDays™ too, but only during billing cycles with at least

---

<sup>1</sup> Attachment A. Load Impact Estimation for Demand Response: Protocols and Regulatory Guidance, California Public Utilities Commission, Energy Division, April 2008.

<sup>2</sup> I.e., without considering the effects of other demand response programs on the estimated SmartRate™ impacts.

<sup>3</sup> The RA window is 5 PM to 10 PM for March and April and 4 PM to 9 PM for all other months.

<sup>4</sup> PG&E has requested a PY2021 back cast as part of the ex-ante impact analysis.

<sup>5</sup> Portfolio level impacts exclude the load impacts from dually enrolled participants attributed to concurrent SmartAC events.

<sup>6</sup> Details on the program design can be found on PG&E's SmartRate™ website:

<https://www.pge.com/en/account/rate-plans/find-your-best-rate-plan/smartrate.html#accordion-aab9e3dddd-item-a7aa982cf5>

one SmartDay™. All consumption increases and decreases are measured relative to customer-specific baselines.

**Bill Protection Guarantee.** During their first full summer season (May through October) of program enrollment (and any preceding partial season), customers are backed by PG&E’s Bill Protection Guarantee that refunds customers at the end of the season if their SmartRate™ costs exceed their regular pricing plan.

**SmartDays™ (Events).** The program must dispatch at least nine and no more than 15 SmartDays™ each year. PG&E typically dispatches SmartDays™ during the summer, most often on weekdays, but can dispatch them year-round. High temperatures, CAISO alerts, and other factors, including Public Safety Power Shutoff (PSPS) activity, influence event dispatches. In PY2023, PG&E dispatched the minimum number of events (nine) from June through September, as shown in Table ES-1. Six of these SmartDays™ coincided with SmartAC™ events, though not all Sub-LAPs were dispatched for each event, and hours did not always overlap with the SmartDay™ event windows.

**Notification.** PG&E provides day-ahead notifications via text and/or email by 5 PM the day before a SmartDay™, giving customers time to plan their energy use or shift their demand away from event hours.

The PY2023 program design remained consistent with the design of the PY2022 program, with all major changes from that year carrying forward.

Table ES-1 PY2023 SmartDays™

Date	Day of Week
June 30	Friday
July 1	Saturday
July 14	Friday
July 15	Saturday
July 17	Monday
July 21	Friday
August 15	Tuesday
August 16	Wednesday
September 26	Tuesday

<sup>a</sup> Concurrent SmartAC events days are highlighted gray. SmartAC events were dispatched for specific Sub-LAPs and event hours that did not always coincide with the SmartRate™ event

## PY2023 Participation

More than 48k unique customers were enrolled in SmartRate™ in the PY2023 season. The rate of participation remained constant across events, with minimal customers unenrolling during the summer months. The majority of SmartRate™ participants belonged to the Greater Fresno Area (24%) or unknown/other (28%) local capacity areas (LCA), as shown in Table ES-2 and Figure ES-1. The total shows the number of participants on a typical event day.

Table ES-2 PY2023 Enrollment by LCA

LCA	# of Accounts
Greater Bay Area	5,586
Greater Fresno Area	11,064
Humboldt	68
Kern	4,236
North Coast and North Bay	2,223
Stockton	5,003
Sierra	4,622
Other	12,756
<b>Total</b>	<b>45,558</b>

Figure ES-1 PY2023 Enrollment by LCA

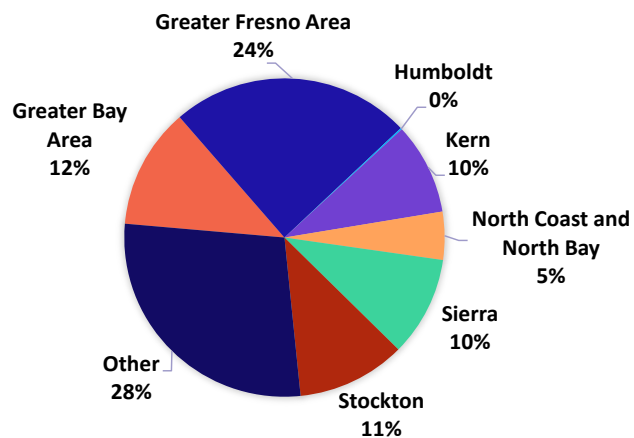


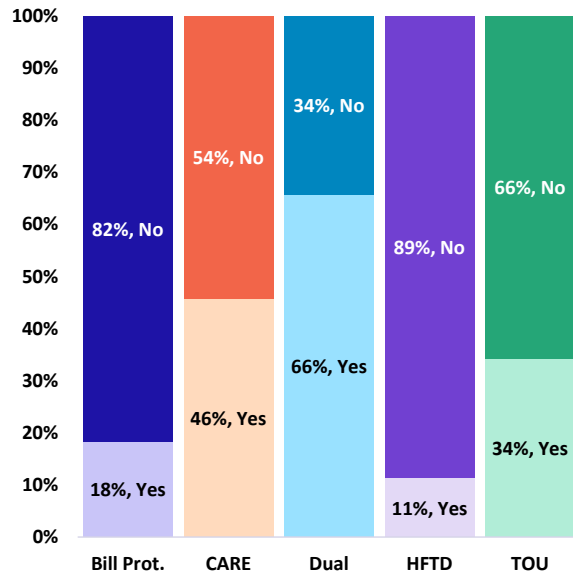
Table ES-3 and Figure ES-2 show the distribution of SmartRate™ participants in each segment of interest. Enrollment in most segments aligns with the PY2022 program, with the majority of customers no longer under bill protection, on a CARE rate, dually enrolled in SmartAC™ or ELRP A6, outside of high fire-threat districts, and not on a time-of-use (TOU) rate.

Table ES-3 PY2023 Enrollment by Segment

Segment	Status	# Accounts <sup>a</sup>
Bill Protection	No	37,287
	Yes	8,271
CARE Enrollment	No	25,884
	Yes	19,674
Dual Program Enrollment	SmartRate Only	16,838
	Dual – ELRP A6	24,049
	Dual – SmartAC	4,671
High Fire Thread District	No	38,975
	Yes	6,583
Time-of-Use	No	28,440
	Yes	17,118

<sup>a</sup> Since customers can belong to more than one segment, these counts should not be summed.

Figure ES-2 PY2023 Reference Load by Segment



## Load Impact Evaluation Results

The following sections provide the results of the impact evaluation.

### Ex-Post Load Impact Results

In the subsequent sections, we report the following metrics:

- The number of participants enrolled during each SmartDay™
- The aggregate and per-customer reference load (i.e., what AEG estimated participants would have consumed without the SmartRate™ program)
- The aggregate and per-customer load impacts, both in absolute (MW or kW) and as a percentage of the reference load
- The average temperature.

All reported estimates represent the average of the SmartDay™ event window (4-9 PM).

### Ex-Post Results by SmartDay™

Table ES-4 shows the results of AEG's impact evaluation for each PY2023 SmartDay™. SmartRate™ participants reduced their demand by 5.2 MW during the average SmartDay™ event hour, an average of 0.11 kW (4.7%) per customer. Impacts remained consistent across event days, with participants most often saving between 0.10 kW and 0.12 kW during the average event hour. The exceptions included the SmartDay™ with the hottest temperatures (July 1<sup>st</sup>, 95 °F) and the lowest temperatures (September 26<sup>th</sup>, 75 °F). All impact estimates were statistically significant. AEG removed the September 26<sup>th</sup> event day from the average event day metrics as it did not reflect the typical SmartDay™ in PY2023—PG&E only dispatched this event to meet the program's minimum requirements for SmartDays™ dispatched in a program year.

Six of the nine SmartDays™ coincided with SmartAC event days. The impacts estimated for these event days reflect the effects of SmartAC customers responding to SmartAC days in addition to the SmartRate™ price signals. AEG excluded these event days for SmartAC customers from the average event day.

Table ES-4 Ex-Post Load Impacts by Event

Event Date <sup>a</sup>	# Accounts	Aggregate (MW)		Per Customer (kW)		% Load Impact	Avg. Event Temp (°F)
		Reference Load	Load Impact	Reference Load	Load Impact		
Jun. 30	45,811	100.3	5.0	2.19	0.11	5.0%	90
Jul. 1	45,777	111.3	5.8	2.43	0.13	5.2%	95
Jul. 14	45,565	99.5	4.7	2.18	0.10	4.8%	90
Jul. 15	45,562	111.9	5.4	2.46	0.12	4.9%	93
Jul. 17	45,529	113.7	5.1	2.50	0.11	4.5%	92
Jul. 21	45,475	109.6	5.3	2.41	0.12	4.8%	92
Aug. 15	45,376	114.3	5.1	2.52	0.11	4.5%	92
Aug. 16	45,367	107.8	4.7	2.38	0.10	4.4%	91
Sep. 26	45,602	48.2	3.9	1.06	0.09	8.0%	75
<b>Average Event Day<sup>b</sup></b>	<b>45,558</b>	<b>108.5</b>	<b>5.2</b>	<b>2.38</b>	<b>0.11</b>	<b>4.7%</b>	<b>92</b>

<sup>a</sup> Concurrent SmartAC events days are highlighted gray. SmartAC events were dispatched for specific Sub-LAPs and event hours that did not always coincide with the SmartRate™ event window.

<sup>b</sup> The average event day excludes the September 26<sup>th</sup> SmartDay™ because it was dispatched to meet the minimum SmartRate™ program requirements and did not reflect other PY2023 SmartDays™.

### Ex-Post Results by Local Capacity Area

Table ES-5 summarizes the aggregate ex-post results for the average event day for PG&E’s eight local capacity areas (LCA). Nearly 25% of all participants belong to the Greater Fresno Area, with slightly more (28%) in the “Other or Unknown” category. These two LCAs combined contributed 55% of the total SmartRate™ impact (2.8 MW).

Table ES-5 Ex-Post Savings by Load Capacity Area

LCA	# Accounts	Reference Load (MW)	Load Impact (MW)	% Load Impact	Avg. Event Temp (°F)
Greater Bay Area	5,586	9.5	0.5	5.5%	80
Greater Fresno Area	11,064	31.2	1.4	4.4%	101
Humboldt	68	█	█	█	76
Kern	4,236	12.3	0.5	4.0%	103
North Coast and North Bay	2,223	3.3	0.2	5.5%	89
Sierra	4,622	10.6	0.5	5.1%	98
Stockton	5,003	12.0	0.6	4.8%	98
Other or Unknown	12,756	29.5	1.5	5.0%	95

### Ex-Post Results by Customer Segment

Table ES-6 summarizes ex-post estimates for the average event day for key customer segments. As expected, customers with a bill protection guarantee appeared to generate lower impacts than customers not on bill protection. Similarly, customers dually enrolled in SmartAC, who respond to price signals via a switch installed on their air-conditioning (AC) units, saved substantially more than customers without that automated response capability.

Table ES-6 Ex-Post Savings by Segment

Segment	Status	# Accounts	Aggregate (MW)		Per Customer (kW)		% Load Impact	Avg. Event Temp (°F)
			Reference Load	Load Impact	Reference Load	Load Impact		
Bill Protection	No	37,287	88.6	4.6	2.38	0.12	5.2%	92
	Yes	8,271	20.0	0.5	2.42	0.06	2.6%	91
CARE Enrollment	No	25,884	58.9	3.0	2.27	0.12	5.2%	91
	Yes	19,674	49.7	2.1	2.53	0.11	4.2%	93
Dual-Program Enrollment	SmartRate Only	16,838	37.1	1.8	2.20	0.11	4.9%	92
	Dual – ELRP A6	24,049	60.5	2.0	2.52	0.08	3.4%	91
	Dual – Smart AC	4,671	10.9	1.3	2.34	0.28	11.8%	95
High Fire-Threat District	No	38,975	96.2	4.4	2.47	0.11	4.6%	92
	Yes	6,583	12.4	0.7	1.88	0.11	5.9%	92
Time-of-Use	No	28,440	71.3	3.3	2.51	0.12	4.7%	92
	Yes	17,118	37.3	1.8	2.18	0.11	4.9%	91

<sup>a</sup> Since customers can belong to more than one segment, values should not be summed across segments.

### Ex-Ante Load Impacts Results

This section summarizes the results of the ex-ante analysis, where AEG used the ex-post models to forecast SmartRate™ impacts through 2034 under multiple weather scenarios. Specifically, we met the following objectives of the ex-ante load impact analysis:

- Develop hourly load impact estimates for the average customer and all customers in aggregate for the RA window.<sup>7</sup>
- Estimate impacts for each year over an 11-year<sup>8</sup> horizon based on PG&E’s and CAISO’s 1-in-2 and 1-in-10 weather conditions for a typical event day and each monthly system peak day.
- Provide program-specific ex-ante estimates by forecasting SmartRate™ impacts without considering the effects of dual enrollment in other demand response programs, i.e., assuming no SmartAC™ or ELRP A6 events are dispatched in future years.
- Avoid double-counting impacts attributable to SmartRate™ and other demand response programs by providing portfolio-adjusted estimates, i.e., assuming SmartAC™ and ELRP A6 events are dispatched in future years.

As part of the ex-ante evaluation, we worked with PG&E staff to develop the following key approaches and assumptions:

- **AEG used the ex-post models to forecast the 11-year SmartRate™ per-customer impacts in summer and winter months.** The RA window coincides with the SmartRate™ event window in all months of the year except for March, April, and May, when it spans 5 PM to 10 PM. AEG shifted impacts to align with the reference loads estimated during these hours.

<sup>7</sup> The RA window is 5 PM to 10 PM for March, April, and May and 4 PM to 9 PM for all other months.

<sup>8</sup> AEG included the PY2023 back cast as part of the ex-ante impact analysis.



- **PG&E provided an enrollment forecast by customer segment, LCA, and sub-LAP**, which AEG used to aggregate per-customer impacts to the program level. We dropped some customers from the forecast based on their ineligibility for the program after discussing with PG&E (less than 30 per year).<sup>9</sup>
- **All dually enrolled ELRP A6 customers rejoined the SmartRate™ only group starting in January 2026**, when the ERLP A6 pilot is set to close. We maintained the ERLP A6 per-customer impacts through 2034.

### Program-Specific Ex-Ante Impacts

Table ES-7 summarizes the aggregate and per-customer load impact forecasts for SmartRate™ participants on a typical event day in 2024. The table includes impact forecasts under the 1-in-2 and 1-in-10 weather scenarios for both PG&E and CAISO peaks.

We forecasted high per-customer impacts for participants dually enrolled in SmartAC™ compared to customers in other segments, as expected given their technology-supported response, contributing nearly 25% of the aggregate impact (PG&E 1-in-2 weather scenario) despite accounting for only 9% of the total enrollment population. Conversely, participants dually enrolled in ELRP A6 make up most of SmartRate™ enrollments in 2024 (54%), since SmartRate™ CARE participants are defaulted in ELRP A6, and contributed 43% of the aggregate impact under the PG&E 1-in-2 weather scenario.

Table ES-7 Typical Event Day Enrollment and Impacts by Program Enrollment: 2024

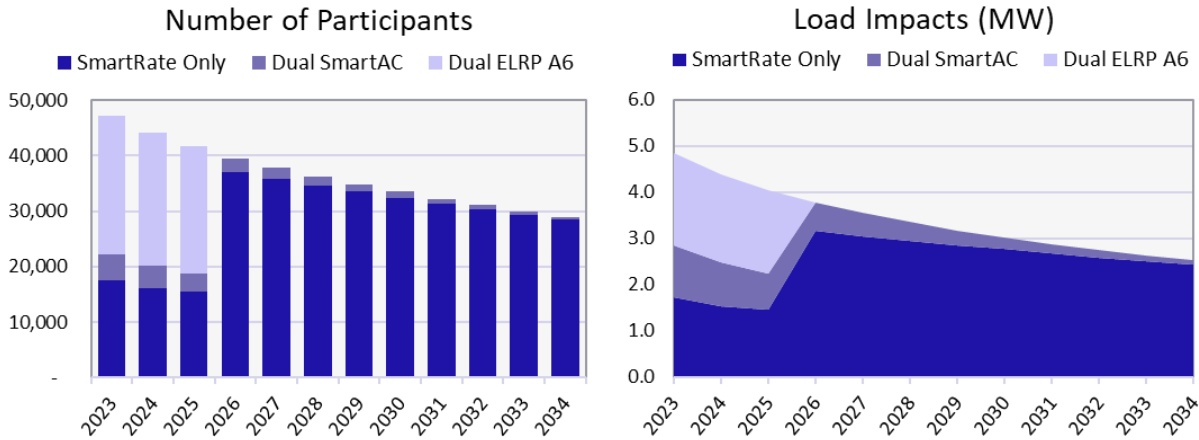
Program Enrollment	# Accounts	Aggregate Impact (MW)				Per Customer Impact (kW)			
		PG&E Peak		CAISO Peak		PG&E Peak		CAISO Peak	
		1-in-2 (96 °F)	1-in-10 (100 °F)	1-in-2 (96 °F)	1-in-10 (97 °F)	1-in-2 (96 °F)	1-in-10 (100 °F)	1-in-2 (96 °F)	1-in-10 (97 °F)
SmartRate™ Only	16,173	1.5	1.7	1.6	1.6	0.09	0.11	0.10	0.10
Dually Enrolled - SmartAC	4,001	1.0	1.2	1.0	1.0	0.24	0.31	0.24	0.26
Dually Enrolled – ELRP A6	24,051	1.9	2.0	1.9	1.9	0.08	0.08	0.08	0.08
<b>Total</b>	<b>44,225</b>	<b>4.4</b>	<b>5.0</b>	<b>4.5</b>	<b>4.6</b>	<b>0.10</b>	<b>0.11</b>	<b>0.10</b>	<b>0.10</b>

Figure ES-3 shows PG&E’s annual enrollment forecast and the associated aggregated load impact forecasts for the PG&E 1-in-2 weather scenario on a typical event day, including the 2023 backcast. Overall, PG&E expects enrollment to decrease over time without any planned marketing efforts to offset program attrition over time.

We see the effects of the ELRP A6 pilot ending in both forecasts as these customers transition back into the SmartRate™ only segment. AEG assumed that ELRP A6 participants would maintain their impacts through 2025. A learning curve was applied to these customers’ impacts in the PY2022 ex-ante forecast following their lower performance that year. As discussed, this was likely driven by their confusion from being defaulted into ELRP A6 without any targeted messaging. However, given the similarities in their PY2023 per-customer ex-ante savings to SmartRate™ only customers, AEG did not apply any assumptions to these customers’ future performance.

<sup>9</sup> These included bill-protected, dually enrolled SmartAC™ participants, since SmartAC™ no longer enrolls new customers to the program; participants enrolled in SmartAC™ and ERLP A6, since triple enrollment is not allowed; and customers on ineligible billing rates. In total, at most 30 customers were dropped from the enrollment forecast each year for ineligibility.

Figure ES-3 Enrollment and Impact Forecast: PG&E 1-in-2, Typical Event Day, 2023 - 2034



**Portfolio-Adjusted Ex-Ante Impacts**

The estimated program-specific ex-ante impacts forecast savings of the SmartRate™ program without considering the effects of other demand response programs. To avoid double-counting impacts of dually enrolled customers across all the program ex-ante forecasts, AEG provided portfolio-adjusted forecasts, which follow a portfolio hierarchy structure predetermined by PG&E.

Table ES-8 shows the program and portfolio-adjusted impacts for the PG&E 1-in-2 weather scenario for 2024. For each program, we used the following assumptions to develop the portfolio-adjusted impacts:

- **For customers dually enrolled in SmartAC™, AEG maintained the assumption that SmartRate™ participation will add 18% to the SmartAC™ load impact on dual event days.** Historically, these dually enrolled customers have achieved higher impacts during concurrent program events than during SmartAC™ events even, showing that an incremental, behavior-driven effect of the SmartRate™ price incentive exists. We estimated incremental impacts of 18% during a previous evaluation year, which we have maintained for the PY2023 portfolio-adjusted ex-ante forecast. Note that SmartAC™ is only available from June through September. Thus, a portfolio-adjusted forecast is only applicable during those months.
- **For customers dually enrolled in ELRP A6, AEG assumed that all impacts were included in the SmartRate™ portfolio-adjusted forecast throughout the ELRP pilot implementation.** The ELRP A6-specific ex-ante forecast will remove SmartRate™ impacts when adjusting for dually enrolled SmartRate™ customers. AEG did not make any adjustments to the portfolio for dual ELRP A6 enrollment.

As discussed, the March through May RA window is from 5 PM to 10 PM, which does not fully coincide with the SmartRate™ event. This shift leads to slightly lower impacts on these months compared to other non-summer months.

Table ES-8 Portfolio-Level vs. Portfolio-Adjusted Load Impacts: PG&E 1-in-2, Monthly Peak Day, 2024

Month	Program-Level Load Impacts (MW)				Portfolio-Adjusted Load Impacts (MW)			
	SmartRate™ Only	Dually Enrolled SmartAC™	Dually Enrolled ELRP A6	Total	SmartRate™ Only	Dually Enrolled SmartAC™	Dually Enrolled ELRP A6	Total
January	0.80	0.43	0.86	<b>2.09</b>	0.80	0.43	0.86	<b>2.09</b>
February	0.74	0.38	0.79	<b>1.92</b>	0.74	0.38	0.79	<b>1.92</b>
March	0.47	0.19	0.47	<b>1.13</b>	0.47	0.19	0.47	<b>1.13</b>
April	0.57	0.22	0.57	<b>1.36</b>	0.57	0.22	0.57	<b>1.36</b>

Month	Program-Level Load Impacts (MW)				Portfolio-Adjusted Load Impacts (MW)			
	SmartRate™ Only	Dually Enrolled SmartAC™	Dually Enrolled ELRP A6	Total	SmartRate™ Only	Dually Enrolled SmartAC™	Dually Enrolled ELRP A6	Total
May	0.67	0.27	0.70	<b>1.64</b>	0.67	0.27	0.70	<b>1.64</b>
June	1.68	1.17	2.02	<b>4.87</b>	1.68	0.21	2.02	<b>3.91</b>
July	1.63	1.08	1.99	<b>4.70</b>	1.63	0.19	1.99	<b>3.81</b>
August	1.49	0.94	1.89	<b>4.32</b>	1.49	0.17	1.89	<b>3.55</b>
September	1.34	0.71	1.74	<b>3.80</b>	1.34	0.13	1.74	<b>3.21</b>
October	0.81	0.41	0.98	<b>2.20</b>	0.81	0.41	0.98	<b>2.20</b>
November	0.66	0.31	0.71	<b>1.68</b>	0.66	0.31	0.71	<b>1.68</b>
December	0.81	0.37	0.86	<b>2.04</b>	0.81	0.37	0.86	<b>2.04</b>

## Key Findings and Recommendations

AEG identified the following key findings based on the [ex-post impact evaluation](#):

- **The SmartRate™ program continued to successfully drive customers to reduce their demand during SmartDay™ event hours.** During the average event hour, customers delivered savings of 5.2 MW in total (4.5% of reference load consumption).
- **Customers generated the lowest demand reductions during the last event of the season, which was dispatched to meet the program’s minimum SmartDays™ requirement.** Therefore, the September 26<sup>th</sup> event day did not look like the other SmartDays™, with temperatures reaching just 75 °F (compared to a minimum of 90 °F during the other PY2023 SmartDays™). As a result, AEG removed this event from the average event day metrics.
- **As expected, customers dually enrolled in the SmartAC™ program generated the largest savings on a per-customer basis (0.28 kW)** compared to SmartRate™ only participants (0.11 kW) and those dually enrolled in ELRP A6 (0.08 kW). The switch installed on their central cooling equipment gives PG&E control of their cooling capacities during SmartAC™ and SmartRate™ events such that responses do not rely entirely on customers’ behavior.
- **SmartRate™ participants dually enrolled in ELRP A6 performed substantially better in PY2023 (0.08 kW per customer) than in PY2022 (0.02 kW per customer) under similar temperatures.** This could suggest that customers overcame any confusion created by being defaulted into the ELRP A6 pilot in PY2022.<sup>10</sup> However, the lack of ELRP A6 events dispatched in PY2023 may have also helped minimize the confusion. Therefore, whether these impacts will hold in PY2024 if ELRP A6 events are dispatched is unclear.
- **CARE customers performed better in PY2023, delivering impacts of 4.2% (compared to 2.6% in PY2022).** This is much closer to the average non-CARE customer, who achieved reductions of 5.2%. Since most CARE customers are now dually enrolled in ELRP A6, these findings are largely driven by the improved performance of ELRP A6 customers in PY2023 compared to PY2022.
- **Nearly 20% of PY2023 SmartRate™ participants qualified for the Bill Protection Guarantee,** a substantial increase from the 12% in PY2022, which aligns with the increased SmartRate™ enrollments over the previous year. These customers generated lower load impacts compared to customers not under the bill protection group by about half for most event days.
- **Customers on the TOU-B, TOU-D, and E-ELEC rates generated some of the smallest impacts during the average SmartDay™ hour (2.4% to 3.4%) despite including higher-consuming**

<sup>10</sup> Most of these customers had previously been SmartRate™-only CARE participants and had delivered load impacts comparable to SmartRate™-only customers prior to PY2022. However, the lack of messaging about their enrollment into ELRP A6 likely caused the low impacts observed for these customers in PY2022.

**customers.** These rates target customers with high electricity consumption, including those with electric vehicles and electrified homes, which we see reflected in their reference loads (all greater than 3.1 kW per customer). However, customers on these rates already shift their consumption to hours outside of the event window on SmartDays™, reducing their capacity to save incrementally. Similar logic applies to customers on the EV2-A rate, though to a lesser extent.

- **Despite including some of the lowest-consuming customers of all the rates, customers on TOU-C delivered some of the highest impacts (0.11 kW per customer, 6.3% of their reference load).** For comparison, the average TOU-B customer also delivered 0.11 kW (3.4%) while having almost twice the capacity to lower their demand during events. Only E1 (standard rate) customers delivered higher per-customer impacts (0.12 kW), which likely reflects the fact that they are not encouraged to shift their load to off-peak hours.

AEG identified the following key findings based on the [ex-ante impact evaluation](#):

- **PG&E expects enrollment to decrease through the 11-year horizon without any planned marketing efforts to offset program attrition. That said, they forecasted more participants than included in the PY2022 enrollment forecast and decreased annual attrition for SmartRate™ only customers to 3.29% (from 7.4% for PY2022).** The current ex-ante forecast included over 4k more customers than the PY2022 forecast but aligns better with other previous years, e.g., PY2021, when 45k customers were expected to participate. Still, the consistent decrease in enrollment resulted in decreased forecasted impacts from the program over time.
- **We estimated that the SmartRate™ program (before portfolio adjustments) will deliver demand reductions of 4.4 MW in 2024 under PG&E's 1-in-2 weather conditions.** These reductions assume that over 44k customers will participate in the PY2024 program and reduce their demand during the average SmartRate™ event hour by 4.4% of their reference load. These impacts include the technology-driven response of SmartAC™ customers responding to concurrent SmartAC™ events.
- **Despite the increased participation from the PY2022 forecast, we estimated lower load impacts (4.4 MW) than last time (5.3 MW) under PG&E's 1-in-2 weather conditions.** While we forecasted higher per-customer impacts for the ELRP A6 participants—the largest participant segment—we estimated lower per-customer impacts than previously forecasted for both the SmartRate™ only and dually enrolled SmartAC™ customers, both in absolute (kW) and relative to the reference load. This may be driven by the higher proportion of new enrollments on bill protection in PY2023. As shown in the ex-post analysis, bill-protected customers achieved lower per-customer impacts on a typical event day than customers not on bill protection.
- **The PY2023 SmartDays™ experienced cooler average event temperatures compared to most weather scenarios, leading to slightly higher percentage impacts compared to ex-post savings.** Under the extreme weather forecasted in the PG&E 1-in-10 scenario, reference loads and impacts increased as expected. Ex-ante impacts remained similar to ex-post under the other weather scenarios with temperatures closer to those observed in PY2023. Impacts as percentages of the estimated reference load correlated with temperatures as expected, though they remained similar to those observed during the PY2023 season.
- **The shift in the RA window to later hours in March through May (5 PM to 10 PM) resulted in slightly lower impacts during these months' peaks compared to other non-summer months.** The SmartRate™ event window (4-9 PM) coincides with the RA window in all other months such that no adjustment to the impacts was necessary.

We provide the following [recommendations](#) to PG&E based on findings from the ex-post and ex-ante impacts evaluations:

- **Consider re-estimating the incremental effect of SmartRate™ over the technology-enabled response of SmartAC™ participants during concurrent SmartRate™ and SmartAC™ events.** This analysis was last completed during the PY2018 evaluation and found that the behavior-driven response

to SmartRate™ events contributed 18% of impacts measured during concurrent SmartAC™ events. SmartAC™ events are dispatched for specific sub-LAPs and various hours that often coincide with SmartDays™, making it difficult to estimate the incremental impacts of SmartRate™ over SmartAC™ appropriate for ex-ante purposes. AEG recommends a supplemental analysis to update this estimate using multiple recent program years, which will build a larger pool of SmartAC™-only and concurrent SmartAC™ and SmartRate™ event days and provide a more robust estimate of the incremental effects.

- **Even though the ELRP program will end after 2025, continue monitoring ELRP A6 participant performance in 2024.** While the improved performance of these customers suggests that they have overcome the initial confusion created by being defaulted into ELRP A6 in PY2022, no ELRP A6 events were dispatched in PY2023. Confusion may still be a factor if ELRP A6 events are dispatched in 2024.
- **Move forward with the conservation effect analysis to determine whether SmartRate™ participants generate overall decreases in their consumption, i.e., conserve energy during non-SmartDays™, in addition to shifting their demand to hours outside the 4 PM to 9 PM event window.** This analysis will help PG&E gauge the effect of its two price credits (SmartRate Non-High Price credit and the SmartRate Participation Credit) on customer load profiles and assess the precision and accuracy of PG&E's customer-specific baselines against which the credits are calculated.

# Table of Contents

<b>Abstract .....</b>	<b>3</b>
<b>EXECUTIVE SUMMARY .....</b>	<b>4</b>
Overview of SmartRate .....	4
PY2023 Participation .....	5
Load Impact Evaluation Results .....	6
Ex-Post Load Impact Results .....	6
Ex-Ante Load Impacts Results .....	8
Key Findings and Recommendations .....	11
<b>1   Introduction .....</b>	<b>17</b>
Overview of SmartRate .....	17
PY2023 Participation .....	18
Load Impact Evaluation .....	19
Report Organization .....	20
<b>2   Ex-Post Evaluation Results .....</b>	<b>21</b>
Overview of PY2023 Ex-Post Impacts.....	21
Comparisons to Previous Years .....	22
Ex-Post Savings by Subgroups .....	23
Local Capacity Area .....	23
Other Customer Segments.....	24
<b>3   Ex-Ante Evaluation Results .....</b>	<b>35</b>
Program-Specific Ex-Ante Impacts .....	35
Portfolio-Adjusted Ex-Ante Impacts.....	37
Comparisons to Ex-Post and Previous Ex-Ante .....	38
<b>4   Key Findings and Recommendations .....</b>	<b>40</b>
<b>A   Detailed Analysis Methods .....</b>	<b>43</b>
<b>B   Table Generators .....</b>	<b>48</b>
<b>C   Model Validity.....</b>	<b>49</b>
<b>D   Bill Impact Analysis .....</b>	<b>53</b>

# List of Tables

Table ES-1	PY2023 SmartDays™	5
Table ES-2	PY2023 Enrollment by LCA	5
Table ES-3	PY2023 Enrollment by Segment	6
Table ES-4	Ex-Post Load Impacts by Event	7
Table ES-5	Ex-Post Savings by Load Capacity Area	7
Table ES-6	Ex-Post Savings by Segment	8
Table ES-7	Typical Event Day Enrollment and Impacts by Program Enrollment: 2024	9
Table ES-8	Portfolio-Level vs. Portfolio-Adjusted Load Impacts: PG&E 1-in-2, Monthly Peak Day, 2024	10
Table 1-1	PY2023 SmartDays™	18
Table 1-2	PY2023 Enrollment by LCA	18
Table 1-3	PY2023 Enrollment by Segment	19
Table 1-4	Overview of Evaluation Methods	19
Table 2-1	Ex-Post Load Impacts by Event	21
Table 2-2	Ex-Post Load Impacts for the Average Event Day Over Time	22
Table 2-3	PY2023 Ex-Post vs. PY2023 Ex-Ante (PG&E 1-in-2)	23
Table 2-4	Ex-Post Savings by Load Capacity Area	23
Table 2-5	Ex-Post Savings by Segment	24
Table 2-6	By Bill Protection Status: Ex-Post Savings on an Average SmartDay™	25
Table 2-7	By Dual-Program Enrollment Status: Ex-Post Savings on an Average SmartDay™	27
Table 2-8	By CARE Status: Ex-Post Savings on an Average SmartDay™	31
Table 2-9	By High Fire-Threat District Status: Ex-Post Savings on an Average SmartDay™	31
Table 2-10	By Billing Rate: Ex-Post Savings on an Average SmartDay™	33
Table 3-1	Typical Event Day Enrollment and Impacts by Program Enrollment: 2024	36
Table 3-2	Per-Customer Load Impacts on PG&E 1-in-2 Monthly Peak Days, 2024	37
Table 3-3	Portfolio-Level vs. Portfolio-Adjusted Load Impacts: PG&E 1-in-2, Monthly Peak Day, 2024	38
Table 3-4	Current Ex-Post (Average Event Day) and Current Ex-Ante (Typical Event Day, 2023), 4 to 9 PM	38
Table 3-5	Previous and Current Ex-Ante, PG&E 1-in-2, Typical Event Day, 2024, 4 to 9 PM	39
Table A-1	Participation and Analysis Pool Attrition	44
Table C-1	Weighted Average MPE and MAPE by Model Segment	51
Table D-1	Bill Impacts for All Participants	53
Table D-2	Participant Distribution by Bill Protection Status	54
Table D-3	Bill Impacts for Participants under the Bill Protection Guarantee	54
Table D-4	Bill Impacts for Participants without the Bill Protection Guarantee	55
Table D-5	Bill Impacts by LCA	55
Table D-6	Bill Impacts by CARE Status	55
Table D-7	Bill Impacts by Billing Rate	56

# List of Figures

Figure ES-1	PY2023 Enrollment by LCA .....	5
Figure ES-2	PY2023 Reference Load by Segment .....	6
Figure ES-3	Enrollment and Impact Forecast: PG&E 1-in-2, Typical Event Day, 2023 - 2034 .....	10
Figure 1-1	PY2023 Enrollment by LCA .....	18
Figure 1-2	PY2023 Reference Load by Segment .....	19
Figure 2-1	Per-Customer Load Profiles on an Average Event Day .....	22
Figure 2-2	LCA-Specific Contributions to Average Event Day Impacts .....	24
Figure 2-3	Ex-Post Impacts Per Customer for the Average Event Day by Subgroup .....	25
Figure 2-4	by Bill Protection Status: Ex-Post Savings on each SmartDay™ .....	26
Figure 2-5	By Bill Protection Status: Per-Customer Load Profiles on an Average Event Day .....	26
Figure 2-6	By SmartAC™ Enrollment Status: Ex-Post Savings on each SmartDay™ .....	28
Figure 2-7	By SmartAC™ Dual-Enrollment Status: Per-Customer Load Profiles on an Average Event Day .....	29
Figure 2-8	By ELRP A6 Dual-Enrollment Status: Ex-Post Savings on each SmartDay™ .....	30
Figure 2-9	By ELRP A6 Dual-Enrollment Status: Per-Customer Load Profiles on an Average Event Day .....	30
Figure 2-10	By High Fire-Threat District Status: Ex-Post Savings on each SmartDay™ .....	31
Figure 2-11	High Fire-Threat District Status: Per-Customer Load Profiles on an Average Event Day .....	32
Figure 2-12	By TOU Status: Ex-Post Savings on each SmartDay™ .....	33
Figure 2-13	By Billing Rate: Per-Customer Load Profiles on an Average Event Day .....	34
Figure 3-1	Enrollment and Impact Forecast: PG&E 1-in-2, Typical Event Day, 2023 - 2034 .....	36
Figure C-1	Daily Temperatures of Event Days v. Event-Like Days .....	49
Figure C-2	Average Load of Participant v. Matched Control on Event-Like Days .....	50
Figure C-3	Actual and Predicted Loads: Event-Like Days (Out-of-Sample Test) .....	51
Figure C-4	Actual and Predicted Loads: Event Days (In-Sample Test) .....	52



# 1 | Introduction

---

This report documents the program year 2023 (PY2023) load impact evaluation of the residential SmartRate™ program offered by Pacific Gas & Electric (PG&E), conducted by the Applied Energy Group (AEG). The study's key objectives include estimating ex-post and ex-ante load impacts for the residential SmartRate™ program using methods and assumptions consistent with the California Demand Response (DR) Load Impact Protocols (LIP),<sup>11</sup> as follows:

- **Estimate Ex-post load impacts** for the average customer and all customers in aggregate for each hour of each event day and the average event day. We present all estimates at the program level<sup>12</sup> and separately for key customer segments.
- **Estimate Ex-ante load impacts** for the average customer and all customers in aggregate for the resource adequacy (RA) window.<sup>13</sup> We provide estimates for each year over an 11-year<sup>14</sup> time horizon based on PG&E and CAISO's 1-in-2 and 1-in-10 weather conditions for a typical event day and each monthly system peak day. We provide estimates for both program-specific and portfolio-adjusted<sup>15</sup> scenarios. We also provide estimates by dual program enrollment.

In this chapter, we provide an overview of the SmartRate™ program, a review of the PY2023 participation, and an overview of the evaluation approach.

## Overview of SmartRate

SmartRate™ is a voluntary critical peak pricing program that overlays a customer's electric rate. It is designed to lower summer electricity costs while conserving California's power grid. Key aspects of the SmartRate™ program design follow.<sup>16</sup>

**Eligibility.** Residential customers with a SmartMeter on the standard rate (E1) or one of five time-of-use (TOU) rates (TOU-B, TOU-C, TOUD, EV2-A, and E-ELEC) are eligible to participate in SmartRate™. Participants may be dually enrolled in SmartAC™ or Emergency Load Reduction Program (ELRP) A6. All participants dually enrolled to SmartAC™ enrolled in both programs before October 26th, 2018. Participants dually enrolled to ELRP A6 are residential customers on CARE and FERA rates defaulted onto the ELRP pilot and other customers that may have optionally enrolled.

**Price Incentives.** The SmartRate™ programs charges customers more for their consumption from 4 PM to 9 PM on SmartDays™ (\$0.60/kWh) and rewards participants for shifting their consumption away from those hours through the SmartRate Non-High Price credit (\$0.00636/kWh) and the SmartRate Participation Credit (\$0.00167/kWh). The credits apply to non-SmartDays™ too, but only during billing cycles with at least one SmartDay™. All consumption increases and decreases are measured relative to customer-specific baselines.

---

<sup>11</sup> Attachment A. Load Impact Estimation for Demand Response: Protocols and Regulatory Guidance, California Public Utilities Commission, Energy Division, April 2008.

<sup>12</sup> I.e., without considering the effects of other demand response programs on the estimated SmartRate™ impacts.

<sup>13</sup> The RA window is 5 PM to 10 PM for March and April and 4 PM to 9 PM for all other months.

<sup>14</sup> PG&E has requested a PY2021 back cast as part of the ex-ante impact analysis.

<sup>15</sup> Portfolio level impacts exclude the load impacts from dually enrolled participants attributed to concurrent SmartAC events.

<sup>16</sup> Details on the program design can be found on PG&E's SmartRate™ website:

<https://www.pge.com/en/account/rate-plans/find-your-best-rate-plan/smartrate.html#accordion-aab9e3dddd-item-a7aa982cf5>

**Bill Protection Guarantee.** During their first full summer season (May through October) of program enrollment (and any preceding partial season), customers are backed by PG&E’s Bill Protection Guarantee that refunds customers at the end of the season if their SmartRate™ costs exceed their regular pricing plan.

**SmartDays™ (Events).** The program must dispatch at least nine and no more than 15 SmartDays™ each year. PG&E typically dispatches SmartDays™ during the summer, most often on weekdays, but can dispatch them year-round. High temperatures, CAISO alerts, and other factors, including Public Safety Power Shutoff (PSPS) activity, influence event dispatches. In PY2023, PG&E dispatched the minimum number of events (nine) from June through September, as shown in Table 1-1. Six of these SmartDays™ coincided with SmartAC™ events, though not all Sub-LAPs were dispatched for each event, and hours did not always overlap with the SmartDay™ event windows.

**Notification.** PG&E provides day-ahead notifications via text and/or email by 5 PM the day before a SmartDay™, giving customers time to plan their energy use or shift their demand away from event hours.

The PY2023 program design remained consistent with the design of the PY2022 program, with all major changes from that year carrying forward.

Table 1-1 PY2023 SmartDays™

Date	Day of Week
June 30	Friday
July 1	Saturday
July 14	Friday
July 15	Saturday
July 17	Monday
July 21	Friday
August 15	Tuesday
August 16	Wednesday
September 26	Tuesday

<sup>a</sup> Concurrent SmartAC events days are highlighted gray. SmartAC events were dispatched for specific Sub-LAPs and event hours that did not always coincide with the SmartRate™ event

## PY2023 Participation

More than 48k unique customers were enrolled in SmartRate™ in the PY2023 season. The rate of participation remained constant across events, with minimal customers unenrolling during the summer months. The majority of SmartRate™ participants belonged to the Greater Fresno Area (24%) or unknown/other (28%) local capacity areas (LCA), as shown in Table 1-2 and Figure 1-1. The total shows the number of participants on a typical event day.

Table 1-2 PY2023 Enrollment by LCA

LCA	# of Accounts
Greater Bay Area	5,586
Greater Fresno Area	11,064
Humboldt	68
Kern	4,236
North Coast and North Bay	2,223
Stockton	5,003
Sierra	4,622
Other	12,756
<b>Total</b>	<b>45,558</b>

Figure 1-1 PY2023 Enrollment by LCA

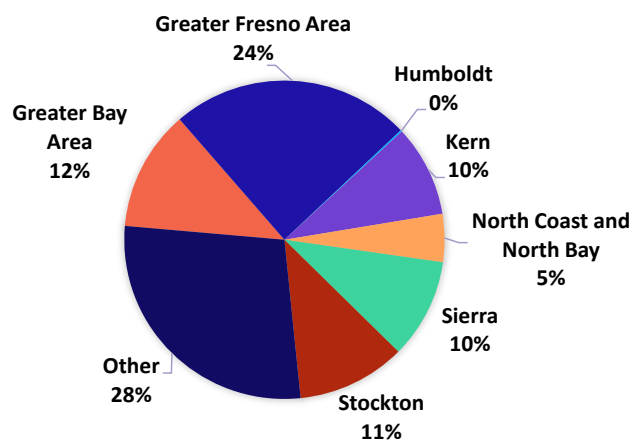


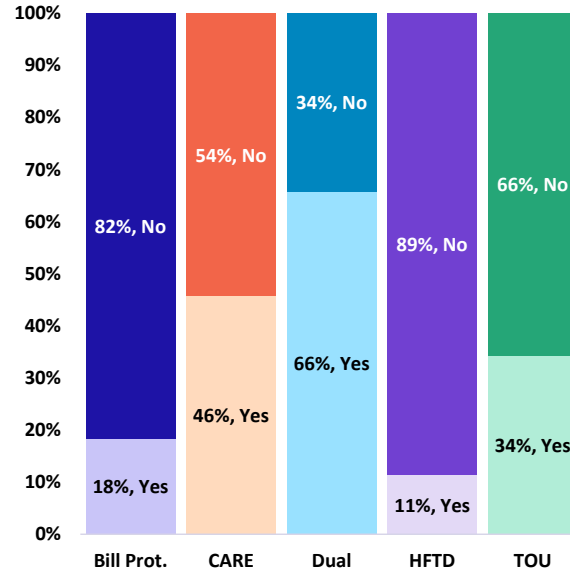
Table 1-3 and Figure 1-2 show the distribution of SmartRate™ participants in each segment of interest. Enrollment in most segments aligns with the PY2022 program, with the majority of customers no longer under bill protection, on a CARE rate, dually enrolled in SmartAC™ or ELRP A6, outside of high fire-threat districts, and not on a time-of-use (TOU) rate.

Table 1-3 PY2023 Enrollment by Segment

Segment	Status	# Accounts <sup>a</sup>
Bill Protection	No	37,287
	Yes	8,271
CARE Enrollment	No	25,884
	Yes	19,674
Dual Program Enrollment	SmartRate Only	16,838
	Dual – ELRP A6	24,049
	Dual – SmartAC	4,671
High Fire Thread District	No	38,975
	Yes	6,583
Time-of-Use	No	28,440
	Yes	17,118

<sup>a</sup> Since customers can belong to more than one segment, these counts should not be summed.

Figure 1-2 PY2023 Reference Load by Segment



## Load Impact Evaluation

AEG designed the PY2023 SmartRate™ evaluation to meet PG&E’s specific research objectives for the program. Table 1-4 briefly describes these analysis steps. The [Detailed Analysis Methods](#) appendix provides more details on the specific approaches.

In outcome, AEG produced Excel workbooks in conformance with the California LIP, referred to as the Table Generators, which were supplied to PG&E separately for ex-post and ex-ante results. These workbooks have been embedded in Appendix B.

Table 1-4 Overview of Evaluation Methods

Step	Description
Define the Participation Population	<p>Starting with the full SmartRate™ participation list, AEG screened out the following customers from the final PY2023 participation population:</p> <ul style="list-style-type: none"> <li>Accounts that went inactive before start of summer (June 1, 2023)</li> <li>Accounts that unenrolled before start of summer</li> <li>Accounts that did not receive any SmartRate event notifications</li> </ul>
Establish the Analysis Sample	<p>AEG further removed accounts from the analysis pool based on the quality of their billing data, mitigating the need for oversampling because of data inadequacies:</p> <ul style="list-style-type: none"> <li>Accounts with zero / negative usage in billing data</li> <li>Accounts without sufficient remaining summer billing data</li> </ul> <p>After defining the final sample frame, AEG selected a random sample of participants for the analysis to avoid having to process and model the entire nearly 49k participant population. We selected 17k participants in total, stratified by the following customer segments:</p> <ul style="list-style-type: none"> <li>Dually enrolled SmartAC™ customers (1,500 customers)</li> <li>Dually enrolled ELRP A6 customers on bill protection (census of 5,056 customers)</li> <li>Dually enrolled ELRP A6 customers not on bill protection (3,000 customers)</li> <li>SmartRate™ only customers on bill protection (census of 5,146 customers)</li> <li>SmartRate™ only customers not on bill protection (3,000 customers)</li> </ul>

Step	Description
Develop a Matched Control Group	<p>AEG analyzed SmartRate™ impacts using quasi-experimental methods, creating a control group of nonparticipants similar in energy consuming behavior to participants. We developed the matched control group as follows:</p> <ul style="list-style-type: none"> <li>• First, we selected event-like days based on their similarity in weather to PY2023 SmartDays™.</li> <li>• Then, we matched eligible nonparticipants to SmartRate™ participants based on their consumption on event-like days using Euclidean distance matching.<sup>17</sup></li> </ul>
Estimate Ex-Post Load Impacts	<p>Using the final sample of participants and the matched control group, we estimated ex-post impacts for the average participant in each of the customer segments (see Establish the Analysis Sample) using panel regression difference-in-differences models with customer fixed effects.</p> <p>We then calculated program-total demand savings for each PY2023 SmartDay™ by applying per-customer impacts to the final participant population.</p>
Estimate Ex-Ante Load Impacts	<p>We calculated ex-ante savings for each year and monthly peak of an 11-year forecast period as follows:</p> <ul style="list-style-type: none"> <li>• First, we applied the ex-post regression models to the ex-ante weather scenarios to estimate ex-ante impacts for an average customer in each segment.</li> <li>• Then, we calculated program-specific ex-ante savings by applying per-customer impacts to the 11-year enrollment forecast (provided by PG&amp;E).</li> <li>• Finally, we developed portfolio-adjusted impacts by applying assumptions to the program-specific ex-ante impacts for the effects of dual-enrollment in other demand repose programs.</li> </ul>

## Report Organization

The remaining chapters provide the following:

- Chapter 2: [Ex-Post Evaluation Results](#)
- Chapter 3: [Ex-Ante Impact Analysis](#)
- Chapter 4: [Key Findings and Recommendations](#)

---

<sup>17</sup> Euclidean distance matching calculates the distance (i.e., the square-root of the sum of squared differences) between multiple matching variables (e.g., early morning load, on-peak load, etc.) to create a single metric for assessing the quality of each participant-nonparticipant candidate match.

## 2 | Ex-Post Evaluation Results

This chapter provides the results of AEG’s ex-post evaluation for PG&E’s PY2023 SmartRate™ program. In the subsequent sections, we report the following metrics:

- The number of participants enrolled during each SmartDay™
- The aggregate and per-customer reference load (i.e., what AEG estimated participants would have consumed without the SmartRate™ program)
- The aggregate and per-customer load impacts, both in absolute (MW or kW) and as a percentage of the reference load
- The average temperature.

All reported estimates represent the average of the SmartDay™ event window (4-9 PM).

### Overview of PY2023 Ex-Post Impacts

Table 2-1 shows the results of AEG’s impact evaluation for each PY2023 SmartDay™. SmartRate™ participants reduced their demand by more than 5 MW during the average SmartDay™ event hour, an average of 0.11 kW (4.7%) per customer. Impacts remained consistent across event days, with participants most often saving between 0.10 kW and 0.12 kW during the average event hour. The exceptions included the SmartDay™ with the hottest temperatures (July 1<sup>st</sup>, 95 °F) and the lowest temperatures (September 26<sup>th</sup>, 75 °F). All impact estimates were statistically significant. AEG removed the September 26<sup>th</sup> event day from the average event day metrics as it did not reflect the typical SmartDay™ in PY2023—PG&E only dispatched this event to meet the program’s minimum requirements for SmartDays™ dispatched in a program year.

Six of the nine SmartDays™ coincided with SmartAC event days. The impacts estimated for these event days reflect the effects of SmartAC customers responding to SmartAC days in addition to the SmartRate™ price signals. AEG excluded these event days for SmartAC customers from the average event day.

Table 2-1 Ex-Post Load Impacts by Event

Event Date <sup>a</sup>	# Accounts	Aggregate (MW)		Per Customer (kW)		% Load Impact	Avg. Event Temp (°F)
		Reference Load	Load Impact	Reference Load	Load Impact		
Jun. 30	45,811	100.3	5.0	2.19	0.11	5.0%	90
Jul. 1	45,777	111.3	5.8	2.43	0.13	5.2%	95
Jul. 14	45,565	99.5	4.7	2.18	0.10	4.8%	90
Jul. 15	45,562	111.9	5.4	2.46	0.12	4.9%	93
Jul. 17	45,529	113.7	5.1	2.50	0.11	4.5%	92
Jul. 21	45,475	109.6	5.3	2.41	0.12	4.8%	92
Aug. 15	45,376	114.3	5.1	2.52	0.11	4.5%	92
Aug. 16	45,367	107.8	4.7	2.38	0.10	4.4%	91
Sep. 26	45,602	48.2	3.9	1.06	0.09	8.0%	75
<b>Average Event Day<sup>b</sup></b>	<b>45,558</b>	<b>108.5</b>	<b>5.2</b>	<b>2.38</b>	<b>0.11</b>	<b>4.7%</b>	<b>92</b>

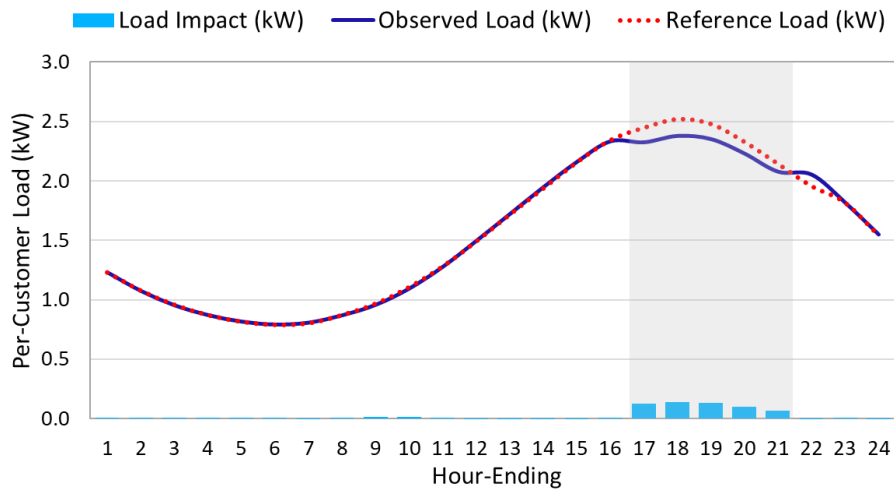
<sup>a</sup> Concurrent SmartAC events days are highlighted gray. SmartAC events were dispatched for specific Sub-LAPs and event hours that did not always coincide with the SmartRate™ event window.

<sup>b</sup> The average event day excludes the September 26<sup>th</sup> SmartDay™ because it was dispatched to meet the minimum SmartRate™ program requirements and did not reflect other PY2023 SmartDays™.

Figure 2-1 shows the per-customer hourly observed loads, estimated reference loads, and estimated load impacts on the average event day. SmartRate™ participants produced a relatively flat event response, reaching the highest impact during the second event hour (HE18). At the program level, hourly load impacts

show minimal signs of pre-cooling or post-event snapback. This response is typical of programs where participants do not have a technology-enabled device to assist in event response. We will discuss this more in a subsequent section on the impacts of dual enrollment in SmartAC™.

Figure 2-1 Per-Customer Load Profiles on an Average Event Day



### Comparisons to Previous Years

Table 2-2 shows how the ex-post load impacts have changed over time, starting with the 2020 program year.

While enrollment decreased from 2020 through 2022, PG&E’s SmartRate™ program participation slightly increased in PY2023. Since PG&E did not increase its marketing efforts for the program, the temperature extremes in PY2022 could have driven customers to explore alternative rates to save on their energy bills.

Per-customer load impacts also increased slightly from the PY2022 year, though they remained lower than those estimated for PY2020 and PY2021. The shift in the on-peak window from 2-7 PM to 4-9 PM likely drove the general decline in PY2022 and PY2023 from previous years, which may have prompted a “learning curve” as participants adjusted their behavior to the new window. In PY2023, participants appeared to have made some of these changes, as evidenced by the slight increase in impacts over PY2022. However, a persistent notification issue in PY2022 also led to lower performance that year and did not affect PY2023.

Notably, the per-customer reference load did not appear to be affected by the event window shift, suggesting that participants had as much capacity to curtail their demand during the 4-9 PM window as they did during the 2-7 PM window.

Table 2-2 Ex-Post Load Impacts for the Average Event Day Over Time

Program Year	# Accounts	Aggregate (MW)		Per Customer (kW)		% Load Impact	Avg. Event Temp (°F)
		Reference Load	Load Impact	Reference Load	Load Impact		
2020 (2-7 PM)	64,752	153.8	12.3	2.38	0.19	8.0%	96
2021 (2-7 PM)	51,489	125.1	7.3	2.43	0.14	5.8%	95
2022 (4-9 PM)	43,376	104.7	4.1	2.41	0.09	3.9%	91
2023 (4-9 PM)	45,558	108.5	5.2	2.38	0.11	4.7%	92

Table 2-3 shows how the PY2023 ex-post load impacts compared to the prior evaluation year’s (PY2022) ex-ante estimates for 2023. Overall participation did not drop at the rate anticipated in the PY2022 ex-ante forecast, consistent with the increased participation the program experienced between PY2022 and PY2023.

However, participants performed slightly worse than the prior ex-ante forecast, likely because of the milder temperatures experienced in PY2023 (92 °F during the average event hour) than assumed in the 1-in-2 weather conditions. Increased temperatures drove the higher reference load estimated for the average customer.

Table 2-3 PY2023 Ex-Post vs. PY2023 Ex-Ante (PG&E 1-in-2)

Program Year	# Accounts	Aggregate (MW)		Per Customer (kW)		% Load Impact	Avg. Event Temp (°F)
		Reference Load	Load Impact	Reference Load	Load Impact		
PY2022 Ex-Ante (2023) <sup>a</sup>	43,941	98.9	5.9	2.25	0.13	6.0%	96
PY2023 Ex-Post	45,558	108.5	5.2	2.38	0.11	4.7%	92

<sup>a</sup> The PY2022 ex-ante forecast excluded impacts from customers impacted by the notification issues experienced in PY2022, increasing ex-ante impacts compared to the ex-post impacts.

## Ex-Post Savings by Subgroups

This section presents all load impact estimates for each of the following customer segments: LCA, bill protection status, CARE enrollment, dual-program enrollment,<sup>18</sup> high fire-threat district status, and TOU enrollment, along with the distribution of impacts for each segment.

### Local Capacity Area

Table 2-4 summarizes the aggregate ex-post results for the average event day for PG&E’s eight LCAs. Nearly 25% of all participants belong to the Greater Fresno Area, with slightly more (28%) in the “Other or Unknown” category. These two LCAs combined contributed 55% of the total SmartRate™ impact (2.8 MW).

Table 2-4 Ex-Post Savings by Load Capacity Area

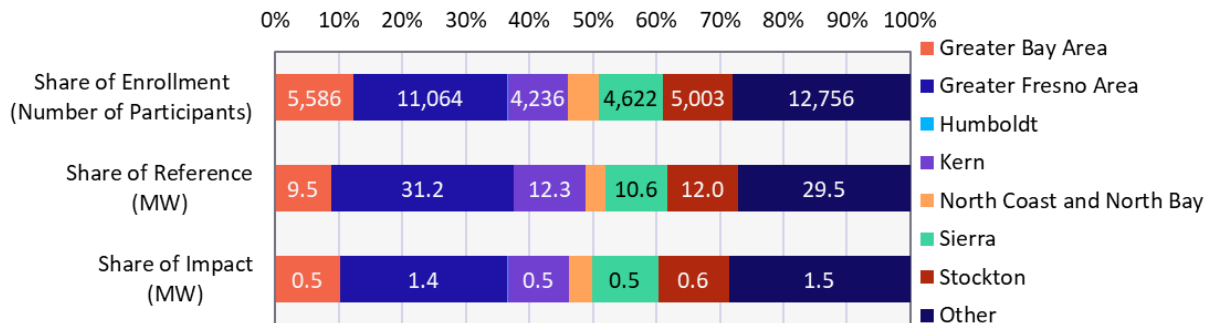
LCA	# Accounts	Reference Load (MW)	Load Impact (MW)	% Load Impact	Avg. Event Temp (°F)
Greater Bay Area	5,586	9.5	0.5	5.5%	80
Greater Fresno Area	11,064	31.2	1.4	4.4%	101
Humboldt	68	█	█	█	76
Kern	4,236	12.3	0.5	4.0%	103
North Coast and North Bay	2,223	3.3	0.2	5.5%	89
Sierra	4,622	10.6	0.5	5.1%	98
Stockton	5,003	12.0	0.6	4.8%	98
Other or Unknown	12,756	29.5	1.5	5.0%	95

Figure 2-2 shows each LCA’s share of the program enrollment, impacts, and reference load. As expected, the LCAs’ shares of impacts align closely with their shares of the enrollment population, showing that customers generally reduced their demand by the same distribution across LCAs. Notably, customers in the Greater Bay Area saved less, on average, compared to other LCAs, while customers in the Greater Fresno Area and Kern tended to save more. This reflects the differences in the temperatures experienced by customers in these LCAs during the average event.

<sup>18</sup> SmartRate™ only or dual enrollment in SmartAC™ or ELRP A6.



Figure 2-2 LCA-Specific Contributions to Average Event Day Impacts



### Other Customer Segments

Table 2-5 summarizes ex-post estimates for the average event day for each customer segment described in [PY2023 Participation](#). The following Figure 2-3 shows each subgroup’s per-customer load impacts on the average event day and corresponding 90% confidence intervals. Non-overlapping confidence intervals within segments suggest that these customers reduced their demand at statistically different rates.

In particular, customers with a bill protection guarantee appeared to generate lower impacts than customers not on bill protection, as expected. Similarly, customers dually enrolled in SmartAC, who respond to price signals via a switch installed on their air-conditioning (AC) units, saved substantially more than customers without that automated response capability. We discuss differences within segments in the remainder of this section.

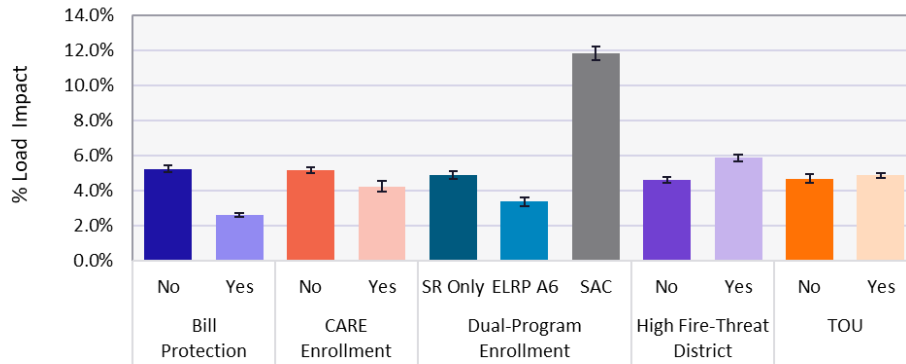
Table 2-5 Ex-Post Savings by Segment

Segment	Status	# Accounts	Aggregate (MW)		Per Customer (kW)		% Load Impact	Avg. Event Temp (°F)
			Reference Load	Load Impact	Reference Load	Load Impact		
Bill Protection	No	37,287	88.6	4.6	2.38	0.12	5.2%	92
	Yes	8,271	20.0	0.5	2.42	0.06	2.6%	91
CARE Enrollment	No	25,884	58.9	3.0	2.27	0.12	5.2%	91
	Yes	19,674	49.7	2.1	2.53	0.11	4.2%	93
Dual-Program Enrollment	SmartRate Only	16,838	37.1	1.8	2.20	0.11	4.9%	92
	Dual – ELRP A6	24,049	60.5	2.0	2.52	0.08	3.4%	91
	Dual – Smart AC	4,671	10.9	1.3	2.34	0.28	11.8%	95
High Fire-Threat District	No	38,975	96.2	4.4	2.47	0.11	4.6%	92
	Yes	6,583	12.4	0.7	1.88	0.11	5.9%	92
Time-of-Use	No	28,440	71.3	3.3	2.51	0.12	4.7%	92
	Yes	17,118	37.3	1.8	2.18	0.11	4.9%	91

<sup>a</sup> Since customers can belong to more than one segment, values should not be summed across segments.



Figure 2-3 Ex-Post Impacts Per Customer for the Average Event Day by Subgroup



<sup>a</sup> Error bars show the 90% confidence interval around estimated impacts.

### Bill Protection Guarantee

During their first full summer season (May through October) of program enrollment (and any preceding partial season), customers are backed by PG&E’s Bill Protection Guarantee that refunds customers if their SmartRate™ costs are more than their regular residential pricing plan. PG&E would credit the difference on the customer’s November bill if they did not save on SmartRate™. This section explores any implications of PG&E’s Bill Protection Guarantee on load impacts.

Nearly 20% of PY2023 SmartRate™ participants qualified for the Bill Protection Guarantee, a substantial increase from the 12% in PY2022, which aligns with the increased SmartRate™ enrollments over the previous year.

Table 2-6 shows the per-customer reference loads and load impacts by bill protection status on an average event day, while Figure 2-4 provides the impacts estimated for each SmartDay™. In total, customers with bill protection contributed 10% of total SmartRate™ MW impacts during the average SmartDay™ event hour. These customers generated lower load impacts compared to customers not under bill protection by about half for most event days. We attribute these differences to the following typical expectations from the Bill Protection Guarantee:

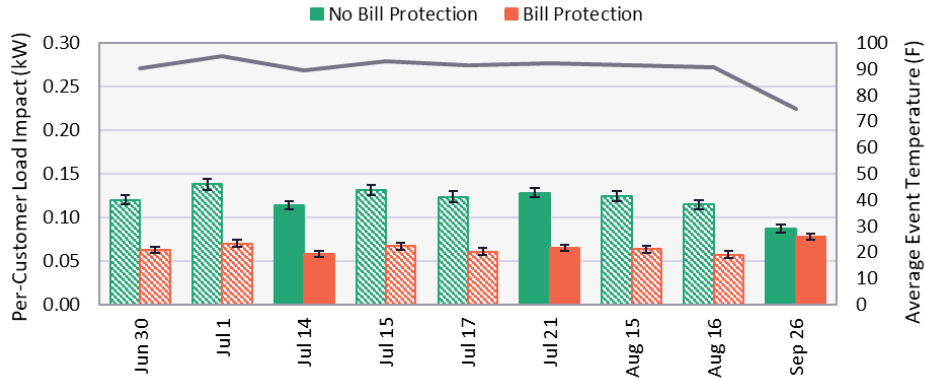
- Customer “complacency” due to the absence of cost impacts.
- A learning curve for new participants who have yet to adjust their behaviors to respond to events adequately.
- The absence of technology-enabled participants in the bill-protected group, since dual enrollment in SmartAC™ is closed to new customers.

Both groups show some correlation between impacts and temperatures, though notably, bill-protected customers produced some of their savings on the last event day in September compared to the other SmartDays™. This is in stark contrast to non-bill-protected customers, who generated their lowest impacts on this day because of the milder temperatures.

Table 2-6 By Bill Protection Status: Ex-Post Savings on an Average SmartDay™

Event Date	# Accounts	Aggregate (MW)		Per Customer (kW)		% Load Impact	Avg. Event Temp (°F)
		Reference Load	Load Impact	Reference Load	Load Impact		
No Bill Protection	37,287	88.6	4.6	2.38	0.12	5.2%	92
Bill Protection	8,271	20.0	0.5	2.42	0.06	2.6%	91

Figure 2-4 by Bill Protection Status: Ex-Post Savings on each SmartDay™



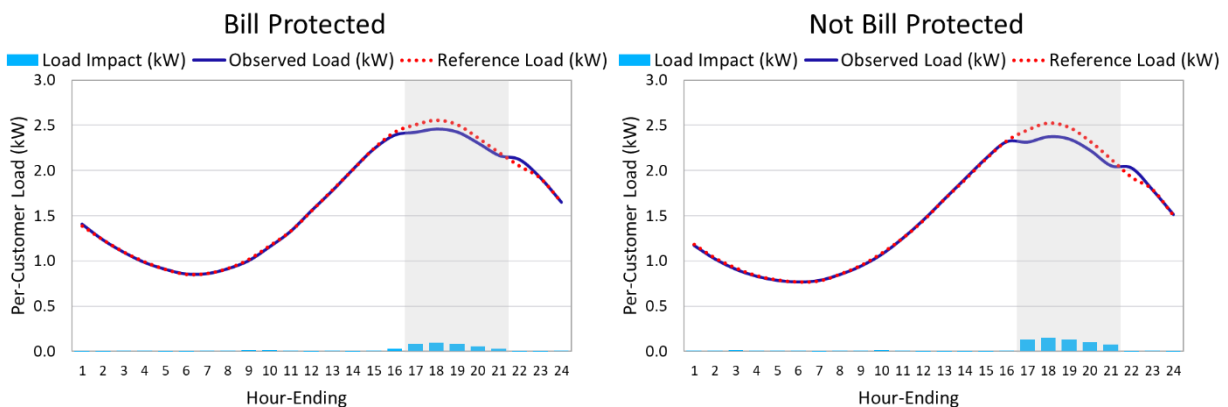
<sup>a</sup> Concurrent SmartAC events days are striped. SmartAC™ events were dispatched for specific Sub-LAPs and event hours that did not always coincide with the SmartRate™ event window.

<sup>b</sup> Error bars show the 90% confidence interval around estimated impacts.

Figure 2-5 compares the per-customer hourly reference loads, observed loads, and estimated load impacts on the average event day based on bill protection status. AEG modeled these customer segments separately based on the assumption that customers would respond differently depending on whether they were guaranteed protection on their bills when participating. We observed the following:

- Customers did not substantially shift their load to hours outside the event window in either segment, except for some snapback immediately following the event.
- Both sets of customers appeared similar in their consumption absent the event, i.e., their reference loads align well in magnitude and general shape.
- The shape of customer impacts is similar in both segments, with the highest impacts achieved in the second hour (HE18) of the event window. The differences in the magnitudes of impacts can be clearly seen in the size of the bars, with bill-protected customers savings about half of other customers.

Figure 2-5 By Bill Protection Status: Per-Customer Load Profiles on an Average Event Day



### Dual Program Enrollment

Next, we present the implications of SmartRate™ customers dual enrolling in PG&E’s other demand response programs. Participants may be dually enrolled in SmartAC™ or Emergency Load Reduction Program (ELRP A6):

- **The SmartAC™ program** installs devices on participants’ air conditioner (AC) units that allow PG&E to remotely reduce the units’ capacities during both SmartAC™ and SmartRate™ events.

- **The ELRP pilot** is a statewide initiative that targets various customer segments and end uses for incremental load reductions. PG&E automatically enrolled residential CARE and FERA rates as well as participants of PG&E’s Home Energy Reports (HER) program into the pilot. Customers not in these segments may opt-in to the program.

In PY2023, dually enrolled participants comprised 63% of all SmartRate™ participants and contributed 65% of total MW impacts during the average SmartDays™ event hour.

Table 2-7 reveals differences in the magnitude of per-customer load impacts between customers in these three segments. As expected given the direct load control mechanism of the SmartAC™ program, the average dually-enrolled customer generated higher impacts than customers not enrolled in SmartAC™ by more than double—0.28 kW per customer (11.8% of their reference load), compared to 0.11 kW (4.9%) from the average SmartRate™-only customer.

That said, customers dually enrolled in ELRP A6 delivered larger demand reductions during the average PY2023 SmartDay™ event hour (3.4%) than they did in PY2022 (1.0%). Many ELRP A6 customers were newly enrolled into SmartRate in PY2022, which may have contributed to their low impacts in that year. They appeared to successfully respond to the SmartRate™ price signals in PY2023.

Table 2-7 By Dual-Program Enrollment Status: Ex-Post Savings on an Average SmartDay™

Event Date	# Accounts	Aggregate (MW)		Per Customer (kW)		% Load Impact	Avg. Event Temp (°F)
		Reference Load	Load Impact	Reference Load	Load Impact		
SmartRate™ Only	16,838	37.1	1.8	2.20	0.11	4.9%	92
Dual – Smart AC	4,671	10.9	1.3	2.34	0.28	11.8%	95
Dual – ELRP A6	24,049	60.5	2.0	2.52	0.08	3.4%	91

The remainder of this section explores the effect of SmartRate for SmartAC™ and ERLP A6 dual participants.

### Dual-Enrollment in SmartAC™

The SmartAC™ program calls emergency-based and Sub-LAP-level events lasting between one and six hours per day. Customers enrolled in the SmartAC™ program have a switch installed on their air conditioning (AC) unit (including heat pumps), which allows PG&E to remotely signal cooling equipment to run at a lower capacity. During SmartDays™, PG&E also remotely controls participants' cooling equipment via the SmartAC™ switch such that dually enrolled participants receive the same experience on both SmartAC™ events and SmartDays™. All dually enrolled participants enrolled in both programs before October 26th, 2018. Dual enrollment is not currently available to new participants.

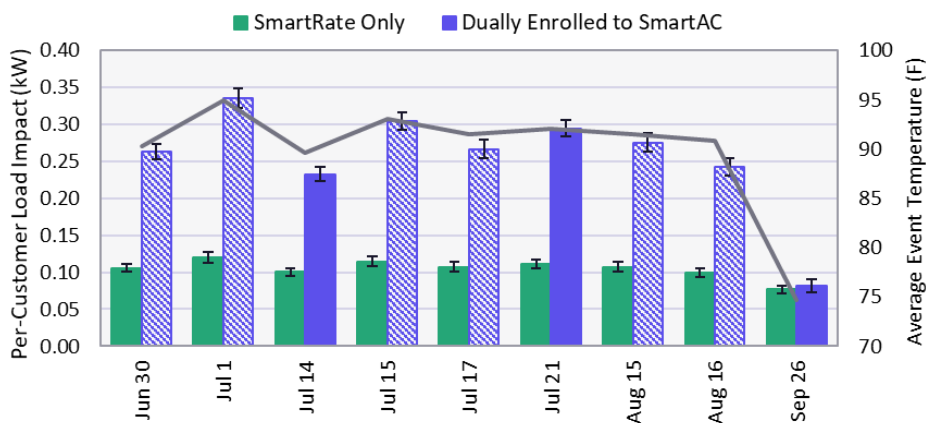
The PY2023 analysis showed results consistent with this segment’s historical performance. On average, participants dually enrolled in SmartAC™ saved 11.8% compared to 4.9% for participants only enrolled in SmartRate™. (See Table 2-7.) These differences in magnitudes can be directly attributed to PG&E’s control of the SmartAC™ switches, which allows participants to respond to events with minimal to no impact on customer behavior.

Figure 2-6 shows the per-customer ex-post load impacts for each event day for SmartRate™-only and dually enrolled participants. We observed the following:

- As discussed, participants dually enrolled in SmartAC™ exhibit higher per-customer load impacts compared to singly enrolled participants since their response to events is supported by PG&E’s control of their AC units and not driven entirely by behavioral change.
- Again, because SmartAC™ participants’ AC units respond directly to events via PG&E-controlled switches, their impacts correlated highly with temperatures. This correlation existed for SmartRate™-only customers too, but to a less obvious degree given the relative size of their impacts in comparison.

- Previous years highlighted the incremental impact attributed to SmartRate™ in addition to impacts attributed to the SmartAC™ program by comparing SmartAC™ per-customer impacts achieved during SmartRate™-only events to those achieved during concurrent SmartDays™ and SmartAC™ events. However, the small number of events dispatched in PY2023—most of them concurrent with SmartAC™ events—makes this comparison difficult.

Figure 2-6 By SmartAC™ Enrollment Status: Ex-Post Savings on each SmartDay™



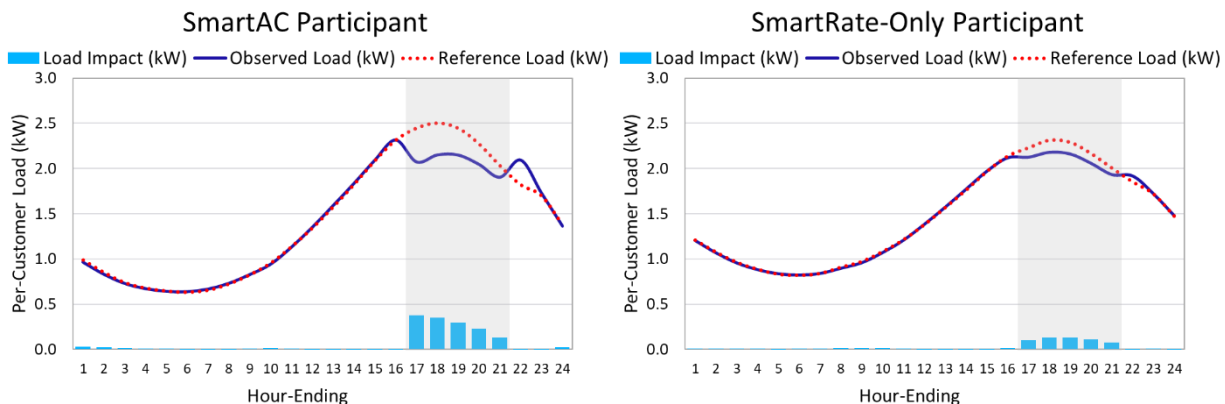
<sup>a</sup> Concurrent SmartAC events days are striped. SmartAC™ events were dispatched for specific Sub-LAPs and event hours that did not always coincide with the SmartRate™ event window.

<sup>b</sup> Error bars show the 90% confidence interval around estimated impacts.

Figure 2-7 compares the per-customer hourly reference loads, observed loads, and estimated load impacts on the average event day for participants of SmartRate™ only and those dually enrolled in SmartAC™.

- SmartRate™-only customers did not substantially shift their load to hours outside the event window in either segment, except for some snapback immediately following the event. In contrast, dually enrolled SmartAC™ customers exhibited some (albeit minor) pre-cooling effects and large snapback usage patterns, typical of technology-enabled participants.
- The average SmartAC™ dual-enrolled customer had slightly higher reference load consumption than the average SmartRate™-only customer, consistent with previous years. While AC saturations are likely high in PG&E’s territory, the requirement that homes have central cooling to be eligible for the SmartAC program could lead this group to consume slightly more, on average.
- In addition to the magnitudes of impacts, where SmartAC™ dual-enrolled customers achieved more than double the impacts of SmartRate™-only customers, the shape of the impacts also differs between the two sets of customers. While SmartRate™-only customers achieved their highest impacts in the second hour (HE18) of the event window, SmartAC™ customer impacts peaked in the first hour of the event (HE17). This coincides with when PG&E would have initially lowered the capacities at which customers’ AC units had been operating.

Figure 2-7 By SmartAC™ Dual-Enrollment Status: Per-Customer Load Profiles on an Average Event Day



### Dual-Enrollment in ELRP A6

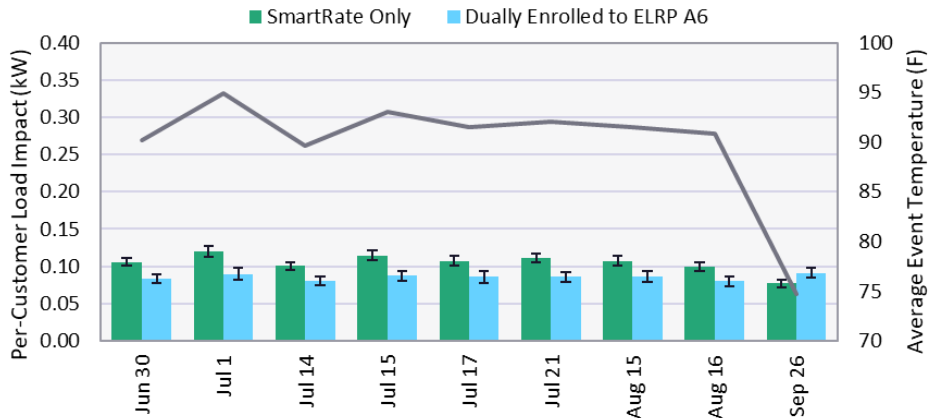
ELRP is a five-year pilot implemented statewide in 2021 that encourages customers to reduce their demand during times of high stress on the electrical grid. Specifically, it was designed as a last-resort option for curtailing load during grid emergencies. The ELRP A6 pilot is set to conclude after 2025. Other program characteristics follow.

- Events can be dispatched from May through October during the 4-9 PM hours, seven days a week. They are triggered based on the day-ahead CAISO system conditions or day-of grid emergencies.
- Customers receive \$2/kWh in bill credits for responding to dispatched events based on individual customer baseline calculations. They are not penalized for non-response or increasing consumption relative to the calculated baseline.
- Customers receive day-ahead notification of events most often via email, though they can sign up to receive text notifications.
- Per CPUC Decision, PG&E automatically enrolled residential customers on CARE or FERA rates within their territory, as well as participants of PG&E’s HER program, into the pilot. Customers not in these segments may opt-in to the program, including customers in PG&E’s SmartRate™ program.

However, no ERLP A6 events were dispatched in PY2023. Figure 2-8 shows the per-customer ex-post load impacts for each event day for SmartRate™-only customers and those dually enrolled in ELRP A6. We observed the following:

- The 90% confidence intervals (shown by the error bars) suggest that some of the observed differences in impacts across SmartDays™ are statistically meaningful, i.e., ELRP A6 customers saved slightly less than SmartRate™-only customers on average, but in reality, their impacts closely aligned.
- The impacts estimated for the ELRP A6 dual-enrolled segment in PY2023 suggest that customers overcame any confusion created by being defaulted into the ELRP A6 pilot in PY2022. Most of these customers had previously been SmartRate™-only CARE participants and had delivered load impacts comparable to SmartRate™-only customers prior to PY2022. However, the lack of messaging about their enrollment into ELRP A6 likely caused the low impacts observed for these customers in PY2022. However, there were also no ELRP A6 events dispatched in PY2023, which may have helped the confusion, too. Therefore, these impacts may not hold in PY2024 if ELRP A6 events are dispatched.

Figure 2-8 By ELRP A6 Dual-Enrollment Status: Ex-Post Savings on each SmartDay™

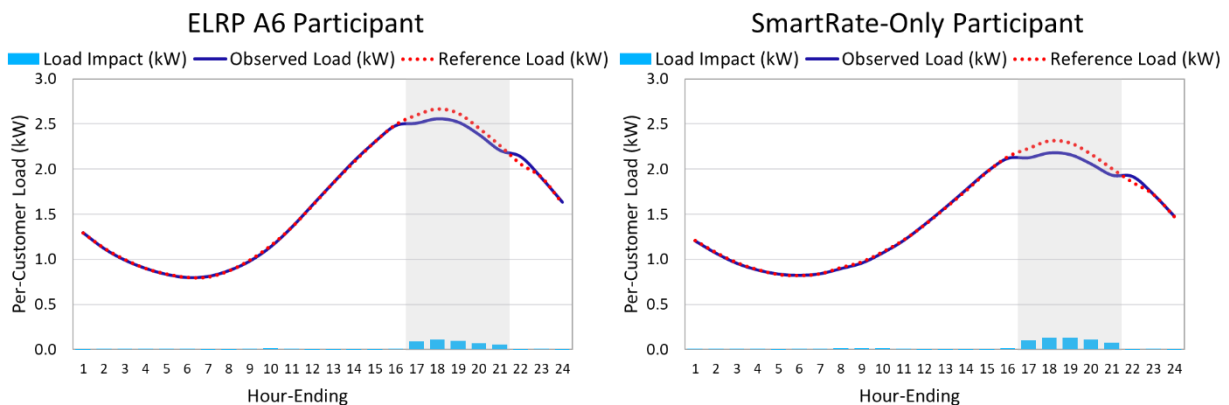


<sup>a</sup> Error bars show the 90% confidence interval around estimated impacts.

Figure 2-9 compares the per-customer hourly reference loads, observed loads, and estimated load impacts on the average event day for participants of SmartRate™ only and those dually enrolled in ELRP A6.

- Customers did not substantially shift their load to hours outside the event window in either segment, except for some snapback immediately following the event.
- The average ELRP A6 dual-enrolled customer had slightly higher reference load consumption than the average SmartRate™-only customer, consistent with previous years. Because customers on CARE comprise much of the ELRP A6 dual-enrollment segment, it is likely a less efficient group.
- The shape of customer impacts is similar in both segments, with the highest impacts achieved in the second hour (HE18) of the event window—this generally coincides with the peak of their reference load, i.e., when customers have the greatest capacity to reduce their consumption. The small difference in the magnitudes of impacts is highlighted here, with differences between the size of the bars being difficult to distinguish.

Figure 2-9 By ELRP A6 Dual-Enrollment Status: Per-Customer Load Profiles on an Average Event Day



### CARE Enrollment

Before CARE customers were defaulted in the ELRP A6 pilot, CARE and non-CARE performed similarly during SmartRate™ events. However, defaulting CARE customers into ELRP A6 severely impacted the average performance of this segment in PY2022. Table 2-8 shows that while some effects of confusion surrounding the initial default still linger, CARE customers performed better in PY2023, delivering impacts of 4.2% (compared to 2.6% in PY2022). This is much closer to the average non-CARE customer, who achieved reductions of 5.2%. Because CARE customers had higher reference loads compared to non-CARE customers, both segments delivered roughly the same impacts on a per-customer kW basis.

Table 2-8 By CARE Status: Ex-Post Savings on an Average SmartDay™

CARE Status	# Accounts	Aggregate (MW)		Per Customer (kW)		% Load Impact	Avg. Event Temp (°F)
		Reference Load	Load Impact	Reference Load	Load Impact		
Non-CARE Customer	25,884	58.9	3.0	2.27	0.12	5.2%	91
CARE Customer	19,674	49.7	2.1	2.53	0.11	4.2%	93

### High Fire-Threat District

High fire-threat districts refer to areas with a higher risk of power line fires igniting and spreading rapidly. These high fire-threat areas are chosen by several maps approved on an interim basis. Each interim map covers a different part of California and uses its own method for identifying high fire-threat areas, showing consistency and potential enforcement issues. Around 14% of PY2022 SmartRate™ participants were located within high fire-threat districts and they contributed 14% of total MW impacts.

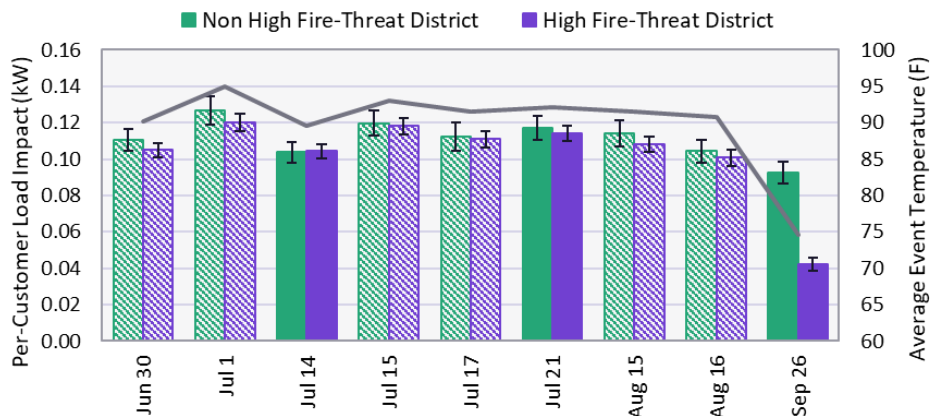
Table 2-9 shows the per-customer reference loads and load impacts by high fire-threat district status on an average event day, while Figure 2-10 provides the impacts estimated for each SmartDay™. On average, we see slightly higher load impacts as a percentage of reference loads for customers in high fire-threat districts (5.9%) compared to customers residing outside of these areas (4.6%), which reflects the substantially lower average customer consumption (reference load) estimated for the high fire-threat district participants.

However, customers delivered similar impacts on a per-customer kW basis on the average event day and consistently across event days, with the exception of the September 26<sup>th</sup> event. While customers not in a high fire-threat district saved similarly to other, hotter event days, customers in high fire-threat districts produced much smaller impacts on this milder day.

Table 2-9 By High Fire-Threat District Status: Ex-Post Savings on an Average SmartDay™

High Fire-Threat District Status	# Accounts	Aggregate (MW)		Per Customer (kW)		% Load Impact	Avg. Event Temp (°F)
		Reference Load	Load Impact	Reference Load	Load Impact		
Non-High Fire-Threat District	38,975	96.2	4.4	2.47	0.11	4.6%	92
High Fire-Threat District	6,583	12.4	0.7	1.88	0.11	5.9%	92

Figure 2-10 By High Fire-Threat District Status: Ex-Post Savings on each SmartDay™



<sup>a</sup> Concurrent SmartAC events days are striped. SmartAC™ events were dispatched for specific Sub-LAPs and event hours that did not always coincide with the SmartRate™ event window.

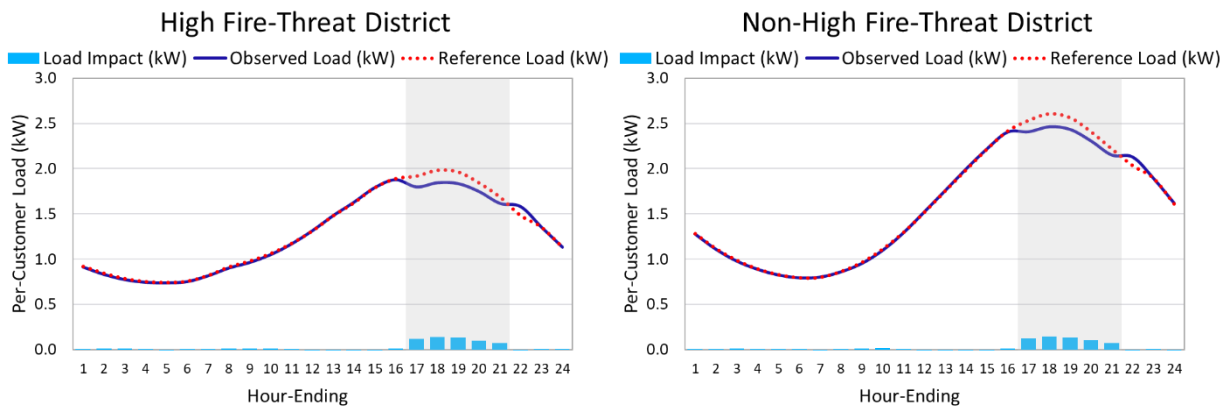
<sup>b</sup> Error bars show the 90% confidence interval around estimated impacts.



Figure 2-11 compares the per-customer hourly reference loads, observed loads, and estimated load impacts on the average event day for participants belonging to high fire-threat districts and those residing elsewhere.

- Like with other segments, customers did not substantially shift their load to hours outside the event window in either segment, except for some snapback immediately following the event.
- The average customer living in a high fire-threat district had much lower reference load consumption than the average customer belonging to other areas, consistent with previous years. Despite this, customers generated similar impacts on a per-customer kW basis, as shown by the size of the bars.
- The shape of customer impacts is also similar in both segments, with the highest impacts achieved in the second hour (HE18) of the event window. This coincides somewhat with the peak of their reference loads, i.e., when customers have the greatest capacity to reduce their consumption.

Figure 2-11 High Fire-Threat District Status: Per-Customer Load Profiles on an Average Event Day



### Time-of-Use Enrollment

SmartRate™ is currently available to customers on the standard rate (E1) and the five TOU rates described below. Starting in 2021, PG&E began defaulting residential customers onto the TOU-C rate in monthly waves. Since completing the transition of all customers in 2022, PG&E has experienced opt-out rates of about 20%. As a result, the share of standard rate enrollment in SmartRate™ remains high at 60%, compared to 77% before the defaulting transition. The TOU periods of the different rates mentioned above are as follows.

- TOU-B (Opt-in customers): Peak pricing on weekdays from 4 to 9 PM.
- TOU-C (Defaulted customers): Peak pricing every day from 4 to 9 PM.
- TOU-D (Opt-in customers): Peak pricing on weekdays from 5 to 8 PM.
- EV2-A (Home charging electric vehicle customers): Peak pricing every day from 4 to 9 PM, partial peak pricing every day from 3 to 4 PM and 9 PM to 12 AM.
- E-ELEC (Electric Home Rate Plan): Peak pricing every day from 4 to 9 PM with partial peak pricing every day from 3 to 4 PM and 9 PM to 12 AM.

Table 2-10 shows the per-customer reference loads and load impacts by billing rate on an average event day, while Figure 2-12 provides the impacts estimated for each SmartDay™ for TOU and standard rate customers. Across all the rates, customers saved between 2.4% and 6.3% of their reference load consumption during the average SmartDay™ hour.

The TOU-B, TOU-D, and E-ELEC rates target higher-consuming customers (including those with electric vehicles and electrified homes), which we see reflected in the size of their per-customer reference loads in comparison to the other rates. However, because they are already shifting their consumption to hours outside the event window, these customers generated some of the lowest impacts during the average



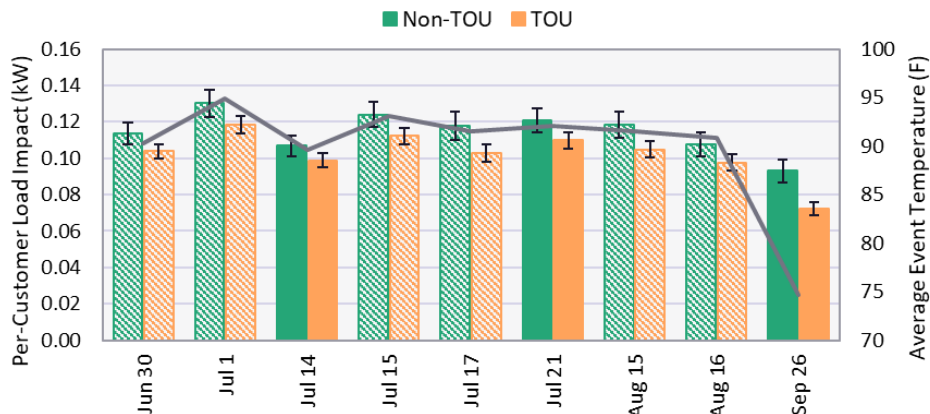
SmartDay™ hour on a percentage basis. Similar logic applies to customers on the EV2-A rate, though to a lesser extent.

In contrast, the TOU-C rate included some of the lowest-consuming customers, but these customers delivered some of the highest impacts (0.11 kW per customers, 6.3% of their reference load). For comparison, the average TOU-B customer also delivered 0.11 kW (3.4%) while having almost twice the capacity to lower their demand during events. Only standard rate customers delivered higher per-customer impacts (0.12 kW), which likely reflects the fact that they are not encouraged to shift their load to off-peak hours.

Table 2-10 By Billing Rate: Ex-Post Savings on an Average SmartDay™

Billing Rate	# Accounts	Aggregate (MW)		Per Customer (kW)		% Load Impact	Avg. Event Temp (°F)
		Reference Load	Load Impact	Reference Load	Load Impact		
E1	27,429	69.0	3.3	2.51	0.12	4.7%	93
TOU-B	2,050	6.4	0.2	3.13	0.11	3.4%	91
TOU-C	11,989	21.2	1.3	1.77	0.11	6.3%	91
TOU-D	3,079	9.6	0.2	3.13	0.08	2.6%	93
EV2-A	731	1.5	0.0	2.00	0.07	3.3%	91
E-ELEC	280	0.9	0.0	3.10	0.07	2.4%	92

Figure 2-12 By TOU Status: Ex-Post Savings on each SmartDay™



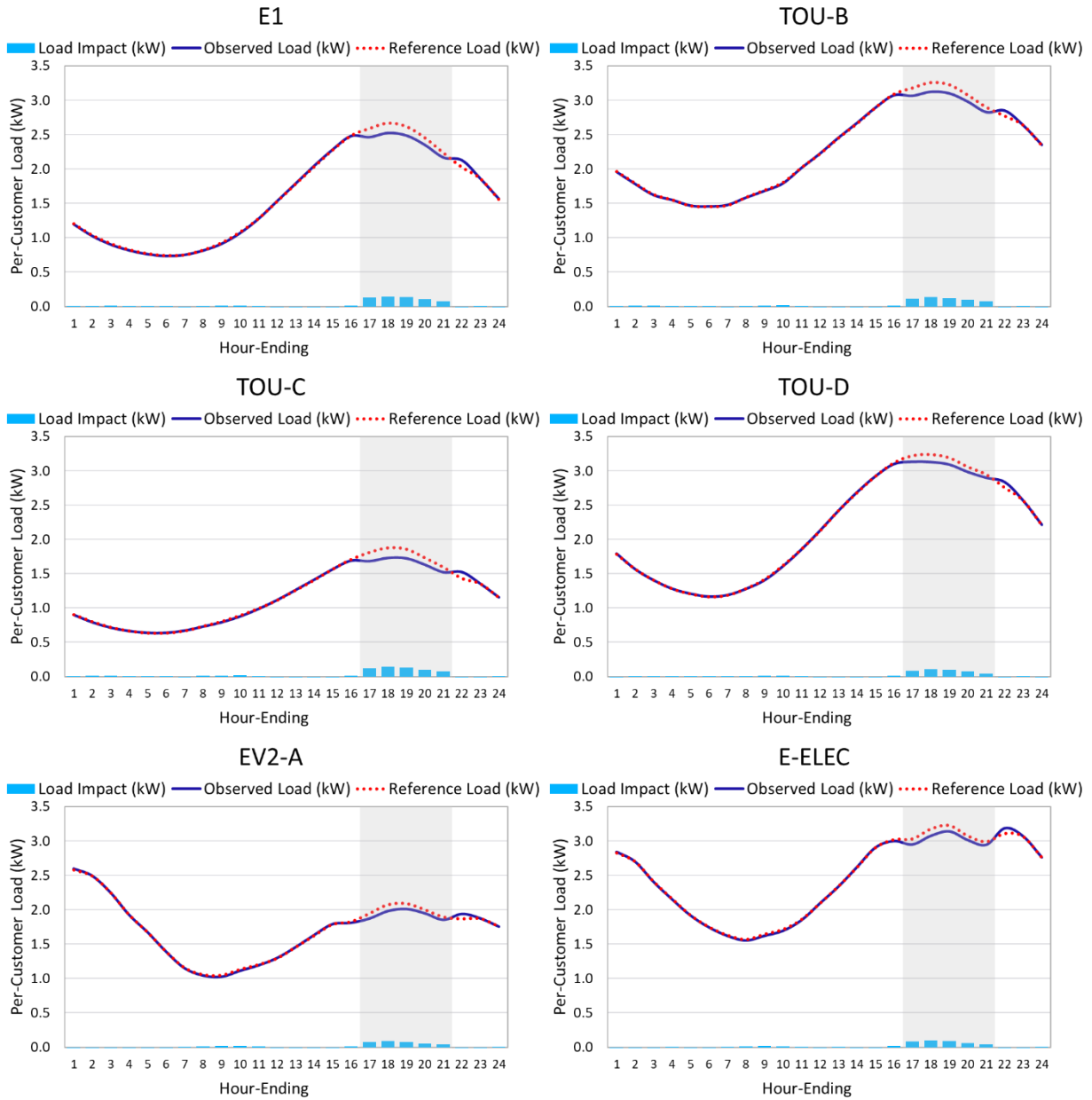
Note: Concurrent SmartAC events days are striped. SmartAC events were dispatched for specific Sub-LAPs and event hours that did not always coincide with the SmartRate™ event window.

Figure 2-13 compares the per-customer hourly reference loads, observed loads, and estimated load impacts on the average event day for participants on each of the six billing rates eligible for SmartRate™ participation.

- The reference loads clearly highlight the differences in customer size across the billing rates. E-ELEC, TOU-B, and TOU-D rates include substantially larger customers, on average, compared to the other rates. This is by design: TOU-D targets high-consuming customers, while E-ELEC and TOU-B target customers with electric vehicles and electrified homes.
- We also see the differences in per-customer load impacts showcased by the size of the bars, with participants on the standard rate (E1) and the default TOU rate (TOU-C) delivering the highest load reductions.
- The shape of customer impacts, remains similar between the standard and TOU rates, with the highest impacts achieved in the second hour (HE18) of the event window. This coincides somewhat with the

peak of their reference loads, i.e., when customers have the highest capacity to reduce their consumption.

Figure 2-13 By Billing Rate: Per-Customer Load Profiles on an Average Event Day



### 3 | Ex-Ante Evaluation Results

---

This section summarizes the results of the ex-ante analysis, where AEG used the ex-post models to forecast SmartRate™ impacts through 2034 under multiple weather scenarios. Specifically, we met the following objectives of the ex-ante load impact analysis:

- Develop hourly load impact estimates for the average customer and all customers in aggregate for the RA window.<sup>19</sup>
- Estimate impacts for each year over an 11-year<sup>20</sup> horizon based on PG&E's and CAISO's 1-in-2 and 1-in-10 weather conditions for a typical event day and each monthly system peak day.
- Provide program-specific ex-ante estimates by forecasting SmartRate™ impacts without considering the effects of dual-enrollment in other demand response programs, i.e., assuming no SmartAC™ or ELRP A6 events are dispatched in future years.
- Avoid double-counting impacts attributable to SmartRate™ and other demand response programs by providing portfolio-adjusted estimates, i.e., assuming SmartAC™ or ELRP A6 events are dispatched in future years.

As part of the ex-ante evaluation, we worked with PG&E staff to develop the following key approaches and assumptions:

- **AEG used the ex-post models to forecast the 11-year SmartRate™ per-customer impacts in summer and winter months.** The RA window coincides with the SmartRate™ event window in all months of the year except for March, April, and May, when it spans 5 PM to 10 PM. AEG shifted impacts to align with the reference loads estimated during these hours.
- **PG&E provided an enrollment forecast by customer segment, LCA, and sub-LAP**, which AEG used to aggregate per-customer impacts to the program level. We dropped some customers from the forecast based on their ineligibility for the program after discussing with PG&E (less than 30 per year).<sup>21</sup>
- **All dually enrolled ELRP A6 customers rejoined the SmartRate™ only group starting in January 2026**, when the ERLP A6 pilot is set to close. We maintained the ERLP A6 per-customer impacts through 2034.

#### Program-Specific Ex-Ante Impacts

Table 3-1 summarizes the aggregate and per-customer load impact forecasts for SmartRate™ participants on a typical event day in 2024. The table includes impact forecasts under the 1-in-2 and 1-in-10 weather scenarios for both PG&E and CAISO peaks.

We forecasted high per-customer impacts for participants dually enrolled in SmartAC™ compared to customers in other segments, as expected given their technology-supported response, contributing nearly 25% of the aggregate impact (PG&E 1-in-2 weather scenario) despite accounting for only 9% of the total enrollment population. Conversely, participants dually enrolled in ELRP A6 make up most of SmartRate™ enrollments in 2024 (54%), since SmartRate™ CARE participants defaulted in ELRP A6, and contributed 43% of the aggregate impact under the PG&E 1-in-2 weather scenario.

---

<sup>19</sup> The RA window is 5 PM to 10 PM for March, April, and May and 4 PM to 9 PM for all other months.

<sup>20</sup> AEG included the PY2023 back cast as part of the ex-ante impact analysis.

<sup>21</sup> These included bill-protected, dually enrolled SmartAC™ participants, since SmartAC™ no longer enrolls new customers to the program; participants enrolled in SmartAC™ and ELRP A6, since triple enrollment is not allowed; and customers on ineligible billing rates. In total, at most 30 customers were dropped from the enrollment forecast each year for ineligibility.

Table 3-1 Typical Event Day Enrollment and Impacts by Program Enrollment: 2024

Program Enrollment	# Accounts	Aggregate Impact (MW)				Per Customer Impact (kW)			
		PG&E Peak		CAISO Peak		PG&E Peak		CAISO Peak	
		1-in-2 (96 °F)	1-in-10 (100 °F)	1-in-2 (96 °F)	1-in-10 (97 °F)	1-in-2 (96 °F)	1-in-10 (100 °F)	1-in-2 (96 °F)	1-in-10 (97 °F)
SmartRate™ Only	16,173	1.5	1.7	1.6	1.6	0.09	0.11	0.10	0.10
Dually Enrolled - SmartAC	4,001	1.0	1.2	1.0	1.0	0.24	0.31	0.24	0.26
Dually Enrolled – ELRP A6	24,051	1.9	2.0	1.9	1.9	0.08	0.08	0.08	0.08
<b>Total</b>	<b>44,225</b>	<b>4.4</b>	<b>5.0</b>	<b>4.5</b>	<b>4.6</b>	<b>0.10</b>	<b>0.12</b>	<b>0.10</b>	<b>0.10</b>

Figure 3-1 shows PG&E’s annual enrollment forecast and the associated aggregated load impact forecasts for the PG&E 1-in-2 weather scenario on a typical event day, including the 2023 backcast. Overall, PG&E expects enrollment to decrease through the 11-year horizon without any planned marketing efforts to offset program attrition over time.

We see the effects of the ELRP A6 pilot ending in both forecasts as these customers transition back into the SmartRate™ only segment. AEG assumed that ELRP A6 participants would maintain their impacts through 2025. A learning curve was applied to these customers’ impacts in the PY2022 ex-ante forecast following their lower performance that year. As discussed, this was likely driven by their confusion from being defaulted into ELRP A6 without any targeted messaging. However, given the similarities in their PY2023 per-customer ex-ante savings to SmartRate™ only customers, AEG did not apply any assumptions to these customers’ future performance.

Figure 3-1 Enrollment and Impact Forecast: PG&E 1-in-2, Typical Event Day, 2023 - 2034

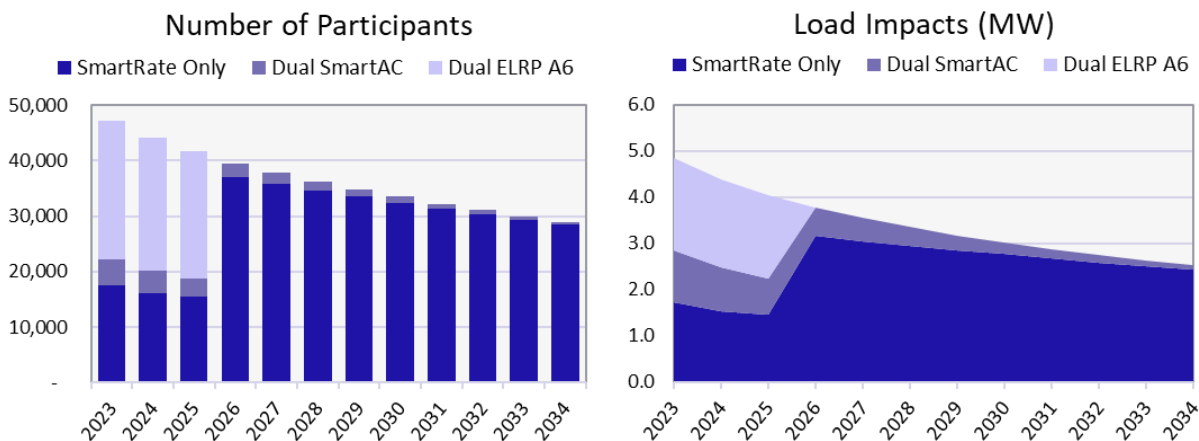


Table 3-2 shows the per-customer load impacts estimated during the RA window for PG&E 1-in-2 monthly peak days in 2023 for each of the program enrollment segments. Load impact estimates are required for non-summer months (October – May) even though PG&E only calls summer-month events. We estimated load impacts for non-summer months by applying the hourly percentage impacts for a typical event day to the estimated reference loads during non-summer months.

While the SmartRate™ event window (4-9 PM) coincides with the RA window in most months, the March, April, and May RA window spans 5 PM to 10 PM. This shift in hours results in slightly lower impacts during these months’ peaks compared to other non-summer months.

Table 3-2 Per-Customer Load Impacts on PG&E 1-in-2 Monthly Peak Days, 2024

Month	SmartRate™ Only Impacts		Dually Enrolled – SmartAC Impacts		Dually Enrolled – ERLP A6 Impacts	
	kW	%	kW	%	kW	%
January	0.05	4.6%	0.09	10.3%	0.03	3.4%
February	0.04	4.6%	0.09	10.2%	0.03	3.4%
March	0.03	2.9%	0.04	5.2%	0.02	1.9%
April	0.03	2.9%	0.05	4.9%	0.02	1.8%
May	0.04	2.9%	0.06	5.1%	0.03	1.8%
June	0.10	5.0%	0.28	13.2%	0.08	3.6%
July	0.10	4.8%	0.27	11.7%	0.08	3.4%
August	0.09	4.5%	0.23	10.6%	0.08	3.3%
September	0.08	4.5%	0.18	9.7%	0.07	3.4%
October	0.05	4.6%	0.11	10.6%	0.04	3.4%
November	0.04	4.6%	0.08	10.3%	0.03	3.4%
December	0.05	4.6%	0.10	10.3%	0.04	3.4%

### Portfolio-Adjusted Ex-Ante Impacts

The estimated program-specific ex-ante impacts forecast savings of the SmartRate™ program without considering the effects of other demand response programs. To avoid double-counting impacts for dually enrolled customers across all the program ex-ante forecasts, AEG provided portfolio-adjusted forecasts, which follow a portfolio hierarchy structure predetermined by PG&E.

Table 3-3 shows the program and portfolio-adjusted impacts for the PG&E 1-in-2 weather scenario for 2024. For each program, we used the following assumptions to develop the portfolio-adjusted impacts:

- **For customers dually enrolled in SmartAC™, AEG maintained the assumption that SmartRate™ participation will add 18% to the SmartAC™ load impact on dual event days.** Historically, these dually enrolled customers have achieved higher impacts during concurrent program events than during SmartAC™ events even, showing that an incremental, behavior-driven effect of the SmartRate™ price incentive exists. We estimated incremental impacts of 18% during a previous evaluation year, which we have maintained for the PY2023 portfolio-adjusted ex-ante forecast. Note that SmartAC™ is only available from June through September. Thus, a portfolio-adjusted forecast is only applicable during those months.
- **For customers dually enrolled in ERLP A6, AEG assumed that all impacts were included in the SmartRate™ portfolio-adjusted forecast throughout the ERLP pilot implementation.** The ERLP A6-specific ex-ante forecast will remove SmartRate™ impacts when adjusting for dually enrolled SmartRate™ customers. AEG did not make any adjustments to the portfolio for dual ERLP A6 enrollment.

As discussed, the March through May RA window is from 5 PM to 10 PM, which does not fully coincide with the SmartRate™ event. This shift leads to slightly lower impacts on these months compared to other non-summer months.

Table 3-3 Portfolio-Level vs. Portfolio-Adjusted Load Impacts: PG&E 1-in-2, Monthly Peak Day, 2024

Month	Program-Level Load Impacts (MW)				Portfolio-Adjusted Load Impacts (MW)			
	SmartRate™ Only	Dually Enrolled SmartAC™	Dually Enrolled ELRP A6	Total	SmartRate™ Only	Dually Enrolled SmartAC™	Dually Enrolled ELRP A6	Total
January	0.80	0.43	0.86	<b>2.09</b>	0.80	0.43	0.86	<b>2.09</b>
February	0.74	0.38	0.79	<b>1.92</b>	0.74	0.38	0.79	<b>1.92</b>
March	0.47	0.19	0.47	<b>1.13</b>	0.47	0.19	0.47	<b>1.13</b>
April	0.57	0.22	0.57	<b>1.36</b>	0.57	0.22	0.57	<b>1.36</b>
May	0.67	0.27	0.70	<b>1.64</b>	0.67	0.27	0.70	<b>1.64</b>
June	1.68	1.17	2.02	<b>4.87</b>	1.68	0.21	2.02	<b>3.91</b>
July	1.63	1.08	1.99	<b>4.70</b>	1.63	0.19	1.99	<b>3.81</b>
August	1.49	0.94	1.89	<b>4.32</b>	1.49	0.17	1.89	<b>3.55</b>
September	1.34	0.71	1.74	<b>3.80</b>	1.34	0.13	1.74	<b>3.21</b>
October	0.81	0.41	0.98	<b>2.20</b>	0.81	0.41	0.98	<b>2.20</b>
November	0.66	0.31	0.71	<b>1.68</b>	0.66	0.31	0.71	<b>1.68</b>
December	0.81	0.37	0.86	<b>2.04</b>	0.81	0.37	0.86	<b>2.04</b>

### Comparisons to Ex-Post and Previous Ex-Ante

Table 3-4 compares the current ex-post estimates with the current ex-ante estimates (before portfolio adjustments), which demonstrates the effect of adjusting the impacts and reference loads to reflect the various weather scenarios.

The PY2023 SmartDays™ experienced cooler average event temperatures compared to all weather scenarios. Under the extreme weather forecasted in the PG&E 1-in-10 scenario, reference loads and impacts increased as expected. Ex-ante impacts remained similar to ex-post under the other weather scenarios with temperatures closer to those observed in PY2023. Impacts as percentages of the estimated reference load correlated with temperatures as expected, though remained similar to those observed during the PY2023 season.

Table 3-4 Current Ex-Post (Average Event Day) and Current Ex-Ante (Typical Event Day, 2023), 4 to 9 PM

Estimate	Scenario	# Accounts	Per Customer (kW)		% Load Impact	Avg. Event Temp (°F)
			Reference Load	Load Impact		
Current Ex-Post	Program Average	45,379	2.38	0.11	4.5%	92
	PG&E 1-in-2		2.26	0.10		
Current Ex-Ante	PG&E 1-in-10	47,247	2.42	0.12	4.8%	100
	CAISO 1-in-2		2.27	0.10		
	CAISO 1-in-10		2.31	0.11		

Table 3-5 compares the previous (PY2022) and current (PY2023) ex-ante forecast for 2024, showing how current program performance affected the load impact forecast from the previous year.

The current ex-ante forecast included over 4k more customers than the PY2022 forecast, which attempted to account for the higher-than-expected attrition rates. However, the PY2023 enrollment forecast aligns better with previous years, when PG&E forecasted approximately 45k participants. As discussed, hotter temperatures in 2022 may have driven customers to look for way to save on their energy bills in the 2023 summer.

Despite the increased the participation from the PY2022 forecast, we estimated smaller load impacts (4.4 MW) than last time (5.3 MW). While we forecasted higher per-customer impacts for the ELRP A6 participants—the largest participant segment—we estimated smaller per-customer impacts than previously forecasted for both the SmartRate™ only and dually enrolled SmartAC™ customers, both in absolute (kW) and relative to the reference load.

Table 3-5 Previous and Current Ex-Ante, PG&E 1-in-2, Typical Event Day, 2024, 4 to 9 PM

Segment	# Accounts	Aggregate (MW)		Per Customer (kW)			Avg. Event Temp (°F)
		Reference Load	Load Impact	Reference Load	Load Impact	% Load Impact	
<b>Previous (2022) Ex-Ante, Typical Event Day, 2024</b>							
SmartRate™ Only <sup>a</sup>	14,940	31.1	3.3	2.08	0.22	10.7%	94
Dually Enrolled – SmartAC™	4,312	9.1	1.4	2.10	0.32	15.4%	97
Dually Enrolled – ELRP	21,246	51.0	0.6	2.40	0.03	1.2%	97
<b>Total</b>	<b>40,498</b>	<b>91.2</b>	<b>5.3</b>	<b>2.25</b>	<b>0.13</b>	<b>5.9%</b>	<b>96</b>
<b>Current (2023) Ex-Ante, Typical Event Day, 2024</b>							
SmartRate™ Only	16,173	33.6	1.5	2.08	0.09	4.5%	94
Dually Enrolled – SmartAC™	4,001	8.9	1.0	2.23	0.24	10.8%	97
Dually Enrolled – ELRP	24,051	57.8	1.9	2.40	0.08	3.3%	97
<b>Total</b>	<b>44,225</b>	<b>100.3</b>	<b>4.4</b>	<b>2.27</b>	<b>0.10</b>	<b>4.4%</b>	<b>96</b>

<sup>a</sup> A notification issue affected the ex-post impacts in PY2022. However, the PY2022 ex-ante forecast excluded impacts from this group of customers not notified of events, increasing ex-ante impacts compared to the ex-post impacts.



## 4 | Key Findings and Recommendations

---

AEG identified the following key findings based on the [ex-post impact evaluation](#):

- **The SmartRate™ program continued to successfully drive customers to reduce their demand during SmartDay™ event hours.** During the average event hour, customers delivered savings of 5.2 MW in total (4.5% of reference load consumption).
- **Customers generated the lowest demand reductions during the last event of the season, which was dispatched to meet the program's minimum SmartDays™ requirement.** Therefore, the September 26<sup>th</sup> event day did not look like the other SmartDays™, with temperatures reaching just 75 °F (compared to a minimum of 90 °F during the other PY2023 SmartDays™). As a result, AEG removed this event from the average event day metrics.
- **As expected, customers dually enrolled in the SmartAC™ program generated the largest savings on a per-customer basis (0.28 kW)** compared to SmartRate™ only participants (0.11 kW) and those dually enrolled in ELRP A6 (0.08 kW). The switch installed on their central cooling equipment gives PG&E control of their cooling capacities during SmartAC™ and SmartRate™ events such that responses do not rely entirely on customers' behavior.
- **SmartRate™ participants dually enrolled in ELRP A6 performed substantially better in PY2023 (0.08 kW per customer) than in PY2022 (0.02 kW per customer) under similar temperatures.** This could suggest that customers overcame any confusion created by being defaulted into the ELRP A6 pilot in PY2022.<sup>22</sup> However, the lack of ELRP A6 events dispatched in PY2023 may have also helped minimize the confusion. Therefore, whether these impacts will hold in PY2024 if ELRP A6 events are dispatched is unclear.
- **CARE customers performed better in PY2023, delivering impacts of 4.2% (compared to 2.6% in PY2022).** This is much closer to the average non-CARE customer, who achieved reductions of 5.2%. Since most CARE customers are now dually enrolled in ELRP A6, these findings are largely driven by the improved performance of ELRP A6 customers in PY2023 compared to PY2022.
- **Nearly 20% of PY2023 SmartRate™ participants qualified for the Bill Protection Guarantee,** a substantial increase from the 12% in PY2022, which aligns with the increased SmartRate™ enrollments over the previous year. These customers generated lower load impacts compared to customers not under the bill protection group by about half for most event days.
- **Customers on the TOU-B, TOU-D, and E-ELEC rates generated some of the smallest impacts during the average SmartDay™ hour (2.4% to 3.4%) despite including higher-consuming customers.** These rates target customers with high electricity consumption, including those with electric vehicles and electrified homes, which we see reflected in their reference loads (all greater than 3.1 kW per customer). However, customers on these rates already shift their consumption to hours outside of the event window on SmartDays™, reducing their capacity to save incrementally. Similar logic applies to customers on the EV2-A rate, though to a lesser extent.
- **Despite including some of the lowest-consuming customers of all the rates, customers on TOU-C delivered some of the highest impacts (0.11 kW per customer, 6.3% of their reference load).** For comparison, the average TOU-B customer also delivered 0.11 kW (3.4%) while having almost twice the capacity to lower their demand during events. Only E1 (standard rate) customers delivered higher per-customer impacts (0.12 kW), which likely reflects the fact that they are not encouraged to shift their load to off-peak hours.

---

<sup>22</sup> Most of these customers had previously been SmartRate™-only CARE participants and had delivered load impacts comparable to SmartRate™-only customers prior to PY2022. However, the lack of messaging about their enrollment into ELRP A6 likely caused the low impacts observed for these customers in PY2022.



AEG identified the following key findings based on the [ex-ante impact evaluation](#):

- **PG&E expects enrollment to decrease through the 11-year horizon without any planned marketing efforts to offset program attrition. That said, they forecasted more participants than included in the PY2022 enrollment forecast and decreased annual attrition for SmartRate™ only customers to 3.29% (from 7.4% for PY2022).** The current ex-ante forecast included over 4k more customers than the PY2022 forecast but aligns better with other previous years, e.g., PY2021, when 45k customers were expected to participate. Still, the consistent decrease in enrollment resulted in decreased forecasted impacts from the program over time.
- **We estimated that the SmartRate™ program (before portfolio adjustments) will deliver demand reductions of 4.4 MW in 2024 under PG&E's 1-in-2 weather conditions.** These reductions assume that over 44k customers will participate in the PY2024 program and reduce their demand during the average SmartRate™ event hour by 4.4% of their reference load. These impacts include the technology-driven response of SmartAC™ customers responding to concurrent SmartAC™ events.
- **Despite the increased participation from the PY2022 forecast, we estimated lower load impacts (4.4 MW) than last time (5.3 MW) under PG&E's 1-in-2 weather conditions.** While we forecasted higher per-customer impacts for the ELRP A6 participants—the largest participant segment—we estimated lower per-customer impacts than previously forecasted for both the SmartRate™ only and dually enrolled SmartAC™ customers, both in absolute (kW) and relative to the reference load. This may be driven by the higher proportion of new enrollments on bill protection in PY2023. As shown in the ex-post analysis, bill-protected customers achieved lower per-customer impacts on a typical event day than customers not on bill protection.
- **The PY2023 SmartDays™ experienced cooler average event temperatures compared to most weather scenarios, leading to slightly higher percentage impacts compared to ex-post savings.** Under the extreme weather forecasted in the PG&E 1-in-10 scenario, reference loads and impacts increased as expected. Ex-ante impacts remained similar to ex-post under the other weather scenarios with temperatures closer to those observed in PY2023. Impacts as percentages of the estimated reference load correlated with temperatures as expected, though they remained similar to those observed during the PY2023 season.
- **The shift in the RA window to later hours in March through May (5 PM to 10 PM) resulted in slightly lower impacts during these months' peaks compared to other non-summer months.** The SmartRate™ event window (4-9 PM) coincides with the RA window in all other months such that no adjustment to the impacts was necessary.

We provide the following [recommendations](#) to PG&E based on findings from the ex-post and ex-ante impacts evaluations:

- **Consider re-estimating the incremental effect of SmartRate™ over the technology-enabled response of SmartAC™ participants during concurrent SmartRate™ and SmartAC™ events.** This analysis was last completed during the PY2018 evaluation and found that the behavior-driven response to SmartRate™ events contributed 18% of impacts measured during concurrent SmartAC™ events. SmartAC™ events are dispatched for specific sub-LAPs and various hours that often coincide with SmartDays™, making it difficult to estimate the incremental impacts of SmartRate™ over SmartAC™ appropriate for ex-ante purposes. AEG recommends a supplemental to update this estimate using multiple recent program years, which will build a larger pool of SmartAC™-only and concurrent SmartAC™ and SmartRate™ event days and provide a more robust estimate of the incremental effects.
- **Even though the ELRP program will end after 2025, continue monitoring ELRP A6 participants performances in 2024.** While the improved performance of these customers suggests that they have overcome the initial confusion created by being defaulted into ELRP A6 in PY2022, no ELRP A6 events were dispatched in PY2023. Confusion may still be a factor if ELRP A6 events are dispatched in 2024.

- **Move forward with the conservation effect analysis to determine whether SmartRate™ participants generate overall decreases in their consumption, i.e., conserve energy during non-SmartDays™, in addition to shifting their demand to hours outside the 4 PM to 9 PM event window.** This analysis will help PG&E gauge the effect of its two price credits (SmartRate Non-High Price credit and the SmartRate Participation Credit) on customer load profiles and assess the precision and accuracy of PG&E's customer-specific baselines against which the credits are calculated.

# A | Detailed Analysis Methods

---

This appendix describes AEG's approach to estimating ex-post and ex-ante savings from the SmartRate™ program.

## Define the Participant Population and Analysis Sample

Table A-1 shows the steps AEG took to determine the final PY2023 participant population and define the pool of customers eligible for the ex-post analysis. The eligible analysis pool defines the sample frame from which we selected a representative sample of participants for the ex-post analysis. Estimating impacts based on a sample of participants increased the efficiency of the analysis while still producing robust results. The specific steps follow.

**Stratify the PY2023 Participant Population.** We stratified the participant population by the customer segments shown in Table A-1, which group customers by the following based on expected differences in per-customer impacts:

- **Bill Protection Status.** Previous evaluations have shown that customers with bill protection generate lower impacts than those without bill protection, likely because of (1) complacency due to the absence of cost impacts, and (2) learning for new participants who have yet to change their behavior adequately in response to events.
- **Dual-Enrollment Status.** Previous evaluations have also shown that customers dually enrolled in SmartAC™ and ELRP A6 generate different impacts than customers enrolled only in SmartRate™.
  - The SmartAC™ program installs devices on participants' air conditioner (AC) units that allow PG&E to remotely reduce the units' capacities during both SmartAC™ and SmartRate™ events.
  - The ELRP pilot is a statewide initiative that targets various customer segments and end uses for incremental load reductions. PG&E automatically enrolled residential CARE, FERA, and HER customers into the pilot, though customers not in these segments may opt-in to the program.

**Establish the PY2023 Participant Population.** Starting with the full SmartRate™ participation list, AEG screened out customers who went inactive or unenrolled before the first PY2023 event or never received event notifications. Some segments experienced higher drop rates than others, but overall, fewer than four percent of customers were dropped from the final SmartRate participant pool.

**Exclude Participants after Data Validation.** Next, we used the participant billing data to screen participants for inclusion in the analysis pool. These steps dropped customers with erroneous usage (zero or negative reads), and then customers without any remaining usable billing data. The final sample frame only included customers we expected to have usable data, mitigating the need for oversampling due to data quality issues.

**Select an Analysis Sample.** The final step included sampling customers for the analysis. Previous program year evaluations have shown that sample sizes of 3,000 participants were sufficient for detecting significant program effects on event days for most segments. For participants dually enrolled in SmartAC, smaller sample sizes have yielded precise estimates of savings, likely driven by the technology-enabled response to events and higher magnitude of impacts. Conversely, AEG included the population of bill-protected segments because these participants will likely have small impacts, making them more difficult to detect. A census sample mitigated the risk of not detecting significant impacts where they exist.

Table A-1 Participation and Analysis Pool Attrition

Step	Bill-Protected		Non-Bill Protected			Total
	Dual-Enrolled ELRP A6	SmartRate™ Only	Dual-Enrolled ELRP A6	Dual-Enrolled SmartAC™	SmartRate™ Only	
<b>Starting Participant List</b>	<b>5,228</b>	<b>5,584</b>	<b>20,788</b>	<b>4,752</b>	<b>14,172</b>	<b>50,524</b>
Drop inactive account before start of summer (June 1, 2023)	5,190 (99%)	5,380 (96%)	20,754 (100%)	4,752 (100%)	13,835 (98%)	49,911 (99%)
Drop accounts unenrolled before start of summer	5,173 (99%)	5,350 (96%)	20,677 (99%)	4,752 (100%)	13,761 (97%)	49,713 (98%)
Drop accounts with no SmartRate™ event participation	5,091 (97%)	5,175 (93%)	20,349 (98%)	4,752 (100%)	13,218 (93%)	48,585 (96%)
<b>Final PY2023 Participant Population</b>	<b>5,091</b>	<b>5,175</b>	<b>20,349</b>	<b>4,752</b>	<b>13,218</b>	<b>48,585</b>
Drop accounts with zero / negative usage in billing data	5,073 (97%)	5,166 (93%)	20,292 (98%)	4,749 (100%)	13,145 (93%)	48,425 (96%)
Drop accounts with no remaining summer billing data	5,056 (97%)	5,146 (92%)	20,254 (97%)	4,744 (100%)	13,121 (93%)	48,321 (96%)
<b>Final Analysis Sample Frame</b>	<b>5,056</b>	<b>5,146</b>	<b>20,254</b>	<b>4,744</b>	<b>13,121</b>	<b>48,321</b>
<b>Sampled for Analysis</b>	<b>5,056</b>	<b>5,146</b>	<b>3,000</b>	<b>1,500</b>	<b>3,000</b>	<b>17,702</b>

### Develop a Matched Control Group

AEG analyzed SmartRate™ impacts using quasi-experimental methods by creating a control group of nonparticipants similar in energy consuming behavior to participants. We developed the matched control group by first selecting event-like days and then matching eligible nonparticipants to SmartRate™ participants based on their consumption on the event-like days. Details follow.

#### Select Event-Like Days

As an event-based program, SmartRate™ does not actively encourage customers to change their energy-consuming behavior outside of SmartDays™. Therefore, we matched participants to eligible nonparticipants based on their similarity in consumption during specific days in PY2023 that were not dispatched for events, i.e., event-like days. We used Euclidean distance metrics to select event-like days based on their similarity to dispatched SmartDays™ in weather, day of the week and month of the year.<sup>23</sup>

#### Match Control Customers to SmartRate Participants

AEG developed a pool of non-participants to estimate what consumption for SmartRate™ participants would have been absent the program. We used a stratified Euclidean distance matching approach to select control customers similar to participants in their energy consumption as follows.

First, AEG stratified participants and non-participants by weather station and whether they belonged to a CARE rate. We assumed that customers within these strata would behave more similarly than customers across strata, and by matching participants to non-participants within strata would help capture some of the unobservable attributes that affect the way customers use energy.

Next, we performed a one-to-one match (i.e., one non-participant to each sampled participant) within each stratum based on customers' energy consumption on the selected event-like days. We used a Euclidean distance metric to assess the quality of each match:

<sup>23</sup> We included three weather variables in the Euclidean distance metrics calculation to select similar non-event days: (1) daily maximum temperature; (2) daily minimum temperatures; and (3) average daily temperature. We combined the metrics into a single Euclidean distance metric by the following equation:

$$ED = \sqrt{(MaxTemp_{event} - MaxTemp_{non-event})^2 + (MinTemp_{event} - MinTemp_{non-event})^2 + (MeanTemp_{event} - MeanTemp_{non-event})^2}$$

$$ED_{ij} = \sqrt{(early\ morning_i - early\ morning_j)^2 + (late\ morning_i - late\ morning_j)^2 + (onpeak_i - onpeak_j)^2 + (late\ evening_i - late\ evening_j)^2}$$

where:

- ED* = The Euclidean distance value for each participant *i* with candidate control customer *j*.
- early morning<sub>i,j</sub>* = The average consumption during hours ending 6 to 9 (i.e., the early morning load) across event-like days for participant *i* or candidate control customer *j*.
- late morning<sub>i,j</sub>* = The average consumption during hours ending 10 to 13 (9 AM to 1 PM, i.e., the late morning load) across event-like days for participant *i* or candidate control customer *j*.
- onpeak<sub>i,j</sub>* = The average consumption during hours ending 15 to 19 (2 PM to 7 PM, the SmartRate™ event window) across event-like days for participant *i* or candidate control customer *j*.
- late evening<sub>i,j</sub>* = The average consumption during hours ending 23 to 24 (10 PM to 12 AM, i.e., the late evening load) across event-like days for participant *i* or candidate control customer *j*.

After calculating the Euclidean distance metric for each combination of participant and candidate control customer, we selected the candidate control customer that minimized the Euclidean distance for each participant. We performed the matching without replacement, meaning that control customers could only be matched once to a participant. In cases where a control customer was matched more than once, we selected the next-best matches for some participants. We assessed the final matches using t-tests and visual inspections of the load shapes on the event-like days.

### Estimate Ex-Post Load Impacts

Using the final sample of participants and the matched control group, we estimated ex-post impacts for the average participant in each of the following customer segments using panel regression difference-in-differences models with customer fixed effects:

- Dually enrolled in SmartAC™
- Dually enrolled in ELRP A6 on bill protection
- Dually enrolled in ELRP A6 not on bill protection
- Singly enrolled in SmartRate™ on bill protection
- Singly enrolled in SmartRate™ not on bill protection

We selected the final models and estimated load impacts from the SmartRate™ program as follows.

### Model Selection and Validation

AEG estimated hourly regression models, which allowed us to estimate the impact of SmartDays™ independently in each hour. For all 24 fitted models, we used the same set of independent variables and referred to them as one model. This approach allowed us to control for seasonal and other effects independently but consistently for each hour of the day.

We tested several difference-in-difference models that each controlled for non-programmatic changes to consumption, including:

- **Customer-variant** differences in consumption through customer fixed effects, and

- **Time-variant** differences in consumption driven by weather and other factors exogenous to the program through variables like month indicators and cooling degree hours (CDH).

We validated the candidate sets of models through in-sample and out-of-sample testing to ensure that the selected model accurately predicted actual participant load on SmartDays™ and on event-like days as follows.

- To perform the **in-sample (IS) test**, we assessed each candidate model’s ability to predict actual participant consumption on SmartDays™. The ideal model predicted consumption that closely followed actual observed participant consumption in the hours pre- and post-event and during the on-peak hours. We used several metrics of accuracy and bias to assess each model’s predictive ability, including the mean absolute percent error (MAPE) and mean percent error (MPE).
- To perform the **out-of-sample (OOS) test**, we estimated candidate model coefficients on a data set that excluded the event-like days used for developing the matched control group. Then, we used the candidate models to predict consumption on the event-like days. This OOS test helped us assess the ability of each model to predict what participants would have consumed on SmartDays™ in the absence of the program. We similarly calculated the MAPE and MPE of each candidate model to assess the accuracy and bias of its predictions.

The best model will produce MAPE and MPE values close to zero. In selecting the final model, we considered the results of the IS and OOS tests and selected the final model for each segment that minimized the following metric:

$$metric_{ic} = (0.4 \times MAPE_{IS}) + (0.4 \times MAPE_{OOS}) + (0.1 \times |MPE_{IS}|) + (0.1 \times |MPE_{OOS}|)$$

Results of the model validation are provided in Appendix C. For each of the model segments, we selected the following model:

$$kWh_{it} = \beta_0 + \beta_1 Part_i + \beta_b (\delta_{mt} + Weekend_t + CDH_t + CDH_{t-1} + Avg. Load_{ih}) + \beta_t Event_{it} (1 + CDH_t + CDH_{t-1} + SR-SAC_{it} + SAC_{it}) + \varepsilon_{it}$$

where:

$kWh_{it}$	=	The consumption of customer $i$ during time period $t$ .
$\beta_0$	=	The average per-customer consumption across all customers and time periods, i.e., the model intercept coefficient estimate.
$\beta_1$	=	The average per-customer consumption across all SmartRate™ participants and time periods.
$Part_i$	=	A variable indicating that customer $i$ is a SmartRate™ participant (1 = participant, 0 = control customer).
$\beta_b$	=	Model coefficient estimates for the baseline variables that explain variability in consumption unrelated to the SmartRate™ program.
$\delta_{mt}$	=	A set of variables indicating that time period $t$ is in month of the year $m$ (June, July, August, or September).
$Weekend_t$	=	A variable indicating whether time period $t$ is a weekend day (1 = weekend, 0 = weekday).
$CDH_t$	=	A set of variables for the cooling degree hours in time period $t$ calculated for base temperatures of 70 °F and 90 °F.
$CDH_{t-1}$	=	A set of variables for the cooling degree hours in the previous time period ( $t - 1$ ) calculated for base temperatures of 70 °F and 90 °F.

$Avg. Load_{ih}$	=	A variable for the average load of customer $i$ for a specified window $h$ (HE5-7, HE10-13, and HE23-24).
$\beta_{\tau}$	=	Model coefficient estimates for the impact variables that explain variability in consumption related to the SmartRate™ program or time period $t$ being a SmartDay™.
$Event_{it}$	=	A variable indicating that time period $t$ is a SmartDay™ that was dispatched for participant $i$ .
$SR-SAC_{it}$	=	A variable indicating that time period $t$ for dual-enrolled SmartAC™ participant $i$ was dispatched for both a SmartRate™ and SmartAC™ event.
$SAC_{it}$	=	A variable indicating that time period $t$ for dual-enrolled SmartAC™ participant $i$ was dispatched for a SmartAC™ event.

AEG estimated separate hourly models and included monthly indicator variables to minimize hour-to-hour and seasonal autocorrelation, and then used Huber-White robust clustered standard errors to account for heteroskedasticity.

### Load Impact Estimates

We used the final model to estimate per-customer impacts for each SmartDay™ for each of the reporting subgroups required by the California Load Impact Protocols, including load capacity area (LCA), bill protection status, CARE status, dual program enrollment, billing rate, and high fire-threat district status. Specifically for each, we calculated the following:

- **Predicted Load.** The model-predicted estimates of participant consumption in each hour of the SmartDays™.
- **Reference Load.** The estimate of what participant consumption would have been during the SmartDays™ absent the SmartRate™ program, i.e., the counterfactual consumption.
- **Load Impact.** The difference between the predicted and reference loads showing the estimated program impacts on consumption in each hour of the SmartDays™.

After estimating per-customer impacts, AEG calculated program-total demand savings for each PY2023 SmartDay™ by applying per-customer impacts to the final participant population. We estimated confidence intervals around per-customer load impacts, program total impacts, and impacts by subgroup.

### Estimate Ex-Ante Load Impacts

AEG used the ex-post regression models to estimate SmartRate™ per-customer impacts under multiple weather scenarios (PG&E and CAISO 1-in-2 and 1-in-10) from 2024 through 2034 for the typical event day and for each monthly peak. We estimated separate ex-ante impacts for each reporting subgroup required by the California Load Impact Protocols. We also estimated ex-ante impacts for the 2023 program year (i.e., backcast ex-ante estimates) to see what impacts would have been under the different weather scenarios.

The resource adequacy window coincides with the SmartRate™ event window in all months of the year except for March, April, and May, when it spans 5 PM to 10 PM. AEG shifted impacts to align with the reference loads estimated during these hours.

# B | Table Generators

---

3a. PGE\_2023\_SmartRate\_Ex\_Post\_PUBLIC

3b. PGE\_2023\_SmartRate\_Ex\_Ante\_PUBLIC



## C | Model Validity

As discussed in the Detailed Analysis Methods ([Appendix A](#)), AEG selected and validated regression models for each of the following customer segments:

- Dually enrolled in SmartAC™
- Dually enrolled in ELRP A6 on bill protection
- Dually enrolled in ELRP A6 not on bill protection
- Singly enrolled in SmartRate™ on bill protection
- Singly enrolled in SmartRate™ not on bill protection

Details on the model selection and validation process can be found in [Appendix A](#). Here we present the results of that process for the PY2023 evaluation, specifically for:

- Selecting the event-like days
- Developing the matched control group
- Selecting and validating the final regression model

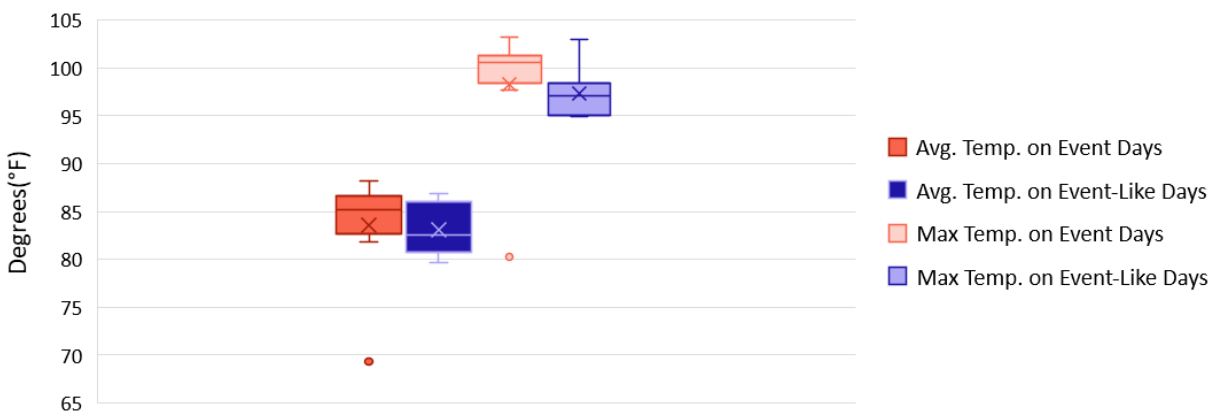
### Event-Like Day Selection

As discussed in the Detailed Analysis Methods appendix, AEG used event-like days to:

- Match participants to eligible non-participants
- Assess the performance of regression models

We used Euclidean distance matching to select several days in 2023 that were similar to SmartDays™ in maximum, minimum, and average daily temperatures. Figure C-1 compares the distributions of the average and maximum daily temperature on event days and the selected event-like days. The event-like days experienced lower temperatures than days dispatched for events, as expected. The milder temperatures in 2023 led to fewer eligible event-like days since most events were dispatched during most of the higher temperature days. However, temperatures were similar enough that the selected event-like days served as adequate event-day proxies for developing a matched control group and validating regression model performance.

Figure C-1 Daily Temperatures of Event Days v. Event-Like Days



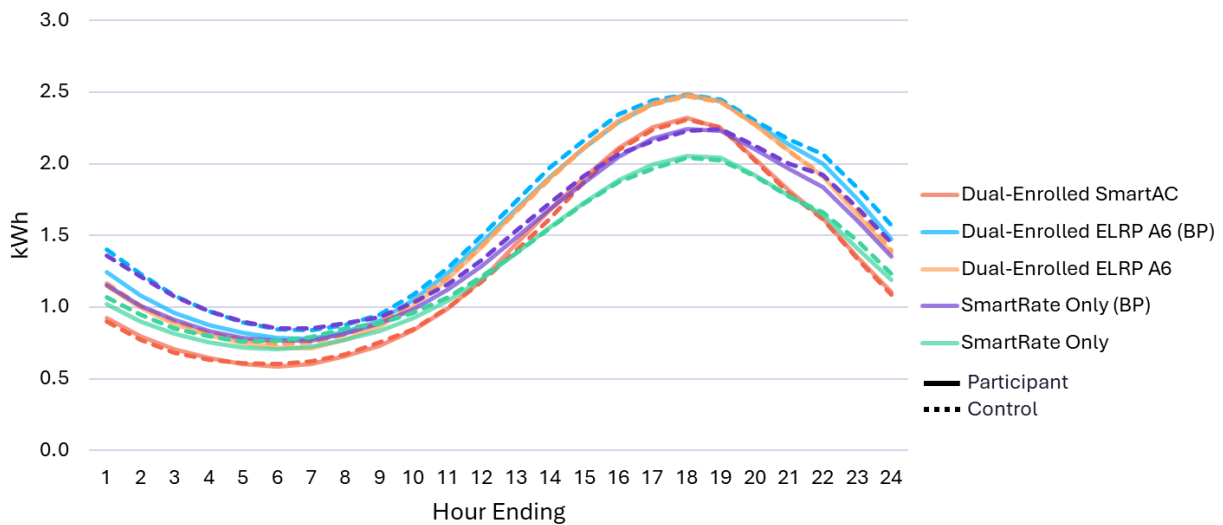
### Matched Control Group Development

AEG developed a pool of non-participants to estimate what consumption for SmartRate™ participants would have been absent the program. We used a stratified Euclidean distance matching approach to select control customers similar to participants in their energy consumption as follows:

- First, AEG stratified participants and non-participants by weather station and whether they belonged to a CARE rate. We assumed that customers within these strata would behave more similarly than customers across strata, and by matching participants to non-participants within strata would help capture some of the unobservable attributes that affect the way customers use energy.
- Next, we performed a one-to-one match (i.e., one non-participant to each sampled participant) within each stratum based on customers' energy consumption on the selected event-like days. We used a Euclidean distance metric to assess the quality of each match.

Figure C-2 shows the consumption for the average participant and matched control customer for each hour of the average event-like day, by customer segment. In general, the load profiles align within segments, particularly during the on-peak hours (4-9 PM), indicating that the control group behaves similarly to the participants in the energy consumption on days when events were not dispatched.

Figure C-2 Average Load of Participant v. Matched Control on Event-Like Days



### Final Model Selection and Validation

For each customer segment, AEG tested several hourly difference-in-difference regression models that each controlled for non-programmatic changes to consumption. We validated the candidate sets of models through in-sample and out-of-sample testing to ensure that the selected model accurately predicted actual participant load on SmartDays™ and on event-like days as follows.

- To perform the **in-sample (IS) test**, we assessed each candidate model's ability to predict actual participant consumption on SmartDays™. The ideal model predicted consumption that closely followed actual observed participant consumption in the hours pre- and post-event and during the on-peak hours. We used several metrics of accuracy and bias to assess each model's predictive ability, including the mean absolute percent error (MAPE) and mean percent error (MPE).
- To perform the **out-of-sample (OOS) test**, we estimated candidate model coefficients on a data set that excluded the event-like days used for developing the matched control group. Then, we used the candidate models to predict consumption on the event-like days. This test helped us assess the ability of each model to predict what participants would have consumed on SmartDays™ in the absence of the program. We similarly calculated the MAPE and MPE of each candidate model to assess the accuracy and bias of its predictions.

Table C-1 shows the weighted average MAPE and MPE for each segment's final set of models. Close-to-zero values indicate low levels of bias (MPE) and accurate predictions (MAPE). The out-of-sample values (all under ±4.0%) show that the models performed well on new data, i.e., data not used to train the initial

models. The in-sample values are all closer to zero as expected (all under  $\pm 0.5\%$ ) and show that models predicted customers' actual consumption on SmartDays™ accurately with minimal bias.

Table C-1 Weighted Average MPE and MAPE by Model Segment

Model Segment	Out-of-Sample		In-Sample	
	MPE	MAPE	MPE	MAPE
Dually enrolled in SmartAC™	1.40%	2.56%	0.00%	0.00%
Dually enrolled in ELRP A6 on bill protection	-1.35%	2.21%	-0.32%	0.43%
Dually enrolled in ELRP A6 not on bill protection	-0.69%	1.78%	0.02%	0.07%
Singly enrolled in SmartRate™ on bill protection	-3.12%	3.64%	-0.13%	0.27%
Singly enrolled in SmartRate™ not on bill protection	-1.59%	2.27%	0.02%	0.10%

Figure C-3 and Figure C-4 show the average participant's actual consumption (solid lines) and predicted consumption (dotted lines) on event-like days and on dispatched SmartDays™ by customer segment. We see that the predicted consumption closely aligns with the actual consumption, indicating that the regression models should produce accurate and unbiased reference loads, i.e., estimates of what participant consumption would have been on dispatched SmartDays™.

Figure C-3 Actual and Predicted Loads: Event-Like Days (Out-of-Sample Test)

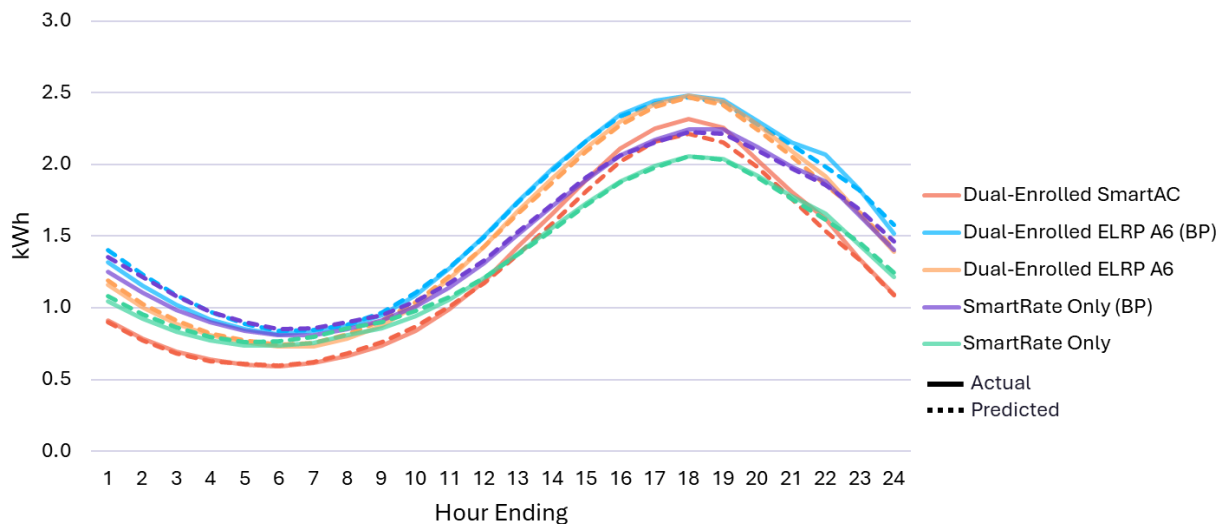
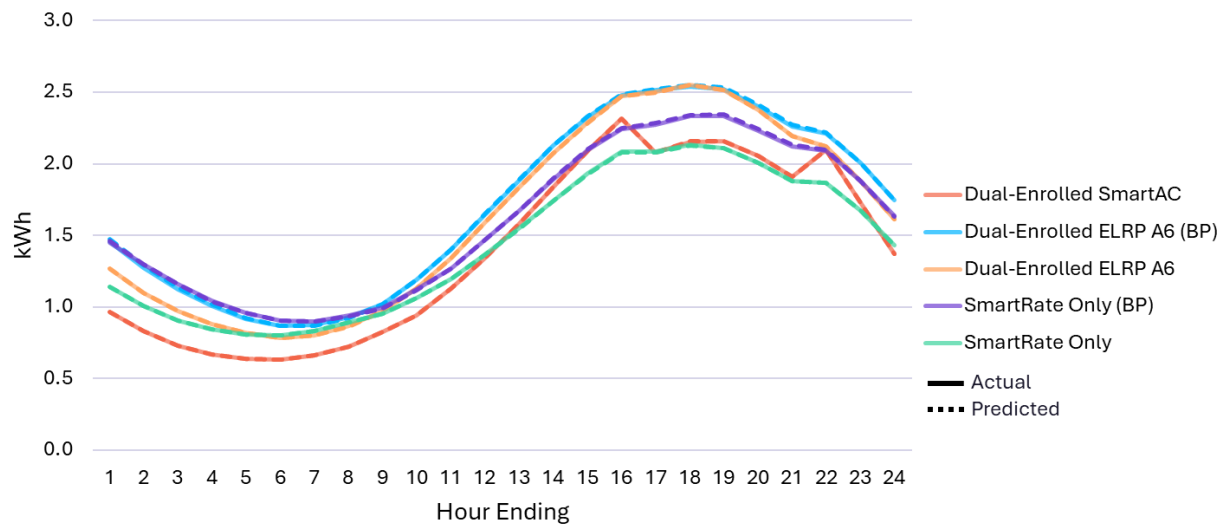


Figure C-4 Actual and Predicted Loads: Event Days (In-Sample Test)



## D | Bill Impact Analysis

As part of the SmartRate™ evaluation, AEG investigated the impact of the program on customers' energy bills. As discussed in [Chapter 1](#), SmartRate™ provides customers with incentives for shifting their consumption away from the on-peak period on SmartDays™ and non-SmartDays™ during billing cycles when PG&E dispatched at least one SmartDay™. PG&E also offers new participants its Bill Protection Guarantee, which would refund them during their first full season (and previous partial season) if their SmartRate™ costs exceeded their regular residential pricing plan. Bill Protection credits appear on customers' November bills if needed.

AEG gathered billing data from PG&E covering the May 2023 through November 2023 bills, which included program-specific credits and charges for all PY2023 SmartRate™ participants. AEG analyzed the data to understand the impact on the program's customer bills. Consistent with previous analyses, AEG defined participants as customers who enrolled between June 1, 2023, and September 30, 2023, and participated in at least one SmartDay™. We then excluded customers with fewer than three months of billing data between May and September 2023, leaving AEG a working sample of 47,925 out of the 48,593 unique PY2023 participants for the bill impact analysis.

The following sections discuss the findings of the bill impact analysis.

### Overview of Billing Impacts

Table D-1 presents the average billing impacts in PY2023. The average participant saved \$2.22 on their energy bill each month of the SmartRate™ season. Bill savings decreased from previous years (\$7.14 in PY2022 and \$45.89 in PY2021), which may be driven by the increased participant population under bill protection and the milder weather experienced by customers during the 2023 summer season compared to previous years.

Table D-1 Bill Impacts for All Participants

Enrollment Status	Impact	Count of Participants	% of Enrollment Status	Average Bill Change per Month
SmartRate™ Only	Decreased Bill	11,183	62%	-\$14.59
	Increased Bill	6,609	37%	\$14.76
	No Change	187	1%	n/a
	<b>All</b>	<b>17,979</b>	<b>100%</b>	<b>-\$3.65</b>
Dually Enrolled in SmartAC™	Decreased Bill	2,433	51%	-\$15.10
	Increased Bill	2,312	49%	\$15.67
	<b>All</b>	<b>4,745</b>	<b>100%</b>	<b>-\$0.11</b>
Dually Enrolled in ELRP A6	Decreased Bill	14,094	56%	-\$14.07
	Increased Bill	10,985	44%	\$14.37
	No Change	122	0%	n/a
	<b>All</b>	<b>25,201</b>	<b>100%</b>	<b>-\$1.61</b>
All	Decreased Bill	27,710	58%	-\$14.37
	Increased Bill	19,906	42%	\$14.65
	No Change	309	1%	n/a
	<b>All</b>	<b>47,925</b>	<b>100%</b>	<b>-\$2.22</b>

## Bill Protection Guarantee

Over 20% of participants qualified for the Bill Protection Guarantee during the PY2023 SmartRate™ season, higher than the PY2022 participant population (12%). Since SmartAC™ no longer enrolls new customers, no one dual enrolled in SmartAC™ was under bill protection in PY2023.

Table D-2 shows the SmartRate™ bills impacts for customers by dual-enrollment status and bill protection status, while Table D-3 and Table D-4 show the proportions of customers with and without bill protection whose bills increased or decreased because of SmartRate™. Consistent with the PY2022 evaluation, customers with bill protection saved slightly more on their average energy bills than customers without bill protection. Overall, 67% of customers with bill protection experienced decreased energy bills, compared to 55% of customers without bill protection. The actual change in bills remained similar between the two groups, with customers not on bill protection seeing slightly larger decreases (-\$14.70) and larger increases (\$15.25) in general than bill-protected customers (-\$13.34 and \$11.35, respectively).

Table D-2 Participant Distribution by Bill Protection Status

Enrollment Status	Protection Status	Count of Participants	% of Enrollment Status	% of Population	Average Bill Change per Month
SmartRate™ Only	Unprotected	12,930	72%	27%	-\$2.78
	Protected	5,049	28%	11%	-\$5.87
	<b>All</b>	<b>17,979</b>	<b>100%</b>	<b>38%</b>	<b>-\$3.65</b>
Dually Enrolled in SmartAC™	Unprotected	4,745	100%	10%	-\$0.11
	<b>All</b>	<b>4,745</b>	<b>100%</b>	<b>10%</b>	<b>-\$0.11</b>
Dually Enrolled in ELRP A6	Unprotected	20,129	80%	42%	-\$0.73
	Protected	5,072	20%	11%	-\$5.08
	<b>All</b>	<b>25,201</b>	<b>100%</b>	<b>53%</b>	<b>-\$1.61</b>
All	Unprotected	37,804	79%	79%	-\$1.36
	Protected	10,121	21%	21%	-\$5.47
	<b>All</b>	<b>47,925</b>	<b>100%</b>	<b>100%</b>	<b>-\$2.22</b>

Table D-3 Bill Impacts for Participants under the Bill Protection Guarantee

Enrollment Status	Impact	Count of Participants	% of Enrollment Status	Average Bill Change per Month
SmartRate™ Only	Decreased Bill	3,349	66%	-\$13.99
	Increased Bill	1,515	30%	\$11.38
	No Change	185	4%	n/a
	<b>All</b>	<b>5,049</b>	<b>100%</b>	<b>-\$5.87</b>
Dually Enrolled in ELRP A6	Decreased Bill	3,407	67%	-\$12.69
	Increased Bill	1,544	30%	\$11.32
	No Change	121	2%	n/a
	<b>All</b>	<b>5,072</b>	<b>100%</b>	<b>-\$5.08</b>
All	Decreased Bill	6,756	67%	-\$13.34
	Increased Bill	3,059	30%	\$11.35
	No Change	306	3%	n/a
	<b>All</b>	<b>10,121</b>	<b>100%</b>	<b>-\$5.47</b>

Table D-4 Bill Impacts for Participants without the Bill Protection Guarantee

Enrollment Status	Impact	Count of Participants	% of Enrollment Status	Average Bill Change per Month
SmartRate™ Only	Decreased Bill	7,834	61%	-\$14.84
	Increased Bill	5,094	39%	\$15.76
	No Change	2	0%	n/a
	<b>All</b>	<b>12,930</b>	<b>100%</b>	<b>-\$2.78</b>
Dually Enrolled in SmartAC™	Decreased Bill	2,433	51%	-\$15.10
	Increased Bill	2,312	49%	\$15.67
	<b>All</b>	<b>4,745</b>	<b>100%</b>	<b>-\$0.11</b>
Dually Enrolled in ELRP A6	Decreased Bill	10,687	53%	-\$14.51
	Increased Bill	9,441	47%	\$14.87
	No Change	1	0%	n/a
	<b>All</b>	<b>20,129</b>	<b>100%</b>	<b>-\$0.73</b>
All	Decreased Bill	20,954	55%	-\$14.70
	Increased Bill	16,847	45%	\$15.25
	No Change	3	0%	n/a
	<b>All</b>	<b>37,804</b>	<b>100%</b>	<b>-\$1.36</b>

### Billing Impacts by Other Subgroups

Table D-5 shows the average bill impacts by LCA. Across LCAs, most customers saved on their energy bills by participating in SmartRate™, with the most significant reductions experienced by participants in Humboldt. Customers in Stockton experienced slight increases in their energy bills.

Table D-5 Bill Impacts by LCA

LCA	Count of Participants	% of Population	Average Bill Change per Month
Greater Bay Area	5,817	12%	-\$2.50
Greater Fresno Area	11,644	24%	-\$3.13
Humboldt	113	0%	-\$15.14
Kern	4,480	9%	-\$6.10
North Coast and North Bay	2,307	5%	-\$7.52
Sierra	4,833	10%	-\$0.13
Stockton	5,272	11%	\$1.31
Other	13,459	28%	-\$1.15
<b>All</b>	<b>47,925</b>	<b>100%</b>	<b>-\$2.22</b>

Table D-6 shows the average impacts on energy bills experienced by customers on a CARE rate. Customers on non-CARE status experienced slightly higher billing reductions, on average, compared to CARE customers, though nearly 60% of customers in each segment saw some decreases.

Table D-6 Bill Impacts by CARE Status

CARE Status	Impact	Count of Participants	% of CARE Status	Average Bill Change per Month
Non-CARE	Decreased Bill	16,157	59%	-\$14.89
	Increased Bill	10,847	40%	\$15.67
	No Change	186	1%	n/a
	<b>All</b>	<b>27,190</b>	<b>100%</b>	<b>-\$2.60</b>

CARE Status	Impact	Count of Participants	% of CARE Status	Average Bill Change per Month
CARE	Decreased Bill	11,553	56%	-\$13.64
	Increased Bill	9,059	44%	\$13.43
	No Change	123	1%	n/a
	<b>All</b>	<b>20,735</b>	<b>100%</b>	<b>-\$1.73</b>

Table D-7 shows the average bill impacts achieved by customers across billing rates. Customers on the TOU-B, EV2-A, and E-ELEC rates reduced their energy bills by over \$14 per month on average, with over two-thirds of customers experiencing at least some decreases. The SmartRate™ program also reduced energy bills for customers on the other TOU rates (TOU-C and TOU-D), though to a lesser degree. However, half of the customers on the standard rate (E1) saw their bills increase after joining smart rate.

Table D-7 Bill Impacts by Billing Rate

Billing Rate	Impact	Count of Participants	% of Rate Population	Average Bill Change per Month
E1 (Standard)	Decreased Bill	14,088	50%	-\$13.10
	Increased Bill	13,903	49%	\$14.77
	No Change	141	1%	n/a
	<b>All</b>	<b>28,132</b>	<b>100%</b>	<b>\$0.74</b>
TOU-B (Opt-in)	Decreased Bill	1,614	72%	-\$26.68
	Increased Bill	615	28%	\$16.76
	No Change	0	0%	n/a
	<b>All</b>	<b>2,229</b>	<b>100%</b>	<b>-\$14.69</b>
TOU-C (Defaulted)	Decreased Bill	8,482	68%	-\$11.66
	Increased Bill	4,014	32%	\$14.41
	No Change	66	1%	n/a
	<b>All</b>	<b>12,562</b>	<b>100%</b>	<b>-\$3.27</b>
TOU-D (Opt-in)	Decreased Bill	2,386	66%	-\$18.29
	Increased Bill	1,152	32%	\$13.59
	No Change	84	2%	n/a
	<b>All</b>	<b>3,622</b>	<b>100%</b>	<b>-\$7.73</b>
EV2-A (Home Charging EV)	Decreased Bill	752	83%	-\$24.89
	Increased Bill	137	15%	\$10.84
	No Change	12	1%	n/a
	<b>All</b>	<b>901</b>	<b>100%</b>	<b>-\$19.13</b>
E-ELEC (Electric Home Rate Plan)	Decreased Bill	388	81%	-\$23.93
	Increased Bill	85	18%	██████
	No Change	6	1%	n/a
	<b>All</b>	<b>479</b>	<b>100%</b>	<b>-\$17.38</b>



A decorative graphic element is positioned in the lower half of the gray area. It starts as a horizontal purple line on the left, then steps up vertically, continues horizontally, steps up again vertically, and finally continues as a horizontal orange line that extends to the right edge of the gray area.

**Applied Energy Group, Inc.**  
2300 Clayton Road  
Suite 1370  
Concord, CA 94520  
P: 510-982-3526