AEG

2022 Statewide Load Impact Evaluation of California Capacity Bidding Programs

EX-POST AND EX-ANTE LOAD IMPACTS

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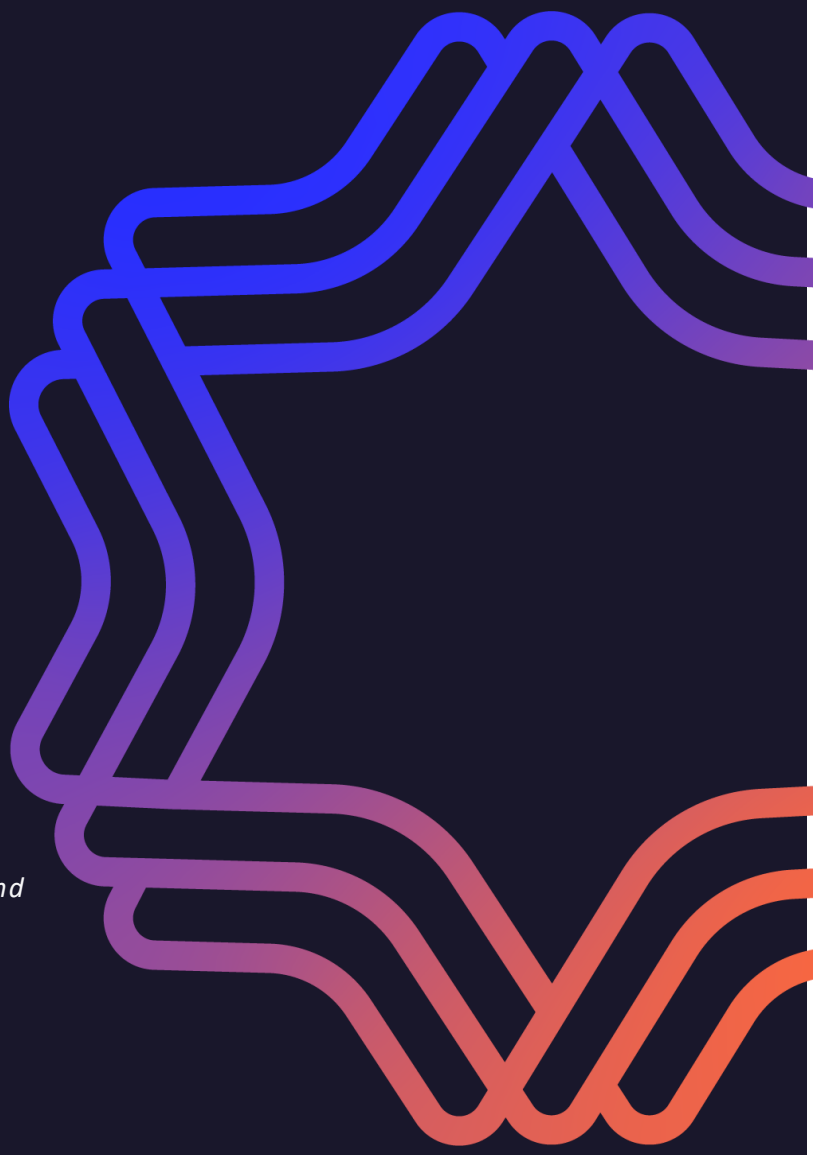

Public Version. Redactions in 2022 Statewide Load Impact Evaluation of California Capacity Bidding Programs and Appendices.

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ABSTRACT

This report documents the Program Year 2022 (PY2022) statewide load impact evaluation of the Capacity Bidding Program (CBP) operated by the three California investor-owned utilities (IOUs): Pacific Gas and Electric (PG&E), Southern California Edison (SCE), and San Diego Gas and Electric (SDG&E). The primary goals of this evaluation are to (1) estimate the ex-post load impacts for PY2022 and (2) estimate ex-ante load impacts for years 2023 through 2033.

CBP is an aggregator-based demand response (DR) program. As part of these programs[1], DR aggregators contract with customers to act on their behalf in all aspects of the DR program, including receiving notices from the IOU, arranging for load reductions on event days, receiving incentive payments, and paying penalties (if warranted) to the IOU. Each aggregator forms a portfolio of service accounts whose aggregated load reductions participate as a single resource for each program. Aggregators can nominate customer service accounts to various products depending on each program's product[2] offerings, including day-ahead (DA) and day-of[3] (DO) notifications and corresponding event triggers. The terms and conditions of service can vary widely, depending on tariffs specific to each IOU and contracts between aggregators and customers.

In PY2022, the number of dispatched customer service accounts[4] on a single event day ranged from two to 793 service accounts, depending on the program and product. Programs dispatched as few as three event days, while others dispatched up to 57 event days. These events are dispatched for various combinations of distribution-based geographical locations or Sub-Load Aggregation Points (Sub-LAPs). Sub-LAP events are based on CAISO market awards and may not require the IOU to dispatch the entire available portfolio of nominated resources.

AEG estimated hourly ex-post load impacts for each program, product, and dispatched event in PY2022 using regression analysis of hourly load, weather, and event data. The estimated load impacts are reported by program, product, and event day. Load impacts for the average event day are also reported by industry type, CAISO local capacity area (LCA), and Sub-LAP where relevant. Estimated aggregate load impacts for an average Non-residential CBP DA event were 28.0 MW for PG&E, 1.1 MW for SCE, and [redacted] MW for SDG&E. Aggregate load impacts for Non-residential CBP DO were 1.9 MW for SCE and 1.4 MW for SDG&E, on average.

AEG developed ex-ante load impact forecasts by combining enrollment forecasts provided by the IOUs and per-customer load impacts generated from analysis of current and prior ex-post load impact estimates. The forecast numbers of nominated customer service accounts and aggregate ex-ante load impacts presented in the report reflect several program changes expected to be effective in 2023.

[1] "Program" refers to each IOU's notification type by customer class. For example, SDG&E's Non-residential CBP Day Of notification is a program. SCE and SDG&E both have Non-residential Day Ahead and Non-residential Day Of programs, while PG&E has the Day Ahead program for both Residential and Non-residential customers.

[2] "Product" refers to different product offerings within each program. For example, the PG&E Day Ahead program has 3 products offerings: Elect, Elect+, and Prescribed.

[3] Starting in PY2018, DO products are no longer offered by PG&E.

[4] PG&E refers to these as service agreements.

EXECUTIVE SUMMARY

This report documents the Program Year 2022 (PY2022) statewide load impact evaluation of the Capacity Bidding Program (CBP) offered by Pacific Gas and Electric (PG&E), Southern California Edison (SCE), and San Diego Gas and Electric (SDG&E), the three California investor-owned utilities (IOUs).

The primary goals of the PY2022 load impact evaluation are as follows:

- Estimate hourly ex-post load impacts for each program[5], product[6], and dispatched event in PY2022.
- Estimate hourly ex-ante load impacts for each program and product for the years 2023-2033.

We present the program description, evaluation methodology, ex-post load impacts, ex-ante load impacts, key findings, and recommendations in the following subsections.

Program Description

The Capacity Bidding Program is a statewide price-responsive and aggregator-managed program launched in 2007. It is available at the three CA IOUs, although each IOU's program differs slightly in program features and operations.

Aggregators. In CBP, aggregators contract with eligible residential[7] and non-residential utility customers to act on their behalf in all aspects of the program. Aggregators receive dispatch notifications (day-ahead or day-of), incentive payments, and penalties from the IOUs. Each aggregator forms a resource, a portfolio of customers, to provide load reduction during events. Each resource participates collectively, wherein load reduction is measured on an aggregate basis. The aggregators enroll customers under the terms of their contracts to provide the load reduction capacity and receive corresponding incentives. In other words, IOUs are not directly involved in the contracts between aggregators and customers unless a customer is classified as self-aggregated.

Eligibility. Aggregators must have Internet access. Enrolled customers must have a qualifying interval meter and receive Bundled, Direct Access, or Community Choice Aggregation service.[8] Customers enrolled in CBP may dually participate in an energy-only DR program (i.e., cannot have a capacity payment component) that does not have the same notification type (DA or DO).

Incentives. CBP provides monthly capacity payments ($/kW) to aggregators based on the nominated kW load, the specific operating month, the event duration, resource performance during an event, and the event notice option. Delivered capacity determines performance. If an aggregator's delivered capacity is less than the tariff threshold (50% for SCE and SDG&E and 60% for PG&E), the aggregator is assessed a penalty. For months without dispatched events, CBP aggregators receive the full monthly capacity payment based and no energy payments.[9] Additional energy payments ($/kWh) are made to

[5] "Program" refers to each IOU's notification type by customer class. For example, SDG&E's Non-residential CBP Day Of notification is a program. SCE and SDG&E both have Non-residential Day Ahead and Non-residential Day Of programs, while PG&E has the Day Ahead program for both Residential and Non-residential customers.

[6] "Product" refers to different product offerings within each program. For example, the PG&E Day Ahead program has 3 products offerings: Elect, Elect+, and Prescribed.

[7] Since PY2018, the program was open to residential customer enrollment.

[8] PG&E's partial standby, net-metered, and Automated Demand Response (AutoDR) customers are also eligible.

[9] Self-aggregated customers receive up to 80% of the available capacity payment; aggregators receive 100% of the capacity payment for the load reduction received. Note that all of PG&E and SCE's CBP customers participate through an aggregator.

the aggregator[10] based on the measured kWh reductions (relative to the program baseline) achieved when an event is dispatched.[11]

Programs, Products, and Events. All CBP events are determined by California Independent System Operator (CAISO) market awards at varying thresholds specified by each program and product.

- **PG&E** has two programs: Residential and Non-residential DA. Both programs offer three products: Elect, Elect+, and Prescribed. PG&E operating hours are between 1 PM to 9 PM. Events are called Monday through Friday (option available to include weekends), excluding holidays, during May through October, with a maximum of six events and 30 hours per month (or possibly more hours under Elect and Elect+ Options if the participants so choose).
- **SCE** has two programs: Non-residential DA and DO. Both programs offer one product: DA 1-6 Hour and DO 1-6 Hour. SCE operating hours (dispatch window) are between 3 PM to 9 PM. Events may be called Monday through Friday, excluding holidays, year-round, with a maximum of 5 events and 30 hours per month. Residential CBP is now open to aggregators, but SCE has not yet received nominations.
- **SDG&E** has two programs: Non-residential DA and DO. Altogether, both programs currently offer six products: Prescribed DA 11-7 Hour, Prescribed DA 1-9 Hour, Elect DA 1-9 Hour, Prescribed DO 11-7 Hour, Prescribed DO 1-9 Hour, and Elect DO 1-9 Hour. SDG&E's Elect products are three price trigger options: $200/MWh, $400/MWh, and $600/MWh. Events may be called Monday through Friday, excluding holidays, from May through October, with a maximum of 24 hours per month. SDG&E can dispatch up to 6 event days per month with up to three consecutive event days per month.

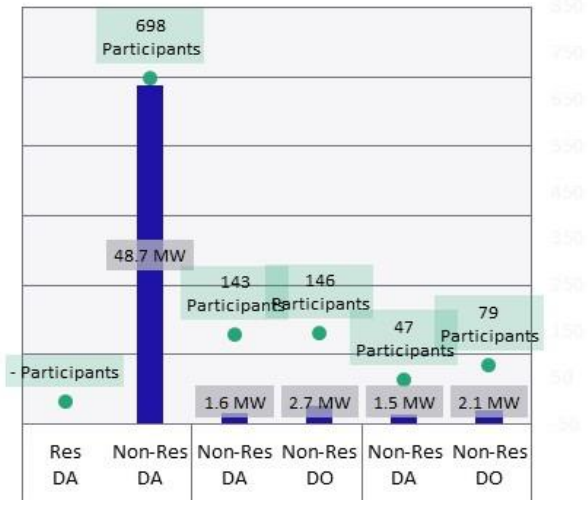
Program Nominations

Figure ES-1 shows the average summer[12] nominations for each program in PY2022. These counts and capacity nominations represent the total resources available for dispatch during the PY2022 summer season.

Nomination vs. Dispatch

Throughout the report, we distinguish between nominations and dispatches. A **Nomination** is a monthly nominated resource by program, product, aggregator, and Sub-LAP. Each nominated resource has a corresponding capacity nomination (MW) and enrolled customers. A **Dispatch** is an entity called to a market-triggered event. For

Figure ES-1 Average Summer Nominations by Program



[10] Self-aggregated customers receive additional energy payments directly.

[11] PG&E and SDG&E's energy payments are made to bundled customers. SCE's energy payment calculation is based upon all types of customers including bundled, DA, and CCA.

[12] A summer month is defined as months between May through October.

example, a dispatched resource, dispatched customers, or dispatched capacity. Not all nominated entities are dispatched.

Dispatched Events

Since CBP events are triggered by CAISO market awards specific to Sub-LAPs, not all available nominations are dispatched for each event. Some months may dispatch more events than others, and some events may dispatch all or a portion of nominations. Table ES-1 compares the average summer nominations to the average summer dispatches for each program. Note that the dispatched capacity is also separate from the estimated ex-post impact presented in the subsequent section.

Table ES-1 Average Summer Nominations v. Dispatch

IOU	Program	Nomination		Dispatched		
		No. of Accounts	Capacity (MW)	No. of Accounts	Capacity (MW)	Number of Events
PG&E	Res DA	-	-	-	-	-
	Non-Res DA	698	48.7	475	31.3	24
SCE	Non-Res DA	143	1.6	83	0.9	40
	Non-Res DO	146	2.7	98	1.7	37
SDG&E	Non-Res DA	47	1.5	3	[redacted]	3
	Non-Res DO	79	2.1	63	2.1	6

Evaluation Methods

We used the same methodology across all programs to ensure consistency of results. Each program is modeled independently, modifying assumptions to account for CBP program design and implementation specific to each IOU's CBP tariff. With the addition of PG&E's Residential[13] participation in PY2020, it is important to highlight the key differences in the approach used for the two customer classes:

The Residential program analysis used a matched control group and aggregate hourly regression models. This approach is the best practice for participant populations with less variable loads, which can leverage the higher statistical power with more customers included in each model. A matched control group also more effectively estimates the counterfactual load without a randomized control trial.

The Non-residential programs analyses continued to use a within-subjects design using customer-specific hourly regression models. It remains the most flexible, consistent, and appropriate solution for CBP's evaluation goals and population distributions. Non-residential customers often vary significantly from one another in load shape, weather response, and overall size. Customer-specific regressions allow us to control for variation in load due to weather conditions, geography, time-related variables, and other unobservable customer-specific effects. This approach also allows for aggregating individual customer impacts to estimate load impacts at any level or customer segmentation.

[13] PY2022 did not have active Residential program, but the approach to Residential program analysis is included for reference.

AEG used the same hourly regression models to predict the ex-ante load impacts under the Utility and CAISO 1-in-2 and 1-in-10 weather scenarios. AEG estimated load impacts for all five hours of the Resource Adequacy (RA) window, developing IOU-specific adjustments based on historical performance and expected program changes through the 2023-2033 forecast horizon.

Ex-Post Load Impacts

Table ES-2 presents the PY2022 average summer event day impacts by IOU and program at the aggregate and per-customer levels. We show the results for the most dispatched hour (reporting hour) for each program, which is HE19 (6 PM – 7 PM) for PG&E and SDG&E and HE16 (3 PM – 4 PM) for SCE. Note that we calculate the average event day using all events regardless of dispatched count and event timing.

Table ES-2 Statewide CBP Impacts Summary, Average Summer Event Day PY2022

IOU	Program	# Accts	Aggregate (MW)			Per-Customer (kW)		
			Dispatch Capacity	Load Impact	% Delivered	Ref. Load	Load Impact	% Impact
PG&E	Residential DA	-	-	-	-	-	-	-
	Non-residential DA	475	31.3	28.0	89%	150.9	58.9	39%
SCE	Non-residential DA	83	0.9	1.1	117%	78.8	12.8	16%
	Non-residential DO	98	1.7	1.9	109%	142.2	19.1	13%
SDG&E	Non-residential DA	3	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	Non-residential DO	63	2.1	1.4	65%	167.1	22.0	13%

At the program level, we observe the following:

- PG&E's average delivery performance (89%) decreased slightly compared to PY2021 (96%).
- SCE's average delivery performance improved significantly, with both programs above 100%. SCE primarily dispatched events on HE16 (3 PM – 4 PM), which may have higher available load for participant delivery.
- SDG&E's Non-Residential DO improved average delivery performance (65%) compared to PY2021 (30%). However, the Non-Residential DA performance ([redacted]%) dropped significantly compared to PY2021 (25%). SDG&E launched Elect product offerings in PY2022.

Table ES-3 summarizes each CBP program's PY2022 overall season performance using the following reporting metrics:

- Nominations – counts and total capacity,
- Dispatched – average counts and capacity for all events dispatched,
- HE* Dispatched – average counts and capacity for all events dispatched on the most dispatched hour, and
- Ex-post load impacts – aggregate impacts, delivery performance relative to the overall dispatched capacity, and adjusted delivery performance relative to HE* dispatched capacity.

Table ES-3 Statewide CBP Delivery Performance PY2022

Program		Nominations		Overall Dispatched		Reporting Hour Dispatched		Ex-Post Analysis		
		# Accts	Capacity (MW)	# Accts	Capacity (MW)	# Accts	Capacity (MW)	Impact (MW)	% Delivered	Adj. % Delivered
PG&E	Res DA	-	-	-	-	-	-	-	-	-
	Non-res DA	698	49	475	31.3	448	31.1	28.0	89%	90%
SCE	Non-res DA	143	1.6	83	0.9	75	0.7	1.1	117%	145%
	Non-res DO	146	2.7	98	1.7	78	1.4	1.9	109%	132%
SDGE	Non-res DA	47	1.5	3	[redacted]	3	[redacted]	[redacted]	[redacted]	[redacted]
	Non-res DO	79	2.1	63	2.1	63	2.1	1.4	65%	65%

Some key notes when reviewing Table ES-3:

- We show the average dispatched counts and capacity, which is dependent on CAISO market awards. Low counts are not indicative of low participation but rather an indication of necessity.
- Delivered dispatched capacity is the correct measure of the program's success (delivery performance or % delivered). 100% delivery performance means aggregators and customers curtailed the load obligations when asked to do so.
- The delivery performance metrics allow for an adjusted metric for dispatched capacity coincident with the reporting hour. Our definition of the average event day includes events that did not dispatch capacity during the reporting hour.

Notably, all program (except for SDG&E Non-Residential DA) performances increased after the appropriate adjustment for dispatched capacity on the reporting hour.

PY2022 ex-post load impacts and dispatched capacity for each event day are provided in the following sections: PG&E Impacts by Event Day, SCE Impacts by Event Day, and SDG&E Event Day Load Impacts.

Ex-Ante Load Impacts

Table ES-4 summarizes the 11-year average Resource Adequacy (RA) window load impact forecast by IOU and program for an August peak day scenario, and Table ES-5 summarizes the corresponding 11-year enrollment forecast.

Table ES-4 Statewide CBP: 2023-2033 Load Impact Forecast, August Peak Day

IOU	Program	Aggregate Load Impacts (MW)				
		2023	2024	2025	2026	2027-2033 (Each Year)
PGE	Residential DA	0.3	0.3	0.3	0.3	0.3
	Non-residential DA	33.5	33.5	33.5	33.5	33.5
SCE	Non-residential DA	0.9	1.3	4.9	4.9	4.9
	Non-residential DO	[redacted]	-	-	-	-
SDG&E	Non-residential DA	0.5	0.5	0.5	0.5	0.5
	Non-residential DO	1.3	1.4	1.4	1.4	1.5

Table ES-5 Statewide CBP: 2023-2033 Enrollment Forecast, August Peak Day

IOU	Program	Number of Service Accounts				
		2023	2024	2025	2026	2027-2033 (Each Year)
PGE	Residential DA	1,743	1,743	1,743	1,743	1,743
	Non-residential DA	980	980	980	980	980
SCE	Non-residential DA	150	225	848	848	848
	Non-residential DO	150	0	0	0	0
SDG&E	Non-residential DA	51	52	53	54	55
	Non-residential DO	97	99	101	103	105

Each program's load impact forecast is based on IOU-specific assumptions that incorporate a combination of the following: aggregator/nomination outlook, delivery performance, ex-ante per-customer load impacts, enrollment growth, and an impact degradation rate across the RA window.

PG&E's forecast assumptions are as follows:

- **Residential DA** – PG&E assumed a constant 2 MW nomination through the 11-year forecast. Given that PY2022 did not have active residential participation, we maintained the rest of PY2021 assumptions. We maintained the 61% delivery performance, which is the minimum threshold before aggregators are charged a penalty. We also assume a maximum 4-hour event duration based on historical participation in the 1- to 4-hour product option.
- **Non-Residential DA** – PG&E increased forecasted capacity nominations to 65 MW for an August peak day. We updated the delivery performance (89%) and impact degradation rate (69% overall RA) based on PY2022 performance. We also assume a maximum 4-hour event duration based on historical participation in the 1- to 4-hour product option.

SCE's forecast assumptions are as follows:

- **Enrollment Outlook** – consistent with the submitted DR Application A22-05-004:
  - Updated according to PY2022 and PY2023 nominations,
  - In 2024 through 2033, zero enrollment in non-summer months and the DO program.
  - In 2024, assume 50% of DO participants will move to the DA program.

- In 2025, assume some DRAM customers will move to the DA program.

- **Updated assumptions based on PY2022 performance** – we assume the per-customer load impacts on reporting hour (HE16 for summer, HE19 for non-summer) as the maximum impact during the RA window. The impact degradation was updated to 69% (DA summer), 65% (DO summer), and 71% (non-summer) overall RA window.

SDG&E's forecast assumptions are as follows:

- **Delivery Performance** – we calculated program-level delivery performance based on PY2020 through PY2022 performance to produce modest estimates, given the inconsistent delivery performance over the last three years, 33% (Non-Residential DA) and 56% (Non-Residential DO).
- **Enrollment Growth** – we updated the enrollment forecast based on PY2022 nominations and assumed a 2% growth per year from 2023-2027 due to the CBP program improvements proposed by SDG&E and no additional growth from 2027-2033.
- **Impact Degradation Rate** – we used PY2020-22 historical data to update the Impact Degradation Rate, 55% (DA 11-7 Hour), 68% (DA 1-9 Hour), 50% (DO 11-7 Hour), and 77% (DO 1-9 Hour). Note that both 11-7 Hour[14] products show zero impacts on HE20-HE21 since these products are not available for these hours.

Table ES-6 summarizes the average RA window load impact estimates for an August peak day in 2023 by IOU and program for each weather scenario.

Table ES-6 Statewide CBP: RA Window Ex-Ante Impacts, August Peak Day, 2023

IOU	Program	# of Accts	Per Customer (kW)	Aggregate Impact (MW)	Percent Impact (%)			
					Utility Peak		CAISO Peak	
					1-in-2	1-in-10	1-in-2	1-in-10
PGE	Residential DA	1,743	0.2	0.3	39.0%	30.5%	33.3%	31.5%
	Non-residential DA	980	33.5	34.2	20.6%	20.2%	20.4%	20.2%
SCE	Non-residential DA	150	5.7	0.9	7.6%	7.5%	7.5%	7.6%
	Non-residential DO	150	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
SDG&E	Non-residential DA	51	9.7	0.5	7.5%	7.3%	7.5%	7.4%
	Non-residential DO	97	13.9	1.3	12.6%	12.4%	12.6%	12.5%

Note that since CBP impacts are inherently nomination-driven, not weather-driven, we assumed constant non-residential per-customer load impacts across the weather scenarios. This assumption results in varying percent impacts across the months and weather scenarios.

The above statement does not apply to Residential RA window load impacts. We do not assume load impacts to be flat across months and weather scenarios. Instead, we assume constant HE20 percent impacts, accounting for the available load during each hour of the RA window. However, the differences between weather scenarios are minimal and cannot be distinguished at the per-customer (kw) and aggregate (MW) level.

[14] Used PY2019-2021 historical data. Not updated in PY2022 due to no events dispatched for the 11-7 Hour products.

Each program's load impact forecast is based on IOU-specific assumptions that incorporate a combination of the following: aggregator/nomination outlook, delivery performance, ex-ante per-customer load impacts, enrollment growth, and an impact degradation rate across the RA window.

Key Findings

PG&E Key Findings. The PY2022 LI analysis has the following key findings for PG&E's CBP:

- Non-residential DA resulted in 89% delivery performance and 90% adjusted delivery performance, which is lower than PY2021. However, the program is still relatively successful and is collectively the largest resource in the state, with an average of 48.7 MW nominations in the PY2022 season.
- HE19 (6 PM – 7 PM) is the most dispatched event hour in PY2022, with an average of 28 MW load impacts and 475 participants dispatched.
- PG&E dispatched four system-level events: September 1st, 6th, 7th, and 8th. All four events delivered over 60 MW load impacts on HE19, well above the overall 54.2 MW capacity nominations in September.
- Non-Residential DA is continuing to grow. Based on aggregator outlook, PG&E estimates approximately 65 MW capacity nominations in 2023. This is an increase to last year's forecast of 55 MW nominations.
- Residential DA did not have active participation in PY2022. PG&E also updated the Residential DA forecast to 2 MW capacity nominations in 2023. The lower target is more realistic and achievable, given Residential DA's historical performance. PG&E expects new aggregators to participate in residential CBP and anticipates increased automation for residential customers, further supporting the MW forecast's realization.

SCE Key Findings. The PY2022 LI analysis has the following key findings for SCE's CBP:

- Non-Residential DA and Non-Residential DO jointly resulted in 112% delivery performance and 137% adjusted delivery performance in the summer season, a significant increase from PY2021.
    - HE16 (3 PM – 4 PM) is the most dispatched event hour in PY2022 for the summer season, which may have higher available load for participant delivery. Both programs delivered, on average, 2.9 MW load impacts and 181 participants dispatched.
- Non-Residential DO's non-summer season remains a small collective resource but improved overall delivery performance from PY2021. Non-Residential DA did not have active non-summer participation.
    - HE19 (6 PM – 7 PM) is the most dispatched event hour in PY2022 for the non-summer season.
- SCE updated the ex-ante enrollment forecast to be consistent with the submitted DR Application A22-05-004, which includes the following assumptions:
    - Updated according to PY2022 and PY2023 nominations,
    - 2024 through 2033: zero enrollment in non-summer months and the DO program,
    - 2024: assume 50% of DO participants will move to the DA program, and
    - 2025: assume some DRAM customers will move to the DA program.

- The CPUC required SCE to submit a supplemental application on March 3rd, 2023 with a proposed Elect product design. The supplemental application is not currently incorporated in the ex-ante forecast assumptions.

SDG&E Key Findings. The PY2022 LI analysis has the following key findings for SDG&E's CBP:

- SDG&E implemented two new Elect Products: Elect DA 1-9 Hour and Elect DO 1-9 Hour, each with three price trigger options: $200/MWh, $400/MWh, $600/MWh.
  - SDG&E still offers their previously existing products as Prescribed options, with the following price triggers: $90/MWh (Prescribed DA 11-7 Hour and 1-9 Hour), $115/MWh (Prescribed DO 11-7 Hour), and $125/MWh (Prescribed DO 1-9 Hour).
  - Non-residential DA nominations were primarily split between Elect DA ($400) and Elect DA ($600) products, while Non-residential DO nominations were primarily in the Elect DO ($400) product. Prescribed product options had close to no nominations in PY2022.
- SDG&E's Non-Residential DO improved average delivery performance (65%) compared to PY2021 (30%). However, the Non-Residential DA performance ([redacted]%) dropped significantly compared to PY2021 (25%).
- HE19 (6 PM – 7 PM) is the most dispatched event hour in PY2022, with a combined 1.3 MW and 66 participants dispatched on average.
- SDG&E dispatched a combined total of 6 event days in PY2022. Under the Prescribed product option, SDG&E historically dispatched around 20-30 events per program year, which has $90-$125/MWh price triggers. In PY2022, more aggregators opted for the $400/MWh and $600/MWh price triggers, reducing the resources that qualify for dispatch through the program year.
- SDG&E updated the ex-ante forecast assumptions to incorporate delivery performance based on PY2020 through PY2022 performance to produce modest estimates, given the inconsistent delivery performance over the last three years.
  - We updated the enrollment forecast based on PY2022 nominations and maintained the 2% growth per year from 2023-2027 due to the CBP program improvements proposed by SDG&E and no additional growth from 2027-2033.

Recommendations

AEG has the following recommendations for future research and evaluation related to the Capacity Bidding Programs.

- **Reevaluate the approach to reporting delivery performance.** We have two considerations for future reports:
  - **Produce an average event hour for reporting delivery performance.** Given CBP's need-based nature of dispatching events (Sub-LAP level CAISO market awards), reporting the average load impacts for a coincident hour (i.e., the most dispatched hour) produces a "watered-down" average load impact. We've attempted to reconcile this by including an adjusted delivery performance metric, but it can still be improved. We recommend producing an average event hour strictly for reporting delivery performance, which can directly be measured against the nominated capacity without needing an adjustment.

  - **Maintain the existing approach to the average event day** due to limitations of the CPUC LIP, which requires reporting a 24-hour load profile for an average event day.
- **Consider including dispatched capacity in the Ex-Post table generators** (MS Excel-based Protocol) as available to each reporting customer segment.

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INTRODUCTION

This report documents the Program Year 2022 (PY2022) statewide load impact evaluation of the Capacity Bidding Program (CBP), an aggregator-based demand response (DR) program operated by the three California investor-owned utilities (IOUs): Pacific Gas and Electric (PG&E), Southern California Edison (SCE), and San Diego Gas and Electric (SDG&E).

Research Objectives

This study's key objectives are estimating ex-post and ex-ante impacts for each IOU's CBP program. More specifically:

- **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 and separately for each product offering. For the Non-residential programs, we provide estimates for the following customer segments: aggregator, size group, industry type, local capacity area (LCA), sub-load aggregation point (Sub-LAP), and enrollment in AutoDR or other DR programs. For Residential[15] programs, we provide estimates for the following customer segments: aggregator, LCA, Sub-LAP, and CARE status.
- **Estimate Ex-ante load impacts** for the average customer and all customers in aggregate for the resource adequacy (RA) window[16] (4 PM to 9 PM). We provide estimates for each year over an 11-year[17] time horizon based on each IOU's 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 scenarios. As applicable, we also provide estimates for the following customer segments: size group, LCA, Sub-LAP, and busbar.

Program Description

The Capacity Bidding Program (CBP) is a statewide price-responsive program launched in 2007. It is available at the three CA IOUs: PG&E, SCE, and SDG&E, although each IOU's program differs slightly in program features and operations.

Aggregators. In CBP, aggregators contract with eligible residential[18] and non-residential utility customers to act on their behalf in all aspects of the demand response (DR) program. Aggregators receive dispatch notifications (day-ahead or day-of), incentive payments, and penalties from the IOUs. Each aggregator forms a resource, a portfolio of customers, to provide load reduction during events. Each resource participates collectively, wherein load reduction is measured on an aggregate basis. The aggregators enroll customers under the terms of their contracts to provide the load reduction capacity and receive corresponding incentives. In other words, IOUs are not directly involved in the

[15] PY2022 did not have active Residential programs.

[16] For March and April, the RA window is 5 PM to 9 PM.

[17] We included a PY2022 back cast as part of the ex-ante impact analysis.

[18] Since PY2018, the program was open to residential customer enrollment.

contracts between aggregators and customers. CBP may have customers/participants classified as self-aggregated.

Eligibility. Aggregators must have Internet access. Enrolled customers must have a qualifying interval meter and receive Bundled, Direct Access, or Community Choice Aggregation service.[19] Customers enrolled in CBP may dually participate in an energy-only DR program (i.e., cannot have a capacity payment component) that does not have the same notification type (DA or DO).

Incentives. CBP provides monthly capacity payments ($/kW) to aggregators based on the nominated kW load, the specific operating month, the event duration, resource performance during an event, and the event notice option. Delivered capacity determines performance. If an aggregator's delivered capacity is less than the tariff threshold (50% for SCE and SDG&E and 60% for PG&E), the aggregator is assessed a penalty. CBP aggregators receive the full monthly capacity payment for months without dispatched events based on their nominations with no energy payments.[20] Additional energy payments ($/kWh) are made to the aggregator[21] based on the measured kWh reductions (relative to the program baseline) achieved when an event is dispatched.[22]

Product Offerings. We provide descriptions of each IOU's PY2022 product offerings in Section 4 (PG&E), Section 5 (SCE), and Section 6 (SDG&E).

Report Terminology

In the PY2021 evaluation report, AEG made significant efforts to improve the overall clarity of the evaluation report. These efforts include updating the terminology used in the report and carefully reviewing it for consistency. Table 1-1 presents the key terms and corresponding definitions as used in this report.

Table 1-1 Report Terminology

TERM	DEFINITION
PROGRAM	**A combination of IOU, Customer Class, and Notification Type.** For example, SDG&E has two programs: (1) SDG&E Non-residential Day Ahead and (2) SDG&E Non-residential Day Of.
PRODUCT	**A product offering within each program.** For example, the PG&E Day Ahead program has three products: (1) Elect, (2) Elect+, and (3) Prescribed.
CUSTOMER CLASS	Defined as **Residential or Non-residential**.
NOMINATION	**A monthly nominated resource by program, product, aggregator, and Sub-LAP.** Each nominated resource has a corresponding capacity nomination (MW) and enrolled customers.
DISPATCHED	**An entity called to a market-triggered event.** For example, a dispatched resource, dispatched customers, dispatched capacity, etc. Not all nominated entities are dispatched.
AVERAGE EVENT DAY	For each product, calculated as **the average of all events dispatched** regardless of event hours and number of Sub-LAPS. The program-level average event day is the sum of all

[19] PG&E's partial standby, net-metered, and Automated Demand Response (AutoDR) customers are also eligible.

[20] Self-aggregated customers receive up to 80% of the available capacity payment; aggregators receive 100% of the capacity payment for the load reduction received. Note that all of PG&E and SCE's CBP customers participate through an aggregator.

[21] Self-aggregated customers receive additional energy payments directly.

[22] PG&E and SDG&E's energy payments are made to bundled customers. SCE's energy payment calculation is based upon all types of customers including bundled, DA, and CCA.

TERM	DEFINITION
	product-level average event days. Load impacts are reported for each program and product's most dispatched event hour.
REPORTING HOUR	**The hour reported for the ex-post average event day.** This hour is the most dispatched event hour for each program and product (HE19 for PG&E, SCE Non-Summer, and SDG&E or HE16 for SCE Summer).
DELIVERY PERFORMANCE	A percentage metric equal to the ex-post aggregate load impacts **divided by the overall dispatched capacity**. It was referred to as "nomination achievement" in the PY2020 report.
ADJUSTED DELIVERY PERFORMANCE	A percentage metric equal to the ex-post aggregate load impacts **divided by the reporting hour dispatched capacity**. We calculate an adjusted metric to measure performance because our definition of the average event day includes events that did not dispatch capacity during the reporting hour.
IMPACT DEGRADATION RATE	**An assumption developed for a simulated 5-hour RA window** based on historical events. This assumption represents how customers, on average, can maintain impacts throughout events called for longer durations.

Other Report References

For reference, Table 1-2 presents the eight industry-type definitions and corresponding NAICS codes, and Table 1-3 presents the three customer-size definitions.

Table 1-2 Non-Residential Industry Type Definitions

Industry Type	NAICS Codes
1. Agriculture, Mining & Construction	11, 21, 23
2. Manufacturing	31-33
3. Wholesale, Transport, Other Utilities	22, 42, 48-49
4. Retail Stores	44-45
5. Offices, Hotels, Finance, Services	51-56, 62, 72
6. Schools	61
7. Institutional/Government	71, 81, 92
8. Other/Unknown	N/A

Table 1-3 Non-Residential Customer Size Definitions

Customer Size Group	Maximum Demand
Large	200 kW and above
Medium	20 kW to 199.99 kW
Small	19.99 kW and below

Report Organization

As a recommendation from the PY2021 evaluation, we reorganized the report to deliver findings by IOU. Although we use consistent approaches in analyses and reporting, we recognize that each IOU has a unique story to tell. The new approach to organization presents each IOU's ex-post results, ex-ante results, and key findings in one section to add overall clarity and value.

This report is organized into the following sections:

- Section 2 describes the methods used to estimate the ex-post and ex-ante load impacts.
- Section 3 presents state-level summaries of PY2022:
  - Program participation,
  - Ex-post load impact estimates,
  - Ex-ante load impact estimates, and
  - Key findings and recommendations.
- Sections 4 through 6 present IOU-level summaries of PY2022:
  - Product descriptions and expected program changes
  - Program participation,
  - Ex-post load impact estimates,
  - Ex-ante load impact estimates, and
  - Key findings.

2

STUDY METHODS

This section presents the methods used to estimate the ex-post and ex-ante load impacts for statewide CBP.

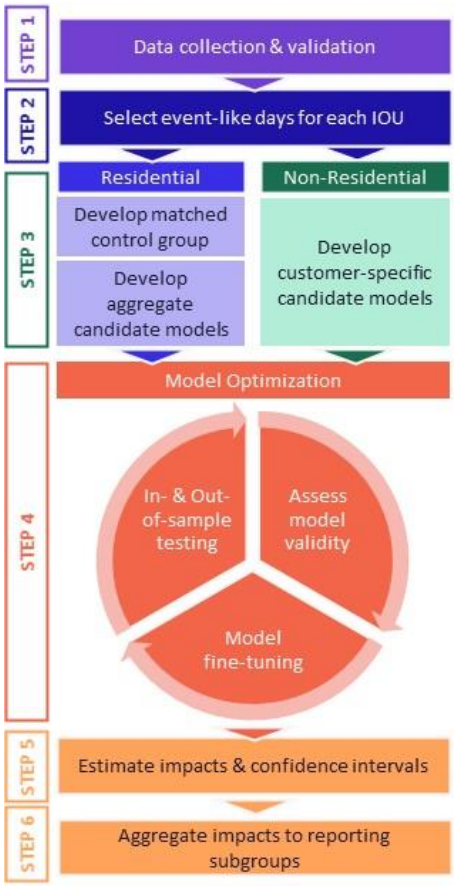
Ex-Post Load Impact Analysis

We explicitly designed the PY2022 ex-post LI analysis to meet each of the objectives listed below, all objectives to be provided at the program level and separately for each product offering.

- To develop hourly load impact estimates for each event in PY2022 and estimate the average event day by season, as applicable,
- To provide estimates by various segments:
  - Non-residential: aggregator, size group, industry type, local capacity area (LCA), sub-load aggregation point (Sub-LAP), and enrollment in AutoDR or other DR programs; and
  - Residential: aggregator, LCA, Sub-LAP, and CARE status, and
- To estimate the distribution of load impacts by customer segment for the average event.

We used the same methodology across all programs to ensure consistency of results. Figure 2-1 presents an overview of our ex-post analysis approach. Each program is modeled independently, modifying assumptions to account for unique program features (program design and implementation) specified within each IOU's CBP tariff. With the addition of PG&E's Residential participation in PY2020, it is important to highlight the key differences in the approach used for the two customer classes.

Figure 2-1 Ex-Post Analysis Approach



The Residential[23] program analysis used a matched control group and aggregate hourly regression models. This approach is the best practice for participant populations with less variable loads, which can leverage the higher statistical power with more customers included in each model. A matched control group also more effectively estimates the counterfactual load without a randomized control trial.

The Non-Residential program analyses continued to use a within-subject design using customer-specific hourly regression models. It remains the most flexible, consistent,

[23] PY2022 did not have active Residential program, but the approach to Residential program analysis is included for reference.

and appropriate solution for CBP's evaluation goals and population distributions. This approach has the following features:

- The individual customer impacts can be added together to estimate load impacts at any level or customer segmentation.
- Regression models can be easily used to control for variation in load due to weather conditions, geography, and time-related variables (day of the week, month, hour, etc.).
- Estimating models for each customer can also control for unobservable customer-specific effects that are more difficult to account for in aggregate regression models.
- Commercial and industrial customers often vary significantly from one another in load shape, weather response, and overall size. Customer-specific regressions allow us to capture differences between customers; therefore, they can better model changes in energy usage than an aggregated model.
- The data conforms to a repeated-measures design wherein events are dispatched on isolated days over the program year, and customers face similar TOU rates on all other days. A repeated-measures design means that all participants are subjected to the treatment simultaneously and repeatedly throughout the study. In this case, the control is defined as non-event days, i.e., an absence of treatment.

Each step in the ex-post analysis is detailed in the next subsections.

Step 1: Data Collection and Validation

Data Collection. We collected the data items (listed below) from each IOU, as available, and constructed a database that houses the data collected to perform the analysis across all three IOUs. The database served as the foundation for the data validation process.

- Aggregator monthly bid and nomination data,
- Customer characteristics and participation information,
- Customer characteristics for residential[24] non-participant pool,
- Local capacity area and local busbar identifier,
- CBP dispatched event data, including product, dates, time, and duration of each event, and trigger information,
- Other DR program event data (for dually enrolled participants),
- Post-event estimated load impacts provided to CAISO,
- Hourly interval usage data, and
- Actual hourly weather data by weather station

Data Validation. AEG's validation process included screening the interval data for zero usage intervals, missing intervals, potentially erroneous peaks and valleys, and other erroneous intervals while being mindful of the risks posed by over-omitting data. We used this automated approach to flag possible erroneous intervals. We carefully considered how event days differ from non-event days and how each customer class may require a distinct set of screening algorithms. For example, non-residential

[24] PY2022 did not have active Residential program, but the approach to Residential program analysis is included for reference.

participants can potentially have event days that contain zero intervals and outlier reads, depending on their curtailment approach. However, for residential participants, zero intervals and outlier reads more likely to indicate missing data or power outages. *With the addition of Residential participants in PY2020, AEG adjusted the omission rules for the residential participants since zero intervals in residential is more likely to indicate missing data or power outages.*

We documented the counts of intervals or customers removed from the analysis for each IOU, customer class, industry type, and customer size (as appropriate) during each step in the data validation process to determine the reasonableness of omissions from a top-down perspective. In addition, we spot-checked a small sample of dropped intervals from each segment to confirm the appropriateness of omissions in those cases and incorporated any updates to the data validation process, as needed, to ensure we used the best available data for the analyses.

Step 2: Event-like Days Selection

The selection of comparable non-event days (i.e., event-like days) is essential to several evaluation activities. Event-like days were used in the following:

- **Matched control group development.** These event-like days served as the basis for matching participants to non-participants by ensuring that matched customers consume energy similarly on days comparable to event days.
- **Out-of-sample testing.** We used event-like days to test the predictive abilities of each model as part of our model optimization process, employed regardless of the analysis design.

The event-like days include 5 to 15 days (by IOU and customer class) comparable to dispatched CBP events in weather, day of the week, and month of the year. We selected the days that collectively minimize the Euclidean distance (ED)[25] across multiple weather-based criteria. We describe the ED matching method in more detail in a subsequent subsection on Matched Control Group Development under Step 3. This approach identified sets of days as similar as possible to dispatched event days. We discuss selected event-like days in the Model Validity Appendix.

Step 3. Analysis Designs by Customer Class

This step discusses the analysis designs for both non-residential and residential customer classes.

Non-Residential Analysis Design

AEG continued using **a within-subjects, customer-specific modeling approach for all non-residential participants** across all three IOUs. Given the evaluation objectives and the potential differences across service territories, customer-specific models offer the most flexible, consistent, and appropriate solution for several reasons:

- Commercial and industrial customers often vary significantly from one another in load shape, weather response, and overall size. Customer-specific models allow us to capture differences between customers; therefore, they can better model changes in energy usage than an aggregated model. The models can easily control for variation in load due to weather conditions, geography,

[25] We used weather variables in the Euclidean distance metrics calculation to select event-like days and developed a metric specific to each IOU and customer class. We discuss each metric used in the Model Validity Appendix.

and time-related variables (day of the week, month, hour, etc.). They also control for unobservable customer-specific effects that are more difficult to account for in aggregate regression models.

- The data conforms to a repeated-measures design because the events are called only on isolated days over the program year, and the participants face similar TOU rates on all other days. A repeated-measures design means all participants are subjected to the treatment simultaneously and repeatedly throughout the study. In this case, the control is defined as an absence of the treatment or the non-event days.
- The models estimate individual customer impacts that can be summed together to estimate impacts for any reporting subgroup, including but not limited to IOU, program, product, aggregator, LCA, SubLAP, industry type, or customer type.

Develop Candidate Regression Models. It is not practical to develop models individually for thousands of participants; therefore, AEG developed a set of candidate models that will go through our model optimization process to select the best model for each participant.

In general, we think of regression models consisting of building blocks, which are, in turn, made up of one or more explanatory variables. The blocks can be generally categorized into either "baseline" variables or "impact" variables. They could consist of a single variable (e.g., cooling degree hours (CDH)) or a group of variables (e.g., days of the week). The baseline portion of the model explains variation in usage unrelated to DR events, while the impact portion explains the variation in usage related to a DR event.[26] Table 2-1 presents the explanatory variables used to create candidate models for the CBP participants.

Table 2-1 Explanatory Variables Included in Candidate Regression Models

Variable Name	Variable Description
	Baseline Variables
Weather$_{i,d}$	Weather-related variables, including average daily temperature, cooling degree hour (CDH) terms with base value of 70, and lagged versions of various weather-related variables
Month$_{i,d}$	A series of indicator variables for each month
DayOfWeek$_{i,d}$	A series of indicator variables for each day of the week
OtherEvt$_{i,d}$	Equals one on event days of other demand response programs in which the customer is enrolled
AvgLoad$_{i,d}$	The average of each day's load in the specified window[27]
	Impact Variables
P$_{i,d}$	An indicator variable for aggregator program event days
P * Month$_{i,d}$	An indicator variable for aggregator program event days interacted with the month
P*EventWindow$_{i,d}$	An indicator variable for aggregator program event days interacted with an indicator for the window the event is called

With the different variables presented above, we developed sets of candidate models that represent a wide variety of customers and their impacts. Each IOU has customized sets of candidate models, but in general, the candidate models fit into two basic categories:

[26] Any unexplained variation will end up in the error term.

[27] The specified window can be one or more of the following: 4AM – 10 AM; 10 AM – 2 PM; 10 PM – 12 AM.

- Weather-sensitive models include weather effects and calendar effects. These models are less likely to require a load adjustment since much of the day-to-day variation in load is captured by weather terms.
- Non-weather-sensitive models include load adjustment and calendar effects.

Residential Analysis Design[28]

AEG continued using **a matched control group and aggregate modeling approach for all residential participants** across all three IOUs, as applicable. This analysis design is appropriate for several reasons:

- Residential participants do not typically have highly variable loads. This approach allows for the effective use of aggregate models, which have higher statistical power with more customers included in the model.
- Using a matched control group enables us to estimate event-day impacts against counterfactual load developed from non-participant consumption on the actual event day.
- The models will estimate the load impacts for each combination of customer segments required in the CPUC LIP. The results for each combination can be easily aggregated to represent impacts for each customer segment required by the CPUC LIP.

Matched Control Group Development. To create the matched control group, we used a Stratified Euclidean Distance Matching (SEDM) approach that we have used successfully in previous statewide CBP evaluations. The SEDM approach includes the following steps.

Step 1: Define the populations (participant and non-participant) and the periods (treatment and pre-treatment). At this stage, we assessed the eligibility of participant and non-participant customers for matching based on the availability of event-like day usage data, dual participation in other DR programs, demographic information, etc. Next, we assigned the participant and eligible control group customers to strata based on categorized characteristics and will match participants to eligible control customers within their assigned strata. This stratified approach ensures that we match customers with similar characteristics, enabling us to better control some of the unobservable attributes that affect how customers use energy. Note that each stratum should have an appropriate ratio of eligible control customers to participants to ensure accurate matches. A large ratio of control customers to participants is recommended to yield better matches.

Step 2: Perform the one-to-one match based on the hourly demand data of event-like days. As discussed earlier, we use the event-like days to establish that the control and treatment customers would likely have consumed energy similarly on CBP event days in the absence of the program. We used an ED metric to determine the similarity in load shapes on event-like days between each treatment customer and eligible control customer, assessing the similarity in usage patterns using the following three demand variables: morning, midday, and late evening.

Within strata, we matched each treatment customer to every eligible control customer and calculated the ED according to the equation below.

[28] PY2022 did not have active Residential program, but the approach to Residential program analysis is included for reference.

$$ED = \sqrt{\begin{matrix}(morning_{Ti} - morning_{Ci})^2 + (midday_{Ti} - midday_{Ci})^2 \\ + (evening_{Ti} - evening_{Ci})^2\end{matrix}}$$

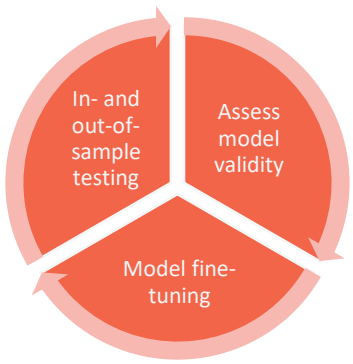
We finalized the one-to-one match of control to treatment customers by selecting the control customer who minimizes the ED. Once the matching process was complete, we thoroughly reviewed the match using the appropriate t-tests and visual inspection of the event-like day load shapes.

Develop Candidate Aggregate Models. AEG developed a set of candidate models that will go through our model optimization process, similar to the process described for non-residential participants. These candidate models were developed for a matched control design using aggregate models. In other words, we included indicator variables for participants in the baseline block and potentially interaction variables with this participant indicator variable.

The PG&E Residential program required only a handful of model subgroups, needing around five candidate models. The model optimization process served as a starting point for our model selection, leveraging automated algorithms that we developed for previous C&I DR evaluations, and played a key role in assessing model validity to justify our confidence in our impact estimates.

Step 4: Model Optimization and Selection

Figure 2-2 Optimization Process



Our optimization process incorporates the validation of the hourly regression models. The hourly regression models are designed to:

- Accurately predict the actual participant load on event days, and
- Accurately predict the reference load or participant usage on event days in the absence of an event.

After fitting each candidate model to a participant (non-residential) or segment (residential), we selected each participant/segment's best model through a three-part optimization process, consisting of the following steps: (1) In-sample and out-of-sample testing; (2) assessing model validity; and (3) model fine-tuning. Each step of the three-part cycle is described below.

In-Sample and Out-of-Sample Testing. We used in-sample tests to assess how well each model performs on the CBP event days, helping us understand how well the model predicts the actual load. We used out-of-sample tests to assess how well each candidate model predicts customers' loads on event-like days, indicating how well each model might predict the reference load.

- **To perform the in-sample test**, we fitted each candidate model to the entire data set. The fitted models were used to predict the usage on CBP event days. The models should be able to accurately predict customers' actual consumption on these days, having controlled for the impacts of the event hours. We assessed the accuracy and bias of the predictions by calculating the mean

absolute percent error (MAPE)[29] and mean percent error (MPE)[30], respectively. We refer to these metrics as the in-sample MAPE and MPE.

- **To perform the out-of-sample test**, we fitted each candidate model to the data set, excluding event-like days. The fitted models were used to predict the usage on event-like days. We similarly assessed the accuracy and bias of the event-like day predictions by calculating the MAPE and MPE, which we refer to as the out-of-sample MAPE and MPE.

These two tests resulted in several in-sample and out-of-sample metrics. To determine the best model for each segment in terms of its ability to predict both the reference load and the actual load for each participant/segment with accuracy and limited bias, we combined the two tests into a single metric as follows:

$$\boldsymbol{metric_{ic}} = (0.4 * MAPE_{in}) + (0.4 * MAPE_{out}) + \left(0.1 * abs(MPE_{in})\right) + (0.1 * abs(MPE_{out}))$$

The best model for each segment will minimize this overall metric.

Assessing Model Validity. AEG confirmed that all best models for each participant/segment collectively deliver acceptable levels of accuracy and bias by calculating the weighted average MAPE and MPE at the program level. Valid models will result in low or very close to zero MAPE and MPE. We present the metrics of the final models in the Model Validity Appendix.

Model Fine-Tuning. We also routinely used visual inspection of the results as a simple but highly effective tool. During the inspection, we looked for specific aspects of the segment-level predicted and reference load shapes to determine how well the models performed. We used observations from these inspections to make any necessary edits to the model specifications obtained from the optimization process. For example:

- We checked to ensure that the reference load is closely aligned with the actual and predicted loads during the early morning and late evening hours when there is likely little effect from the event. Large differences can indicate a problem with the reference load, either over or underestimating usage in the absence of the program.
- We closely examined the reference load for odd increases or decreases in the load that could indicate an effect not properly captured in the model.
- We also looked for bias both visually and mathematically. Identifying bias and its source often allows us to adjust the models to capture and isolate the bias-inducing effects within the model specification.

Step 5. Estimate Load Impacts and Confidence Intervals

The following example illustrates the process of estimating the impacts from the final model for a single modeling segment (i.e., one non-residential participant or one residential program). The process is the same for both residential and non-residential models, with the following differences:

- The non-residential load impacts were estimated individually for each participant from the customer-specific models.

[29] The mean absolute percent error (MAPE) is defined as: $MAPE = \frac{100\%}{n}\sum_{h=1}^{n}\left|\frac{Actual_h - Estimate_h}{Actual_h}\right|$

[30] The mean percent error (MPE) is defined as: $MPE = \frac{100\%}{n}\sum_{h=1}^{n}\frac{Actual_h - Estimate_h}{Actual_h}$

- The residential load impacts were estimated for each combination of customer segments required in the CPUC LIP.

In this simple example below, α_t, δ_t, and CDH_t, make up the baseline blocks of the model, and explain variations in kwh_{it} unrelated to demand response events. The remaining variables, $EVNT$, and the interaction term $(\alpha_t * EVNT)$ are the impact blocks and explain the variation in kwh_t related to a CBP event.[31] An hourly model like the equation below can be equivalently estimated as one model with hourly dummy variables or as 24 separate hourly models.

$$kwh_{it} = \beta_0 + \beta_1\alpha_t + \beta_2\delta_t + \beta_3 CDH_t + \beta_4 EVNT + \beta_5(\alpha_t * EVNT) + \varepsilon_{it}$$

Where:

kwh_{it} is the consumption of customer i in hour t.

β_0 is the intercept.

β_n is the coefficient associated with each explanatory variable.

α_t is a vector of baseline explanatory variables (e.g., average load, baseline interactions, etc.).

δ_t is a vector of calendar variables (i.e., month, year, and day of the week).

CDH_t represents the cooling degree hours for hour t.

$EVNT$ is a dummy variable indicating that hour t was on a CBP event day.

$(\alpha_t * EVNT)$ is an interaction between the event indicator and baseline explanatory variables.

ε_{it} is the error for customer i in time t.

This type of time-series data is likely to have both autocorrelation and heteroskedasticity. To address autocorrelation, we used two techniques: (1) estimated 24 separate models for each hour to remove autocorrelation from hour to hour, and (2) incorporated seasonal indicators to minimize autocorrelation. To address heteroskedasticity, we used the Huber-White robust error correction.

Using the model above as an example, we estimated the load impacts as follows:

- First, we obtained the actual and predicted load for each segment on each hour and day based on the specification defined in the model equation.
- Next, we used the estimated coefficients and the baseline portion of the model to predict what this segment would have used on each day and hour if there had been no events. We call this prediction the reference load.
- We calculated the difference between the reference load (the estimate based on the baseline blocks) and the predicted load (the estimate based on the baseline + impact blocks) on each event day. This difference represents our estimated load impact for each segment.

To avoid confusion between the observed load and the predicted load, we re-estimated the reference load as the sum of the observed load and the estimated load impact.

Because the impacts are statistical estimates, establishing a range or confidence interval around the estimates is essential, resulting in the uncertainty-adjusted load impacts required by the CPUC LIP.

[31] Any unexplained variation will end up in the error term.

We used a statistical package to output the standard errors of the point estimates. The standard errors can then be used to calculate a confidence interval at various levels (e.g., 50%, 70%, 90%, etc.) for each segment.

Step 6. Aggregate Load Impacts to Reporting Subgroups

For non-residential participants, we estimated the load impacts individually for each participant, which was easily aggregated to represent impacts for each of the required customer segments for each of the three IOUs. In some cases, we applied average per-customer impacts as a proxy for the impacts realized by one or more customers on a given event day if part of the data was invalid and, therefore, omitted during the data validation process. In these cases, we determined the aggregate impact for a particular subgroup based on the per-customer estimate of the customers with valid data within that subgroup and the total dispatched accounts associated with that grouping for the given event. This process allowed us to avoid under-reporting the impacts due to missing or invalid data.

For residential[32] **participants,** we estimated the load impacts for each combination of customer segments required in the CPUC LIP. This resulted in a per-customer estimate for each combination of customer segments, which was easily aggregated to each customer segment by multiplying by the number of participants within each combination.

To estimate statistical certainty for each customer segment, we can assume that the estimates are independent across participants, and consequently, estimates are independent across modeling segments. Thus, the variance of the sum is the sum of the variances. We can follow this approach to obtain the confidence intervals for each customer segment and each IOU service territory.

Calculating Impacts for an Average Event Day

We defined the average event day consistently across the three IOUs. At the program and product level, we calculate the average event day as the average of all events dispatched regardless of customer count or Sub-LAP count for each program and product. If multiple event windows were dispatched on the same day, the multiple event windows are combined to give each event day equal weight. The average event day is calculated using aggregate-level results. The corresponding average customer count is calculated as a simple average of the customer counts of each dispatched event day.

For program-level results (e.g., PG&E Non-residential DA is a combination of Elect DA and Prescribed DA), we summed the average event day aggregate-level results and dispatched counts. We calculate the corresponding per-participant impacts from the summed values.

As in previous years, different sets of service accounts were dispatched for each event; therefore, the average is made up of different customer groups across different days. These differences in customer groups can prove problematic when attempting to sum average impacts and customer counts across the multiple combinations of segments presented in this analysis. The approach we used to determine the average involved taking the average of each segment's aggregate impact. Another option would be to create the averages first at the lowest level of disaggregation and then sum them to the desired aggregation level. Though both approaches are equally valid, they often differ slightly. Therefore,

[32] PY2022 did not have active Residential program, but the approach to Residential program analysis is included for reference.

when viewing the average event day impact results in Chapter 4, one may notice that the sum of the subgroup level impacts does not always equal the program level impacts.

Reporting Metrics for Program Performance

We developed the following reporting metrics to evaluate each CBP program's overall season performance. The reporting metrics include the following:

- **Nomination** – represents the monthly program enrollment and available capacity for dispatch. The overall program nomination is the average monthly nomination by season.
- **Dispatched** – represents the resources called to a market-triggered event. We show this metric as follows:
  - **Overall dispatched capacity** – the average of the overall event day dispatched capacity regardless of event hours; reported as a monthly average or overall season average,
  - **Reporting hour dispatched capacity –** the average of the event day dispatched capacity for the reporting hour[33]; reported as a monthly average or overall season average,
- **Ex-post average event day** – represents the average ex-post load impacts of all events dispatched regardless of event hours; reported as a monthly average or overall season average,
- **Delivery performance** – a percentage metric of the ex-post average event day load impacts relative to the dispatched capacity. We express the delivery performance as follows:
  - **Overall delivery performance** – measured relative to overall dispatched capacity:

$$\%Delivered = ExPost/Dispatched_{overall}$$

  - **Adjusted delivery performance** – measured relative to the reporting hour dispatched capacity. We calculate an adjusted metric to measure performance because ur definition of the average event day includes events that did not dispatch capacity during the reporting hour.

$$Adj\ \%Delivered = ExPost/Dispatched_{HE19\ or\ HE20}$$

Estimating Incremental Impacts for Technology-Enabled Participants

AEG did not perform this analysis this year. In previous program years, only SDG&E's AutoDR and TA/TI participants have shown statistically significant incremental impacts. In PY2021, SCE and SDG&E did not have CBP participants also enrolled in AutoDR or TA/TI.

[33] HE20 for PG&E and SCE; HE19 for SDG&E.

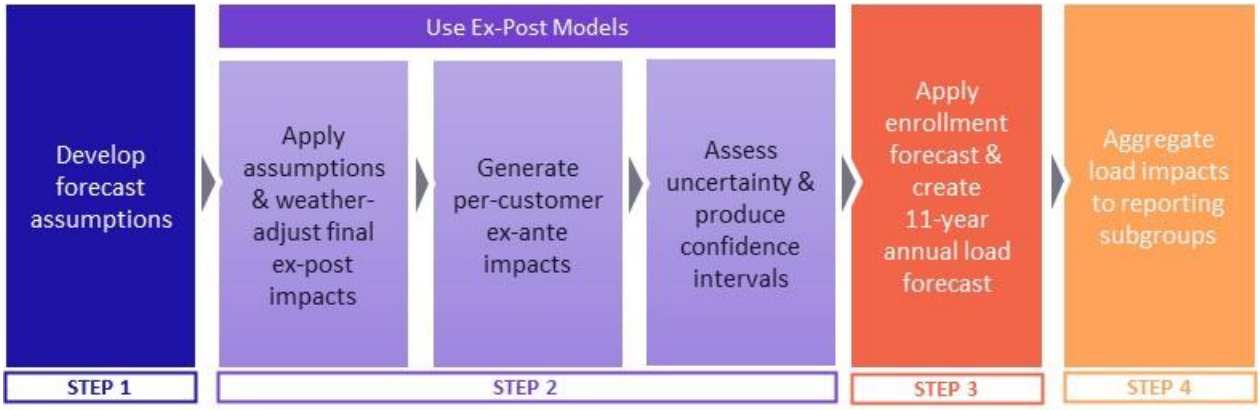
Ex-Ante Load Impact Analysis

We designed the PY2021 ex-ante LI analysis to meet the objectives listed below. All objectives are provided at the program level.

- To develop hourly load impact estimates for the average customer and all customers in aggregate for the resource adequacy (RA) window (4 PM to 9 PM) [34],
- To provide estimates for each year over an 11-year[35] time horizon based on each IOU's and CAISO's 1-in-2 and 1-in-10 weather conditions for a typical event day and each monthly system peak day,
- To provide estimates for both program-specific and portfolio-adjusted scenarios, and
- To provide estimates by various segments: size group, LCA, Sub-LAP, and busbar.

We used the same methodology across all programs to ensure consistency of results. Figure 2-3 presents an overview of our ex-ante analysis approach.

Figure 2-3 Ex-Ante Analysis Approach



Step 1. Develop Forecast Assumptions

We collected the data items (listed below) from each IOU for the ex-ante LI analysis:

- IOU and CAISO 1-in-2 and 1-in-10 hourly weather scenarios for monthly peak day and typical event day, and
- Eleven-year enrollment forecast data for each program and reporting subgroup.

Through continued discussions with each IOU regarding each program's proposed and approved program changes, we developed forecast assumptions specific to each IOU. We discuss program-specific assumptions in each IOU's Ex-Ante Analysis subsection, but they generally fall under the following:

- Updated assumptions on the shape of the impacts across the 5-hour RA window based on historical events called for longer durations for each IOU and program,
- Ex-post analysis findings on delivered capacity,

[34] For March and April, the RA window is 5 PM to 9 PM.

[35] We include a PY2022 back cast as part of the ex-ante impact analysis.

- Program changes such as product offerings, event durations, dispatch windows, resource requirements, event triggers, event notification procedures, etc., and
- Aggregator feedback to IOU program managers on forecasted participant recruitment and deliveries.

Impact Degradation Across the RA Window. We developed assumptions to simulate the 5-hour RA window based on historical events for each IOU and program. The assumptions represent how, on average, customers can maintain impacts throughout events called for longer durations. To develop these assumptions, we used the following approach:

1. Calculated hourly impacts as a percent of the estimated reference load,
2. Calculated the average hourly percent impacts by product, program, and program year,
3. Compared the average hourly percent impacts and discussed the findings with each IOU to determine the appropriate set of assumptions for each product and program. We discuss each program/product-specific assumption in Section 5.
4. We express the shape as the percent of the maximum impact in each subsequent event hour. In Table 2-2 below, we present an example of the impact degradation shape for SCE's Non-residential DA and DO programs developed in PY2020.

Table 2-2 Example: SCE Ex-Ante Impact Degradation Shape by Product

Program	Season	Percent of Maximum Impact				
		HE17	HE18	HE19	HE20	HE21
Non-res DA	Non-Summer	86%	100%	72%	44%	16%
	Summer	100%	79%	61%	58%	48%
Non-res DO	Non-Summer	100%	90%	34%	75%	19%
	Summer	100%	71%	57%	41%	50%

COVID-19 Adjustments. AEG continued to be mindful of the current circumstances with the COVID-19 global pandemic beginning in March 2020 and discussed with each IOU if any additional adjustments related to the economic effects of the COVID-19 pandemic are necessary for each program year's ex-ante forecast. In PY2020, we did not identify conclusive findings to justify assumptions or adjustments to reflect COVID-19 conditions within the CBP ex-ante forecast. For PY2021 and PY2022, we maintained similar assumptions and did not apply any adjustments to reflect COVID-19 conditions.

Step 2. Use Ex-Post Regression Models

We used the ex-post hourly regression models to apply developed forecast assumptions and predict weather-adjusted impacts for each weather scenario. This step produced a set of impacts under each of the different weather scenarios required by the CPUC LIP, typical event day, and monthly peak for both IOU and CAISO 1-in-2 and 1-in-10 weather years. To do this, we carried out the following steps:

- **Apply Assumptions and Weather-Adjust Impacts.** We assembled an input dataset that includes the appropriate forecast assumptions and required weather scenarios for each non-residential

participant with a customer-specific model and each combination of residential customer segments required in the CPUC LIP.

- **Generate Per-Customer Ex-Ante Load Impacts.** Using the final ex-post hourly regression models, we predicted two scenarios of an average customer load for each participant and subgroup: (1) Reference Load – assuming a non-event day; and (2) Predicted Load – assuming a CBP event day. We then calculated the ex-ante load impact for each participant and segment by subtracting the weather-adjusted predicted load from the weather-adjusted reference load. We applied the impact degradation shape to the ex-ante load impact to develop a load impact estimate for all hours of the RA window (HE18 – HE22 for March and April, HE17 – HE21 otherwise).[36]
- **Assess Uncertainty and Produce Confidence Intervals.** Similar to the ex-post analysis, it is vital to establish a confidence interval around the estimates resulting in the uncertainty-adjusted load impacts required by the CPUC LIP. We used a statistical package to output the standard errors of the point estimates. The standard errors can then be used to calculate a confidence interval at various levels (e.g., 50%, 70%, 90%, etc.) for each subgroup and participant.

Step 3. Create 11-Year Annual Forecast

Non-residential participant ex-ante load impacts can be grouped together to produce per-customer average impacts for each combination of non-residential customer segments required in the CPUC LIP. Both residential and non-residential per-customer estimates were multiplied to program enrollment counts to create an annual forecast of load impacts over the next 11 years. We included a "back-cast," which consists of weather-adjusted ex-post estimates of the current program year. Each IOU provided an 11-year enrollment forecast, while the "back-cast" used actual program year enrollment counts.

Step 4. Aggregate Load Impacts to Reporting Subgroups

Once ex-ante load impact forecasts have been predicted for each combination of customer segments for each of the desired weather scenarios, it becomes a relatively simple exercise to aggregate the load impacts and generate per-customer average impacts for each of the CPUC LIP required customer segments.

To estimate statistical uncertainty for each customer segment, we can assume that the estimates are independent across participants, and consequently, estimates are independent across customer segments. Thus, the variance of the sum is the sum of the variances. We followed this approach to obtain the confidence intervals for each customer segments and each IOU service territory.

AEG recognizes that there is also be an error in the enrollment forecast. The uncertainty associated with the enrollment forecast was not provided to AEG and is not incorporated into the ex-ante load impact estimates.

[36] IOU-specific adjustments to the assumptions will be discussed in Section 5, alongside the ex-ante results.

3

STATEWIDE RESULTS & KEY FINDINGS

This section presents PY2022 CBP statewide ex-post load impact estimates, ex-ante load impact estimates, and key findings.

Statewide Ex-Post Analysis

In 2022, PG&E offered only Day Ahead (DA) programs. SCE and SDG&E offered both DA and Day Of (DO) programs. All three IOUs only had Non-residential active programs.[37]

Table 3-1 presents the PY2022 average summer event day impacts by IOU and program at the aggregate and per-customer levels. We show the results for the most dispatched hour (reporting hour) for each program, which is HE19 (6 PM – 7 PM) for PG&E and SDG&E and HE16 (3 PM – 4 PM) for SCE. Note that we calculate the average event day using all events regardless of dispatched count and event timing (see Average Event Calculation).

Table 3-1 Statewide CBP Impacts Summary, Average Summer Event Day PY2022

IOU	Program	# Accts	Aggregate (MW)			Per-Customer (kW)		
			Dispatch Capacity	Load Impact	% Delivered	Ref. Load	Load Impact	% Impact
PG&E	Residential DA	-	-	-	-	-	-	-
	Non-residential DA	475	31.3	28.0	89%	150.9	58.9	39%
SCE	Non-residential DA	83	0.9	1.1	117%	78.8	12.8	16%
	Non-residential DO	98	1.7	1.9	109%	142.2	19.1	13%
SDG&E	Non-residential DA	3	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	Non-residential DO	63	2.1	1.4	65%	167.1	22.0	13%

At the program level, we observe the following:

- PG&E's average delivery performance (89%) decreased slightly compared to PY2021 (96%).
- SCE's average delivery performance improved significantly, with both programs above 100%. SCE primarily dispatched events on HE16 (3 PM – 4 PM), which may have higher available load for participant delivery.
- SDG&E's Non-Residential DO improved average delivery performance (65%) compared to PY2021 (30%). However, the Non-Residential DA performance ([redacted]%) dropped significantly compared to PY2021 (25%). SDG&E launched Elect product offerings in PY2022.

Table 3-2 summarizes each CBP program's PY2022 overall season performance using the following reporting metrics: average nomination, average overall and reporting hour dispatch, the ex-post load impacts, and the overall and adjusted delivery performance. Each metric is described in more detail in Section 2, Reporting Metrics for Program Performance.

[37] PG&E and SCE Residential programs are open, but did not receive any nominations in PY2022. SDG&E is currently running pilots for their Residential DA and DO programs.

Table 3-2 Statewide CBP Delivery Performance PY2022

Program		Nominations		Overall Dispatched		Reporting Hour Dispatched		Ex-Post Analysis		
		# Accts	Capacity (MW)	# Accts	Capacity (MW)	# Accts	Capacity (MW)	Impact (MW)	% Delivered	Adj. % Delivered
PG&E	Res DA	-	-	-	-	-	-	-	-	-
	Non-res DA	698	49	475	31.3	448	31.1	28.0	89%	90%
SCE	Non-res DA	143	1.6	83	0.9	75	0.7	1.1	117%	145%
	Non-res DO	146	2.7	98	1.7	78	1.4	1.9	109%	132%
SDGE	Non-res DA	47	1.5	3	[redacted]	3	[redacted]	[redacted]	[redacted]	[redacted]
	Non-res DO	79	2.1	63	2.1	63	2.1	1.4	65%	65%

Some key notes when reviewing Table 3-2:

- We show the average dispatched counts and capacity, which is dependent on CAISO market awards. Low counts are not indicative of low participation but rather an indication of necessity.
- Delivered dispatched capacity is the correct measure of the program's success (delivery performance or % delivered). 100% delivery performance means aggregators and customers curtailed the load obligations when asked to do so.
- The delivery performance metrics allow for an adjusted metric for dispatched capacity coincident with the reporting hour. Our definition of the average event day includes events that did not dispatch capacity during the reporting hour.

Notably, all program (except for SDG&E Non-Residential DA) performances increased after the appropriate adjustment for dispatched capacity on the reporting hour.

Statewide Ex-Ante Analysis

Table 3-3 summarizes the 11-year average Resource Adequacy (RA) window load impact forecast by IOU and program for an August peak day scenario, and Table 3-4 summarizes the corresponding 11-year enrollment forecast.

Table 3-3 Statewide CBP: 2023-2033 Load Impact Forecast, August Peak Day

IOU	Program	Aggregate Load Impacts (MW)				
		2023	2024	2025	2026	2027-2033 (Each Year)
PGE	Residential DA	0.3	0.3	0.3	0.3	0.3
	Non-residential DA	33.5	33.5	33.5	33.5	33.5
SCE	Non-residential DA	0.9	1.3	4.9	4.9	4.9
	Non-residential DO	[redacted]	-	-	-	-
SDG&E	Non-residential DA	0.5	0.5	0.5	0.5	0.5
	Non-residential DO	1.3	1.4	1.4	1.4	1.5

Table 3-4 Statewide CBP: 2023-2033 Enrollment Forecast, August Peak Day

IOU	Program	Number of Service Accounts				
		2023	2024	2025	2026	2027-2033 (Each Year)
PGE	Residential DA	1,743	1,743	1,743	1,743	1,743
	Non-residential DA	980	980	980	980	980
SCE	Non-residential DA	150	225	848	848	848
	Non-residential DO	150	0	0	0	0
SDG&E	Non-residential DA	51	52	53	54	55
	Non-residential DO	97	99	101	103	105

Each program's load impact forecast is based on IOU-specific assumptions that incorporate a combination of the following: aggregator/nomination outlook, delivery performance, ex-ante per-customer load impacts, enrollment growth, and an impact degradation rate across the RA window.

PG&E's forecast assumptions are as follows:

- **Residential DA** – PG&E assumed a constant 2 MW nomination through the 11-year forecast. Given that PY2022 did not have active residential participation, we maintained the rest of PY2021 assumptions. We maintained the 61% delivery performance, which is the minimum threshold before aggregators are charged a penalty. We also assume a maximum 4-hour event duration based on historical participation in the 1- to 4-hour product option.
- **Non-Residential DA** – PG&E increased forecasted capacity nominations to 65 MW for an August peak day. We updated the delivery performance (89%) and impact degradation rate (69% overall RA) based on PY2022 performance. We also assume a maximum 4-hour event duration based on historical participation in the 1- to 4-hour product option.

SCE's forecast assumptions are as follows:

- **Enrollment Outlook** – consistent with the submitted DR Application A22-05-004:
  - Updated according to PY2022 and PY2023 nominations,
  - In 2024 through 2033, zero enrollment in non-summer months and the DO program.
  - In 2024, assume 50% of DO participants will move to the DA program.
  - In 2025, assume some DRAM customers will move to the DA program.
- **Updated assumptions based on PY2022 performance** – we assume the per-customer load impacts on reporting hour (HE16 for summer, HE19 for non-summer) as the maximum impact during the RA window. The impact degradation was updated to 69% (DA summer), 65% (DO summer), and 71% (non-summer) overall RA window.

SDG&E's forecast assumptions are as follows:

- **Delivery Performance** – we calculated program-level delivery performance based on PY2020 through PY2022 performance to produce modest estimates, given the inconsistent delivery performance over the last three years, 33% (Non-Residential DA) and 56% (Non-Residential DO).

- **Enrollment Growth** – we updated the enrollment forecast based on PY2022 nominations and assumed a 2% growth per year from 2023-2027 due to the CBP program improvements proposed by SDG&E and no additional growth from 2027-2033.
- **Impact Degradation Rate** – we used PY2020-22 historical data to update the Impact Degradation Rate, 55% (DA 11-7 Hour), 68% (DA 1-9 Hour), 50% (DO 11-7 Hour), and 77% (DO 1-9 Hour). Note that both 11-7 Hour[38] products show zero impacts on HE20-HE21 since these products are not available for these hours.

Table 3-5 summarizes the average RA window load impact estimates for an August peak day in 2023 by IOU and program for each weather scenario.

Table 3-5 Statewide CBP: RA Window Ex-Ante Impacts, August Peak Day, 2023

IOU	Program	# of Accts	Per Customer (kW)	Aggregate Impact (MW)	Percent Impact (%)			
					Utility Peak		CAISO Peak	
					1-in-2	1-in-10	1-in-2	1-in-10
PGE	Residential DA	1,743	0.2	0.3	39.0%	30.5%	33.3%	31.5%
	Non-residential DA	980	33.5	34.2	20.6%	20.2%	20.4%	20.2%
SCE	Non-residential DA	150	5.7	0.9	7.6%	7.5%	7.5%	7.6%
	Non-residential DO	150	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
SDG&E	Non-residential DA	51	9.7	0.5	7.5%	7.3%	7.5%	7.4%
	Non-residential DO	97	13.9	1.3	12.6%	12.4%	12.6%	12.5%

Note that since CBP impacts are inherently nomination-driven, not weather-driven, we assumed constant non-residential per-customer load impacts across the weather scenarios. This assumption results in varying percent impacts across the months and weather scenarios.

The above statement does not apply to Residential RA window load impacts. We do not assume load impacts to be flat across months and weather scenarios. Instead, we assume constant HE20 percent impacts, accounting for the available load during each hour of the RA window. However, the differences between weather scenarios are minimal and cannot be distinguished at the per-customer (kw) and aggregate (MW) level.

Key Findings by IOU

This section discusses the key findings for each IOU.

PG&E Key Findings

The PY2022 LI analysis has the following key findings for PG&E's CBP:

- Non-residential DA resulted in 89% delivery performance and 90% adjusted delivery performance, which is lower than PY2021. However, the program is still relatively successful and is collectively the largest resource in the state, with an average of 48.7 MW nominations in the PY2022 season.
- HE19 (6 PM – 7 PM) is the most dispatched event hour in PY2022, with an average of 28 MW load impacts and 475 participants dispatched.

[38] Used PY2019-2021 historical data. Not updated in PY2022 due to no events dispatched for the 11-7 Hour products.

- PG&E dispatched four system-level events: September 1st, 6th, 7th, and 8th. All four events delivered over 60 MW load impacts on HE19, well above the overall 54.2 MW capacity nominations in September.
- Non-Residential DA is continuing to grow. Based on aggregator outlook, PG&E estimates approximately 65 MW capacity nominations in 2023. This is an increase to last year's forecast of 55 MW nominations.
- Residential DA did not have active participation in PY2022. PG&E also updated the Residential DA forecast to 2 MW capacity nominations in 2023. The lower target is more realistic and achievable, given Residential DA's historical performance. PG&E expects new aggregators to participate in residential CBP and anticipates increased automation for residential customers, further supporting the MW forecast's realization.

SCE Key Findings

The PY2022 LI analysis has the following key findings for SCE's CBP:

- Non-Residential DA and Non-Residential DO jointly resulted in 112% delivery performance and 137% adjusted delivery performance in the summer season, a significant increase from PY2021.
  - HE16 (3 PM – 4 PM) is the most dispatched event hour in PY2022 for the summer season, which may have higher available load for participant delivery. Both programs delivered, on average, 2.9 MW load impacts and 181 participants dispatched.
- Non-Residential DO's non-summer season remains a small collective resource but improved overall delivery performance from PY2021. Non-Residential DA did not have active non-summer participation.
  - HE19 (6 PM – 7 PM) is the most dispatched event hour in PY2022 for the non-summer season.
- SCE updated the ex-ante enrollment forecast to be consistent with the submitted DR Application A22-05-004, which includes the following assumptions:
  - Updated according to PY2022 and PY2023 nominations,
  - 2024 through 2033: zero enrollment in non-summer months and the DO program,
  - 2024: assume 50% of DO participants will move to the DA program, and
  - 2025: assume some DRAM customers will move to the DA program.
- The CPUC required SCE to submit a supplemental application on March 3rd, 2023 with a proposed Elect product design. The supplemental application is not currently incorporated in the ex-ante forecast assumptions.

SDG&E Key Findings

The PY2022 LI analysis has the following key findings for SDG&E's CBP:

- SDG&E implemented two new Elect Products: Elect DA 1-9 Hour and Elect DO 1-9 Hour, each with three price trigger options: $200/MWh, $400/MWh, $600/MWh.

  - SDG&E still offers their previously existing products as Prescribed options, with the following price triggers: $90/MWh (Prescribed DA 11-7 Hour and 1-9 Hour), $115/MWh (Prescribed DO 11-7 Hour), and $125/MWh (Prescribed DO 1-9 Hour).
  - Non-residential DA nominations were primarily split between Elect DA ($400) and Elect DA ($600) products, while Non-residential DO nominations were primarily in the Elect DO ($400) product. Prescribed product options had close to no nominations in PY2022.
- SDG&E's Non-Residential DO improved average delivery performance (65%) compared to PY2021 (30%). However, the Non-Residential DA performance (%) dropped significantly compared to PY2021 (25%).
- HE19 (6 PM – 7 PM) is the most dispatched event hour in PY2022, with a combined 1.3 MW and 66 participants dispatched on average.
- SDG&E dispatched a combined total of 6 event days in PY2022. Under the Prescribed product option, SDG&E historically dispatched around 20-30 events per program year, which has $90-$125/MWh price triggers. In PY2022, more aggregators opted for the $400/MWh and $600/MWh price triggers, reducing the resources that qualify for dispatch through the program year.
- SDG&E updated the ex-ante forecast assumptions to incorporate delivery performance based on PY2020 through PY2022 performance to produce modest estimates, given the inconsistent delivery performance over the last three years.
  - We updated the enrollment forecast based on PY2022 nominations and maintained the 2% growth per year from 2023-2027 due to the CBP program improvements proposed by SDG&E and no additional growth from 2027-2033.

Recommendations

AEG has the following recommendations for future research and evaluation related to the Capacity Bidding Programs.

- **Reevaluate the approach to reporting delivery performance.** We have two considerations for future reports:
  - **Produce an average event hour for reporting delivery performance.** Given CBP's need-based nature of dispatching events (Sub-LAP level CAISO market awards), reporting the average load impacts for a coincident hour (i.e., the most dispatched hour) produces a "watered-down" average load impact. We've attempted to reconcile this by including an adjusted delivery performance metric, but it can still be improved. We recommend producing an average event hour strictly for reporting delivery performance, which can directly be measured against the nominated capacity without needing an adjustment.
  - **Maintain the existing approach to the average event day** due to limitations of the CPUC LIP, which requires reporting a 24-hour load profile for an average event day.
  - **Consider including dispatched capacity in the Ex-Post table generators** (MS Excel-based Protocol) as available to each reporting customer segment.

4

PACIFIC GAS & ELECTRIC

This section presents Pacific Gas & Electric's (PG&E) PY2022 CBP program descriptions and expected program changes, participation, ex-post load impact estimates, ex-ante load impact estimates, and key findings.

PG&E Program Description

PG&E's CBP only offers Day Ahead notification. Aggregators nominate a monthly capacity amount for one of three options: Prescribed, Elect, and Elect+.

- **Prescribed DA** – PG&E sets the CAISO market bid price and dispatch strategy within specified operating hours (1-4 hours and 2-6 hours).
- **Elect DA** – Aggregators set their own CAISO market bid price within specified operating hours (1-4 hours, 2-6 hours, and 1-8 hours).
- **Elect+ DA** – Similar to Elect, wherein aggregators set their own CAISO market bid price but includes additional hours outside the minimum specified operating hours (1-4 hours, 2-6 hours, and 1-24 hours).

The PG&E CBP operating hours are between 1 PM to 9 PM. Events are called Monday through Friday, excluding holidays, from May through October, with a maximum of six events and 30 hours per month (or possibly more hours under Elect and Elect+ Options if the participants choose).

In PY2021, PG&E introduced a product option for resource participation on weekends.

Program Changes

The following list summarizes the program changes effective during the PY2022 season:

- PG&E implemented a $650 bid cap on Elect products.

PG&E Program Nominations

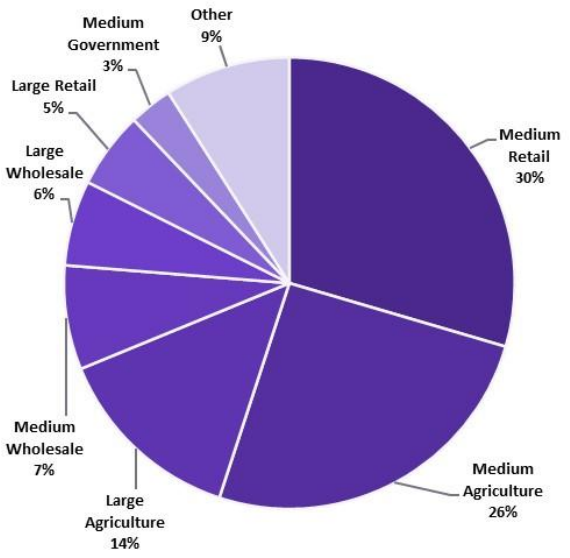
Table 4-1 presents the program-level monthly nominations for PG&E's CBP programs. On average, Non-residential DA had 48.7 MW consisting of 698 customers. Residential DA did not have active nominations in PY2022. Table 4-2 shows the size and industry distribution of Non-residential enrollment, and the accompanying graph highlights the predominant customer segments in PY2022.

Table 4-1 PG&E Monthly Nominations

Month	Residential DA		Non-Residential DA	
	Enrolled Accounts	Nominated Capacity (MW)	Enrolled Accounts	Nominated Capacity (MW)
May	-	-	521	39.4
June	-	-	640	42.3
July	-	-	743	58.5
August	-	-	749	58.1
September	-	-	813	54.2
October	-	-	720	40.0
Avg. Summer	**-**	**-**	**698**	**48.7**

Table 4-2 PG&E Non-Residential Enrollment

Industry Type	Size Group			Total
	Small	Medium	Large	
1. Agriculture, Mining & Construction	18	246	133	**397**
2. Manufacturing	-	-	18	**18**
3. Wholesale, Transport, Other Utilities	5	72	59	**136**
4. Retail Stores	16	285	53	**354**
5. Offices, Hotels, Finance, Services	-	5	10	**15**
6. Schools	-	-	-	-
7. Institutional/ Government	7	30	4	**41**
8. Other/Unknown	-	3	1	**4**
Total	**46**	**641**	**278**	**965**



PG&E Key Findings

The PY2022 LI analysis has the following key findings for PG&E's CBP:

- Non-residential DA resulted in 89% delivery performance and 90% adjusted delivery performance, which is lower than PY2021. However, the program is still relatively successful and is collectively the largest resource in the state, with an average of 48.7 MW nominations in the PY2022 season.
- HE19 (6 PM – 7 PM) is the most dispatched event hour in PY2022, with an average of 28 MW load impacts and 475 participants dispatched.

- PG&E dispatched four system-level events: September 1st, 6th, 7th, and 8th. All four events delivered over 60 MW load impacts on HE19, well above the overall 54.2 MW capacity nominations in September.
- Non-Residential DA is continuing to grow. Based on aggregator outlook, PG&E estimates approximately 65 MW capacity nominations in 2023. This is an increase to last year's forecast of 55 MW nominations.
- Residential DA did not have active participation in PY2022. PG&E also updated the Residential DA forecast to 2 MW capacity nominations in 2023. The lower target is more realistic and achievable, given Residential DA's historical performance. PG&E expects new aggregators to participate in residential CBP and anticipates increased automation for residential customers, further supporting the MW forecast's realization.

PG&E Ex-Post Analysis

Dispatched Events

We present a summary of the 2022 events for PG&E's CBP programs by product offering: Non-residential Elect DA (with and without weekends). The Non-residential Elect DA participants experienced 19 event days and 5 test events and participated in two products: Elect DA 1-4 Hour, with and without weekends.

Similar to previous years, PG&E dispatched a combination of partial and system-level events. Table 4-3 presents the total dispatched event days and hours by month, season, and program. The Elect DA participants experienced 19 event days (58 event hours) and 5 test[39] events (12 test hours) over the program year.

As in previous years, events are dispatched at various times and durations within the 1 PM to 9 PM dispatch window. Figure 4-1 shows each event type's event hour distribution, weighted by dispatched customers. The most dispatched hours in PY2022 are HE19 (event) and HE21 (test).

We calculate the average event day by including all events, excluding test events, dispatched in PY2022 regardless of the event hours and the number of sub-LAPs dispatched. We report impacts for the average event day on the most dispatched hour, HE19.

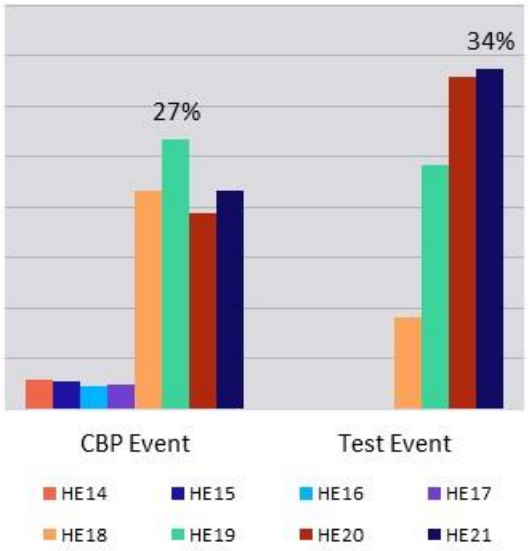
We include a detailed event summary in Table 4-21.

[39] Test events are not triggered by CAISO market awards. However, aggregators and participants experience a similar notification or "experience" as a normal CBP event. Test events are shown in red text.

Table 4-3 PG&E Event Summary

Month	CBP Event		Test Event	
	Total Event Days	Total Event Hours	Total Event Days	Total Event Hours
May	1	4	1	2
June	7	27	1	2
July	-	-	1	3
August	3	3	1	2
September	6	22	-	-
October	2	2	1	3
Total	**19**	**58**	**5**	**12**

Figure 4-1 PG&E Event Hour Distribution



Load Impact Summary

Next, we present an overall impact summary for PY2022, reporting the average event day for each product. The average event day includes all events dispatched in PY2022 and reports impacts for the most dispatched hour, HE19.

Table 4-4 shows an overall impact summary for PY2022, including:

- Dispatched counts,
- Aggregate level dispatched capacity, load impacts, and delivery performance,
- Per-customer level reference loads, load impacts, and % impacts relative to reference loads.

On average, PG&E's CBP programs delivered 28.0 MW out of dispatched 31.3 MW, which amounts to an 89% delivery performance. As mentioned earlier, Residential DA did not have active nominations in PY2022.

Table 4-4 PG&E Impacts Summary, Average Event Day PY2022

Program & Product	# Accts	Aggregate (MW)			Per-Customer (kW)		
		Dispatched Capacity	Load Impact	% Delivered	Reference Load	Load Impact	% Impact
Elect DA 1-4 Hour	132	5.4	4.7	88%	170.6	36.1	21%
Elect DA 1-4 Hour with Weekends	343	25.9	23.2	90%	143.4	67.7	47%
Total Non-Res DA	**475**	**31.3**	**28.0**	**89%**	**150.9**	**58.9**	**39%**

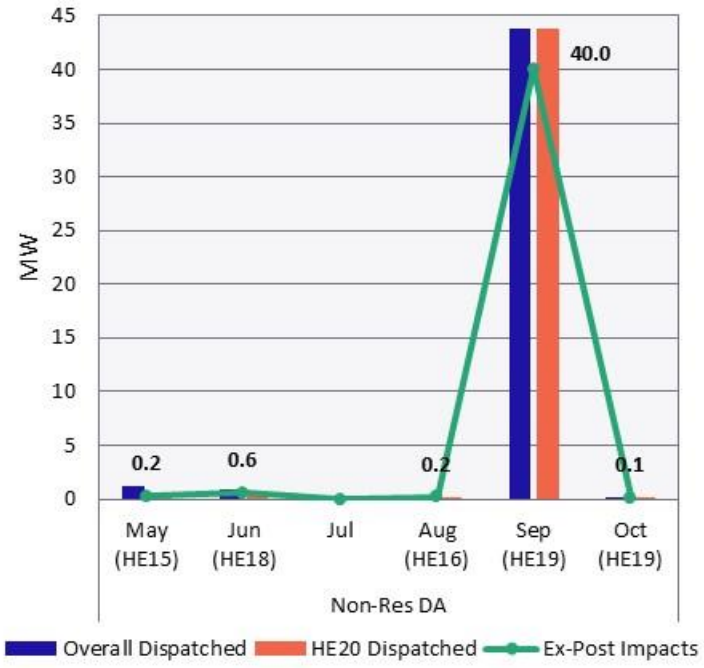
Figure 4-2 and Table 4-5 present monthly summaries for each metric (described in more detail in Section 2, Reporting Metrics for Program Performance):

- Nominations – counts and total capacity,

- Dispatched – average counts and capacity for all events dispatched,
- HE* Dispatched – average counts and capacity for all events dispatched on the most dispatched hour, and
- Ex-post load impacts – aggregate impacts, delivery performance relative to the overall dispatched capacity, and adjusted delivery performance relative to HE* dispatched capacity.

Figure 4-2 visually shows how the ex-post load impacts compare to the overall and HE* dispatched capacities. The figure also identifies the most dispatched hour for each month.

Figure 4-2 PG&E Monthly Delivery Performance Summary



For Non-residential DA, we observe the following:

- PY2022 dispatched events were primarily in September, with 43.8 MW dispatched on average.
- The rest of the months in the PY2022 season, on average, dispatched less than 1 MW. Note that the program dispatched only test events in July.
- Average event temperatures much higher in PY2022.

Table 4-5 presents the monthly averages that correspond to Figure 4-2for Non-residential DA. The overall aggregate impact for the Non-residential DA participants was 28.0 MW for PY2022, which amounts to 89% delivery performance and 90% adjusted delivery performance.

Table 4-5 PG&E Non-Residential DA Monthly Summary

Month	Nominations		Dispatched		HE* Dispatched		Ex-Post Analysis		
	# Accts	Capacity (MW)	# Accts	Capacity (MW)	# Accts	Capacity (MW)	Impact (MW)	% Delivered	Adj. % Delivered
May	521	39.4	56	1.2	24	0.2	0.2	19%	102%
June	640	42.3	77	0.9	40	0.6	0.6	61%	100%
July	743	58.5	-	-	-	-	-	-	-
August	749	58.1	26	0.2	13	0.1	0.2	107%	199%
September	813	54.2	678	43.8	678	43.8	40.0	91%	91%
October	720	40.0	11	0.1	11	0.1	0.1	108%	108%
Overall	**698**	**49**	**475**	**31.3**	**448**	**31.1**	**28.0**	**89%**	**90%**

Hourly Load Impacts

Figure 4-3 through Figure 4-4 illustrate the per-customer hourly profiles of the estimated reference load, observed load, and estimated load impacts (in kW) for PG&E's Non-residential DA products, on an average event day. The hours highlighted in gray show the hours wherein at least one group is dispatched. The vertical dotted line highlights the most dispatched hour, HE19. The data underlying the figures are available in the MS Excel-based Protocol table generators that are included as appendices to this report.

Figure 4-3 PG&E Non-Residential Elect Day Ahead: Hourly Per-Customer Impact, Average Event

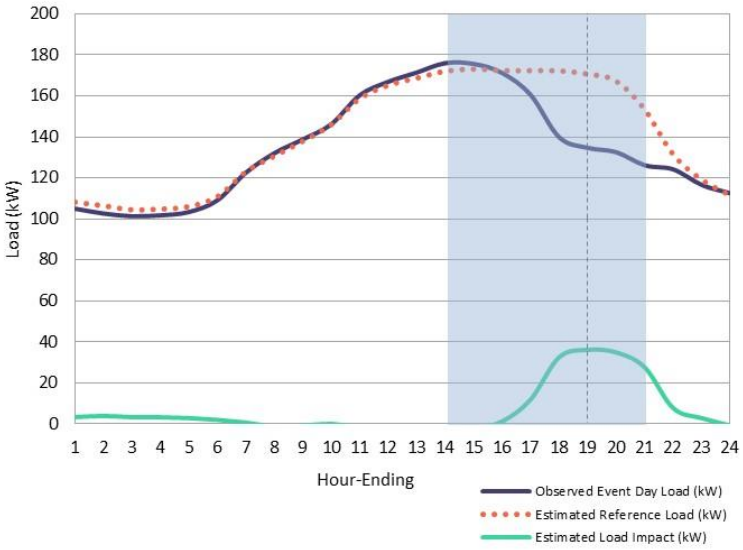
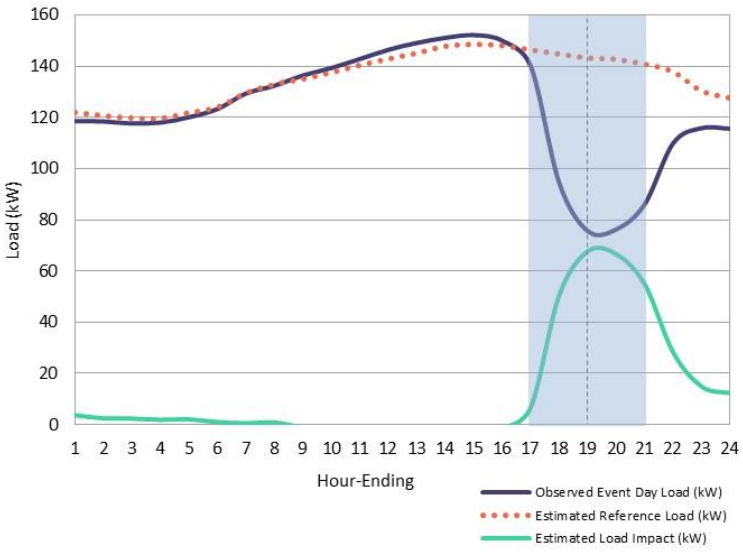


Figure 4-4 PG&E Non-Residential Elect Day Ahead with Weekends: Hourly Per-Customer Impact, Average Event



Load Impacts By Industry, LCA, and Sub-LAP

Table 4-6 through Table 4-8 present the impacts for an average event day by Industry, LCA, and Sub-LAP.[40]

Table 4-6 PG&E Non-Residential DA Impacts by Industry

Industry	# of Accts	Aggregate Impact (MW)		Per-Customer Impact (kW)		% Impact	Temp (F)
		Ref. Load	Impact	Ref. Load	Impact		
Agriculture, Mining & Construction	265	34.9	21.4	131.5	80.9	61%	101
Manufacturing	12	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	96
Wholesale, Transport, other utilities	90	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	102
Retail stores	157	16.9	0.6	107.4	4.0	4%	87
Offices, Hotels, Finance, Services	7	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	88
Institutional/Government	32	2.2	0.2	70.7	5.7	8%	93
Other or unknown	4	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	99
Total Non-Residential DA	**475**	**71.7**	**28.0**	**150.9**	**58.9**	**39%**	**96**

Table 4-7 PG&E Impacts by LCA

Local Capacity Area	# of Accts	Aggregate Impact (MW)		Per-Customer Impact (MW)		% Impact	Temp (F)
		Ref. Load	Impact	Ref. Load	Impact		
Greater Bay Area	163	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	80
Greater Fresno Area	208	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	106
Kern	44	7.1	4.8	161.6	109.6	68%	106
Northern Coast	35	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	89
Sierra	40	4.4	0.6	109.7	15.8	14%	99
Stockton	21	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	101
Other	209	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	101
Total CBP	**475**	**71.7**	**28.0**	**150.9**	**58.9**	**39%**	**96**

[40] The results are for an average event day. Note that the total for the program does not always exactly equal the total of the individual segments (industry, LCA, or Sub-LAP). This is because different groups of customers are called for each event, and in some cases, no customers in a segment are called. The average for that segment will reflect only those events where customers in that segment were called. The total program is the average across all events, regardless of which groups of customers are called for each event. Because the total program and the individual segments are averaged across different events, the total program may not exactly match the sum of the individual segments.

Table 4-8 PG&E Impacts by Sub-LAP

Sub-LAP	# of Accts	Aggregate Impact (MW)		Per-Customer Impact (MW)		% Impact	Temp (F)
		Ref. Load	Impact	Ref. Load	Impact		
PGCC	38	6.5	0.8	170.8	20.8	12%	69
PGEB	72	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	86
PGF1	209	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	106
PGFG	13	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	86
PGHB	12	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	62
PGKN	44	7.1	4.8	161.6	109.6	68%	106
PGNB	24	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	92
PGNP	54	9.3	3.0	171.5	55.5	32%	98
PGP2	22	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	84
PGSB	55	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	87
PGSF	24	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	66
PGSI	40	4.4	0.6	109.7	15.8	14%	99
PGST	21	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	101
PGZP	153	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	102
Total CBP	**475**	**71.7**	**28.0**	**150.9**	**58.9**	**39%**	**96**

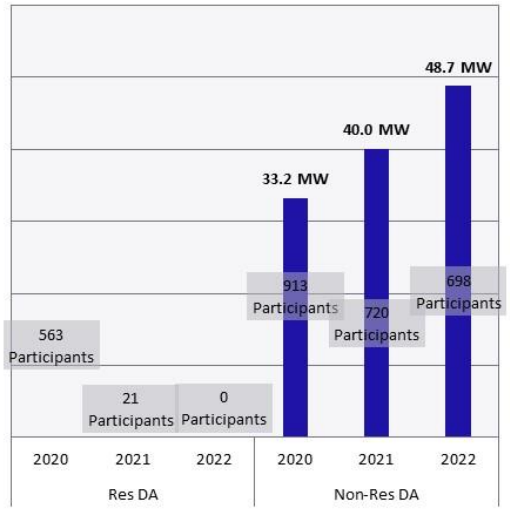
Comparison of Ex-Post Impacts

This section discusses how the PY2022 ex-post load impacts compare to previous years. These comparisons show how the program has performed over time and relative to the most recent forecast.

Figure 4-5[41] presents PG&E's average program nominations for PY2020 through PY2022. The Non-Residential DA program has consistently grown in capacity nominations, despite having fluctuations in enrollment counts. The Residential DA program, still evolving as aggregators determine the appropriate approach for residential participants, did not have active nominations in PY2022.

Table 4-9 below presents the ex-post load impacts over time. Note that these impacts are measured based on performance during dispatched events. In Non-Residential DA,

Figure 4-5 PG&E Annual Nominations



[41] PY2020 and PY2021 Residential DA capacity nominations are confidential and not shown in the figure.

PY2022 saw an overall increase in average dispatched accounts, dispatched capacity, aggregate load impacts, per-customer load impacts, and event temperatures. However, the average delivery performance decreased to 89% compared to 96% in PY2021.

Table 4-9 PG&E: Current v. Previous Ex-Post, Average Event Day

Program	Year	# Accts	Aggregate (MW)			Per-Customer (kW)			Temp (F)
			Dispatched Capacity	Load Impact	% Delivered	Reference Load	Load Impact	% Impact	
Residential DA	2020	623	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	86
	2021	21	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	70
	2022	-	-	-	-	-	-	-	-
Non-Res DA	2020	531	15.6	10.0	64%	120.5	18.9	16%	85
	2021	365	13.5	13.0	96%	81.6	35.6	44%	87
	2022	**475**	**31.3**	**28.0**	**89%**	**150.9**	**58.9**	**39%**	**96**

Table 4-10 below presents the PY2022 ex-post impacts compared to PY2021 ex-ante impacts. Note that the ex-ante impacts forecast performance for a system-level dispatch. In PY2022, PG&E dispatched several Sub-LAP-level events, only dispatching four system-level events out of the 19 events included in the average. Thus, the average summer event day is not necessarily a reasonable comparison to the ex-ante estimates provided at the system level. The Non-Residential DA program showed an increase in per-customer load impacts, indicating that the program recruited/retained higher-performing customers in PY2022.

Table 4-10 PG&E Current Ex-Post (Largest Dispatched Event) v. Prior Ex-Ante (PG&E 1-in-2, Typical Event Day, 2022)

Program	Estimate	# of Accts	Aggregate Impact (MW)		Per-Customer Impact (kW)		% Impact	Temp (F)
			Ref. Load	Impact	Ref. Load	Impact		
Residential DA	PY2021 Ex-Ante	4,357	2.7	0.9	0.6	0.2	32%	80
	Current Ex-Post	-	-	-	-	-	-	-
Non-Res DA	PY2021 Ex-Ante	1,505	214.1	37.1	142.2	24.6	17%	85
	Current Ex-Post	**475**	**71.7**	**28.0**	**150.9**	**58.9**	**39%**	**96**

PG&E Ex-Ante Analysis

Enrollment and Load Impact Summary

PG&E forecasts growth in 2023 relative to 2022 and maintains a constant forecast through the remainder of the forecast horizon. This assumption is applied to both Residential and Non-residential DA programs. Figure 4-6 shows PG&E's CBP DA enrollment and load impact forecast for an August peak day under the PG&E 1-in-2 weather scenario.

Figure 4-6 PG&E CBP Enrollment and Load Impact Forecast (PG&E 1-in-2, August Peak Day)

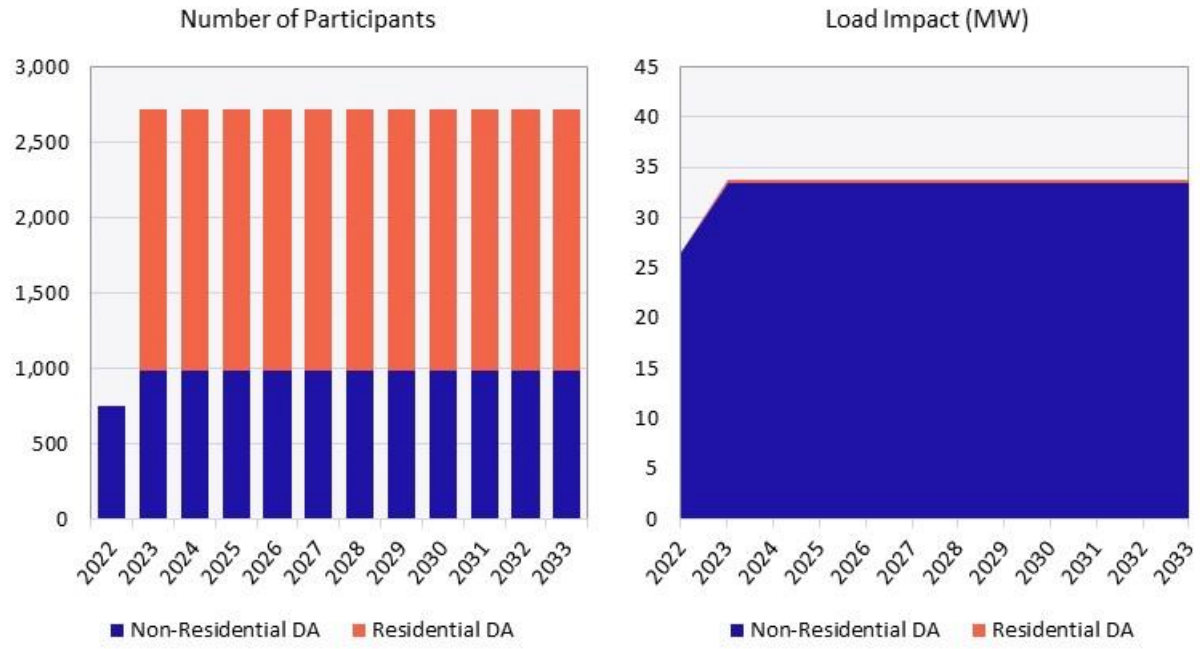


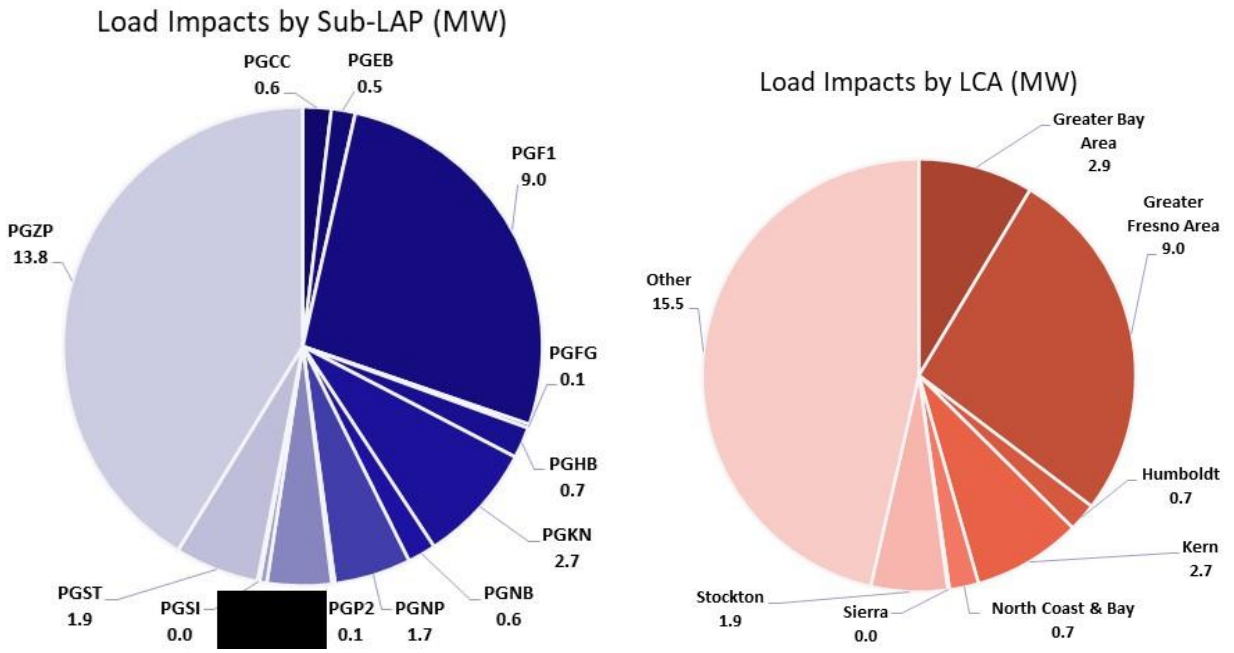
Table 4-11 summarizes the average RA window load impact forecasts for PG&E's CBP DA on an August peak day in 2023. The table includes the per-customer, aggregate, and corresponding percent impacts under the utility and CAISO 1-in-2 and 1-in-10 weather scenarios.

Table 4-11 PG&E: RA Window Ex-Ante Impacts for an August Peak Day, 2023

Program	# of Accts	Per Customer Impact (kW)	Aggregate Impact (MW)	Percent Impact (%)			
				Utility Peak		CAISO Peak	
				1-in-2	1-in-10	1-in-2	1-in-10
Residential DA	1,743	0.2	0.3	39.0%	30.5%	33.3%	31.5%
Non-Residential DA	980	33.5	34.2	20.6%	20.2%	20.4%	20.2%

Figure 4-7 illustrates the average RA window load impact distribution by LCA and Sub-LAP for Non-residential CBP DA on an August peak day in 2023. The results shown are for 1-in-2 weather conditions for the utility peak.

Figure 4-7 PG&E: RA Window Load Impacts by LCA and Sub-LAP (PG&E 1-in-2, August Peak Day, 2023)



Forecast Assumptions

This section discusses the assumptions used to develop the Residential and Non-residential DA forecasts.

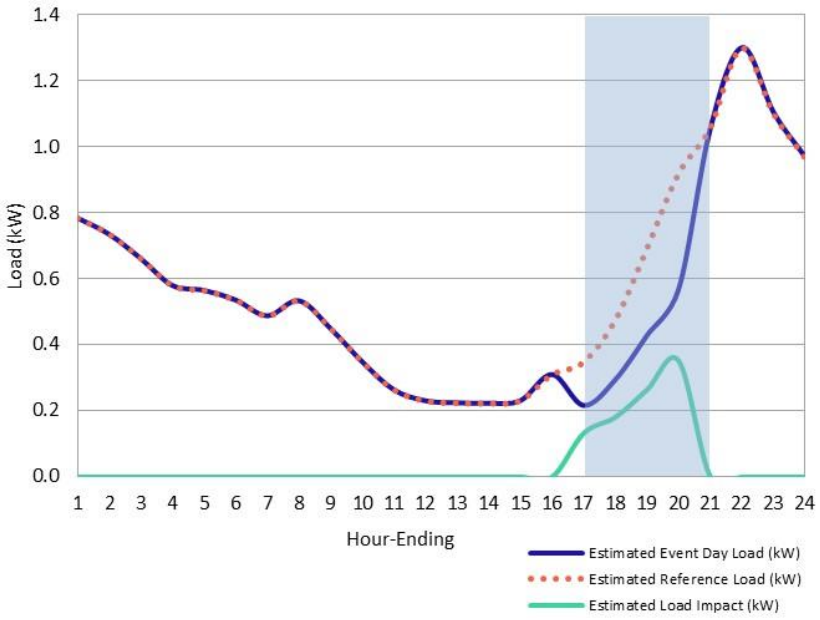
Residential Day Ahead Forecast Assumptions. The residential forecast uses a combination of the following:

- **Capacity nomination forecast (MW) based on aggregator outlook** – PG&E assumed a monthly 2 MW nomination through the 2023-2033 forecast.
- **Delivery performance** – PY2022 did not have active residential participation. We maintained PY2021's assumption of the 61% minimum delivery performance, which is the minimum threshold before aggregators are charged a penalty.
- **Percent load impacts from HE20** – PG&E assumes that Residential DA participants will remain predominantly solar customers, having less available load to curtail during earlier hours of the RA window. As a result, we applied the percent impacts from HE20 (reporting hour and most dispatched event hour) to all hours of the RA window.
- **No Impact Degradation Rate** – the Residential DA program does not have enough historical performance data to develop this assumption.
- **Four-hour RA window response** – historical participation shows a preference for products with 1- to 4-hour event durations. As a result, we assume that the Residential DA program can respond for a maximum of four hours and assume zero impacts during the fifth hour of the RA window (HE21).

These assumptions result in a flat 0.3 MW forecast for an August peak day from 2023-2033. The lower target is more realistic and achievable. Residential DA has historically produced low deliveries, resulting from inexperience in the operation of the residential CBP product and a low rate of automation. PG&E expects new aggregators to participate in residential CBP and anticipates increased automation for residential customers, further supporting the MW forecast's realization.

Figure 4-8 shows the PG&E's Residential DA per-customer estimated reference load, estimated event day load, and resulting load impact estimates for an August peak day in 2023 for the PG&E 1-in-2 weather condition. The hours highlighted in the blue show the RA window, 4 PM to 9 PM.

Figure 4-8 PG&E Residential Day Ahead: Hourly Per-Customer Load Impacts (PG&E 1-in-2, August Peak Day, 2023)



Non-Residential Day Ahead Forecast Assumptions. The non-residential forecast uses a combination of the following:

- **Capacity nomination forecast (MW) based on aggregator outlook** – PG&E forecasts growth in Non-residential DA nominations, forecasting approximately 65 MW nominations for an August peak day. This forecast shows a increase from PY2021's 55 MW average summer nomination.
- **Delivery performance** – PG&E assumes 89% delivery performance based on PY2022 performance and uses this assumption to develop the enrollment forecast.
- **Per-customer load impacts from HE19** – we assume the per-customer load impacts on HE19 (reporting hour and most dispatched event hour) as the maximum impact during the RA window.
- **Impact Degradation Rate** – we developed assumptions to represent how customers can maintain impacts throughout events called for longer durations, similar to the 5-hour RA window. The approach used to develop these assumptions is discussed in Section 3 Impact Degradation Across the RA Window. For PG&E, we used PY2022 data to update the Impact Degradation Rate. Table

4-12 shows the shape of the RA window impacts as a percent of the maximum impact for non-residential DA.

- **Four-hour RA window response** – historical participation shows a preference for products with 1- to 4-hour event durations. As a result, we assume that the Non-residential DA program can respond for a maximum of four hours and assume zero impacts during the fifth hour of the RA window (HE21).

Table 4-12 PG&E CBP: RA Window Shape of Impacts

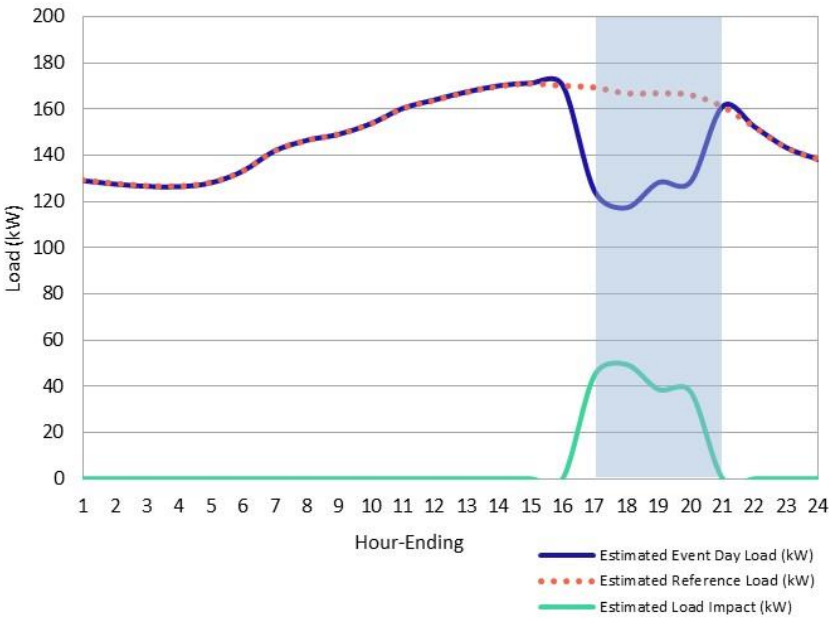
Program	Percent of Maximum Impact					
	HE17	HE18	HE19	HE20	HE21	Overall RA
Non-Res DA	91%	100%	78%	76%	0%	69%

These assumptions result in a flat 33.5 MW load impact forecast for an August peak day from 2023-2033, creating a more accurate and realistic forecast that better integrates aggregator performance. This forecast is lower than PY2021's 37.1 MW forecast for a 2023 August peak day.

PG&E expects the program to produce more reliable MW nominations due to key program changes implemented in PY2022, especially the $650/MWh bid cap.

Figure 4-9 shows the PG&E's Non-residential DA per-customer estimated reference load, estimated event day load, and resulting load impact estimates for an August peak day in 2023 for the PG&E 1-in-2 weather condition. The hours highlighted in the blue show the RA window, 4 PM to 9 PM.

Figure 4-9 PG&E Non-Residential Day Ahead: Hourly Per-Customer Load (PG&E 1-in-2, August Peak Day, 2023)



Comparison of Ex-Ante Impacts

This section discusses how the PY2022 ex-ante load impacts compare to:

- PY2022 (current) ex-post load impacts – demonstrates the effect of adjusting the impacts and reference loads to reflect the various weather scenarios, and
- PY2021 (previous) ex-ante load impact – demonstrates the updates to the load impact forecast using current program performance.

Table 4-13 compares **the current ex-post estimates with the current ex-ante estimates**. The current ex-post estimates show average load impacts for PY2022 dispatched events, while the current ex-ante estimates show how the program would have performed in a 1-in-2 weather year for a system-level event. Note that the ex-ante estimates in this comparison are for a 2022 Typical event day on the maximum impact hour (HE18 for non-residential), which is most comparable to the ex-post average event day reporting hour HE19.

For Non-residential DA, this comparison indicates that PY2022 participants had the potential to deliver over 38 MW if the market triggered a system-level event.

Table 4-13 PG&E: Current Ex-Ante (PG&E 1-in-2, 2022 Typical Event Day, Maximum Impact) v. Current Ex-Post (Average Event Day, HE19)

Program	Estimate	# of Accts	Aggregate Impact (MW)		Per-Customer Impact (kW)		% Impact	Temp (F)
			Ref. Load	Impact	Ref. Load	Impact		
Residential DA	**Current Ex-Ante**	-	-	-	-	-	-	-
	Current Ex-Post	-	-	-	-	-	-	-
Non-Res DA	**Current Ex-Ante**	**746**	**137.2**	**38.4**	**184.0**	**51.5**	**28%**	**90**
	Current Ex-Post	475	71.7	28.0	150.9	58.9	39%	96

Table 4-14 compares **the previous ex-ante forecast to the current ex-ante forecast, both for the year 2022**. This comparison demonstrates how the program forecast was updated since last year. These changes are the following:

- The Residential forecast was updated to assume lower enrollment and capacity nominations.
- The Non-residential enrollment forecast is updated to reflect higher per-customer load impacts but lower customer enrollment, resulting in lower aggregate load impacts.

Table 4-14 PG&E: Current v. Prior Ex-Ante (PG&E 1-in-2, August Peak Day, 2022), RA Window

Program	Estimate	# of Accts	Aggregate Impact (MW)		Per-Customer Impact (kW)		% Impact	Temp (F)
			Ref. Load	Impact	Ref. Load	Impact		
Res DA	**PY2022 Forecast**	**1,743**	**1.2**	**0.3**	**0.7**	**0.2**	**27%**	**84**
	PY2021 Forecast	6,972	33.8	9.0	4.9	1.3	27%	84
Non-Res DA	**PY2022 Forecast**	**980**	**162.9**	**33.5**	**166.2**	**34.2**	**21%**	**84**
	PY2021 Forecast	1,505	214.5	37.1	142.5	24.6	17%	85

PG&E Impacts by Event Day

Table 4-15 and Table 4-16 present the average event hour impacts for the Non-residential DA programs. PG&E also dispatched a number of test[42] events, and those results are presented in Table 4-17 and Table 4-18. Each table includes:

- Dispatched counts,
- Aggregate level dispatched capacity, load impacts, and delivery performance,
- Per-customer level reference loads, load impacts, and % impacts relative to reference loads, and
- Average event window temperature.

Table 4-15 PG&E Non-Residential Elect Day Ahead: Impacts by Event

Event Day	Event Win-dow	# Accts	Aggregate (MW)			Per-Customer (kW)			Temp (F)
			Dispatched Capacity	Load Impact	% Delivered	Reference Load	Load Impact	% Impact	
Avg. Event	**19**	**132**	**5.4**	**4.7**	**88%**	**170.6**	**36.1**	**21%**	**84**
May 25, 2022	15 - 16	24	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	89
	20 - 21	32	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	74
Jun 8, 2022	15 - 15	38	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	68
	20 - 21	8	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	91
Jun 9, 2022	20 - 21	8	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	90
Jun 10, 2022	14 - 17	39	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	82
	18 - 21	15	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	94
	20 - 20	56	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	84
	20 - 21	8	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	99
Jun 21, 2022	16 - 16	19	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	84
	18 - 19	65	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	96
	18 - 20	42	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	98
Jun 22, 2022	15 - 15	46	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	90
	18 - 18	42	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	84
Jun 23, 2022	15 - 18	46	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	88
	18 - 18	14	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	91
	18 - 19	57	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	86
	19 - 20	19	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	80
Jun 24, 2022	16 - 17	19	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	60
Aug 1, 2022	20 - 20	19	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	78
Aug 4, 2022	16 - 16	39	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	83
Aug 16, 2022	20 - 20	19	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	95

[42] Test events are not triggered by CAISO market awards. However, aggregators and participants experience a similar notification or "experience" as a normal CBP event.

Event Day	Event Win-dow	# Accts	Aggregate (MW)			Per-Customer (kW)			Temp (F)
			Dispatched Capacity	Load Impact	% Delivered	Reference Load	Load Impact	% Impact	
Sep 1, 2022	18 - 21	11	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	101
	19 - 20	328	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	83
	19 - 21	28	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	101
Sep 2, 2022	18 - 20	11	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	98
	19 - 19	178	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	75
	19 - 20	20	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	94
Sep 6, 2022	17 - 20	18	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	74
	18 - 21	347	21.7	20.8	96%	205.1	60.1	29%	94
Sep 7, 2022	18 - 21	365	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	90
Sep 8, 2022	17 - 20	61	1.4	2.9	210%	425.9	47.9	11%	97
	18 - 21	304	20.5	18.0	88%	170.1	59.2	35%	91
Oct 6, 2022	19 - 19	11	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	90
Oct 19, 2022	19 - 19	11	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	87

Table 4-16 PG&E Non-Residential Elect Day Ahead with Weekends: Impacts by Event

Event Day	Event Win-dow	# Accts	Aggregate (MW)			Per-Customer (kW)			Temp (F)
			Dispatched Capacity	Load Impact	% Delivered	Reference Load	Load Impact	% Impact	
Avg. Event	**19**	**343**	**25.9**	**23.2**	**90%**	**143.4**	**67.7**	**47%**	**101**
Sep 1, 2022	19 - 20	426	32.3	28.9	89%	136.8	67.8	50%	95
Sep 4, 2022	19 - 19	16	0.4	<0.1	3%	119.1	0.7	1%	100
Sep 6, 2022	17 - 20	5	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	75
	18 - 21	409	31.2	27.5	88%	149.6	67.1	45%	104
	19 - 20	12	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	61
Sep 7, 2022	18 - 21	413	31.5	27.8	88%	145.1	67.4	46%	100
	19 - 20	12	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	63
Sep 8, 2022	17 - 20	11	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	97
	18 - 21	401	31.3	27.8	89%	148.4	69.3	47%	98
	19 - 20	12	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	61

Table 4-17 PG&E Non-Residential Day Ahead Test Events

Event Day	Event Win-dow	# Accts	Aggregate (MW)			Per-Customer (kW)			Temp (F)
			Dispatched Capacity	Load Impact	% Delivered	Reference Load	Load Impact	% Impact	
May 20, 2022	20 - 21	273	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	71
Jun 28, 2022	20 - 21	86	2.6	1.0	40%	87.6	12.2	14%	80

Event Day	Event Win-dow	# Accts	Aggregate (MW)			Per-Customer (kW)			Temp (F)
			Dispatched Capacity	Load Impact	% Delivered	Reference Load	Load Impact	% Impact	
Jul 22, 2022	20 - 21	109	2.1	0.9	46%	93.2	8.7	9%	70
Aug 26, 2022	19 - 20	156	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	86
Oct 20, 2022	19 - 20	12	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	86

Table 4-18 PG&E Non-Residential Day Ahead with Weekends Test Events

Event Day	Event Win-dow	# Accts	Aggregate (MW)			Per-Customer (kW)			Temp (F)
			Dispatched Capacity	Load Impact	% Delivered	Reference Load	Load Impact	% Impact	
May 20, 2022	20 - 21	235	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	77
Jun 28, 2022	20 - 21	11	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	94
Jul 22, 2022	19 - 20	7	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	73
	20 - 21	111	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	81
Aug 26, 2022	19 - 20	338	30.9	23.6	77%	119.9	70.0	58%	93
Oct 20, 2022	18 - 19	74	2.6	1.0	37%	102.9	13.1	13%	80
	19 - 20	7	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	86

Additional Event Day Impacts for TA/TI and Auto DR Participants

The Automated Demand Response (AutoDR) program provides customers incentives to invest in energy management technologies that will enable their equipment or facilities to reduce demand automatically in response to a physical signal sent from the utility. It encourages customers to expand their energy management capabilities by participating in DR programs using automated electric controls and management strategies.

In PY2022, the Elect DA product offering recruited AutoDR participants. Table 4-19 and Table 4-20 show the per-customer and aggregate ex-post impacts by event day for the AutoDR participants for the Elect DA without and with weekend options, respectively. For comparison, we include the aggregate load shed test, which is the confirmed number of MW that AutoDR customers are able to reduce during an event.

Both tables indicate test[43] events using red text and are excluded from the average event day.

Table 4-19 PG&E Non-Residential Elect Day Ahead: AutoDR Participant Impacts by Event

Event Day	Event Win-dow	# Accts	Aggregate (MW)			Per-Customer (kW)			Temp (F)
			Load Shed Test	Load Impact	% Load Shed Test	Reference Load	Load Impact	% Impact	
Avg. Event	**19**	**12**	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	**83**
May 20, 2022	20 - 21	39	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	70
May 25, 2022	15 - 16	6	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	89

[43] Test events are not triggered by CAISO market awards. However, aggregators and participants experience a similar notification or "experience" as a normal CBP event.

Event Day	Event Win-dow	# Accts	Aggregate (MW)			Per-Customer (kW)			Temp (F)
			Load Shed Test	Load Impact	% Load Shed Test	Reference Load	Load Impact	% Impact	
	20 - 21	3	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	75
Jun 8, 2022	15 - 15	4	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	68
	20 - 21	1	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	91
Jun 9, 2022	20 - 21	1	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	90
Jun 10, 2022	14 - 17	4	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	80
	18 - 21	1	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	94
	20 - 20	2	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	83
	20 - 21	1	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	99
Jun 21, 2022	16 - 16	2	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	80
	18 - 19	8	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	97
	18 - 20	2	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	97
Jun 22, 2022	15 - 15	6	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	90
	18 - 18	2	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	86
Jun 23, 2022	15 - 18	6	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	87
	18 - 19	3	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	88
	19 - 20	2	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	81
Jun 24, 2022	16 - 17	2	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	59
Jun 28, 2022	20 - 21	8	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	89
Jul 22, 2022	20 - 21	9	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	75
Aug 1, 2022	20 - 20	2	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	77
Aug 4, 2022	16 - 16	2	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	87
Aug 16, 2022	20 - 20	2	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	92
Aug 26, 2022	19 - 20	11	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	81
Sep 1, 2022	19 - 20	24	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	79
	19 - 21	4	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	101
Sep 2, 2022	19 - 19	18	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	77
	19 - 20	2	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	93
Sep 6, 2022	17 - 20	2	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	72
	18 - 21	26	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	93
Sep 7, 2022	18 - 21	28	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	88
Sep 8, 2022	17 - 20	7	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	97
	18 - 21	21	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	89

Table 4-20 PG&E Non-Residential Elect Day Ahead with Weekends: AutoDR Participant Impacts by Event

Event Day	Event Win-dow	# Accts	Aggregate (MW)			Per-Customer (kW)			Temp (F)
			Load Shed Test	Load Impact	% Load Shed Test	Reference Load	Load Impact	% Impact	
Avg. Event	**19**	**147**	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	**104**
May 20, 2022	20 - 21	174	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	77
Jun 28, 2022	20 - 21	10	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	94
Jul 22, 2022	20 - 21	7	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	83
Aug 26, 2022	19 - 20	153	9.7	12.0	124%	92.8	78.4	84%	99
Sep 1, 2022	19 - 20	183	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	100
Sep 4, 2022	19 - 19	4	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	100
Sep 6, 2022	18 - 21	183	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	107
Sep 7, 2022	18 - 21	182	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	104
Sep 8, 2022	17 - 20	5	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	97
	18 - 21	176	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	100
Oct 20, 2022	18 - 19	17	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	80
	19 - 20	2	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	86

Additional Summary of Dispatched Events

Table 4-21 below shows the number of sub-LAPs, the event hours, and the number of accounts dispatched on each event day. This table includes test events, which are indicated with red text. For reference, Table 4-1 presents the total monthly enrollment for the Non-residential DA program, which would be comparable to dispatched counts for a system-level event, i.e., all nominated customers are dispatched.

Table 4-21 PG&E Dispatched Events

Date	Day of Week	# of Sub-LAPs	Event Hours (HE)	# Accounts
				Non-Residential Elect DA
Avg. Event	**-**	**14**	**19**	**132**
May 20, 2022	Friday	13	20-21	508
May 25, 2022	Wednesday	3	15-16, 20-21	56
June 8, 2022	Wednesday	3	15-15, 20-21	46
June 9, 2022	Thursday	1	20-21	8
June 10, 2022	Friday	6	14-17, 18-21, 20-20, 20-21	118
June 21, 2022	Tuesday	4	16-16, 18-19, 18-20	126
June 22, 2022	Wednesday	2	15-15, 18-18	88
June 23, 2022	Thursday	5	15-18, 18-18, 18-19, 19-20	136
June 24, 2022	Friday	1	16-17	19
June 28, 2022	Tuesday	7	20-21	97

Date	Day of Week	# of Sub-LAPs	Event Hours (HE)	# Accounts
				Non-Residential Elect DA
July 22, 2022	Friday	13	19-20, 20-21	227
August 1, 2022	Monday	1	20-20	19
August 4, 2022	Thursday	1	16-16	39
August 16, 2022	Tuesday	1	20-20	19
August 26, 2022	Friday	12	19-20	494
September 1, 2022	Thursday	14	18-21, 19-20, 19-21	793
September 2, 2022	Friday	9	18-20, 19-19, 19-20	209
September 4, 2022	Sunday	1	19-19	16
September 6, 2022	Tuesday	14	17-20, 18-21, 19-20	791
September 7, 2022	Wednesday	14	18-21, 19-20	790
September 8, 2022	Thursday	14	17-20, 18-21, 19-20	789
October 6, 2022	Thursday	1	19-19	11
October 19, 2022	Wednesday	1	19-19	11
October 20, 2022	Thursday	7	18-19, 19-20	93

5

SOUTHERN CALIFORNIA EDISON

This section presents Southern California Edison's (SCE) PY2022 CBP program descriptions and expected program changes, participation, ex-post load impact estimates, ex-ante load impact estimates, and key findings.

SCE Program Description

SCE's two CBP programs, Non-residential DA and Non-residential DO, offer one product each:

- DA 1-6 Hour – day-ahead notifications with events from 1-6 hour durations.
- DO 1-6 Hour – day-of notifications with events from 1-6 hour durations.

Effective January 19, 2020, the CBP dispatch window was changed to 3 PM to 9 PM to better align with the RA window (4 PM to 9 PM). SCE CBP events are determined by CAISO market awards and may be called Monday through Friday, excluding holidays, year-round, with a maximum of 5 events and 30 hours per month.

Residential CBP is now open to aggregators as a full program using a 5-in-10 baseline, but SCE has not yet received nominations.

Program Changes

In 2022, SCE submitted DR Application A22-05-004. SCE expects a CPUC decision on the proposed changes by later 2023. The proposed changes to be effective in 2024 are as follows:

- Discontinue the Day Of program and products,
- Switch to a summer-only program (May through October),
- Change the CBP dispatch window to 4 PM to 9 PM, aligning with the RA window,
- Require aggregators to commit to bidding into an entire season, allowing for month-to-month adjustments on capacity nominations,
- Adjust the 15-day limit to a 75-day limit for bid entry.
- Increase the maximum number of events allowed per month from 5 to 6 event, with the same number of available hours (30 hours per month).

The CPUC required SCE to submit a supplemental application on March 3rd, 2023 with a proposed Elect product design. The supplemental application is not currently incorporated in the ex-ante forecast assumptions.

SCE Program Nominations

Table 5-1 presents the program-level monthly nominations for SCE's CBP programs. On average, Non-Residential DA had 1.6 MW (143 customers) for summer only. Non-Residential DO had 0.7 MW (15 customers) and 2.7 MW (146 customers) for non-summer and summer, respectively. Table 5-2 shows

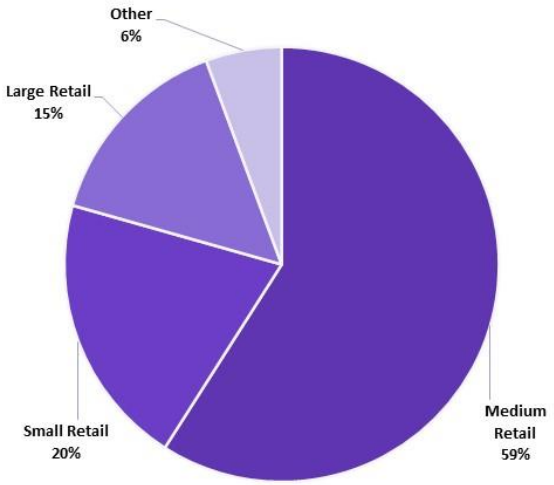
the size and industry distribution of Non-residential enrollment, and the accompanying graph highlights the predominant customer segments in PY2022.

Table 5-1 SCE Monthly Nominations

Month	Non-Residential DA		Non-Residential DO	
	Enrolled Accounts	Nominated Capacity (MW)	Enrolled Accounts	Nominated Capacity (MW)
November	-	-	15	0.7
December	-	-	15	0.7
January	-	-	[redacted]	[redacted]
February	-	-	[redacted]	[redacted]
March	-	-	15	0.7
April	-	-	15	0.7
Avg. Non-Summer	**-**	**-**	**15**	**0.7**
May	32	1.2	142	2.0
June	83	1.4	178	2.9
July	151	1.7	177	2.9
August	198	1.6	126	2.8
September	199	1.5	126	2.8
October	197	2.1	126	2.8
Avg. Summer	**143**	**1.6**	**146**	**2.7**

Table 5-2 SCE Non-Residential Enrollment

Industry Type	Size Group			Total
	Small	Medium	Large	
1. Agriculture, Mining & Construction	-	-	2	**2**
2. Manufacturing	-	-	2	**2**
3. Wholesale, Transport, Other Utilities	-	-	8	**8**
4. Retail Stores	72	209	53	**334**
5. Offices, Hotels, Finance, Services	-	1	5	**6**
6. Schools	-	-	1	**1**
7. Institutional/ Government	-	-	1	**1**
8. Other/Unknown	-	-	-	**-**
Total	**72**	**210**	**72**	**354**



SCE Key Findings

The PY2022 LI analysis has the following key findings for SCE's CBP:

- Non-Residential DA and Non-Residential DO jointly resulted in 112% delivery performance and 137% adjusted delivery performance in the summer season, a significant increase from PY2021.
    - HE16 (3 PM – 4 PM) is the most dispatched event hour in PY2022 for the summer season, which may have higher available load for participant delivery. Both programs delivered, on average, 2.9 MW load impacts and 181 participants dispatched.
- Non-Residential DO's non-summer season remains a small collective resource but improved overall delivery performance from PY2021. Non-Residential DA did not have active non-summer participation.
    - HE19 (6 PM – 7 PM) is the most dispatched event hour in PY2022 for the non-summer season.
- SCE updated the ex-ante enrollment forecast to be consistent with the submitted DR Application A22-05-004, which includes the following assumptions:
    - Updated according to PY2022 and PY2023 nominations,
    - 2024 through 2033: zero enrollment in non-summer months and the DO program,
    - 2024: assume 50% of DO participants will move to the DA program, and
    - 2025: assume some DRAM customers will move to the DA program.
- The CPUC required SCE to submit a supplemental application on March 3rd, 2023 with a proposed Elect product design. The supplemental application is not currently incorporated in the ex-ante forecast assumptions.

SCE Ex-Post Analysis

Dispatched Events

We present a summary of the PY2022 events for SCE's CBP Non-residential DA and DO programs. SCE's CBP program is offered year-round, and the PY2022 evaluation period covers November 2021 through October 2022. We report impacts under two seasons: Non-summer (November-April) and Summer (May-October).

Similar to previous years, SCE dispatched a combination of partial and system-level events. Table 5-3 presents the total dispatched event days and hours by month, season, and program. The DA participants experienced 40 event days and 178 event hours over the program year, while DO participants experienced 57 event days and 185 event hours.

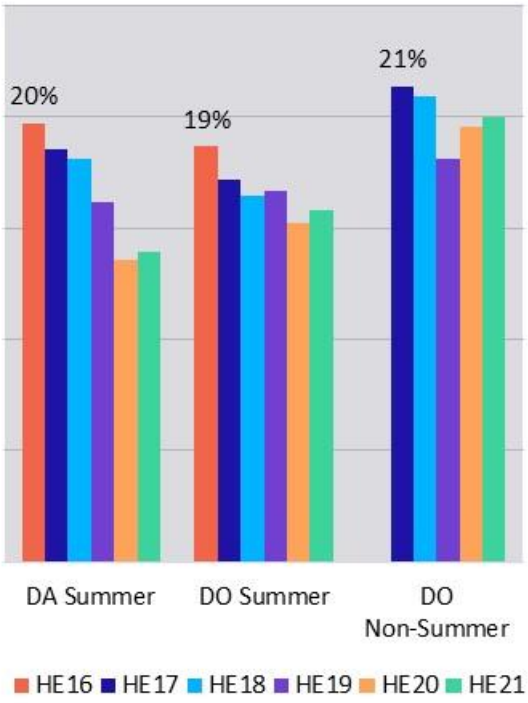
As in previous years, events are dispatched at various times and durations within the 3 PM to 9 PM dispatch window. Figure 5-1 shows each program and season's event hour distribution, weighted by dispatched customers. The most dispatched hours in PY2022 are HE19 (non-summer) and HE16 (summer).

We calculate the average event day (non-summer and summer) by including all events dispatched in PY2022 regardless of the event hours and the number of sub-LAPs dispatched and report impacts for the average event day on the most dispatched hour.

Table 5-3 SCE Event Summary[44]

Month	Non-Res DA		Non-Res DO	
	Total Event Days	Total Event Hours	Total Event Days	Total Event Hours
November	-	-	-	-
December	-	-	-	-
January	-	-	3	12
February	-	-	-	-
March	-	-	10	22
April	-	-	7	25
Non-Summer	**-**	**-**	**20**	**59**
May	10	26	8	26
June	5	13	7	38
July	8	48	6	36
August	8	38	8	38
September	5	30	5	30
October	4	23	3	17
Summer	**40**	**178**	**37**	**185**

Figure 5-1 SCE Event Hour Distribution



We include a detailed event summary in Table 5-26.

Load Impact Summary

Next, we present an overall impact summary for PY2022, reporting the average event day for each program and season. The average event day includes all events dispatched in PY2022 and reports impacts for the most dispatched hour, HE19 (non-summer) and HE16 (summer).

Table 5-4 includes the average event day:

- Dispatched counts,
- Aggregate level dispatched capacity, load impacts, and delivery performance,
- Per-customer level reference loads, load impacts, and % impacts relative to reference loads.

On average, SCE's summer season delivered 2.9 MW out of dispatched 2.6 MW, resulting in a 112% delivery performance.

[44] Maximum of 5 events/month and 30 hours/month for each resource.

Table 5-4 SCE Impacts Summary, Average Event Day PY2022

Season & Program	# Accts	Aggregate (MW)			Per-Customer (kW)		
		Dispatched Capacity	Load Impact	% Delivered	Reference Load	Load Impact	% Impact
Non-Summer DA	-	-	-	-	-	-	-
Non-Summer DO	7	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Non-Summer	**7**	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Summer DA	83	0.9	1.1	117%	78.8	12.8	16%
Summer DO	98	1.7	1.9	109%	142.2	19.1	13%
Total Summer	**181**	**2.6**	**2.9**	**112%**	**113.0**	**16.2**	**14%**

Figure 5-2 and Table 5-5 (Non-residential DA) and Figure 5-3 and Table 5-6 (Non-residential DO) present monthly summaries for each metric (described in more detail in Section 2, Reporting Metrics for Program Performance):

- Nominations – counts and total capacity,
- Dispatched – average counts and capacity for all events dispatched,
- HE* Dispatched – average counts and capacity for all events dispatched on the most dispatched hour, and
- Ex-post load impacts – aggregate impacts, delivery performance relative to the overall dispatched capacity, and adjusted delivery performance relative to HE* dispatched capacity.

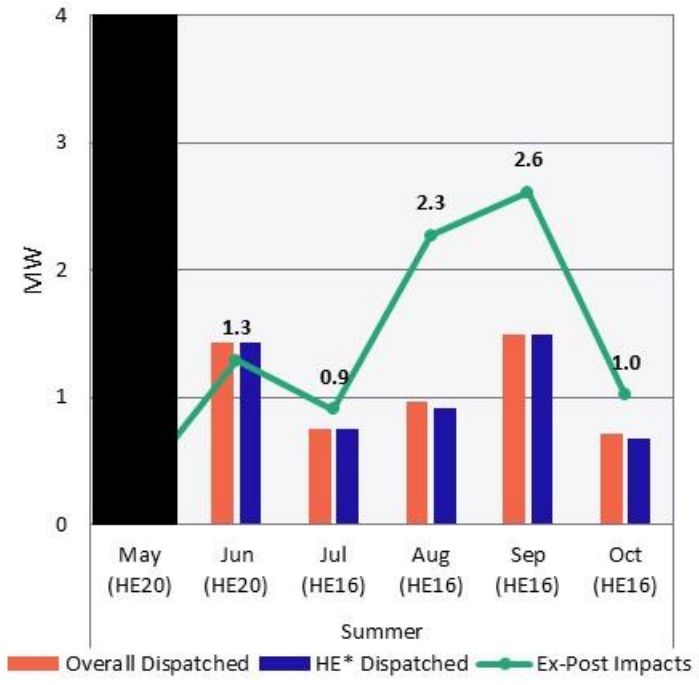
Figure 5-2 visually shows how the ex-post load impacts compare to the overall and HE* dispatched capacities. The figure also identifies the most dispatched hour for each month.

For Non-residential DA, we observe the following:

- Most events were system-level events, resulting in very minimal adjusted delivery performances.
- Delivery performance improved significantly in PY2022. Average monthly impacts for July through October exceeded their average dispatched capacity (above 100%).

Table 5-5 presents the monthly averages that correspond to Figure 5-2. The overall aggregate impact for

Figure 5-2 SCE Monthly Delivery Performance Summary, Non-residential Day Ahead



the Non-residential DA participants was 1.1 MW for the PY2022 summer season, which amounts to a 117% delivery performance and 145% adjusted delivery performance.

Table 5-5 SCE Non-Residential DA Monthly Summary

Month	Nominations		Dispatched		HE* Dispatched		Ex-Post Analysis		
	# Accts	Capacity (MW)	# Accts	Capacity (MW)	# Accts	Capacity (MW)	Impact (MW)	% Delivered	Adj. % Delivered
May	32	1.2	14	[redacted]	14	[redacted]	[redacted]	[redacted]	[redacted]
June	83	1.4	83	1.4	83	1.4	1.3	90%	90%
July	151	1.7	59	0.8	59	0.8	0.9	120%	120%
August	198	1.6	120	1.0	110	0.9	2.3	235%	248%
September	199	1.5	199	1.5	199	1.5	2.6	174%	174%
October	197	2.1	89	0.7	80	0.7	1.0	152%	152%
Avg. Summer	**143**	**1.6**	**83**	**0.9**	**75**	**0.7**	**1.1**	**117%**	**145%**

Figure 5-3 visually shows how the ex-post load impacts compare to the overall and HE* dispatched capacities. The figure also identifies the most dispatched hour for each month.

For Non-residential DO, we see similar findings:

- Most events were system-level events, resulting in very minimal adjusted delivery performances.
- Delivery performance improved significantly in PY2022. Average monthly impacts for June through October exceeded their average dispatched capacity (above 100%).

Figure 5-3 SCE Monthly Delivery Performance Summary, Non-residential Day Of

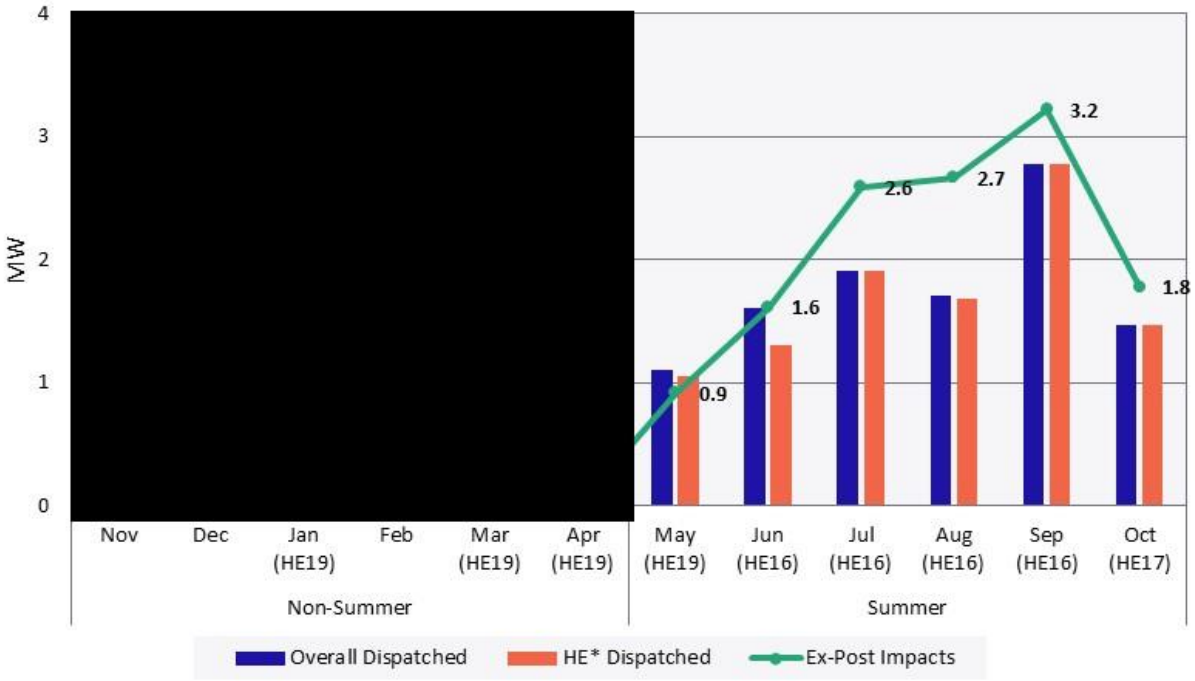


Table 5-6 presents the monthly averages that correspond to Figure 5-3 Non-residential DO. The overall aggregate impact for the Non-residential DO participants was 1.9 MW for PY2022 summer season, which amounts to 103% delivery performance and 132% adjusted delivery performance.

Table 5-6 SCE Non-Residential DO Monthly Summary

Month	Nominations		Dispatched		HE20 Dispatched		Ex-Post Analysis		
	# Accts	Capacity (MW)	# Accts	Capacity (MW)	# Accts	Capacity (MW)	Impact (MW)	% Delivered	Adj. % Delivered
November	15	0.7	-	-	-	-	-	-	-
December	15	0.7	-	-	-	-	-	-	-
January	14	[redacted]	9	[redacted]	8	[redacted]	[redacted]	[redacted]	[redacted]
February	14	[redacted]	-	-	-	-	-	-	-
March	15	0.7	6	[redacted]	6	[redacted]	[redacted]	[redacted]	[redacted]
April	15	0.7	7	[redacted]	7	[redacted]	[redacted]	[redacted]	[redacted]
Avg. Non-Summer	**15**	**0.7**	**7**	[redacted]	**7**	[redacted]	[redacted]	[redacted]	[redacted]
May	142	2.0	80	1.1	76	1.1	0.9	83%	87%
June	178	2.9	108	1.6	88	1.3	1.6	100%	124%
July	177	2.9	129	1.9	129	1.9	2.6	136%	136%
August	126	2.8	78	1.7	76	1.7	2.7	156%	158%
September	126	2.8	126	2.8	126	2.8	3.2	116%	116%
October	126	2.8	65	1.5	65	1.5	1.8	121%	121%
Avg. Summer	**146**	**2.7**	**98**	**1.7**	**78**	**1.4**	**1.9**	**109%**	**132%**

Hourly Load Impacts

Figure 5-4 through Figure 5-6 illustrate the per-customer hourly profiles of the estimated reference load, observed load, and estimated load impacts (in kW) for each SCE CBP program on an average event day by season. The hours highlighted in gray show the hours wherein at least one resource is dispatched. The vertical dotted line highlights the most dispatched hour for each average event day. The data underlying the figures are available in the MS Excel-based Protocol table generators included as appendices to this report.

Figure 5-4 SCE Day-Ahead 1-6 Hour: Hourly Per-Customer Impact, Summer Average Event

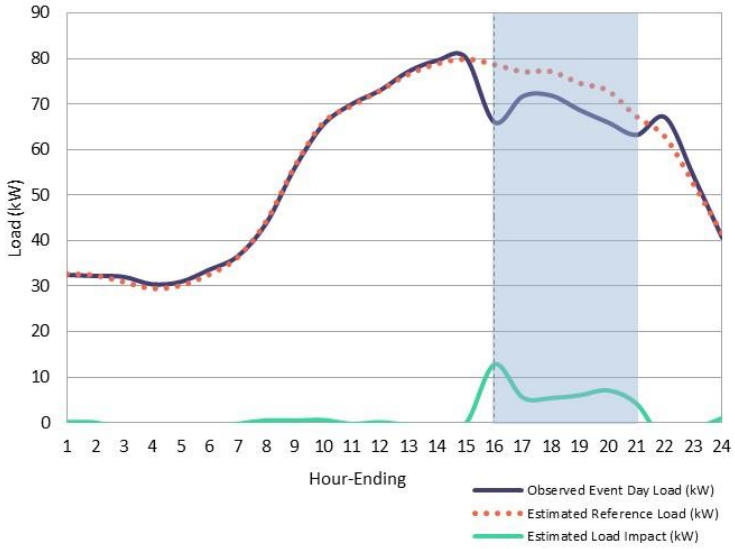
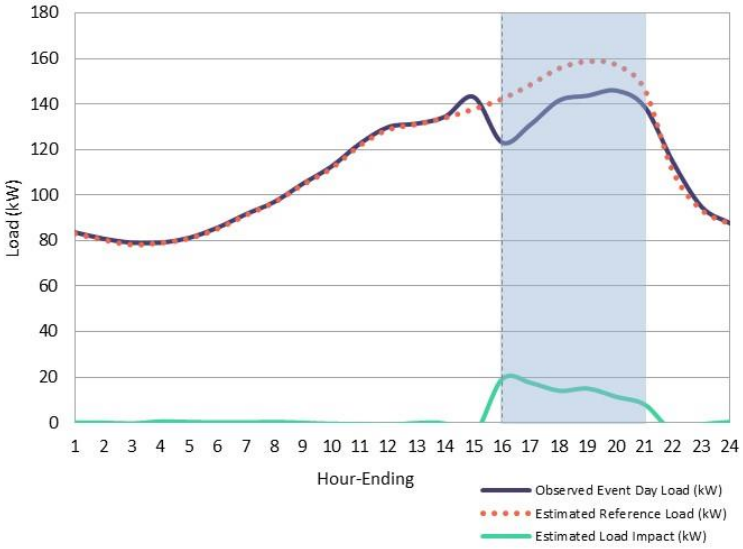


Figure 5-5 SCE Day-Of 1-6 Hour: Hourly Per-Customer Impact, Non-Summer Average Event

Figure 5-6 SCE Day-Of 1-6 Hour: Hourly Per-Customer Impact, Summer Average Event



Load Impacts By Industry, LCA, and Sub-LAP

Table 5-7 through Table 5-12 present the impacts for an average event day by Industry, LCA, and Sub-LAP and by season.[45] [46]

Table 5-7 SCE CBP Impacts by Industry and Program, Non-Summer

	Industry	# of Accts	Aggregate Impact (MW)		Per-Customer Impact (kW)		% Impact	Temp (F)
			Ref. Load	Impact	Ref. Load	Impact		
Day Of	Manufacturing	2	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	71
Day Of	Retail Stores	6	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	70
Day Of	Schools	1	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	69
	Total Day Of	**7**	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	**70**
Total Non-Summer CBP		**7**	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	**70**

[45] The results are for an average event day. Note that the total for the program does not always exactly equal the total of the individual segments (industry or LCAs). This is because different groups of customers are called for each event, and in some cases, no customers in a segment are called. The average for that segment will reflect only those events where customers in that segment were called. The total program is the average across all events, regardless of which groups of customers are called for each event. Because the total program and the individual segments are averaged across different events, the total program may not exactly match the sum of the individual segments.

[46] The small negative impacts are most likely a modeling artifact resulting from an imperfect quantification of weather effects and/or omitted variable bias. We have no reason to think that customers are actually increasing their load in response to events.

Table 5-8 SCE CBP Impacts by Industry and Program, Summer

	Industry	# of Accts	Aggregate Impact (MW)		Per-Customer Impact (kW)		% Impact	Temp (F)
			Ref. Load	Impact	Ref. Load	Impact		
Day Ahead	Agriculture, Mining & Construction	2	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	72
	Wholesale, Transport, other utilities	3	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	92
	Retail Stores	80	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	84
	Offices, Hotels, Finance, Services	2	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	88
	Institutional/Government	1	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	92
	Total Day Ahead	**83**	**6.6**	**1.1**	**78.8**	**12.8**	**16%**	**84**
Day Of	Manufacturing	1	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	93
	Retail Stores	93	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	85
	Offices, Hotels, Finance, Services	4	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	86
	Schools	1	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	74
	Total Day Of	**98**	**13.9**	**1.9**	**142.2**	**19.1**	**13%**	**85**
Total Summer CBP		**181**	**20.5**	**2.9**	**113.0**	**16.2**	**14%**	**81**

Table 5-9 SCE CBP Impacts by LCA and Program, Non-Summer

	Local Capacity Area	# of Accts	Aggregate Impact (MW)		Per-Customer Impact (kW)		% Impact	Temp (F)
			Ref. Load	Impact	Ref. Load	Impact		
Day Of	LA Basin	7	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	71
	Ventura/Big Creek	5	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	71
	Total Day Of	**7**	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	**70**
Total Non-Summer CBP		**7**	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	**70**

Table 5-10 SCE CBP Impacts by LCA and Program, Summer

	Industry	# of Accts	Aggregate Impact (MW)		Per-Customer Impact (kW)		% Impact	Temp (F)
			Ref. Load	Impact	Ref. Load	Impact		
Day Ahead	LA Basin	85	6.9	1.2	81.5	14.4	18%	86
Day Ahead	Outside LA Basin	6	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	94
Day Ahead	Ventura/Big Creek	20	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	84
Day Ahead	**Total Day Ahead**	**83**	**6.6**	**1.1**	**78.8**	**12.8**	**16%**	**84**
Day Of	LA Basin	111	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	85
Day Of	Outside LA Basin	6	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	91
Day Of	Ventura/Big Creek	13	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	84
Day Of	**Total Day Of**	**98**	**13.9**	**1.9**	**142.2**	**19.1**	**13%**	**85**
Total Summer CBP		**181**	**20.5**	**2.9**	**113.0**	**16.2**	**14%**	**81**

Table 5-11 SCE CBP Impacts by Sub-LAP and Program, Non-Summer

	Sub-LAP	# of Accts	Aggregate Impact (MW)		Per-Customer Impact (kW)		% Impact	Temp (F)
			Ref. Load	Impact	Ref. Load	Impact		
Day Of	SCEC	3	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	71
Day Of	SCEW	6	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	70
Day Of	SCNW	5	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	71
Day Of	**Total Day Of**	**7**	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	**70**
Total Non-Summer CBP		**7**	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	**70**

Table 5-12 SCE CBP Impacts by Sub-LAP and Program, Summer

	Sub-LAP	# of Accts	Aggregate Impact (MW)		Per-Customer Impact (kW)		% Impact	Temp (F)
			Impact	Ref. Load	Impact	Ref. Load		
Day Ahead	SCEC	50	4.9	0.8	97.2	16.5	17%	91
	SCEN	17	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	93
	SCEW	56	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	80
	SCHD	4	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	94
	SCNW	12	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	77
	Total Day Ahead	**83**	**6.6**	**1.1**	**78.8**	**12.8**	**16%**	**84**
Day Of	SCEC	61	6.0	1.2	99.3	20.1	20%	92
	SCEN	11	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	90
	SCEW	61	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	79
	SCHD	3	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	94
	SCNW	11	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	80
	Total Day Of	**98**	**13.9**	**1.9**	**142.2**	**19.1**	**13%**	**85**
Total Summer CBP		**181**	**20.5**	**2.9**	**113.0**	**16.2**	**14%**	**81**

Comparison of Ex-Post Impacts

This section discusses how the PY2022 ex-post load impacts compare to previous years. These comparisons show how the program has performed over time and relative to the most recent forecast.

Figure 5-7 presents SCE's average summer nominations for PY2020 through PY2022. The Non-residential DA program experienced an overall decrease in both capacity nominations and enrollment counts. The Non-residential DO program, on the other hand, is seeing an increase in capacity nominations, despite a consistent decrease in enrollment counts.

Figure 5-7 SCE Summer Nominations

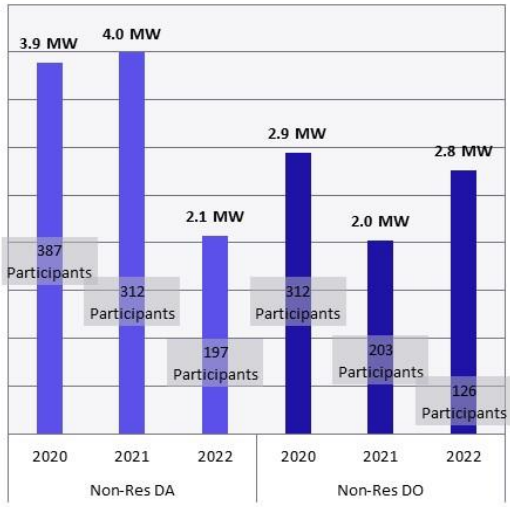


Table 5-13 below presents the ex-post load impacts over time. Note that these impacts are measured based on performance during dispatched events. The non-summer season remains generally consistent for both programs. The summer season saw a decrease in average dispatched accounts and capacity, likely due to SCE's dispatch of several Sub-LAP-level events. However, delivery performance, on average, increased significantly, now both exceeding dispatched capacities. PY2022 also consisted of participants capable

of higher load curtailment, showing higher percent load reductions (relative to the reference load) on average compared to previous years.

Table 5-13 SCE: Current v. Previous Ex-Post, Average Event Day

Season	Program	Year	# Accts	Aggregate (MW)			Per-Customer (kW)			Temp (F)
				Dispatched Capacity	Load Impact	% Delivered	Reference Load	Load Impact	% Impact	
Non-Summer	Non-Res DA	2020	3	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	78
		2021	6	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	61
		2022	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
	Non-Res DO	2020	5	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	62
		2021	13	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	62
		2022	**7**	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	**70**
Summer	Non-Res DA	2020	387	6.0	3.9	65%	35.1	3.9	11%	80
		2021	312	7.6	4.0	53%	81.1	12.8	16%	82
		2022	**83**	**0.9**	**1.1**	**117%**	**78.8**	**12.8**	**16%**	**84**
	Non-Res DO	2020	312	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	78
		2021	203	2.9	2.0	70%	95.7	10.0	10%	79
		2022	**98**	**1.7**	**1.9**	**109%**	**142.2**	**19.1**	**13%**	**85**

Table 5-14 below presents the PY2022 ex-post impacts compared to PY2021 ex-ante impacts for a 2022 January (non-summer) or August (summer) peak day. Note that the ex-ante impacts forecast performance for a system-level dispatch. We have the following findings:

- PY2021 forecasted zero enrollments for the PY2022 non-summer season. However, the Non-Res DO program had a small number of enrollments.
- In PY2022, the summer season experienced a drop in overall enrollment. However, the per-customer performance increased, indicating that both programs recruited/retained higher-performing customers in PY2022.

Table 5-14 SCE Current Ex-Post (Average Event Day) v. Prior Ex-Ante (SCE 1-in-2, Peak Day, 2022)

Season	Program	Estimate	# of Accts	Aggregate Impact (MW)		Per-Customer Impact (kW)		% Impact	Temp (F)
				Ref. Load	Impact	Ref. Load	Impact		
Non-Summer	Non-Res DA	PY2021 Ex-Ante	-	-	-	-	-	-	-
		Current Ex-Post	-	-	-	-	-	-	-
	Non-Res DO	PY2021 Ex-Ante	-	-	-	-	-	-	-
		Current Ex-Post	**7**	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	**70**
Summer	Non-Res DA	PY2021 Ex-Ante	410	32.1	4.2	78.2	10.1	13%	89
		Current Ex-Post	**83**	**6.6**	**1.1**	**78.8**	**12.8**	**16%**	**84**
	Non-Res DO	PY2021 Ex-Ante	290	30.4	1.7	104.7	6.0	6%	88
		Current Ex-Post	**98**	**13.9**	**1.9**	**142.2**	**19.1**	**13%**	**85**

SCE Ex-Ante Analysis

Enrollment and Load Impact Summary

SCE's 11-year forecast aligns with the submitted DR Application A22-05-004, updated according to average PY2022 enrollment. Figure 5-8 (August peak day, summer season) and Figure 5-9 (January peak day, non-summer season) show SCE's Non-residential DA and DO enrollment and load impact forecast an under the SCE 1-in-2 weather scenario. Both figures include the PY2022 "back-cast," which consists of weather-adjusted ex-post estimates of the current program year

Consistent with the DR Application A22-05-004 are the following assumptions:

- In PY2024, SCE's CBP will closeout the Day Of program and the non-summer season.
- In PY2025, the DRAM pilot concludes, and SCE expects a portion of DRAM customers will participate in CBP.

For this filing, SCE assumes zero residential participation in CBP. One aggregator expressed interest in residential CBP, but did not move forward.

Figure 5-8 SCE CBP Enrollment and Load Impact Forecast (SCE 1-in-2, August Peak Day)

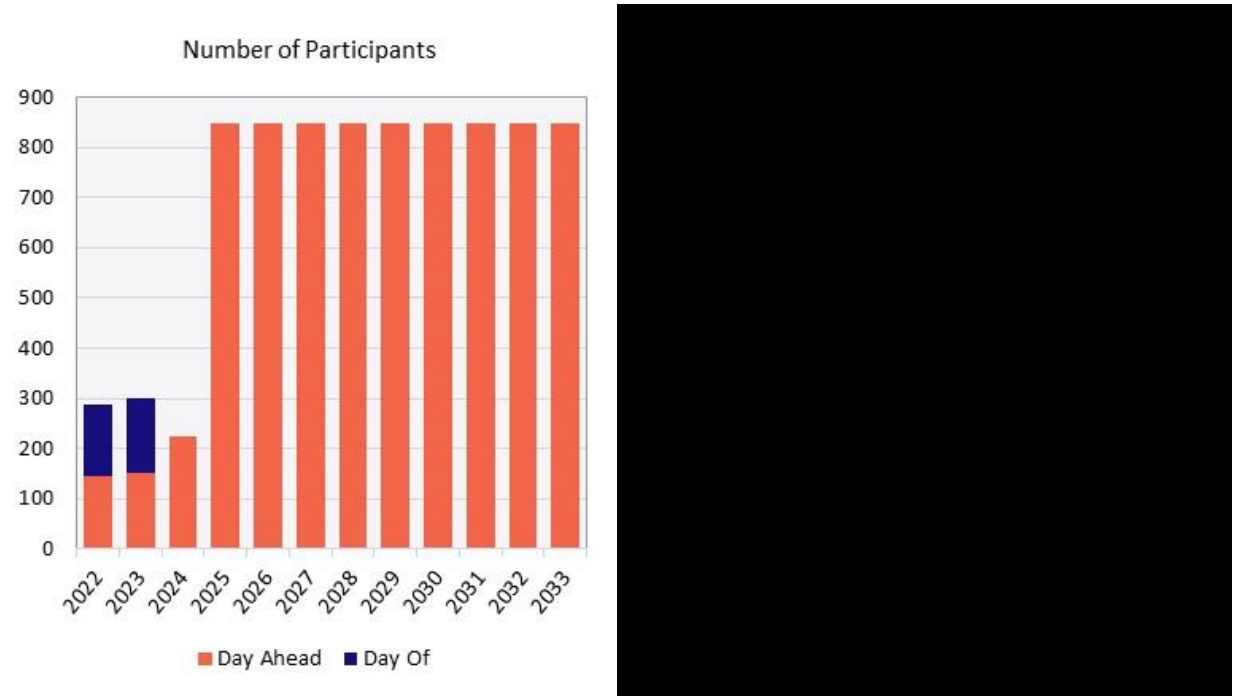


Figure 5-9 SCE CBP Enrollment and Load Impact Forecast (SCE 1-in-2, January Peak Day)

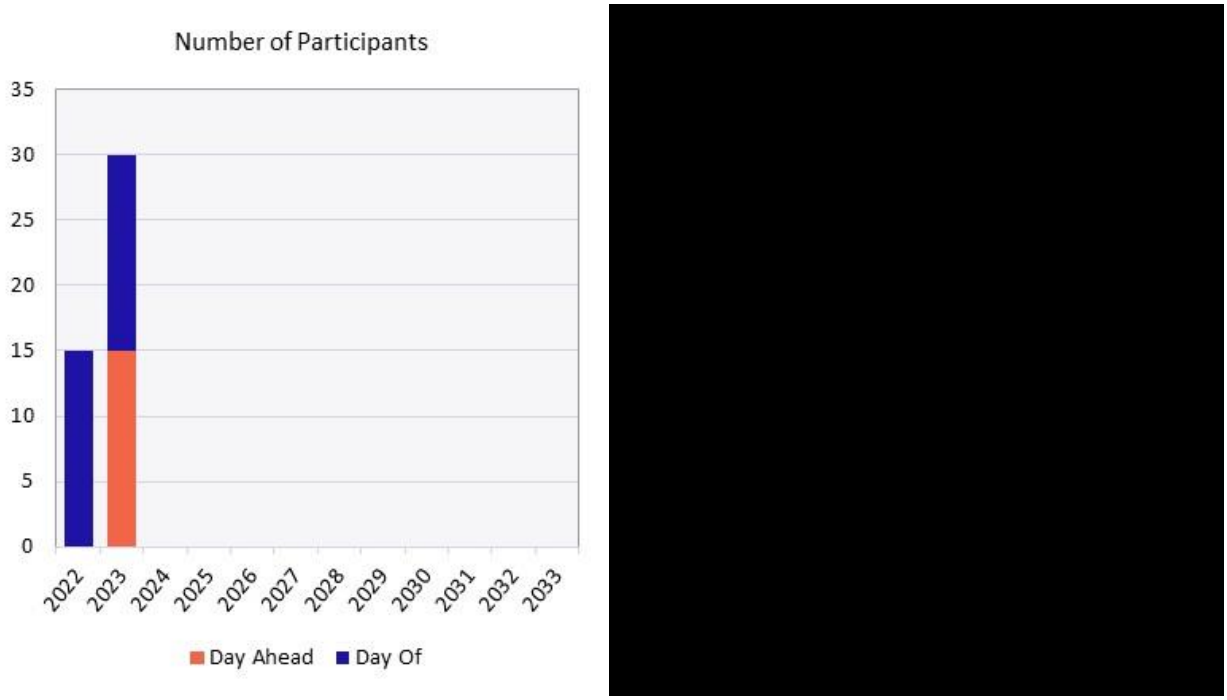


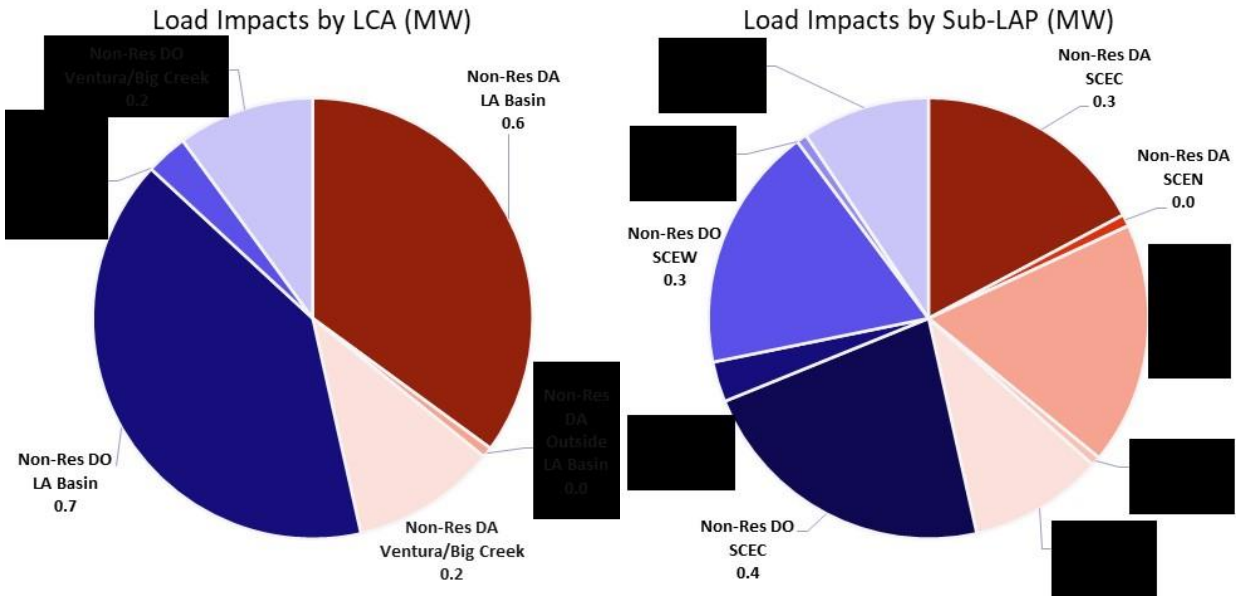
Table 5-15 summarizes the average RA window load impact forecasts for the Non-residential DA and DO products on a January peak day (non-summer) and an August peak day (summer) in 2023. The table includes the per-customer, aggregate, and corresponding percent impacts under the utility and CAISO 1-in-2 and 1-in-10 weather scenarios. We assume constant per-customer average impacts across the weather scenarios, and the varying percent impacts are due to the reference load's response to each weather scenario.

Table 5-15 SCE Non-Residential: RA Window Ex-Ante Impacts, 2023

Season	Program	# of Accts	Per Customer Impact (kW)	Aggregate Impact (MW)	Percent Impact (%)			
					Utility Peak		CAISO Peak	
					1-in-2	1-in-10	1-in-2	1-in-10
Non-Summer	Day Ahead	15	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	Day Of	15	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Summer	Day Ahead	150	5.7	0.9	7.6%	7.5%	7.5%	7.6%
	Day Of	150	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Figure 5-10 illustrates the average RA window load impact distribution by LCA and Sub-LAP for Non-residential DA and DO on an August peak day in 2023. The results shown are for 1-in-2 weather conditions for the utility peak.

Figure 5-10 SCE: RA Window Load Impacts by LCA and Sub-LAP (SCE 1-in-2, August Peak Day, 2023)



Forecast Assumptions

This section discusses the assumptions used to develop the Non-residential DA and DO forecasts. Both forecasts use a combination of the following:

- **Enrollment Outlook** – consistent with the submitted DR Application A22-05-004:
  - Updated according to PY2022 and PY2023 nominations,
  - In 2024 through 2033, zero enrollment in non-summer months and the DO program.
  - In 2024, assume 50% of DO participants will move to the DA program.
  - In 2025, assume some DRAM customers will move to the DA program.
- **Per-customer load impacts** – we assume the per-customer load impacts on reporting hour (HE16 for summer, HE19 for non-summer) as the maximum impact during the RA window.
- **Impact Degradation Rate** – we developed assumptions to represent how customers can maintain impacts throughout events called for longer durations, similar to the 5-hour RA window. The approach used to develop these assumptions is discussed in Section 3 Impact Degradation Across the RA Window. For SCE, we used PY2019-22 historical data to update the Impact Degradation Rate. Table 5-16 shows the estimated shape of the impacts as a percent of the maximum load impact for each program and season.

Table 5-16 SCE CBP: RA Window Shape of Impacts

Season	Program	Percent of Maximum Impact					
		HE17	HE18	HE19	HE20	HE21	Overall RA
Non-Summer	Day Ahead	100%	51%	85%	68%	50%	71%
	Day Of	100%	51%	85%	68%	50%	71%
Summer	Day Ahead	100%	80%	62%	56%	48%	69%
	Day Of	100%	79%	56%	46%	44%	65%

Figure 5-11 through Figure 5-14 show the SCE's Non-residential DA and DO per-customer estimated reference load, estimated event day load, and resulting load impact estimates for an August or January peak day in 2023 for the SCE 1-in-2 weather condition—the hours highlighted in blue show the RA window, 4 PM to 9 PM.

Figure 5-11 SCE Non-Residential Day Ahead: Hourly Per-Customer Load (SCE 1-in-2, January Peak Day, 2023)

Figure 5-12 SCE Non-Residential Day Ahead: Hourly Per-Customer Load (SCE 1-in-2, August Peak Day, 2023)

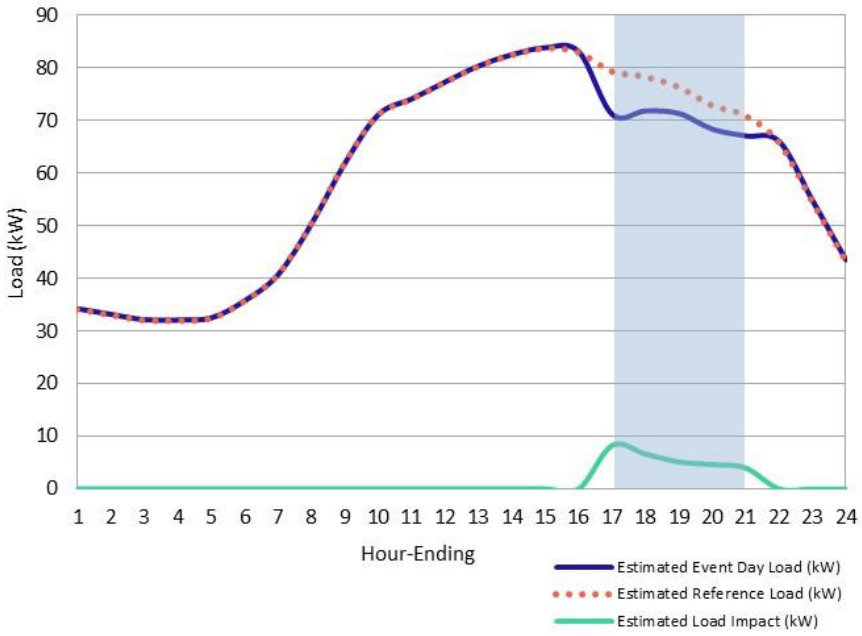


Figure 5-13 SCE Non-Residential Day Of: Hourly Per-Customer Load (SCE 1-in-2, January Peak Day, 2023)

Figure 5-14 SCE Non-Residential Day Of: Hourly Per-Customer Load (SCE 1-in-2, August Peak Day, 2023)

Comparison of Ex-Ante Impacts

This section discusses how the PY2022 ex-ante load impacts compare to:

- PY2022 (current) ex-post load impacts – demonstrates the effect of adjusting the impacts and reference loads to reflect the various weather scenarios, and
- PY2021 (previous) ex-ante load impact – demonstrates the updates to the load impact forecast using current program performance.

Table 5-17 compares **the current ex-post estimates with the current ex-ante estimates**. The current ex-post estimates show average load impacts for PY2022 dispatched events, while the current ex-ante estimates show how the program would have performed in a 1-in-2 weather year for a system-level event. Note that the ex-ante estimates in this comparison are for a 2022 January (non-summer) or August (summer) peak day on the maximum impact hour (HE17), which is most comparable to the ex-post average event day reporting hour, HE19 (non-summer) and HE16 (summer).

Table 5-17 SCE: Current Ex-Ante (SCE 1-in-2, 2022 Peak Day, Maximum Impact) v. Current Ex-Post (Average Event, Reporting Hour)

Season	Program	Estimate	# of Accts	Aggregate Impact (MW)		Per-Customer Impact (kW)		% Impact	Temp (F)
				Ref. Load	Impact	Ref. Load	Impact		
Non-Summer	**Day Ahead**	**Current Ex-Ante**	-	-	-	-	-	-	-
		Current Ex-Post	-	-	-	-	-	-	-
	Day Of	**Current Ex-Ante**	**15**	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	**65**
		Current Ex-Post	7	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	70
Summer	**Day Ahead**	**Current Ex-Ante**	**146**	**11.6**	**1.2**	**79.3**	**8.3**	**10%**	**92**
		Current Ex-Post	83	6.6	1.1	78.8	12.8	16%	84
	Day Of	**Current Ex-Ante**	**143**	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	**92**
		Current Ex-Post	98	13.9	1.9	142.2	19.1	13%	85

Table 5-18 compares **the previous ex-ante forecast to the current ex-ante forecast, both for the year 2023**. This comparison demonstrates how the program forecast was updated since last year. These changes are the following:

- The non-summer forecast was updated, consistent with current PY2023 nominations.
- The summer forecast was updated to reflect PY2022 nominations and performance. In PY2022, SCE's CBP experienced a drop in customer enrollments but saw increased per-customer load impacts. The overall decrease in customer enrollment resulted in lower aggregate load impacts.

Table 5-18 SCE: Current v. Prior Ex-Ante (SCE 1-in-2, Peak Day, 2023), RA Window

Season	Program	Estimate	# of Accts	Aggregate Impact (MW)		Per-Customer Impact (kW)		% Impact	Temp (F)
				Ref. Load	Impact	Ref. Load	Impact		
Non-Summer	**Day Ahead**	**PY2022 Forecast**	**15**	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	**62**
		PY2021 Forecast	-	-	-	-	-	-	-
	Day Of	**PY2022 Forecast**	**15**	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	**62**
		PY2021 Forecast	-	-	-	-	-	-	-

Season	Program	Estimate	# of Accts	Aggregate Impact (MW)		Per-Customer Impact (kW)		% Impact	Temp (F)
				Ref. Load	Impact	Ref. Load	Impact		
Summer	**Day Ahead**	**PY2022 Forecast**	**150**	**11.3**	**0.9**	**75.6**	**5.7**	**8%**	**89**
		PY2021 Forecast	410	32.1	4.2	78.3	10.1	13%	89
	Day Of	**PY2022 Forecast**	**150**	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	**88**
		PY2021 Forecast	290	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	88

SCE Impacts by Event Day

Table 5-19 to Table 5-21 show the average event-hour impacts for SCE's two CBP programs by season, including:

- Dispatched counts,
- Aggregate level dispatched capacity, load impacts, and delivery performance,
- Per-customer level reference loads, load impacts, and % impacts relative to reference loads, and
- Average event window temperature.

Table 5-19 SCE Day Ahead 1-6 Hour: Summer Impacts by Event[47]

Event Day	Event Win-dow	# Accts	Aggregate (MW)			Per-Customer (kW)			Tmp (F)
			Dispatched Capacity	Load Impact	% Delivered	Reference Load	Load Impact	% Impact	
Avg. Summer	**16**	**83**	**0.9**	**1.1**	**117%**	**78.8**	**12.8**	**16%**	**84**
May 2, 2022	19 - 21	9	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	64
May 3, 2022	19 - 21	24	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	68
May 4, 2022	18 - 21	15	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	81
	20 - 20	9	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	70
May 5, 2022	19 - 21	15	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	79
	20 - 20	9	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	70
May 16, 2022	20 - 21	24	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	70
May 17, 2022	20 - 21	15	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	71
May 24, 2022	20 - 21	5	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	63
May 25, 2022	20 - 21	5	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	64
May 26, 2022	20 - 21	5	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	61
May 31, 2022	19 - 21	5	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	68

[47] The small negative impacts are most likely a modeling artifact resulting from an imperfect quantification of weather effects and/or omitted variable bias. We have no reason to think that customers are actually increasing their load in response to events.

Event Day	Event Win-dow	# Accts	Aggregate (MW)			Per-Customer (kW)			Tmp (F)
			Dispatched Capacity	Load Impact	% Delivered	Reference Load	Load Impact	% Impact	
Jun 1, 2022	17 - 21	36	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	75
	18 - 21	47	1.1	0.4	36%	74.3	8.3	11%	81
Jun 2, 2022	18 - 21	83	1.4	0.6	42%	52.5	7.3	14%	75
Jun 9, 2022	20 - 20	83	1.4	1.6	115%	54.6	19.8	36%	80
Jun 10, 2022	20 - 20	83	1.4	1.6	115%	56.0	19.8	35%	82
Jun 23, 2022	20 - 21	83	1.4	1.8	127%	55.2	21.9	40%	84
Jul 11, 2022	16 - 21	59	0.9	0.4	42%	80.5	6.4	8%	89
Jul 14, 2022	16 - 21	59	0.9	0.4	45%	93.7	6.8	7%	86
Jul 15, 2022	16 - 21	59	0.9	0.4	45%	93.3	6.8	7%	93
Jul 18, 2022	16 - 21	59	0.9	0.4	45%	95.0	6.8	7%	92
Jul 19, 2022	16 - 21	59	0.9	0.4	45%	92.2	6.8	7%	94
Jul 22, 2022	16 - 21	80	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	81
Jul 28, 2022	16 - 21	18	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	94
Jul 29, 2022	16 - 21	80	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	80
Aug 1, 2022	20 - 20	16	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	73
Aug 3, 2022	20 - 20	16	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	72
Aug 4, 2022	16 - 21	176	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	82
	19 - 20	16	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	72
Aug 5, 2022	16 - 21	176	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	85
	19 - 20	16	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	73
Aug 8, 2022	16 - 21	182	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	87
	18 - 21	16	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	76
Aug 9, 2022	16 - 21	182	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	89
Aug 10, 2022	16 - 21	70	0.8	0.9	111%	101.0	12.6	12%	94
Aug 31, 2022	16 - 21	92	0.6	0.9	146%	70.1	9.6	14%	91
Sep 1, 2022	16 - 21	199	1.5	1.0	68%	79.1	5.1	6%	91
Sep 2, 2022	16 - 21	199	1.5	0.7	49%	81.9	3.7	5%	92
Sep 6, 2022	16 - 21	199	1.5	1.0	68%	80.7	5.1	6%	94
Sep 7, 2022	16 - 21	199	1.5	1.0	68%	81.1	5.1	6%	94
Sep 8, 2022	16 - 21	199	1.5	1.0	68%	81.7	5.1	6%	94
Oct 5, 2022	16 - 21	20	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	86
Oct 6, 2022	16 - 21	104	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	74
Oct 19, 2022	16 - 21	197	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	86
Oct 20, 2022	17 - 21	36	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	80

Table 5-20 SCE Day Of 1-6 Hour: Non-Summer Impacts by Event[48]

Event Day	Event Win-dow	# Accts	Aggregate (MW)			Per-Customer (kW)			Tmp (F)
			Dispatched Capacity	Load Impact	% Delivered	Reference Load	Load Impact	% Impact	
Avg. Non-Summer	**19**	**7**	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	**70**
Jan 3, 2022	17 - 21	9	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	57
Jan 5, 2022	17 - 21	9	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	62
Jan 31, 2022	18 - 18	3	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	65
	18 - 19	6	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	59
Mar 1, 2022	18 - 19	5	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	72
Mar 2, 2022	19 - 19	5	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	68
Mar 7, 2022	19 - 20	5	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	61
Mar 8, 2022	19 - 19	5	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	61
Mar 11, 2022	19 - 19	5	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	63
Mar 22, 2022	19 - 21	10	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	77
Mar 23, 2022	19 - 21	6	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	76
Mar 24, 2022	19 - 21	6	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	69
Mar 25, 2022	19 - 21	10	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	73
Mar 28, 2022	19 - 21	6	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	58
Apr 6, 2022	19 - 21	11	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	75
Apr 7, 2022	18 - 21	11	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	90
Apr 8, 2022	19 - 21	5	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	77
Apr 11, 2022	19 - 21	5	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	60
Apr 12, 2022	19 - 21	5	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	62
Apr 18, 2022	18 - 21	6	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	66
Apr 25, 2022	17 - 21	6	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	78

Table 5-21 SCE Day Of 1-6 Hour: Summer Impacts by Event

Event Day	Event Win-dow	# Accts	Aggregate (MW)			Per-Customer (kW)			Tmp (F)
			Dispatched Capacity	Load Impact	% Delivered	Reference Load	Load Impact	% Impact	
Avg. Summer	16	98	1.7	1.9	109%	142.2	19.1	13%	85
May 2, 2022	19 - 21	140	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	67
May 3, 2022	19 - 21	140	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	68
May 4, 2022	18 - 21	76	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	70
	19 - 21	53	0.6	0.6	90%	59.5	10.8	18%	81
	20 - 20	11	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	82
May 5, 2022	19 - 21	129	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	73

[48] The small negative impacts are most likely a modeling artifact resulting from an imperfect quantification of weather effects and/or omitted variable bias. We have no reason to think that customers are actually increasing their load in response to events.

Event Day	Event Win-dow	# Accts	Aggregate (MW)			Per-Customer (kW)			Tmp (F)
			Dispatched Capacity	Load Impact	% Delivered	Reference Load	Load Impact	% Impact	
	20 - 20	11	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	80
May 16, 2022	20 - 21	11	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	78
May 25, 2022	16 - 21	64	0.6	0.6	94%	63.9	8.8	14%	68
May 26, 2022	20 - 21	2	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	78
May 31, 2022	19 - 21	2	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	80
Jun 1, 2022	17 - 21	14	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	87
Jun 2, 2022	18 - 21	14	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	83
Jun 8, 2022	16 - 21	150	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	80
Jun 9, 2022	16 - 21	150	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	81
	20 - 20	14	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	87
Jun 10, 2022	16 - 21	164	2.7	2.2	79%	152.1	13.2	9%	83
	20 - 20	14	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	91
Jun 23, 2022	17 - 21	75	1.2	1.3	111%	99.5	17.3	17%	92
	20 - 21	14	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	89
Jun 27, 2022	16 - 21	150	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	88
Jul 11, 2022	16 - 21	149	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	81
Jul 14, 2022	16 - 21	149	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	79
Jul 15, 2022	16 - 21	149	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	84
Jul 18, 2022	16 - 21	149	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	85
Jul 19, 2022	16 - 21	149	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	87
Jul 29, 2022	16 - 21	28	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	84
Aug 1, 2022	20 - 20	2	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	89
Aug 3, 2022	20 - 20	2	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	93
Aug 4, 2022	16 - 21	124	2.7	2.8	104%	196.2	22.9	12%	82
	19 - 20	2	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	86
Aug 5, 2022	16 - 21	124	2.7	2.8	104%	200.1	22.9	11%	85
	19 - 20	2	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	89
Aug 8, 2022	16 - 21	124	2.7	2.8	104%	208.1	22.9	11%	86
	18 - 21	2	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	92
Aug 9, 2022	16 - 21	124	2.7	2.8	104%	210.7	22.9	11%	89
Aug 10, 2022	16 - 21	65	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	92
Aug 16, 2022	16 - 21	49	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	81
Sep 1, 2022	16 - 21	126	2.8	2.2	81%	208.5	17.8	9%	92
Sep 2, 2022	16 - 21	126	2.8	2.2	81%	211.2	17.8	8%	93
Sep 6, 2022	16 - 21	126	2.8	2.2	81%	224.9	17.8	8%	94
Sep 7, 2022	16 - 21	126	2.8	2.2	81%	217.3	17.8	8%	94
Sep 8, 2022	16 - 21	126	2.8	2.2	81%	230.2	17.8	8%	94
Oct 6, 2022	16 - 21	59	1.0	1.0	100%	103.5	17.1	17%	73

Event Day	Event Win-dow	# Accts	Aggregate (MW)			Per-Customer (kW)			Tmp (F)
			Dispatched Capacity	Load Impact	% Delivered	Reference Load	Load Impact	% Impact	
Oct 19, 2022	16 - 21	126	2.8	2.3	82%	205.5	17.9	9%	87
Oct 20, 2022	17 - 21	10	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	76

Additional Event Day Impacts for TA/TI and Auto DR Participants

SCE did not have any TA/TI or AutoDR participants in PY2022.

Additional Event Day Impacts by Geographical Area

Table 5-22 through Table 5-25 show the event day impacts for two additional geographical areas in SCE's service territory: South of Lugo and Southern Orange County.

Table 5-22 South of Lugo Event Day Impacts: Day Ahead 1-6 Hour

Event Day	Event Win-dow	# of Accts	Aggregate Impact (MW)		Per-Customer Impact (kW)		% Impact	Temp (F)
			Reference Load	Impact	Reference Load	Impact		
May 3, 2022	19 - 21	9	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	71
May 4, 2022	18 - 21	9	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	83
May 5, 2022	19 - 21	9	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	81
May 16, 2022	20 - 21	9	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	74
May 17, 2022	20 - 21	9	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	72
Jun 1, 2022	18 - 21	20	1.8	0.3	87.7	15.0	17%	84
Jun 2, 2022	18 - 21	20	1.9	0.3	92.8	15.0	16%	81
Jun 9, 2022	20 - 20	20	1.9	0.6	93.2	28.0	30%	88
Jun 10, 2022	20 - 20	20	2.0	0.6	98.5	28.0	28%	89
Jun 23, 2022	20 - 21	20	1.8	0.6	91.7	27.8	30%	90
Jul 11, 2022	16 - 21	28	3.1	0.2	109.8	7.3	7%	89
Jul 14, 2022	16 - 21	28	3.8	0.2	137.2	7.5	5%	86
Jul 15, 2022	16 - 21	28	3.7	0.2	131.9	7.5	6%	93
Jul 18, 2022	16 - 21	28	3.8	0.2	136.6	7.5	6%	92
Jul 19, 2022	16 - 21	28	3.6	0.2	130.1	7.5	6%	94
Aug 4, 2022	16 - 21	33	4.6	0.6	138.3	17.0	12%	87
Aug 5, 2022	16 - 21	33	4.4	0.6	134.2	17.0	13%	90
Aug 8, 2022	16 - 21	33	4.0	0.6	122.2	17.0	14%	93
Aug 9, 2022	16 - 21	33	4.1	0.6	124.3	17.0	14%	94
Aug 10, 2022	16 - 21	33	4.6	0.6	138.1	17.0	12%	94
Sep 1, 2022	16 - 21	33	4.5	0.3	134.9	9.7	7%	102
Sep 2, 2022	16 - 21	33	4.7	0.1	141.7	4.2	3%	98
Sep 6, 2022	16 - 21	33	4.4	0.3	132.6	9.7	7%	101
Sep 7, 2022	16 - 21	33	4.5	0.3	137.6	9.7	7%	101

Event Day	Event Win-dow	# of Accts	Aggregate Impact (MW)		Per-Customer Impact (kW)		% Impact	Temp (F)
			Reference Load	Impact	Reference Load	Impact		
Sep 8, 2022	16 - 21	33	4.7	0.3	143.7	9.7	7%	97
Oct 19, 2022	16 - 21	30	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	88

Table 5-23 South of Lugo Event Day Impacts: Day Of 1-6 Hour

Event Day	Event Win-dow	# of Accts	Aggregate Impact (MW)		Per-Customer Impact (kW)		% Impact	Temp (F)
			Reference Load	Impact	Reference Load	Impact		
Jan 3, 2022	17 - 21	2	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	57
Jan 5, 2022	17 - 21	2	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	67
Jan 31, 2022	18 - 18	2	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	63
Mar 22, 2022	19 - 21	2	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	83
Mar 25, 2022	19 - 21	2	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	81
May 2, 2022	19 - 21	27	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	69
May 3, 2022	19 - 21	27	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	69
May 4, 2022	19 - 21	27	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	80
May 5, 2022	19 - 21	27	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	79
Jun 8, 2022	16 - 21	34	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	88
Jun 9, 2022	16 - 21	34	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	91
Jun 10, 2022	16 - 21	34	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	92
Jun 23, 2022	17 - 21	34	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	92
Jun 27, 2022	16 - 21	34	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	98
Jul 11, 2022	16 - 21	34	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	89
Jul 14, 2022	16 - 21	34	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	86
Jul 15, 2022	16 - 21	34	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	92
Jul 18, 2022	16 - 21	34	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	92
Jul 19, 2022	16 - 21	34	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	94
Aug 4, 2022	16 - 21	28	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	87
Aug 5, 2022	16 - 21	28	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	90
Aug 8, 2022	16 - 21	28	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	93
Aug 9, 2022	16 - 21	28	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	94
Aug 10, 2022	16 - 21	28	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	94
Sep 1, 2022	16 - 21	28	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	102
Sep 2, 2022	16 - 21	28	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	98
Sep 6, 2022	16 - 21	28	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	101
Sep 7, 2022	16 - 21	28	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	101
Sep 8, 2022	16 - 21	28	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	97
Oct 19, 2022	16 - 21	28	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	88

Table 5-24 Southern Orange County Event Day Impacts: Day Ahead 1-6 Hour

Event Day	Event Win-dow	# of Accts	Aggregate Impact (MW)		Per-Customer Impact (kW)		% Impact	Temp (F)
			Reference Load	Impact	Reference Load	Impact		
May 2, 2022	19 - 21	5	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	64
May 3, 2022	19 - 21	5	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	65
May 4, 2022	20 - 20	5	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	72
May 5, 2022	20 - 20	5	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	74
May 16, 2022	20 - 21	5	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	65
Jun 1, 2022	17 - 21	18	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	71
Jun 2, 2022	18 - 21	18	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	68
Jun 9, 2022	20 - 20	18	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	70
Jun 10, 2022	20 - 20	18	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	73
Jun 23, 2022	20 - 21	18	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	81
Jul 22, 2022	16 - 21	38	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	77
Jul 29, 2022	16 - 21	38	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	76
Aug 4, 2022	16 - 21	56	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	76
Aug 5, 2022	16 - 21	56	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	83
Aug 8, 2022	16 - 21	56	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	82
Aug 9, 2022	16 - 21	56	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	84
Aug 31, 2022	16 - 21	56	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	93
Sep 1, 2022	16 - 21	55	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	85
Sep 2, 2022	16 - 21	55	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	86
Sep 6, 2022	16 - 21	55	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	87
Sep 7, 2022	16 - 21	55	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	89
Sep 8, 2022	16 - 21	55	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	95
Oct 6, 2022	16 - 21	54	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	71
Oct 19, 2022	16 - 21	54	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	88

Table 5-25 Southern Orange County Event Day Impacts: Day Of 1-6 Hour

Event Day	Event Win-dow	# of Accts	Aggregate Impact (MW)		Per-Customer Impact (kW)		% Impact	Temp (F)
			Reference Load	Impact	Reference Load	Impact		
Jan 3, 2022	17 - 21	3	0.5	<0.1	171.4	0.9	0%	56
Jan 5, 2022	17 - 21	3	0.5	<0.1	169.8	0.9	1%	59
Jan 31, 2022	18 - 19	3	0.5	<0.1	169.7	9.3	5%	58
Mar 22, 2022	19 - 21	3	0.5	<0.1	173.8	2.9	2%	72
Mar 23, 2022	19 - 21	3	0.5	<0.1	177.8	2.9	2%	78
Mar 24, 2022	19 - 21	3	0.5	<0.1	175.7	2.9	2%	68

Event Day	Event Win-dow	# of Accts	Aggregate Impact (MW)		Per-Customer Impact (kW)		% Impact	Temp (F)
			Reference Load	Impact	Reference Load	Impact		
Mar 25, 2022	19 - 21	3	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	68
Mar 28, 2022	19 - 21	3	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	59
Apr 6, 2022	19 - 21	3	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	71
Apr 7, 2022	18 - 21	3	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	94
Apr 18, 2022	18 - 21	3	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	66
Apr 25, 2022	17 - 21	3	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	79
May 2, 2022	19 - 21	38	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	64
May 3, 2022	19 - 21	38	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	65
May 4, 2022	18 - 21	38	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	71
May 5, 2022	19 - 21	38	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	72
May 25, 2022	16 - 21	38	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	67
Jun 8, 2022	16 - 21	49	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	71
Jun 9, 2022	16 - 21	49	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	71
Jun 10, 2022	16 - 21	49	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	73
Jun 27, 2022	16 - 21	49	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	80
Jul 11, 2022	16 - 21	49	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	72
Jul 14, 2022	16 - 21	49	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	72
Jul 15, 2022	16 - 21	49	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	74
Jul 18, 2022	16 - 21	49	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	78
Jul 19, 2022	16 - 21	49	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	81
Aug 4, 2022	16 - 21	30	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	75
Aug 5, 2022	16 - 21	30	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	82
Aug 8, 2022	16 - 21	30	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	81
Aug 9, 2022	16 - 21	30	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	83
Aug 16, 2022	16 - 21	30	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	81
Sep 1, 2022	16 - 21	30	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	84
Sep 2, 2022	16 - 21	30	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	85
Sep 6, 2022	16 - 21	30	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	86
Sep 7, 2022	16 - 21	30	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	88
Sep 8, 2022	16 - 21	30	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	95
Oct 6, 2022	16 - 21	30	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	71
Oct 19, 2022	16 - 21	30	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	87

Additional Summary of Dispatched Events

Table 5-26 below shows the number of sub-LAPs, the event hours, and the number of accounts dispatched on each event day. For reference, Table 5-1 presents the total monthly enrollment for both SCE programs, which would be comparable to dispatched counts for a system-level event.

Table 5-26 SCE Dispatched Events

Date	Day of Week	# of Sub-LAPs	Event Hours (HE)	# Accounts	
				Day Ahead	Day Of
Jan 3, 2022	Monday	2	17-21	-	9
Jan 5, 2022	Wednesday	2	17-21	-	9
Jan 31, 2022	Monday	2	18-18, 18-19	-	9
Mar 1, 2022	Tuesday	1	18-19	-	5
Mar 2, 2022	Wednesday	1	19-19	-	5
Mar 7, 2022	Monday	1	19-20	-	5
Mar 8, 2022	Tuesday	1	19-19	-	5
Mar 11, 2022	Friday	1	19-19	-	5
Mar 22, 2022	Tuesday	2	19-21	-	10
Mar 23, 2022	Wednesday	1	19-21	-	6
Mar 24, 2022	Thursday	1	19-21	-	6
Mar 25, 2022	Friday	2	19-21	-	10
Mar 28, 2022	Monday	1	19-21	-	6
Apr 6, 2022	Wednesday	2	19-21	-	11
Apr 7, 2022	Thursday	2	18-21	-	11
Apr 8, 2022	Friday	1	19-21	-	5
Apr 11, 2022	Monday	1	19-21	-	5
Apr 12, 2022	Tuesday	1	19-21	-	5
Apr 18, 2022	Monday	1	18-21	-	6
Apr 25, 2022	Monday	1	17-21	-	6
May 2, 2022	Monday	4	19-21	9	140
May 3, 2022	Tuesday	4	19-21	24	140
May 4, 2022	Wednesday	4	18-21, 19-21, 20-20	24	140
May 5, 2022	Thursday	4	19-21, 20-20	24	140
May 16, 2022	Monday	3	20-21	24	11
May 17, 2022	Tuesday	1	20-21	15	-
May 24, 2022	Tuesday	1	20-21	5	-
May 25, 2022	Wednesday	3	16-21, 20-21	5	64
May 26, 2022	Thursday	2	20-21	5	2
May 31, 2022	Tuesday	2	19-21	5	2
Jun 1, 2022	Wednesday	5	17-21, 18-21	83	14
Jun 2, 2022	Thursday	5	18-21	83	14
Jun 8, 2022	Wednesday	3	16-21	-	150
Jun 9, 2022	Thursday	5	16-21, 20-20	83	164

Date	Day of Week	# of Sub-LAPs	Event Hours (HE)	# Accounts	
				Day Ahead	Day Of
Jun 10, 2022	Friday	5	16-21, 20-20	83	178
Jun 23, 2022	Thursday	5	17-21, 20-21	83	89
Jun 27, 2022	Monday	3	16-21	-	150
Jul 11, 2022	Monday	3	16-21	59	149
Jul 14, 2022	Thursday	3	16-21	59	149
Jul 15, 2022	Friday	3	16-21	59	149
Jul 18, 2022	Monday	3	16-21	59	149
Jul 19, 2022	Tuesday	3	16-21	59	149
Jul 22, 2022	Friday	2	16-21	80	-
Jul 28, 2022	Thursday	1	16-21	18	-
Jul 29, 2022	Friday	3	16-21	80	28
Aug 1, 2022	Monday	2	20-20	16	2
Aug 3, 2022	Wednesday	2	20-20	16	2
Aug 4, 2022	Thursday	5	16-21, 19-20	192	126
Aug 5, 2022	Friday	5	16-21, 19-20	192	126
Aug 8, 2022	Monday	5	16-21, 18-21	198	126
Aug 9, 2022	Tuesday	5	16-21	182	124
Aug 10, 2022	Wednesday	2	16-21	70	65
Aug 16, 2022	Tuesday	1	16-21	-	49
Aug 31, 2022	Wednesday	2	16-21	92	-
Sep 1, 2022	Thursday	5	16-21	199	126
Sep 2, 2022	Friday	5	16-21	199	126
Sep 6, 2022	Tuesday	5	16-21	199	126
Sep 7, 2022	Wednesday	5	16-21	199	126
Sep 8, 2022	Thursday	5	16-21	199	126
Oct 5, 2022	Wednesday	1	16-21	20	-
Oct 6, 2022	Thursday	2	16-21	104	59
Oct 19, 2022	Wednesday	5	16-21	197	126
Oct 20, 2022	Thursday	2	17-21	36	10

6

SAN DIEGO GAS & ELECTRIC

This section presents San Diego Gas & Electric's (SDG&E) PY2022 CBP program descriptions and expected program changes, participation, ex-post load impact estimates, ex-ante load impact estimates, and key findings.

SDG&E Program Description

In PY2022, SDG&E added two Elect products with three price trigger options. SDG&E will refer to the previously existing products as Prescribed products. Altogether, SDG&E currently offers six CBP products under two programs: Non-residential DA and Non-residential DO, summarized in Table 6-1.

SDG&E CBP events may be dispatched on:

- Monday through Friday (excluding holidays),
- May through October,
- 2- to 4-hour durations,
- Maximum of 1 event per event day,
- Maximum of 24 cumulative hours per month, and
- Maximum of 6 event days per month with up to 3 consecutive event days per month.

SDG&E no longer allows dual DR enrollment in CBP. Customers who were dually enrolled before October 1, 2018, were grandfathered in.

Table 6-1 SDG&E Product Types

Program	Product	Operating Hours	Price Trigger
Non-Res DA	Presc DA 11-7 Hour	11 AM–7 PM	$90/MWh
	Presc DA 1-9 Hour	1 PM–9 PM	$90/MWh
	Elect DA 1-9 Hour	1 PM–9 PM	$200/MWh, $400/MWh, $600/MWh
Non-Res DO	Presc DO 11-7 Hour	11 AM–7 PM	$115/MWh
	Presc DO 1-9 Hour	1 PM–9 PM	$125/MWh
	Elect DO 1-9 Hour	1 PM–9 PM	$200/MWh, $400/MWh, $600/MWh

SDG&E program triggers are defined as follows:

- **Day Ahead Program**: SDG&E may call an event whenever the day-ahead market price is equal to or greater than the product price trigger or as utility system conditions warrant. The day-ahead market price is defined as California Independent System Operator (CAISO) DLAP or applicable pnode SDGE-APND day-ahead market locational marginal price (DAM LMP).
- **Day Of Program**: SDG&E may call an event whenever the forecasted real-time price is equal to or greater than the product price trigger or as utility system conditions warrant. Real-time price is

defined as the CAISO DLAP or applicable pnode SDGE-APND average hourly real-time market locational marginal price (LMP).

Program Changes

- SDG&E is currently implementing a Residential CBP pilot, limiting the number of residential enrollments due to system limitations.

SDG&E Program Nominations

Table 6-2 presents the program-level monthly nominations for SDG&E's CBP programs. On average, Non-residential DA had 1.5 MW consisting of 47 customers, while Non-residential DO had 2.1 MW consisting of 79 customers. Figure 6-1 shows the monthly MW nominations by product, illustrating that Non-residential DA nominations were primarily split between Elect DA ($400) and Elect DA ($600) products, while Non-residential DO nominations were primarily in the Elect DO ($400) product.

Table 6-2 SDG&E Monthly Nominations

Month	Non-Residential DA		Non-Residential DO	
	Enrolled Accounts	Nominated Capacity (MW)	Enrolled Accounts	Nominated Capacity (MW)
May	32	0.8	79	2.1
June	32	0.8	83	2.1
July	48	1.4	84	2.2
August	49	1.9	82	2.3
September	60	2.0	72	2.3
October	60	1.9	72	1.5
Avg. Summer	**47**	**1.5**	**79**	**2.1**

Figure 6-1 SDG&E Monthly Nominations by Product

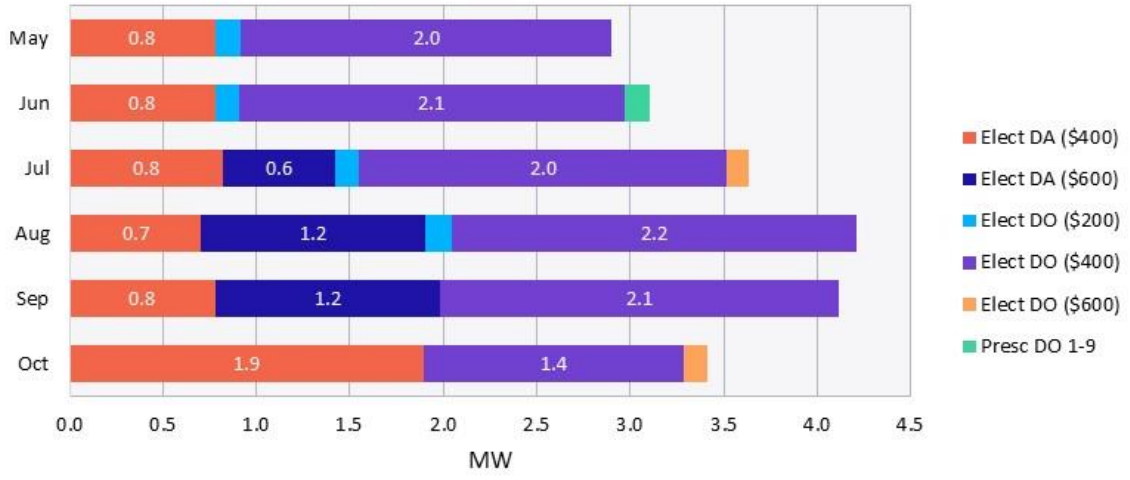
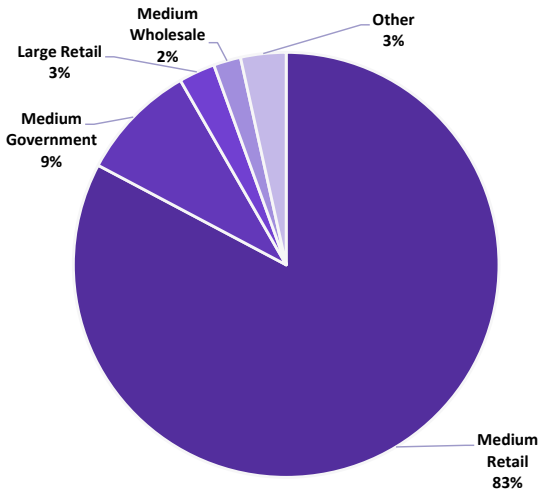


Table 6-3 shows the size and industry distribution of Non-residential enrollment, and the accompanying graph highlights the predominant customer segments in PY2022.

Table 6-3 SDG&E Non-Residential Enrollment

Industry Type	Size Group			Total
	Small	Medium	Large	
1. Agriculture, Mining & Construction	-	-	-	**-**
2. Manufacturing	-	1	1	**2**
3. Wholesale, Transport, Other Utilities	-	3	1	**4**
4. Retail Stores	-	120	4	**124**
5. Offices, Hotels, Finance, Services	-	-	-	**-**
6. Schools	-	-	1	**1**
7. Institutional/ Government	-	13	1	**14**
8. Other/Unknown	-	-	-	**-**
Total	**-**	**137**	**8**	**145**



SDG&E Key Findings

The PY2022 LI analysis has the following key findings for SDG&E's CBP:

- SDG&E implemented two new Elect Products: Elect DA 1-9 Hour and Elect DO 1-9 Hour, each with three price trigger options: $200/MWh, $400/MWh, $600/MWh.
  - SDG&E still offers their previously existing products as Prescribed options, with the following price triggers: $90/MWh (Prescribed DA 11-7 Hour and 1-9 Hour), $115/MWh (Prescribed DO 11-7 Hour), and $125/MWh (Prescribed DO 1-9 Hour).
  - Non-residential DA nominations were primarily split between Elect DA ($400) and Elect DA ($600) products, while Non-residential DO nominations were primarily in the Elect DO ($400) product. Prescribed product options had close to no nominations in PY2022.
- SDG&E's Non-Residential DO improved average delivery performance (65%) compared to PY2021 (30%). However, the Non-Residential DA performance ([redacted]%) dropped significantly compared to PY2021 (25%).
- HE19 (6 PM – 7 PM) is the most dispatched event hour in PY2022, with a combined 1.4 MW and 66 participants dispatched on average.
- SDG&E dispatched a combined total of 6 event days in PY2022. Under the Prescribed product option, SDG&E historically dispatched around 20-30 events per program year, which has $90-$125/MWh price triggers. In PY2022, more aggregators opted for the $400/MWh and $600/MWh price triggers, reducing the resources that qualify for dispatch through the program year.

- SDG&E updated the ex-ante forecast assumptions to incorporate delivery performance based on PY2020 through PY2022 performance to produce modest estimates, given the inconsistent delivery performance over the last three years.
    - We updated the enrollment forecast based on PY2022 nominations and maintained the 2% growth per year from 2023-2027 due to the CBP program improvements proposed by SDG&E and no additional growth from 2027-2033.

SDG&E Ex-Post Analysis

Dispatched Events

We present a summary of the 2022 events for SDG&E's CBP programs by product offering. The Non-residential DA participants experienced a total of three event days (12 event hours) and participated in one product: Elect DA 1-9 Hour ($600). The Non-residential DO participants experienced six event days (21 event hours) and participated in one product: Elect DO 1-9 Hour ($400).

Under the Prescribed product option, SDG&E historically dispatched around 20-30 events per program year, which has $90-$125/MWh price triggers. In PY2022, more aggregators opted for the $400/MWh and $600/MWh price triggers, reducing the resources that qualify for dispatch through the program year.

Table 6-4 below shows the event hours and the number of accounts dispatched on each event day by product offering. For reference, Table 6-2 presents the total monthly enrollment for both programs, comparable to dispatched counts and MW for a system-level event. SDG&E's service territory falls under one Sub-LAP, making all SDG&E dispatched events system-level events.

The average event day is calculated by including all events called in PY2022, regardless of the event hours dispatched. We report impacts for the average event day on the most dispatched hour, HE19.

Table 6-4 SDG&E Dispatched Events

Date	Day of Week	Event Hours (HE)	# Accounts	
			Elect DA 1-9 Hour ($600)	Elect DO 1-9 Hour ($400)
Avg. Event	**-**	**19**	**3**	**63**
Aug 31, 2022	Wednesday	19-20	-	71
Sep 1, 2022	Thursday	19-21	-	61
Sep 2, 2022	Friday	18-21	-	61
Sep 6, 2022	Tuesday	18-21	3	61
Sep 7, 2022	Wednesday	18-21	3	61
Sep 8, 2022	Thursday	18-21	3	61

Load Impact Summary

Next, we present an overall impact summary for PY2022, reporting the average event day for each program. The average event day includes all events dispatched in PY2022 and reports impacts for the most dispatched hour, HE19.

Table 6-5 shows an overall impact summary for PY2022, including:

- Dispatched counts,
- Aggregate level dispatched capacity, load impacts, and delivery performance,
- Per-customer level reference loads, load impacts, and % impacts relative to reference loads.

On average, SDG&E's CBP programs delivered 1.4 MW out of dispatched 3.3 MW, resulting in a 42% delivery performance.

Table 6-5 SDG&E Impacts Summary, Average Event Day PY2022

Program & Product	# Accts	Aggregate (MW)			Per-Customer (kW)		
		Dispatched Capacity	Load Impact	% Delivered	Reference Load	Load Impact	% Impact
Non-Res DA (Elect DA ($600))	3	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Non-Res DO (Elect DO ($400))	63	2.1	1.4	65%	167.1	22.0	13%
Total CBP	**66**	**3.3**	**1.4**	**42%**	**182.3**	**21.6**	**12%**

Figure 6-2, Table 6-6, and Table 6-7 present monthly summaries for each metric (described in more detail in Section 2, Reporting Metrics for Program Performance):

- Nominations – counts and total capacity,
- Dispatched – average counts and capacity for all events dispatched,
- HE19 Dispatched – average counts and capacity for all events dispatched on HE19, and
- Ex-post load impacts – aggregate impacts, delivery performance relative to the overall dispatched capacity, and adjusted delivery performance relative to HE19 dispatched capacity.

Figure 6-2 visually shows how the ex-post load impacts compare to the overall and HE19 dispatched capacities. For both programs, we observe the following:

- Non-residential DA saw a deficient delivery performance in PY2022, dispatching three consecutive events in September under the Elect DA ($600) product.
- Non-residential DO saw improved delivery performance in PY2022, increasing overall delivery performance to 61%, compared to the PY2021 30% delivery performance.

Figure 6-2 SDG&E Monthly Delivery Performance Summary

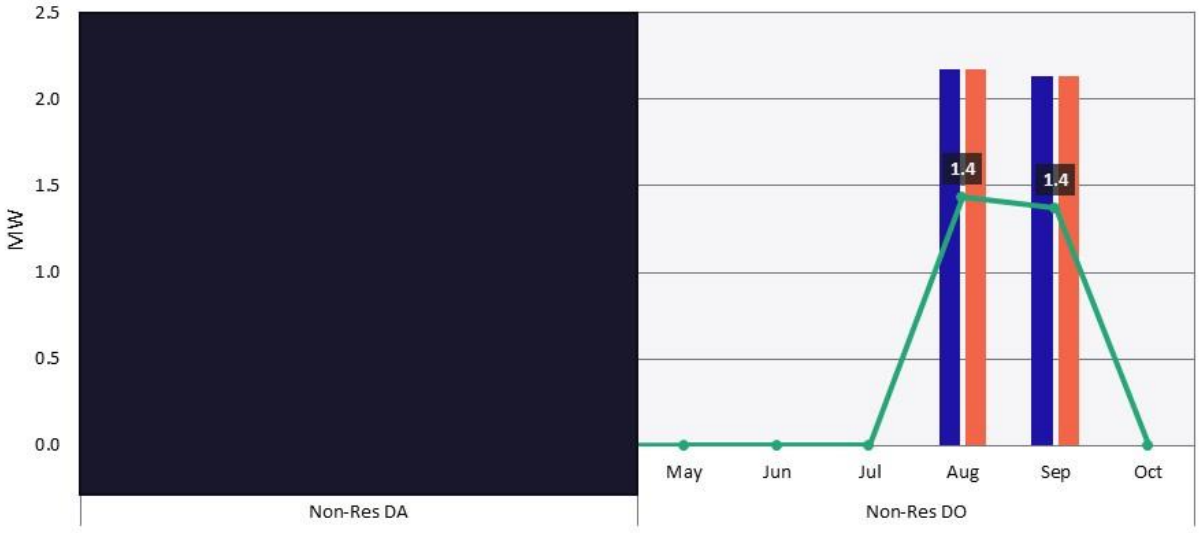


Table 6-6 and Table 6-7 present the monthly averages corresponding to Figure 6-2 for Non-residential DA and Non-residential DO, respectively. The overall aggregate impact for the Non-residential DA participants was [redacted] MW in PY2022, which amounts to a [redacted]% delivery performance. The overall aggregate impact for the Non-residential DO participants was 1.3 MW in PY2022, which amounts to a 61% delivery performance.

Table 6-6 SDG&E Non-Residential DA Monthly Summary

Month	Nominations		Dispatched		HE19 Dispatched		Ex-Post Analysis		
	# Accts	Capacity (MW)	# Accts	Capacity (MW)	# Accts	Capacity (MW)	Impact (MW)	% Delivered	Adj. % Delivered
May	32	0.8	-	-	-	-	-	-	-
June	32	0.8	-	-	-	-	-	-	-
July	48	1.4	-	-	-	-	-	-	-
August	49	1.9	-	-	-	-	-	-	-
September	60	2.0	3	[redacted]	3	[redacted]	[redacted]	[redacted]	[redacted]
October	60	1.9	-	-	-	-	-	-	-
Overall	**47**	**1.5**	**3**	[redacted]	**3**	[redacted]	[redacted]	[redacted]	[redacted]

Table 6-7 SDG&E Non-Residential DO Monthly Summary

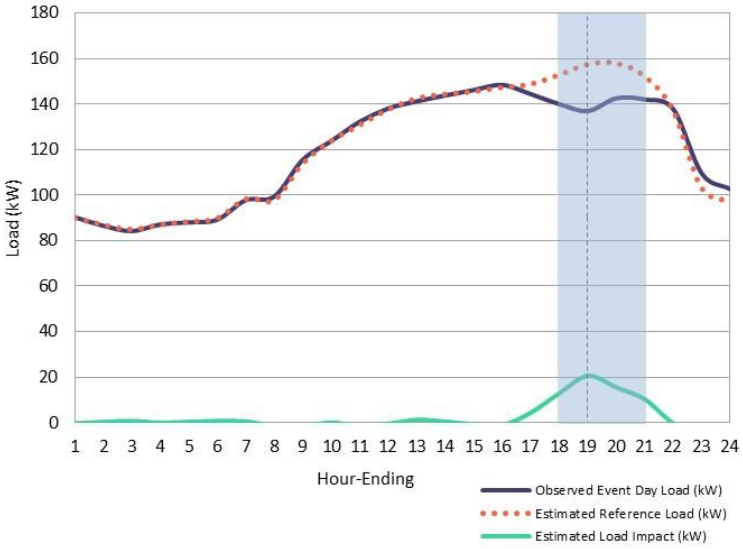
Month	Nominations		Dispatched		HE19 Dispatched		Ex-Post Analysis		
	# Accts	Capacity (MW)	# Accts	Capacity (MW)	# Accts	Capacity (MW)	Impact (MW)	% Delivered	Adj. % Delivered
May	79	2.1	-	-	-	-	-	-	-
June	83	2.1	-	-	-	-	-	-	-
July	84	2.2	-	-	-	-	-	-	-
August	82	2.3	71	2.2	71	2.2	1.4	66%	66%
September	72	2.3	61	2.1	61	2.1	1.4	64%	64%
October	72	1.5	-	-	-	-	-	-	-
Overall	**79**	**2.1**	**63**	**2.1**	**63**	**2.1**	**1.4**	**65%**	**65%**

Hourly Load Impacts

Figure 6-3 and Figure 6-4 illustrate the per-customer hourly profiles of the estimated reference load, observed load, and estimated load impacts (in kW) for SDG&E's CBP programs. The hours highlighted in gray show the hours wherein at least one group is dispatched. The vertical dotted line shows the most dispatched hour, HE19. The data underlying the figures are available in the MS Excel-based Protocol table generators that are included as appendices to this report.

Figure 6-3 SDG&E All Day-Ahead: Hourly Per-Customer Impact, Summer Average Event

Figure 6-4 SDG&E All Day-Of: Hourly Per-Customer Impact, Summer Average Event



Load Impacts By Industry Type

Table 6-8 presents the impacts for an average event day by industry group.[49]

Table 6-8 SDG&E Impacts by Industry[50]

	Industry	# of Accts	Aggregate Impact (MW)		Per-Customer Impact (kW)		% Impact	Temp (F)
			Ref. Load	Impact	Ref. Load	Impact		
DA	Manufacturing	2	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	84
DA	Wholesale, Transport, other utilities	1	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	82
DA	**Total DA**	**3**	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	**83**
DO	Retail stores	50	9.6	1.3	192.5	26.9	14%	84
DO	Institutional/Government	13	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	86
DO	**Total DO**	**63**	**10.5**	**1.4**	**167.1**	**22.0**	**13%**	**85**
Total CBP		**66**	**12.0**	**1.4**	**182.3**	**21.6**	**12%**	**75**

[49] The results are for an average event day. Note that the total for the program does not always exactly equal the total of the individual industry segments. This is because different groups of customers are called for each event, and in some cases, no customers in a segment are called. The average for that segment will reflect only those events where customers in that segment were called. The total program is the average across all events, regardless of which groups of customers are called for each event. Because the total program and the individual segments are averaged across different events, the total program may not exactly match the sum of the individual segments.

[50] The small negative impacts are most likely a modeling artifact resulting from an imperfect quantification of weather effects and/or omitted variable bias. We have no reason to think that customers are actually increasing their load in response to events.

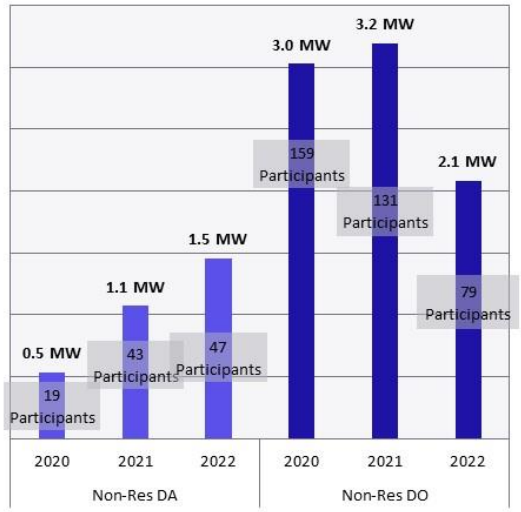
Comparison of Ex-Post Impacts

This section discusses how the PY2022 ex-post load impacts compare to previous years. These comparisons show how the program has performed over time and relative to the most recent forecast.

Figure 6-5 presents SDG&E's average program nominations for PY2020 through PY2022. The Non-residential DA program has steadily grown in both customer enrollments and capacity nominations. The Non-residential DO program, on the other hand, is seeing a decrease in customer enrollments along with fluctuations in capacity nominations.

Table 6-9 below presents **the ex-post load impacts over time**. Note that these impacts are measured based on performance during dispatched events, thus showing a slightly different average dispatched count compared to nomination counts.

Figure 6-5 SDG&E Annual Nominations



For Non-residential DA, we saw a decrease in average dispatched accounts but an increase in aggregate dispatched capacity, indicating that the program dispatched larger participants in PY2022. These large participants, however, did not perform well, giving an overall [redacted]% delivery performance, which is significantly lower compared to previous years.

Non-residential DO, on the other hand, showed a decrease in average dispatched counts and aggregate dispatched capacity. The program also dispatched larger customers, on average. However, these customers performed well in PY2022, giving an overall 65% delivery performance, which is an improvement from PY2021.

Table 6-9 SDG&E: Current v. Previous Ex-Post, Average Summer Event Day

Program	Year	# Accts	Aggregate (MW)			Per-Customer (kW)			Temp (F)
			Dispatched Capacity	Load Impact	% Delivered	Reference Load	Load Impact	% Impact	
Non-Res DA	2020	23	0.6	0.4	71%	121.3	18.0	15%	78
	2021	46	1.1	0.3	25%	110.9	5.8	5%	75
	2022	**3**	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	**83**
Non-Res DO	2020	158	2.9	2.2	74%	115.4	13.8	12%	77
	2021	133	3.4	1.0	30%	103.0	7.8	8%	76
	2022	**63**	**2.1**	**1.4**	**65%**	**167.1**	**22.0**	**13%**	**85**

Table 6-10 below presents the **PY2022 ex-post impacts compared to PY2021 ex-ante impacts**. Note that the ex-ante impacts forecast performance for a system-level dispatch. With the implementation of Elect products in PY2022, SDG&E's dispatched events are no longer always system-level events. Thus, the average summer event day is not necessarily a straightforward comparison to the ex-ante estimates. Both programs show the ex-post average summer event to have dispatched and delivered fewer customers and capacity than last year's ex-ante estimates.

Table 6-10 SDG&E Current Ex-Post (Average Summer Event Day) v. Prior Ex-Ante (SDG&E 1-in-2, Typical Event Day, 2022)

Program	Estimate	# of Accts	Aggregate Impact (MW)		Per-Customer Impact (kW)		% Impact	Temp (F)
			Ref. Load	Impact	Ref. Load	Impact		
Non-Res DA	PY2021 Ex-Ante	105	10.4	2.3	98.7	22.0	22%	82
	Current Ex-Post	**3**	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	**83**
Non-Res DA	PY2021 Ex-Ante	208	20.2	3.5	97.2	16.9	17%	81
	Current Ex-Post	**63**	**10.5**	**1.4**	**167.1**	**22.0**	**13%**	**85**

SDG&E Ex-Ante Analysis

Enrollment and Load Impact Summary

Starting is 2022, SDG&E added two Elect products with three price trigger options: $200/MWh, $400/MWh, or $600/MWh. SDG&E will continue to offer their existing products, referring to them as Prescribed products. Both Non-residential DA and DO programs will have three products: (1) Prescribed 11-7 Hour, (2) Prescribed 1-9 Hour, and (3) Elect 1-9 Hour.

Note that SDG&E is currently implementing a Residential CBP pilot, limiting the number of residential enrollments due to system limitations. The Residential CBP pilot evaluation is not included in this evaluation report.

SDG&E updated the enrollment forecast to align with PY2022 nominations after the addition of the two CBP Elect products. For a 2023 August peak day, SDG&E forecasts 0.5 MW and 1.3 MW load impacts the Non-residential DA and DO[51] programs, respectively. Figure 6-6 shows SDG&E's Non-residential CBP enrollment and load impact forecast for an August peak day under the SDG&E 1-in-2 weather scenario.

[51] SDG&E no longer offers the Technical Incentives (TI) program, thus an additional forecast that includes TI enrollment growth is no longer necessary.

Figure 6-6 SDG&E CBP Enrollment and Load Impact Forecast (SDG&E 1-in-2, August Peak Day)

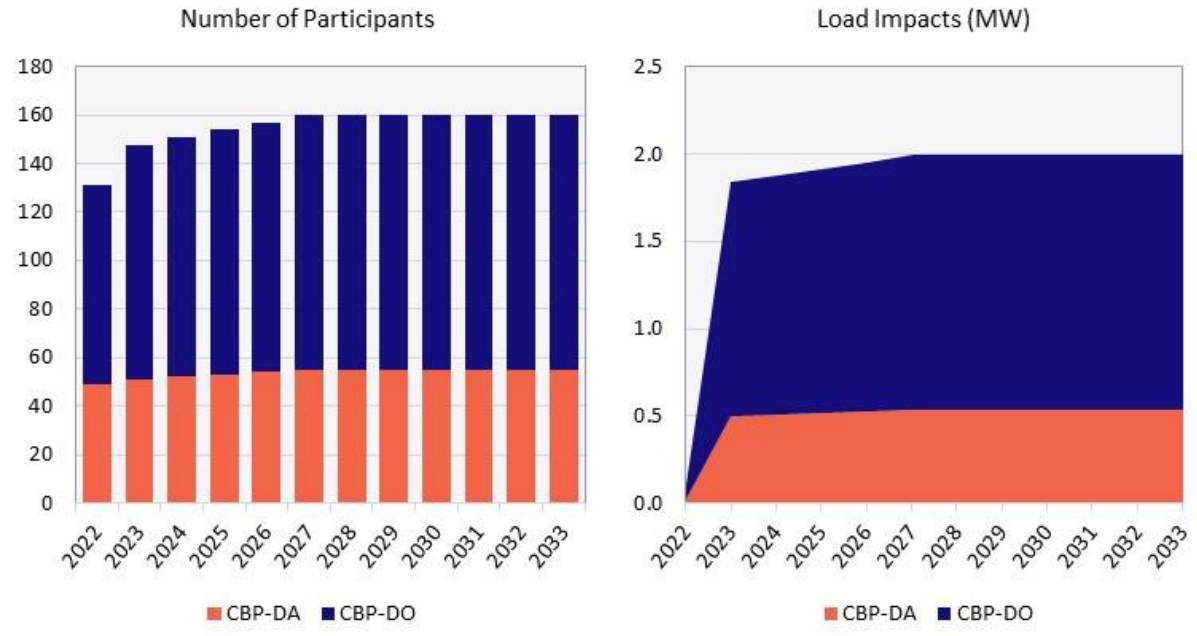


Table 6-11 summarizes the average RA window load impact forecasts for the Non-residential DA and DO programs on an August peak day in 2022. The table includes the per-customer, aggregate, and corresponding percent impacts under the utility and CAISO 1-in-2 and 1-in-10 weather scenarios. We assume constant per-customer average impacts across the weather scenarios and across months within a program year. The varying percent impacts are due to the reference load's response to each weather scenario.

Table 6-11 SDG&E Non-Residential: RA Window Ex-Ante Impacts, 2022

Program	# of Accts	Per Customer Impact (kW)	Aggregate Impact (MW)	Percent Impact (%)			
				Utility Peak		CAISO Peak	
				1-in-2	1-in-10	1-in-2	1-in-10
Non-Res Day Ahead	51	9.7	0.5	7.5%	7.3%	7.5%	7.4%
Non-Res Day Of	97	13.9	1.3	12.6%	12.4%	12.6%	12.5%

Forecast Assumptions

This section discusses the assumptions used to develop the Non-residential DA and DO forecasts. Both forecasts use a combination of the following:

- **Delivery Performance** – We calculated program-level delivery performance based on PY2020 through PY2022 performance to produce modest estimates, given the inconsistent delivery performance over the last three years. Table 6-12 shows the delivery performance assumed for each program, 33% and 56% for Non-Residential DA and DO, respectively. We applied the product-level delivery performances to capacity nominations to estimate maximum ex-ante load impacts.

Table 6-12 SDG&E Delivery Performance

Year	Non-Res DA	Non-Res DO
2020	71%	74%
2021	25%	30%
2022	[redacted]%	62%
Average	**33%**	**56%**

- **Enrollment Growth** – We updated the enrollment forecast based on PY2022 nominations and assumed a 2% growth per year from 2023-2027 due to the CBP program improvements proposed by SDG&E and no additional growth from 2027-2033.
- **Impact Degradation Rate** – we developed assumptions to represent how customers can maintain impacts throughout events called for longer durations, similar to the 5-hour RA window. The approach used to develop these assumptions is discussed in Section 3 Impact Degradation Across the RA Window. For SDG&E, we used PY2020-22 historical data to update the Impact Degradation Rate. Table 6-13 shows the estimated shape of the impacts as a percent of the maximum load impact for each program and product. Note that both 11-7 Hour[52] products show zero impacts on HE20-HE21 since these products are not available for these hours.

Table 6-13 SDG&E CBP: RA Window Shape of Impacts

Season	Program	Percent of Maximum Impact					
		HE17	HE18	HE19	HE20	HE21	Overall RA
Day Ahead	DA 11-7 Hour	75%	100%	99%	0%	0%	55%
	DA 1-9 Hour	100%	70%	67%	56%	45%	68%
Day Of	DO 11-7 Hour	64%	100%	87%	0%	0%	50%
	DO 1-9 Hour	100%	82%	60%	68%	77%	77%

Figure 6-7 and Figure 6-8 show the SDG&E's Non-residential DA and DO per-customer estimated reference load, estimated event day load, and resulting load impact estimates for an August peak day in 2023 for the SCE 1-in-2 weather condition. The hours highlighted in blue show the RA window, 4 PM to 9 PM.

[52] Used PY2019-2021 historical data. Not updated in PY2022 due to no events dispatched for the 11-7 Hour products.

Figure 6-7 SDG&E Non-Residential Day Ahead: Hourly Per-Customer Load (SDG&E 1-in-2, August Peak Day, 2023)

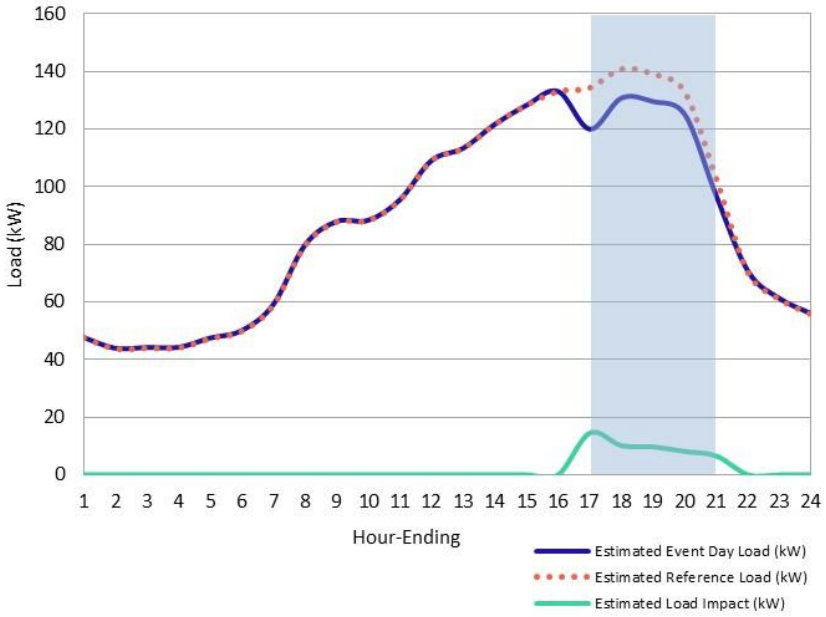
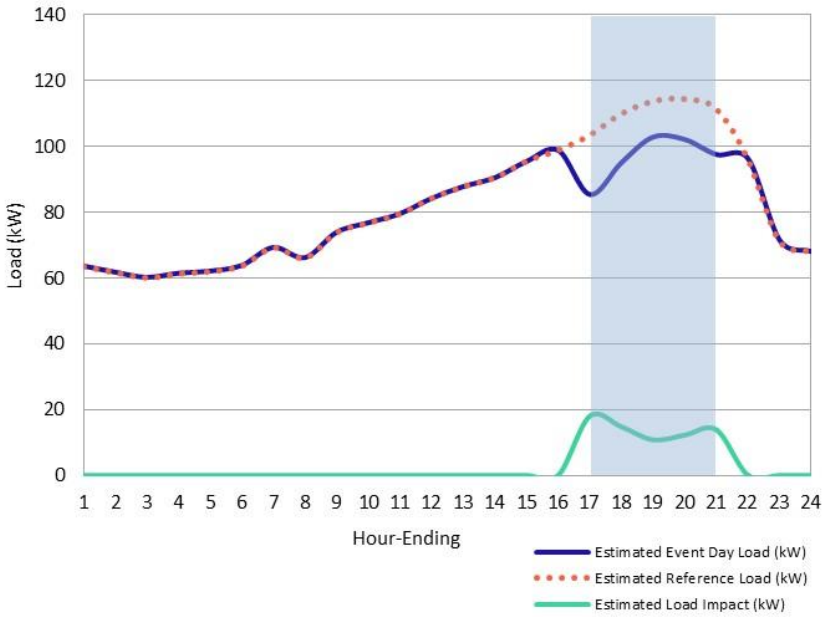


Figure 6-8 SDG&E Non-Residential Day Of: Hourly Per-Customer Load (SDG&E 1-in-2, August Peak Day, 2023)



Comparison of Ex-Ante Impacts

This section discusses how the PY2022 ex-ante load impacts compare to:

- PY2022 (current) ex-post load impacts – demonstrates the effect of adjusting the impacts and reference loads to reflect the various weather scenarios, and
- PY2021 (previous) ex-ante load impact – demonstrates the updates to the load impact forecast using current program performance.

Table 6-14 compares **the current ex-post estimates with the current ex-ante estimates**. The current ex-post estimates show average load impacts for PY2022 dispatched events, while the current ex-ante estimates show how the program would have performed in a 1-in-2 weather year for a system-level event. Note that the ex-ante estimates in this comparison are for a 2022 Typical event day on the maximum impact hour (HE17), which is most comparable to the ex-post average event day reporting hour HE19. The comparison shows minor differences for Non-Residential DO since SDG&E dispatched the majority of nominated customers. However, we see major differences for Non-Residential DA, given the very low PY2022 performance and the average customer size is smaller for the overall group of nominated customers.

Table 6-14 SDG&E: Current Ex-Ante (SDG&E 1-in-2, 2022 Typical Event Day, Maximum Impact) v. Current Ex-Post (Average Summer Event, HE19)

Program	Estimate	# of Accts	Aggregate Impact (MW)		Per-Customer Impact (kW)		% Impact	Temp (F)
			Ref. Load	Impact	Ref. Load	Impact		
Day Ahead	**Current Ex-Ante**	**49**	**6.6**	**0.1**	**135.2**	**1.3**	**1.0%**	**86**
	Current Ex-Post	3	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	83
Day Of	**Current Ex-Ante**	**82**	**8.4**	**1.6**	**102.7**	**19.8**	**19.3%**	**85**
	Current Ex-Post	63	10.5	1.4	167.1	22.0	13.2%	85

Table 6-15 compares **the previous ex-ante forecast to the current ex-ante forecast, both for the year 2022**. This comparison demonstrates how the program forecast was updated since last year. These changes are the following:

- The ex-ante forecast was updated based on PY2022 nominations after the addition of CBP Elect products, which is significantly lower than the previous PY2021 aggregator outlook.
- Per-customer performance was also updated based on PY2020-2022 performance, which is slightly lower than PY2021 assumptions.

Table 6-15 SDG&E: Current v. Prior Ex-Ante (SDG&E 1-in-2, August Peak Day, 2023), RA Window

Program	Estimate	# of Accts	Aggregate Impact (MW)		Per-Customer Impact (kW)		% Impact	Temp (F)
			Ref. Load	Impact	Ref. Load	Impact		
Day Ahead	**PY2022 Forecast**	**51**	**6.6**	**0.5**	**130.0**	**9.7**	**7%**	**83**
	PY2021 Forecast	107	10.6	2.4	98.7	22.0	22%	82
Day Of	**PY2022 Forecast**	**97**	**10.7**	**1.3**	**110.5**	**13.9**	**13%**	**82**
	PY2021 Forecast	210	20.4	3.6	97.2	16.9	17%	81

SDG&E Event Day Load Impacts

Table 6-16 and Table 6-17 show the average event-hour impacts for the two CBP products dispatched in PY2022, including:

- Dispatched counts,
- Aggregate level dispatched capacity, load impacts, and delivery performance,
- Per-customer level reference loads, load impacts, and % impacts relative to reference loads, and
- Average event window temperature.

Table 6-16 SDG&E Elect Day Ahead 1 PM to 9 PM Product ($600/MWh Trigger): Impacts by Event

Event Day	Event Win-dow	# Accts	Aggregate (MW)			Per-Customer (kW)			Temp (F)
			Dispatched Capacity	Load Impact	% Delivered	Reference Load	Load Impact	% Impact	
Avg. Event	**19**	**3**	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	**83**
Sep 6, 2022	18-21	3	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	82
Sep 7, 2022	18-21	3	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	86
Sep 8, 2022	18-21	3	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	85

Table 6-17 SDG&E Elect Day Of 1 PM to 9 PM Product ($400/MWh Trigger): Impacts by Event

Event Day	Event Win-dow	# Accts	Aggregate (MW)			Per-Customer (kW)			Temp (F)
			Dispatched Capacity	Load Impact	% Delivered	Reference Load	Load Impact	% Impact	
Avg. Event	**19**	**63**	**2.14**	**1.38**	**65%**	**167.1**	**22.0**	**13%**	**85**
Aug31,2022	19-20	71	2.17	1.32	61%	151.2	18.5	12%	85
Sep 1, 2022	19-21	61	2.14	1.28	60%	164.6	21.0	13%	86
Sep 2, 2022	19-20	61	2.14	1.54	72%	172.1	25.2	15%	87
Sep 6, 2022	18-21	61	2.14	1.14	53%	165.2	18.7	11%	85
Sep 7, 2022	18-21	61	2.14	1.10	52%	173.4	18.1	10%	89
Sep 8, 2022	18-21	61	2.14	1.07	50%	168.1	17.6	10%	86

Additional Event Day Impacts for TA/TI and Auto DR Participants

SDG&E did not have any TA/TI or AutoDR participants in PY2022.

A

APPENDICES

PG&E CBP Ex-Post Table Generator

PG&E CBP Ex-Ante Table Generator

SCE CBP Ex-Post Table Generator

SCE CBP Ex-Ante Table Generator

SDG&E CBP Ex-Post Table Generator

SDG&E CBP Ex-Ante Table Generator

B

MODEL VALIDITY

We selected and validated regression models during our optimization process. The regression models are designed to:

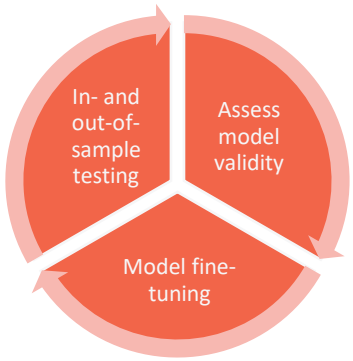
- Accurately predict the actual participant load on event days (addressed by in-sample testing), and
- Accurately predict the reference load or participant usage on event days in the absence of an event (addressed by out-of-sample testing).

As described in Section 2, we selected each participant/segment's best model through a three-part optimization process, consisting of the following steps: (1) In-sample and out-of-sample testing; (2) assessing model validity; and (3) model fine-tuning.

This section presents metrics related to our optimization process, specifically:

- Selection of event-like days used for out-of-sample testing, and
- Metrics from in-sample and out-of-sample tests from the final models of the ex-post analysis, and
- Comparison load graphs.

Figure B-1 Optimization Process



Selecting Event-Like Days

To select similar non-event days, we used a Euclidean Distance matching approach. Euclidean distance is a simple and highly effective way of creating matched pairs. We calculated a Euclidean distance metric defined as the square root of the sum of the squared differences between the matching variables to determine how close event day temperature is to a potential event-like day. Any number of relevant variables could be included in the Euclidean distance. The equation below shows an example of a Euclidean distance metric, and Table B-1 summarizes the variables included in the ED metric used by IOU and customer class.

$$ED = \sqrt{(var\_1_{event} - var\_1_{non-event})^2 + \cdots + (var\_n_{event} - var\_n_{non-event})^2}$$

Table B-1 ED Metrics by Program

IOU/Customer Class	Metric Variables
PG&E Residential	n/a
PG&E Non-Residential	Temp17, Temp19, Temp20, Temp21
SCE Non-Residential	Minimum Temp, Maximum Temp, Mean(Temp16, Temp17, Temp18); segmented by season
SDG&E Non-Residential	Mean(Temp7-Temp11), Mean(Temp14-Temp19), Temp15

In Figure B-2 to Figure B-5, we compare the distributions of the average and maximum daily temperatures of event days and event-like days for each IOU and customer class. The event-like day selection was made at this granularity, i.e., each IOU and customer class combination has the same event and event-like dates.

Both PG&E and SCE have a selection of event-like days with comparable average and maximum temperature distributions to PY2022 events. However, SDG&E's set of event-like days shows less comparable temperature distributions. SDG&E dispatched only six events in PY2022, and all six events were also the hottest days of the season. This scenario left a small pool of available non-event days with comparable weather.

Figure B-2 PG&E Temperatures of Event Days v. Event-Like Days

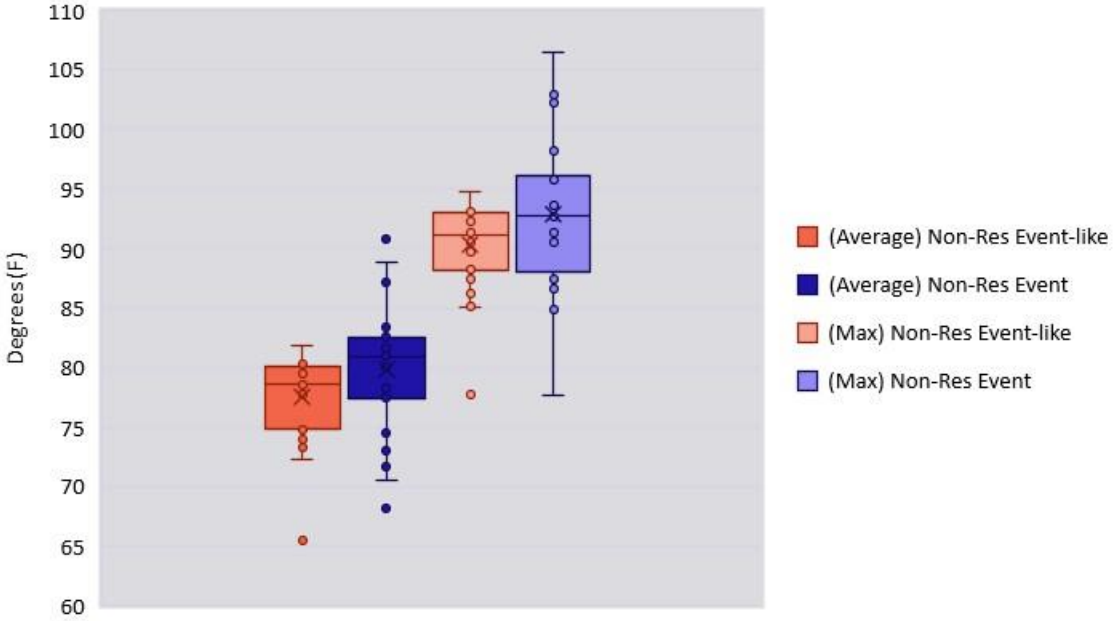


Figure B-3 SCE Temperatures of Event Days v. Event-Like Days – Summer

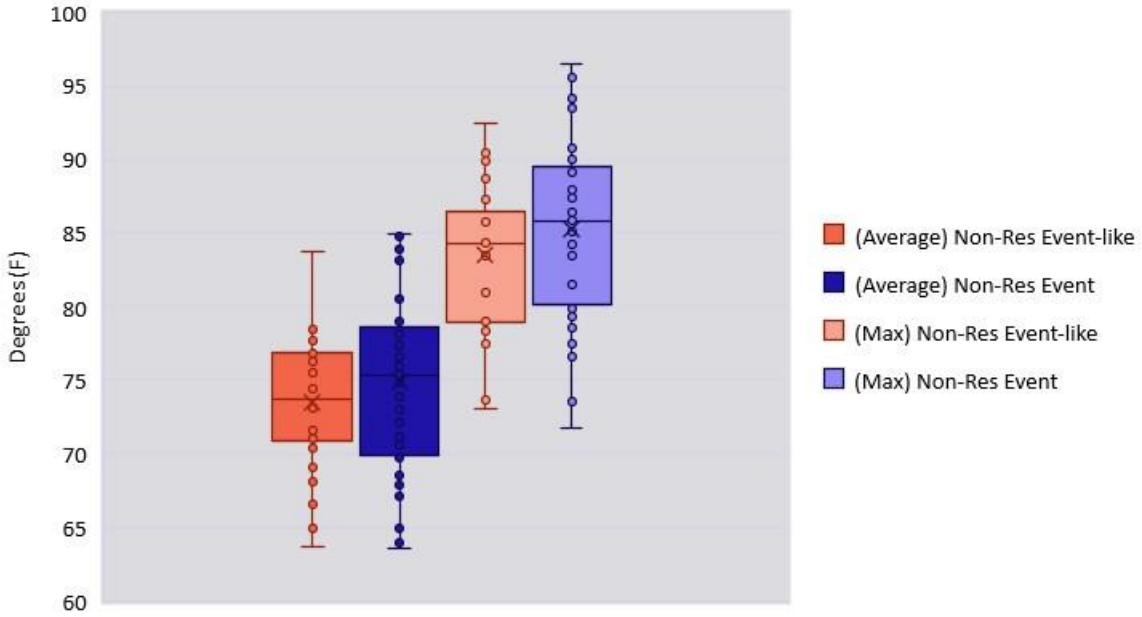


Figure B-4 SCE Temperatures of Event Days v. Event-Like Days – Non-Summer

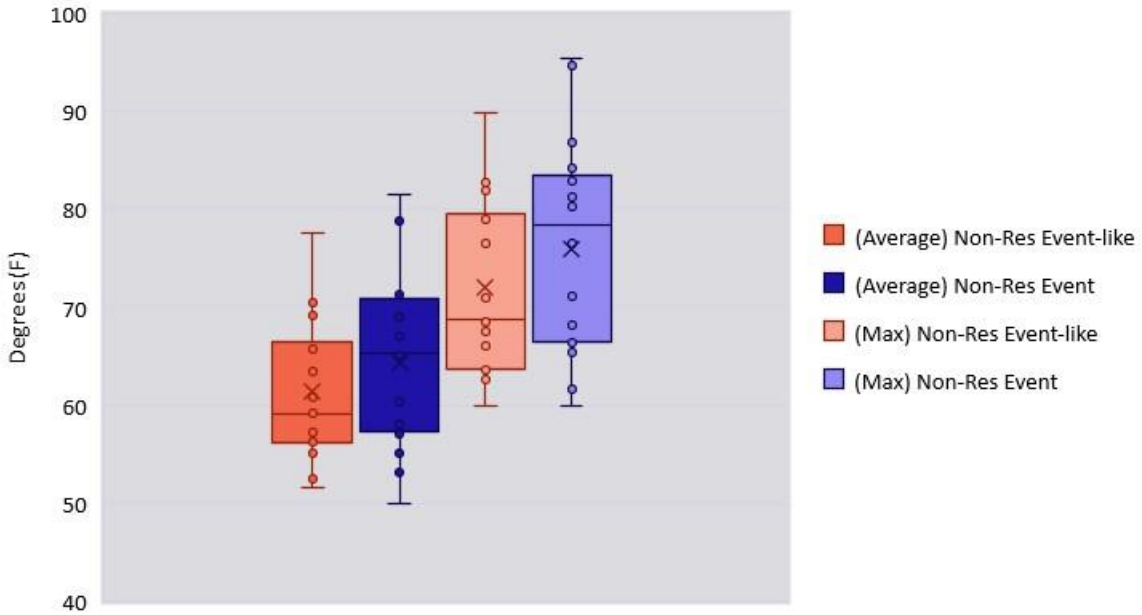
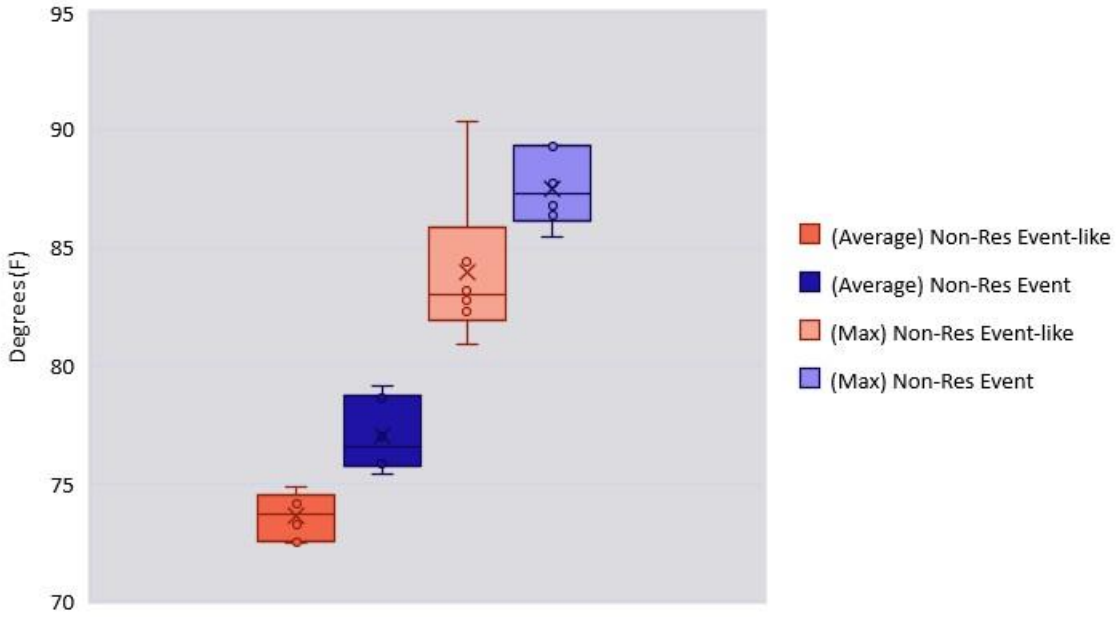


Figure B-5 SDG&E Temperatures of Event Days v. Event-Like Days



Optimization Process and Results

Next, we present the metrics produced by our optimization process for in-sample and out-of-sample testing. To perform each test, we used the following approach:

- **In-sample test.** We fitted each candidate model to the entire data set and used the results of these fitted models to predict the usage on CBP event days. The models should be able to accurately predict customers' actual consumption for these days, having controlled for the impacts of the event hours. We assessed the accuracy and bias of the predictions by calculating the mean absolute percent error (MAPE) and mean percent error (MPE), respectively. We refer to these metrics as the in-sample MAPE and MPE.
- **Out-of-sample test.** We fitted each candidate model to the data set excluding event-like days, and used the results of these fitted models to predict the usage on event-like days. We similarly assessed the accuracy and bias of the event-like day predictions by calculating the MAPE and MPE, which we refer to as the out-of-sample MAPE and MPE.

These two tests resulted in several in-sample and out-of-sample metrics. To determine the best model for each segment in terms of its ability to predict both the reference load and the actual load for each participant with accuracy and limited bias, we combined the two tests into a single metric as follows:

$$\boldsymbol{metric_{ic}} = (0.4 * MAPE_{in}) + (0.4 * MAPE_{out}) + \left(0.1 * abs(MPE_{in})\right) + (0.1 * abs(MPE_{out}))$$

Where,

$$MAPE = \frac{100\%}{n}\sum_{h=1}^{n}\left|\frac{Actual_h - Estimate_h}{Actual_h}\right|, \qquad MPE = \frac{100\%}{n}\sum_{h=1}^{n}\frac{Actual_h - Estimate_h}{Actual_h}$$

Once we had a single metric for each candidate model for each participant, we selected the best model for each participant by choosing the model specification with the smallest overall metric. The optimization process metrics are shown in the following tables and figures.

Table B-2 presents the weighted average MAPE and MPE for each IOU and program's final set of programs. Most MAPE values are below 5%, indicating high accuracy. MPE values very close to zero, indicating low levels of bias. SDG&E's Non-residential DA shows high out-of-sample MAPE (above 11%), resulting from very low participant counts with highly variable loads.

Table B-2 Weighted Average MAPE and MPE by Utility and Program

IOU	Program	Out-of-Sample		In-Sample	
		MAPE	MPE	MAPE	MPE
PG&E	Residential DA	-	-	-	-
	Non-Residential DA	1.24%	0.49%	1.15%	0.08%
SCE	Non-Res DA	1.55%	0.39%	4.31%	0.29%
	Non-Res DO	0.36%	-0.14%	1.29%	0.31%
SDG&E	Non-Residential DA	11.54%	-3.93%	0.00%	0.00%
	Non-Residential DO	1.86%	-0.20%	0.00%	0.00%

Visual inspection can also be a simple but highly effective tool. Figure B-6 to Figure B-8 present the average event-like day predicted loads (dotted lines) and actual loads (solid lines) from the in-sample and out-of-sample tests by IOU and program. Due to confidentiality, SCE non-summer loads are not shown below.

During the inspection, we looked for specific aspects of the predicted and reference load shapes to tell us how well the models performed. For example,

- We checked to ensure that the reference load is closely aligned with the actual and predicted loads during the early morning and late evening hours when there is likely to be little effect from the event. Large differences can indicate a problem with the reference load, either over- or under-estimating usage in the absence of the event.
- We closely examined the reference load for odd increases or decreases in the load that could indicate an effect not correctly captured in the models. If we found such an increase or decrease, we investigated the cause and attempted to control for the effect in the models.
- We also looked for bias, both visually and mathematically. Bias is the consistent over- or under-prediction of the actual load. We may see temperature-related bias, under-predicting on hot days, and over-predicting on cool days. We have also seen bias that is time-based, over-predicting at the beginning of the year and under-predicting at the end of the year. Identification of bias and its source often allows us to adjust the models to capture and isolate the bias-inducing effects within the model specification.

The figures below show predicted loads very close to the actual loads, which visually tells us that, on average, the customer-specific regression models do a good job estimating what customer loads would be like on event-like days therefore, can produce accurate reference loads. SDG&E's Non-residential DA, similar to MAPE metrics shown above, show less accurate predictions likely resulting from very low participant counts with highly variable loads.

Figure B-6 PG&E Actual and Predicted Loads, Non-Residential

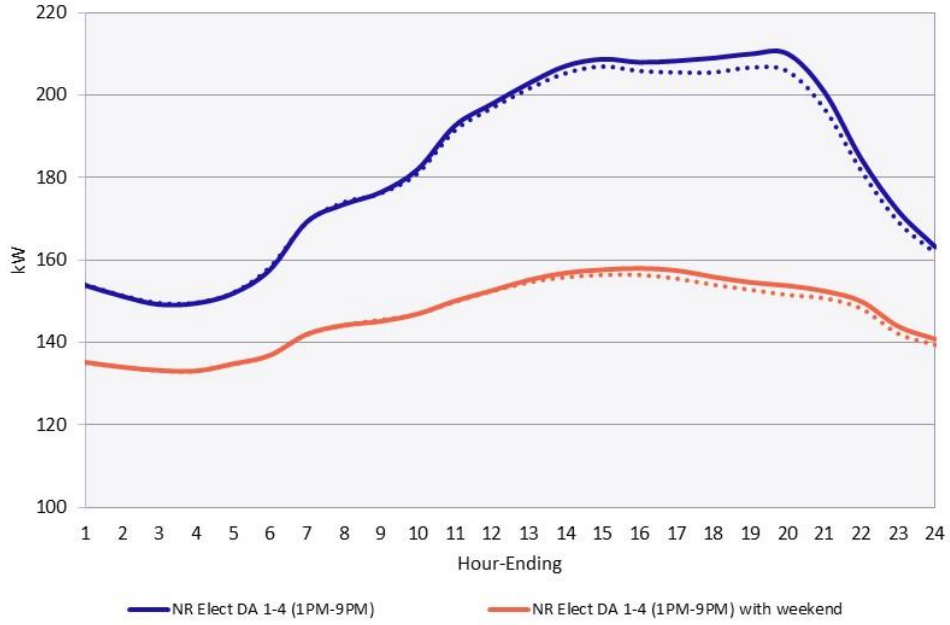


Figure B-7 SCE Actual and Predicted Loads

Figure B-8 SDG&E Actual and Predicted Loads

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