AEG
APPLIED ENERGY GROUP

PY2022 LI Evaluation of California Capacity Bidding Programs

Date: May 2, 2023

Prepared for: 2023 DRMEC Load Impact Workshop

Agenda

Program Descriptions

- Overall Description
- Descriptions by IOU

Program Results by IOU

- Monthly Nominations
- Dispatch Summary
- Ex-Post Load Impacts
- Ex-Ante Forecast Assumptions
- Ex-Ante Load Impacts

Key Findings

- Statewide Summaries

Program
Descriptions
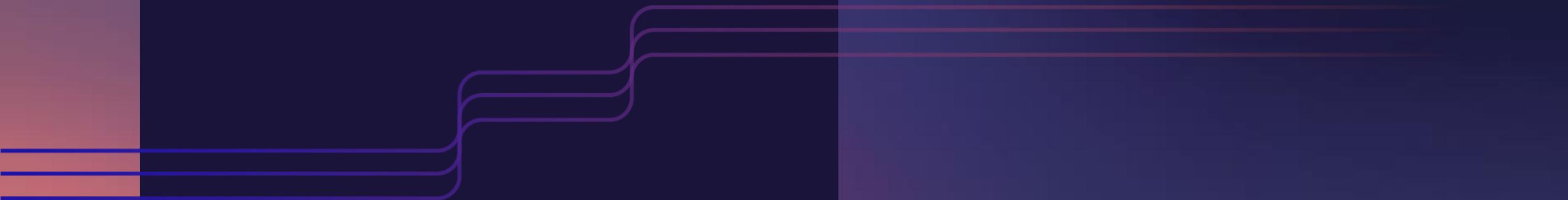
Program Description

Program Basics

- Statewide aggregator-managed DR program offered by PG&E, SCE, and SDG&E
- Report definition of "program" is <u>IOU + Customer Class + Notification Type</u>

Aggregator Responsibilities

- Recruitment and contracting with eligible customers,
- Monthly resource nominations to IOU programs,
- Customer/resource delivery to dispatched events,
- Customer disbursement of program incentives.

Capacity Payments

- Aggregators receive monthly capacity payments based on nominated load + energy payments based on kWh delivered reductions during events.
- Capacity payments may be adjusted based on performance.
- Aggregators receive the full monthly capacity payment according to their nominations if no events are dispatched for that month.

Program Descriptions by IOU

	PG&E	SCE	SDG&E		
Active Programs	Residential Day Ahead Non-Residential Day Ahead	Non-Residential Day Ahead Non-Residential Day Of	Non-Residential Day Ahead Non-Residential Day Of		
Products	Prescribed DA Elect DA Elect+ DA	DA 1-6 Hour DO 1-6 Hour	Prescribed	DA	11-7 Hour 1-9 Hour
				DO	11-7 Hour 1-9 Hour
			Elect	DA	1-9 Hour
				DO	1-9 Hour
Dispatch Window	1 PM — 9 PM	3 PM — 9 PM	11 AM — 7 PM or 1 PM — 9 PM		
Event Trigger	CAISO Market Awards	CAISO Market Awards	CAISO Market Awards		
Eligible Days	May — October non-holiday weekdays, option for weekends	Year-Round non-holiday weekdays	May — October non-holiday weekdays		
Event duration	1-4 hours, 2-6 hours, 1-8 hours or 1-24 hours	1-6 hours	2-4 hours		
Event day limit	6 events per month	5 events per month	6 events per month		
Event hour limit	30 hours per month	30 hours per month	24 hours per month		

Internal

PG&E
Programs

Key Definitions: Nomination v. Dispatch

|	Nomination (July)	Dispatch (July Event 1) SubLAP 2; HE20	Dispatch (July Event 2) SubLAP 1 & 3; HE20-HE21
Aggregator 1	Resource 1 (SubLAP 1)		Resource 1 (SubLAP 1)
	Resource 2 (SubLAP 2)	Resource 2 (SubLAP 2)	
	Resource 3 (SubLAP 3)		Resource 3 (SubLAP 3)
Aggregator 2	Resource 4 (SubLAP 2)	Resource 4 (SubLAP 2)	
	Resource 5 (SubLAP 3)		Resource 5 (SubLAP 3)
Aggregator 3	Resource 6 (SubLAP 2)	Resource 6 (SubLAP 2)	
Aggregator 4	Resource 7 (SubLAP 1)		Resource 7 (SubLAP 1)
	Resource 8 (SubLAP 2)	Resource 8 (SubLAP 2)	
	Resource 9 (SubLAP 3)		Resource 9 (SubLAP 3)

Internal

PG&E Monthly Nominations

Month	Non-Residential DA	
	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

Average Summer Nominations by Program Year

Internal
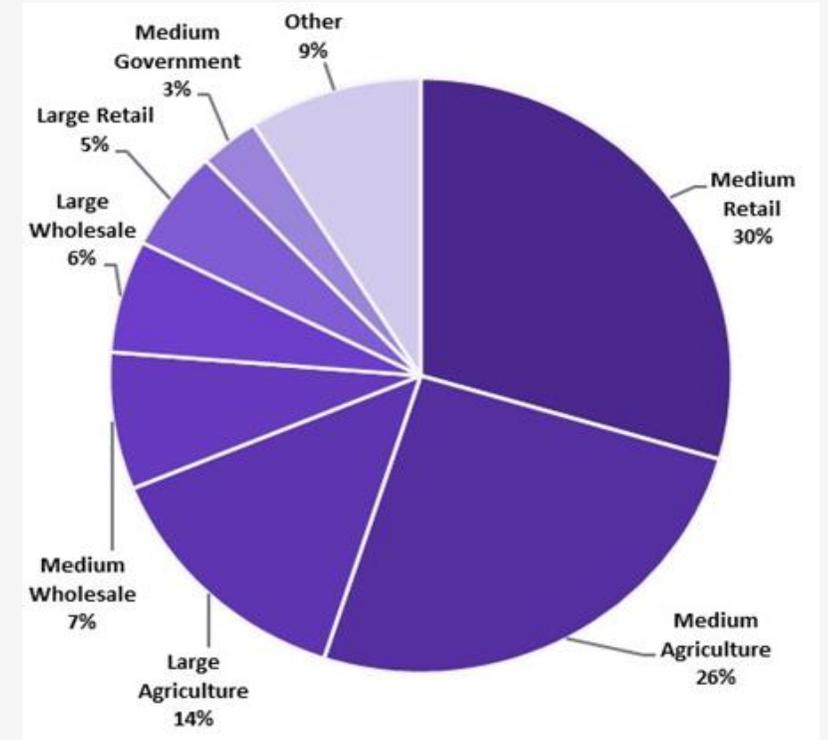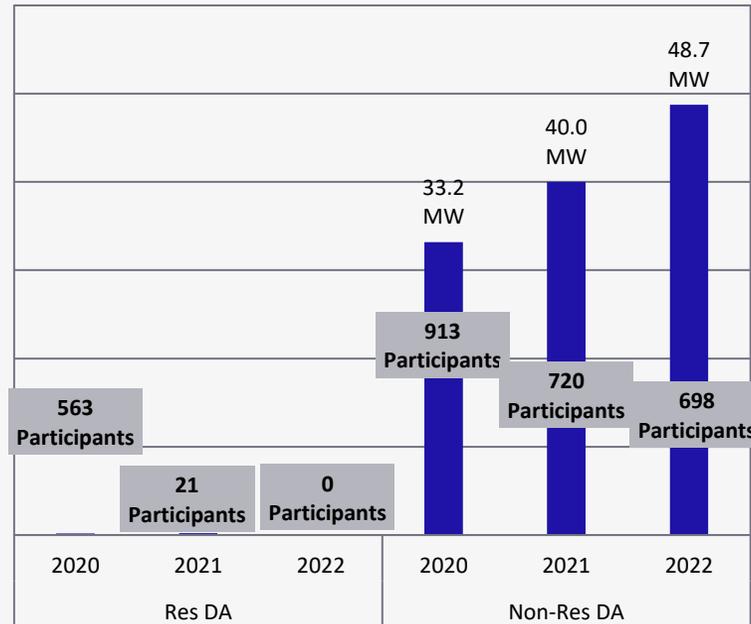
PG&E Dispatch Summary
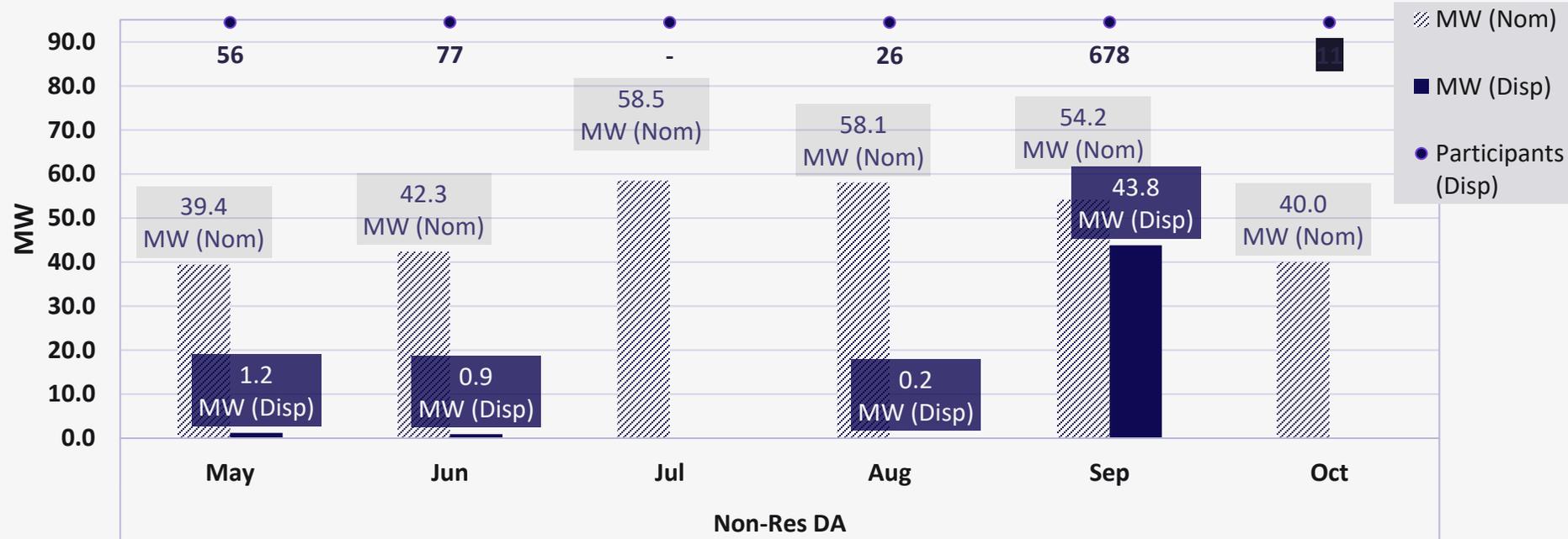
Month	CBP Event		Test Event	
	Total Event Days	Total Event Hours	Total Event Days	Total Event Hours
May	1	4	1	2
June	7	27	1	2
July	-	-	1	3
August	3	3	1	2
September	6	22	-	-
October	2	2	1	3
Total Summer	**19**	**58**	**5**	**12**

Internal

Average Event Day

PG&E

|	HE14	HE15	HE16	HE17	HE18	HE19	HE20	HE21
Event 1								
Event 2						▉		
Event 3						▉	▉	
Event 4						▉		▉
Event 5								▉
Event 6				▉	▉	▉		
Event 7					▉	▉		
Event 8							▉	
Event 9								▉
Event 10			▉					
Event 11						▉		
Event 12						▉	▉	
Event 13							▉	
Event 14								▉
Event 15						▉	▉	▉

*Shaded blocks represent event hours dispatched.

**HE19 is the reporting hour.

Non-Res DA

Internal

Key Definitions: Delivery Performance v. Adjusted Delivery Performance

	Dispatched MW	HE19 Dispatched	HE14	HE15	HE16	HE17	HE18	HE19	HE20	HE21
Event 1	7.0									
Event 2	24.4	Yes						■		
Event 3	24.7	Yes						■	■	
Event 4	0.9	Yes						■		■
Event 5	10.5									■
Event 6	11.0	Yes				■	■	■		
Event 7	11.0	Yes					■			
Event 8	9.3								■	
Event 9	11.0								■	■
Event 10	11.0				■					
Event 11	2.3	Yes						■		
Event 12	0.1	Yes						■	■	
Event 13	5.8								■	
Event 14	9.3								■	■
Event 15	0.1	Yes						■	■	■
Total Dispatch MW	138.5									
HE19 Dispatch MW	92.6									

PG&E Ex-Post Load Impacts
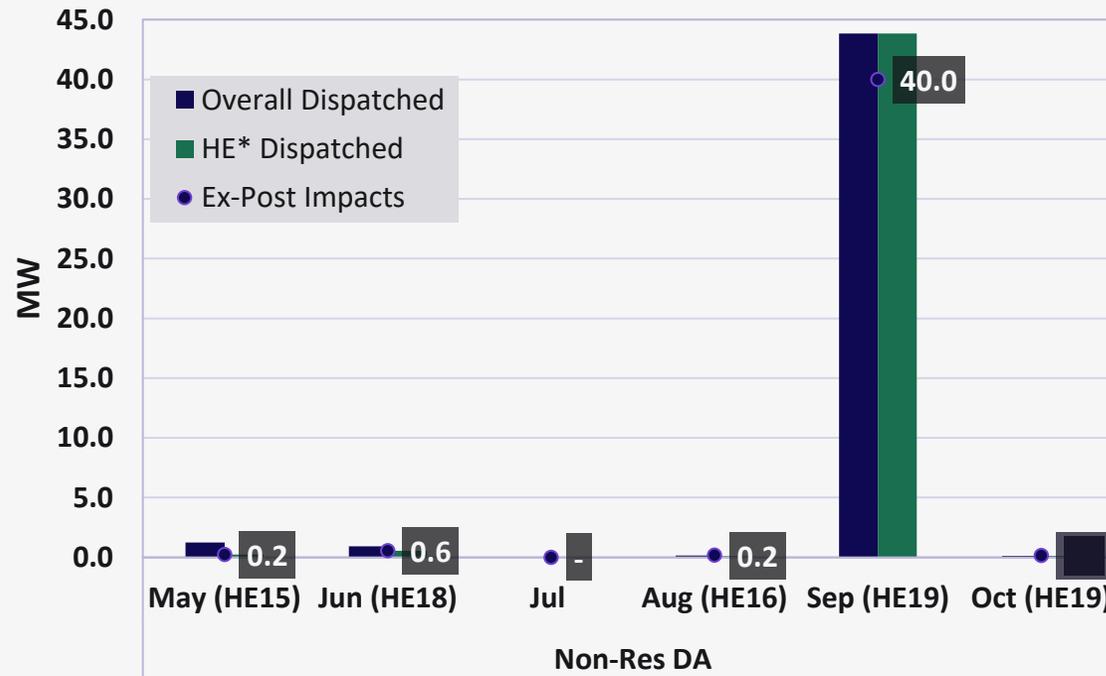
Month	HE	% Delivered	Adj % Delivered
May	15	19%	102%
Jun	18	61%	100%
Jul	-	-	-
Aug	16	107%	199%
Sep	19	91%	91%
Oct	19	108%	108%

Program	Month	Ex-Post Estimate (MW)	Dispatched		HE19 Dispatched	
			MW	% Delivered	MW	Adj % Delivered
	Avg. Event (2022)	28.0	31.3	89%	31.1	90%
Non-Res DA	Avg. Event (2021)	13.0	13.5	96%	12.4	105%
	Avg. Event (2022)	10.0	15.6	64%	-	-

Internal

PG&E PY2021 Ex-Ante (For 2022) and current Ex-Post

| Program | Estimate | # of Accounts | Aggregate (MW) | | Per-Customer (kW) | | % Impact |
			Impact	Ref. Load	Impact	Ref. Load	
Res DA*	**PY2021 Ex-Ante**	4,357	2.7	0.9	0.6	0.2	32%
	Current Ex-Post	-	-	-	-	-	-
Non-Res DA	**PY2021 Ex-Ante**	1,505	37.1	214.5	24.6	142.5	17%
	Current Ex-Post	475	28.0	71.7	58.9	150.9	39%

*Shown for 2022 Typical event day due to zero forecasted August 2022 enrollments.

Internal

PG&E Ex-Ante Forecast Assumptions

|	Res DA	Non-Res DA
Program Changes	No program changes impacting forecast assumptions	Implemented $650/MWh bid cap, expected more reliable MW nominations
Nomination Forecast	Flat 2 MW a month from 2023-2032	65 MW for August 2023 (shows an increase from PY2021's 55 MW average summer nomination) Flat forecast from 2023-2032
Delivery Performance	Maintained PY2021's assumption: 61% min delivery threshold for penalties	Assumed 89% delivery performance based on PY2022 Ex-Post
Impact Degradation Rate*	N/A due to absence of historical performance data	Based on PY2020-2022 historical data.
Max Load Impact	Used % impacts from HE20 results due to solar customers with less available load during earlier hours of the RA window	HE19 per-customer impacts from Ex-Post
RA Window Response	4-hour max response based on historical preference to the 1-4-hour event duration option; assume no response in HE21 (5th hour)	4-hour max response based on historical preference to the 1-4-hour event duration option; assume no response in HE21 (5th hour)

*Represents how customers maintain impacts through events called for longer durations, similar to the 5-hour RA Window.

Ex-Ante Hourly Load Profiles

PG&E

Res DA
PG&E 1-in-2, August Peak Day, 2023
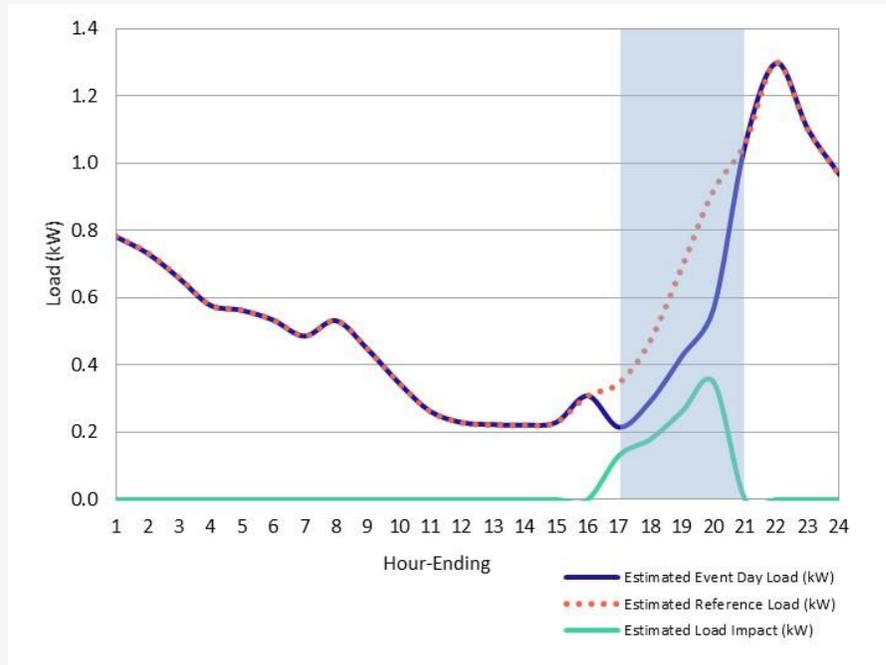
Non-Res DA
PG&E 1-in-2, August Peak Day, 2023
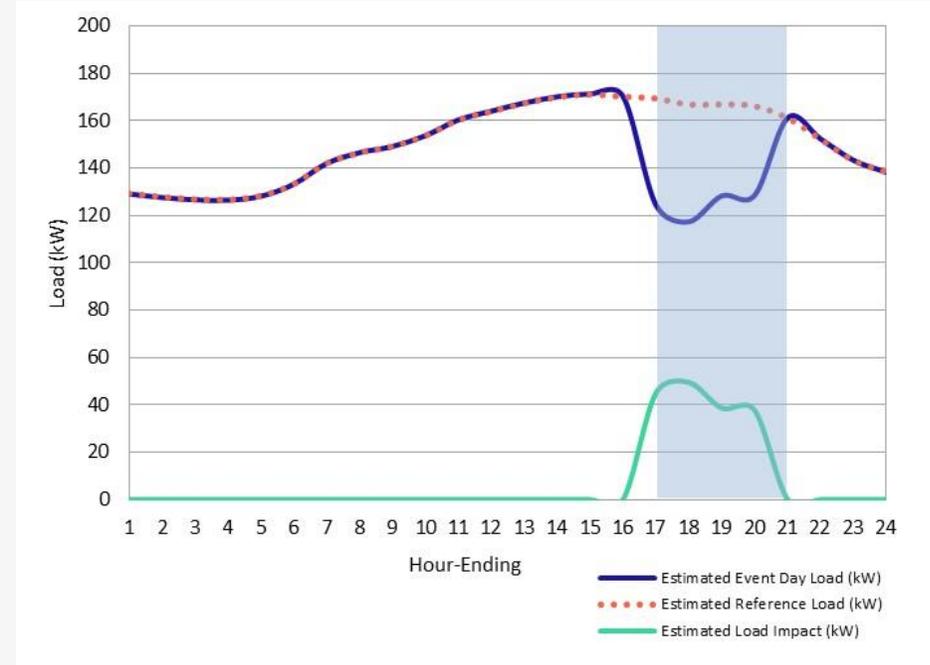
# PG&E Ex-Ante Load Impact Forecast (For 2023)
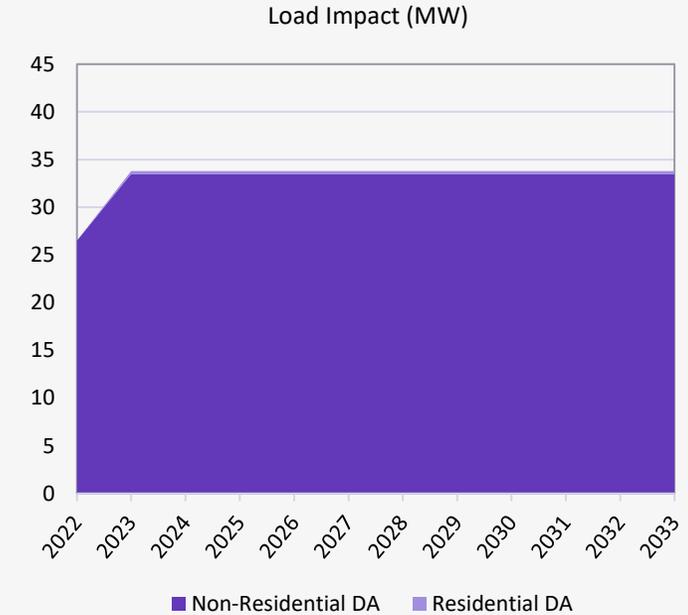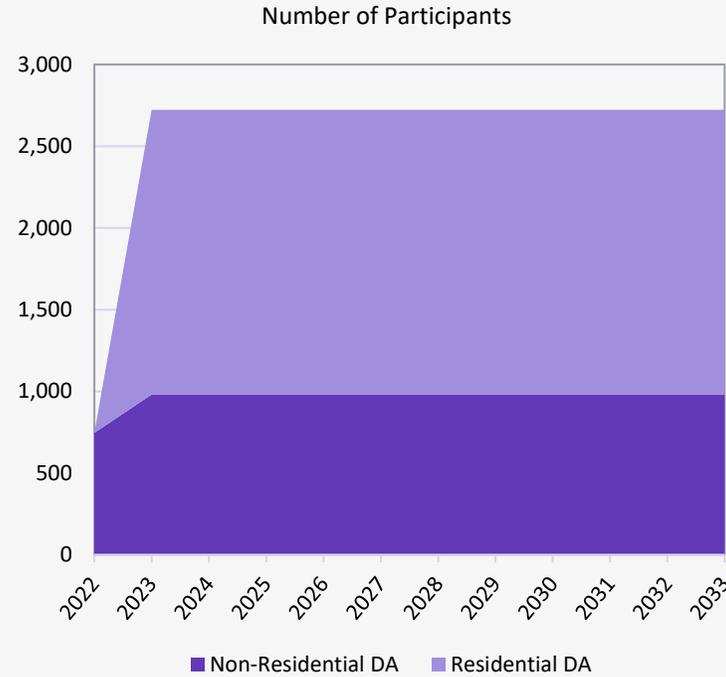
Number of Participants

Non-Residential DA   Residential DA

Load Impact (MW)

Non-Residential DA   Residential DA

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

*Shown for 2022 Typical event day due to zero forecasted August 2022 enrollments.

SCE
Programs

SCE Monthly Nominations

Month	Non-Residential DA		Non-Residential DO	
	Enrolled Accounts	Nominated Capacity (MW)	Enrolled Accounts	Nominated Capacity (MW)
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

Average Summer Nominations by Program Year

Internal
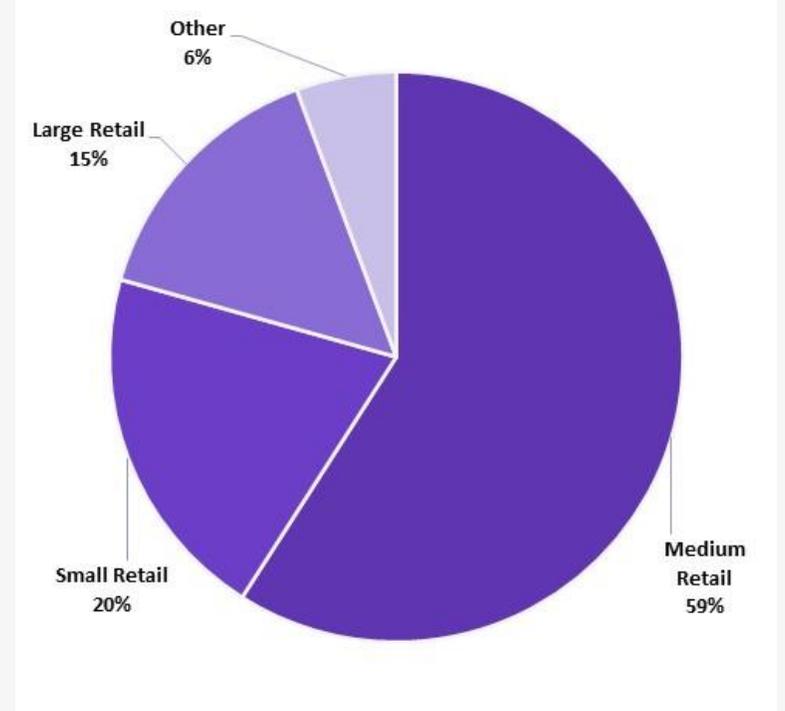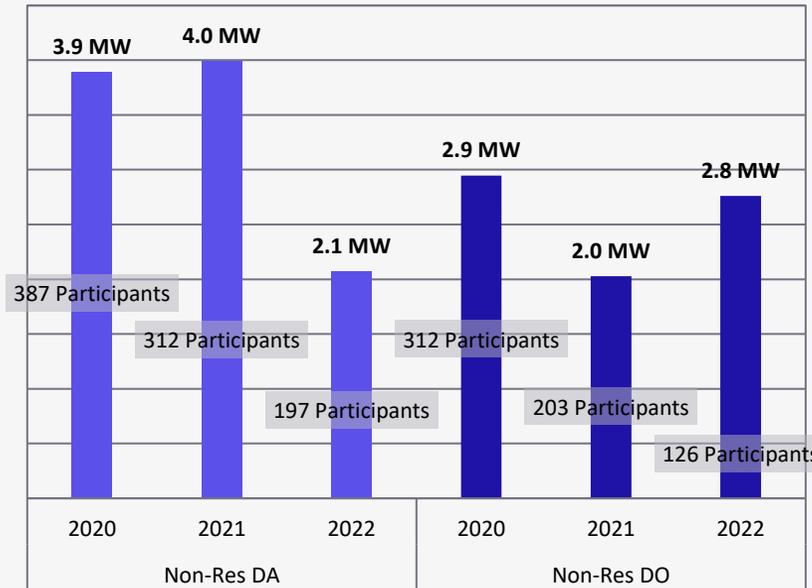
SCE Dispatch Summary
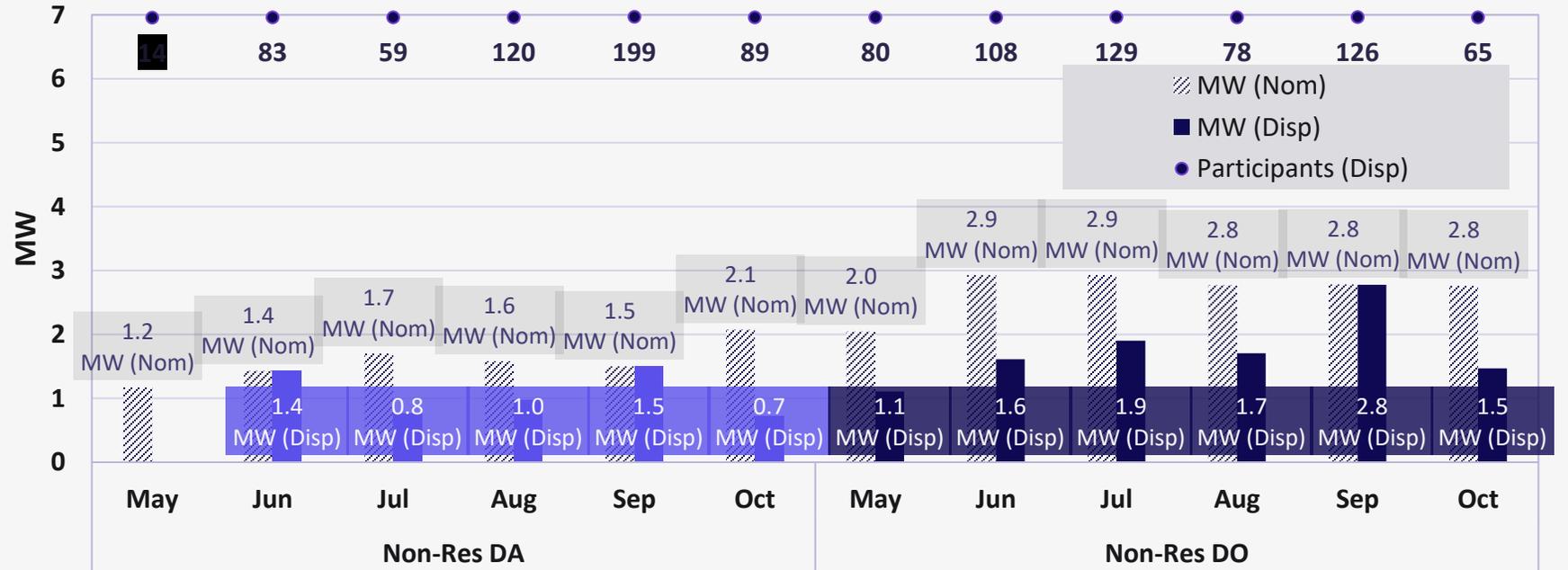
Month	Non-Residential DA		Non-Residential DO	
	Total Event Days	Total Event Hours	Total Event Days	Total Event Hours
May	10	26	8	26
June	5	13	7	38
July	8	48	6	36
August	8	38	8	38
September	5	30	5	30
October	4	23	3	17
Total Summer	40	178	37	185

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Average Event Day

SCE

	HE16	HE17	HE18	HE19	HE20	HE21
Event 1					■	
Event 2	■				■	
Event 3				■	■	■
Event 4	■	■	■	■		
Event 5	■	■	■	■	■	■
Event 6	■					■
Event 7	■		■	■		
Event 8	■	■	■			
Event 9			■	■		
Event 10					■	■
Event 11	■					
Event 12	■					■
Event 13	■			■		
Event 14					■	■
Event 15		■	■	■	■	■

*Shaded blocks represent event hours dispatched.
**HE16 is the reporting hour.
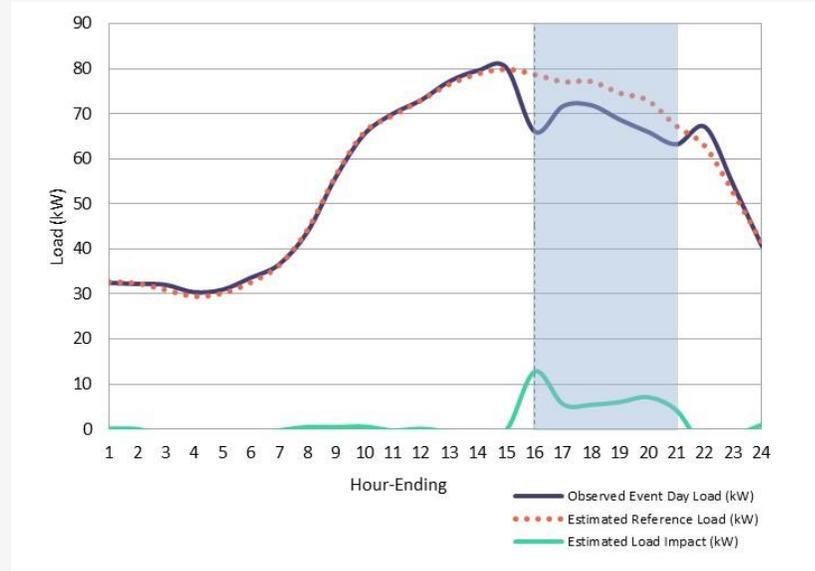
Non-Res DA

Non-Res DO
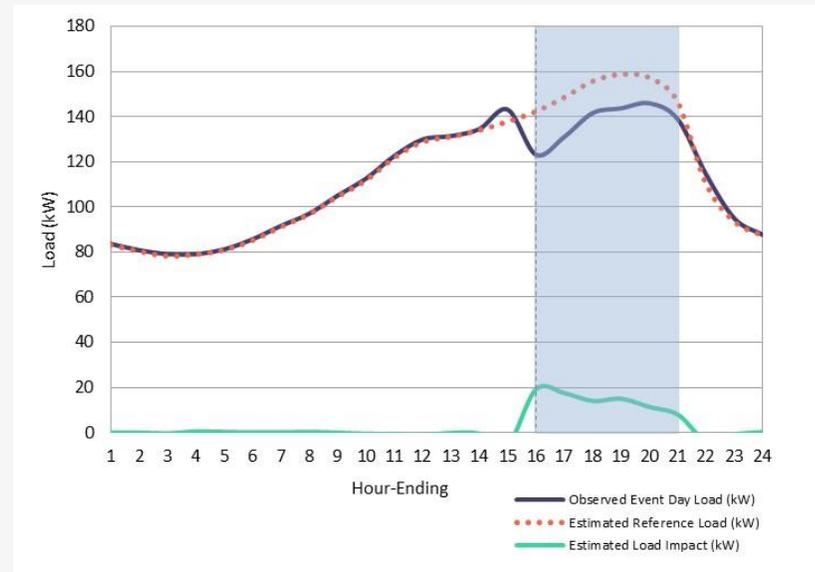
SCE
Ex-Post Load Impacts
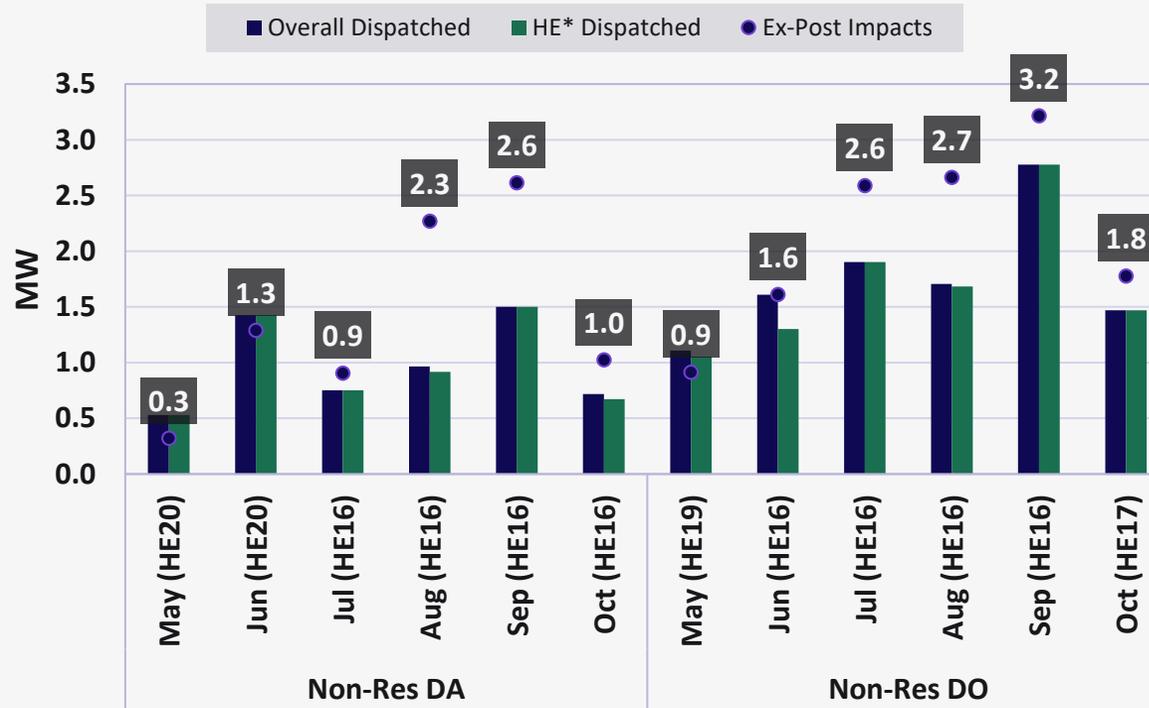
	Month	HE	% Delivered	Adj % Delivered
DA	May	20	61%	61%
	Jun	20	90%	90%
	Jul	16	120%	120%
	Aug	16	235%	248%
	Sep	16	174%	174%
	Oct	16	143%	152%
DO	May	19	83%	87%
	Jun	16	100%	124%
	Jul	16	136%	136%
	Aug	16	156%	158%
	Sep	16	116%	116%
	Oct	19	121%	121%

Season	Program	Month	Ex-Post Estimate (MW)	Dispatched MW	Dispatched % Delivered	HE16 Dispatched MW	HE16 Dispatched Adj % Delivered
Summer	Non-Res DA	Avg. Event (2022)	1.1	0.9	117%	0.7	145%
		Avg. Event (2021)	4.0	7.6	53%	7.5	53%
		Avg. Event (2020)	3.9	6.0	65%	-	-
	Non-Res DO	Avg. Event (2022)	1.9	1.7	109%	1.4	132%
		Avg. Event (2021)	2.0	2.9	70%	2.8	71%
		Avg. Event (2020)	🟥	🟥	🟥	-	-

Internal

SCE PY2021 Ex-Ante (For 2022) and Current Ex-Post

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

Internal

SCE
Ex-Ante
Forecast
Assumptions

|	Non-Residential Day Ahead & Day Of
Program Changes	No program changes impacting forecast assumptions
Enrollment Forecast	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
Delivery Performance	117% for DA summer; 109% for DO summer 0% delivery performance for non-summer months Based on PY2021 findings
Impact Degradation Rate*	Based on PY2019-2021 historical data.
Max Load Impact	HE16 per-customer impacts from Ex-Post

*Represents how customers maintain impacts through events called for longer durations, similar to the 5-hour RA Window.

Internal

Ex-Ante Hourly Load Profiles

SCE

Non-Res DA
SCE 1-in-2, August Peak Day, 2023
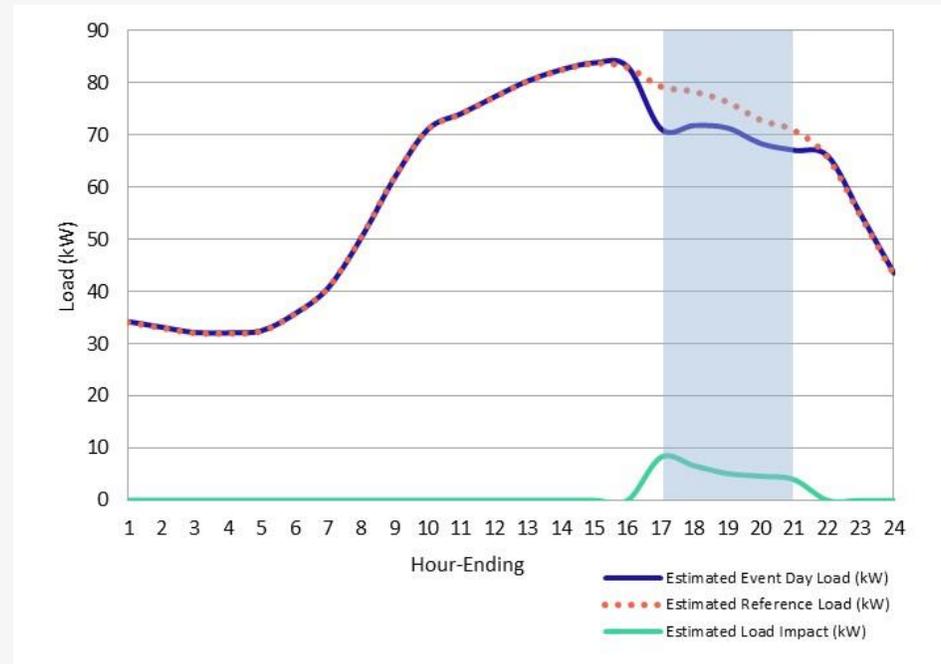
SCE Ex-Ante Load Impact Forecast (For 2023)
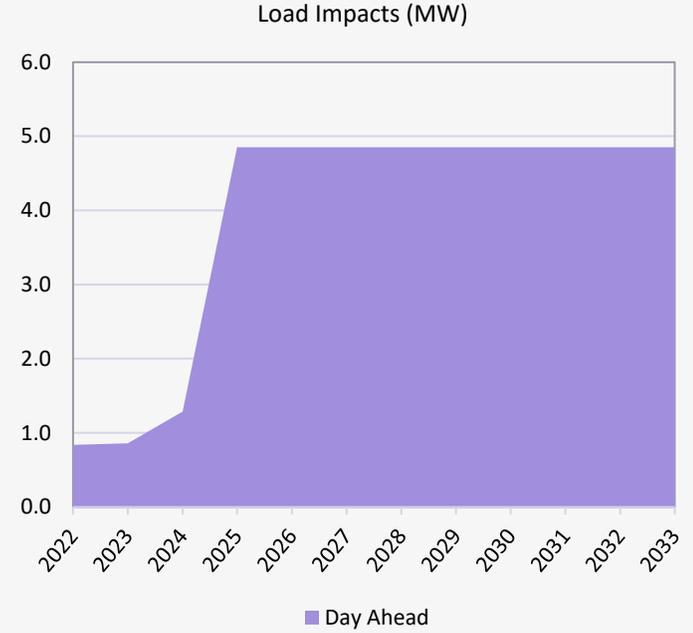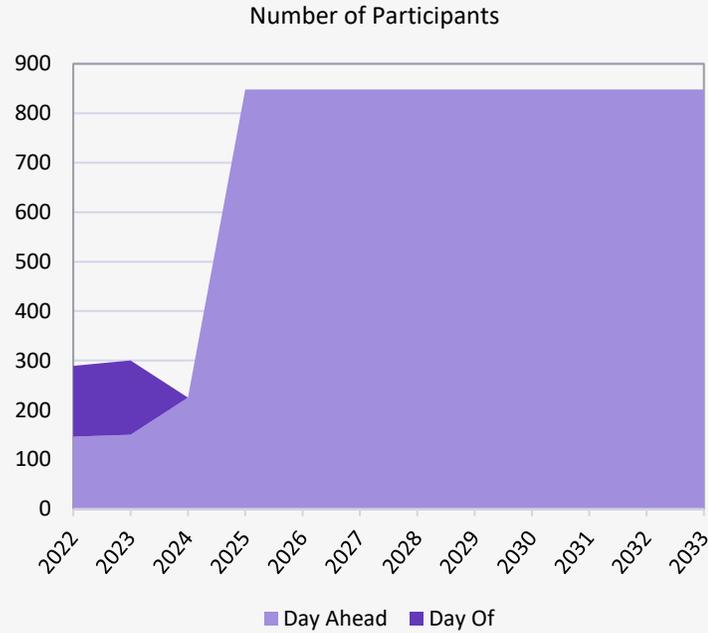
Number of Participants

Load Impacts (MW)

■ Day Ahead ■ Day Of

■ Day Ahead

Season	Program	Estimate	# of Accounts	Aggregate (MW)		Per-Customer (kW)		% Impact
				Impact	Ref. Load	Impact	Ref. Load	
Summer	Non-Res DA	PY2022 Forecast	150	0.9	11.3	5.7	75.6	8%
		PY2021 Forecast	410	4.2	32.1	10.1	78.3	13%
	Non-Res DO	PY2022 Forecast	150	■	■	■	■	■
		PY2021 Forecast	290	■	■	■	■	■

Internal

SDG&E
Programs

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**

Average Summer Nominations by Program Year
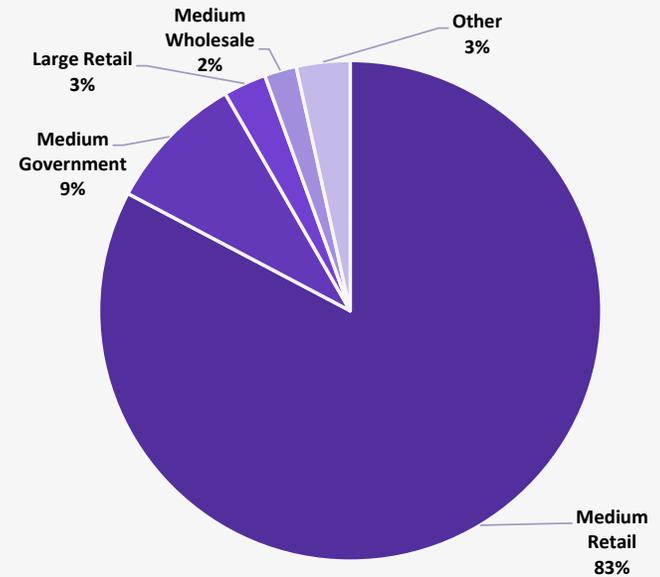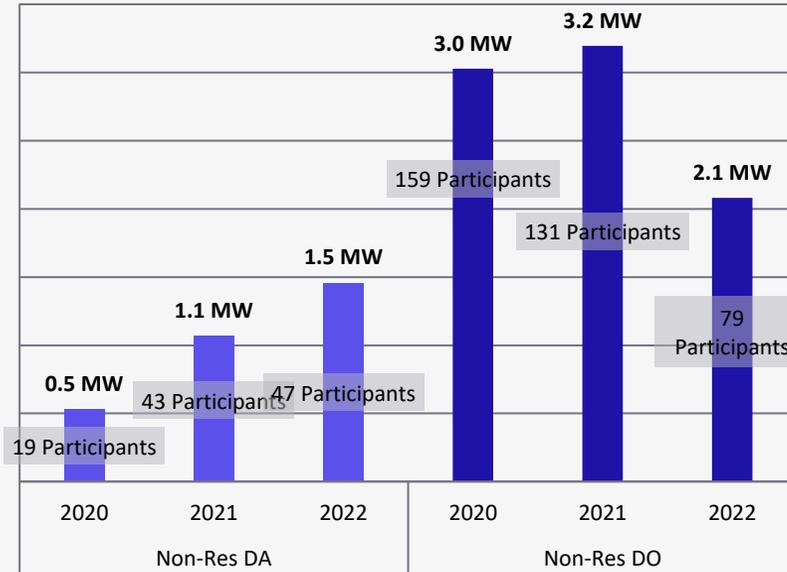
SDG&E Dispatch Summary
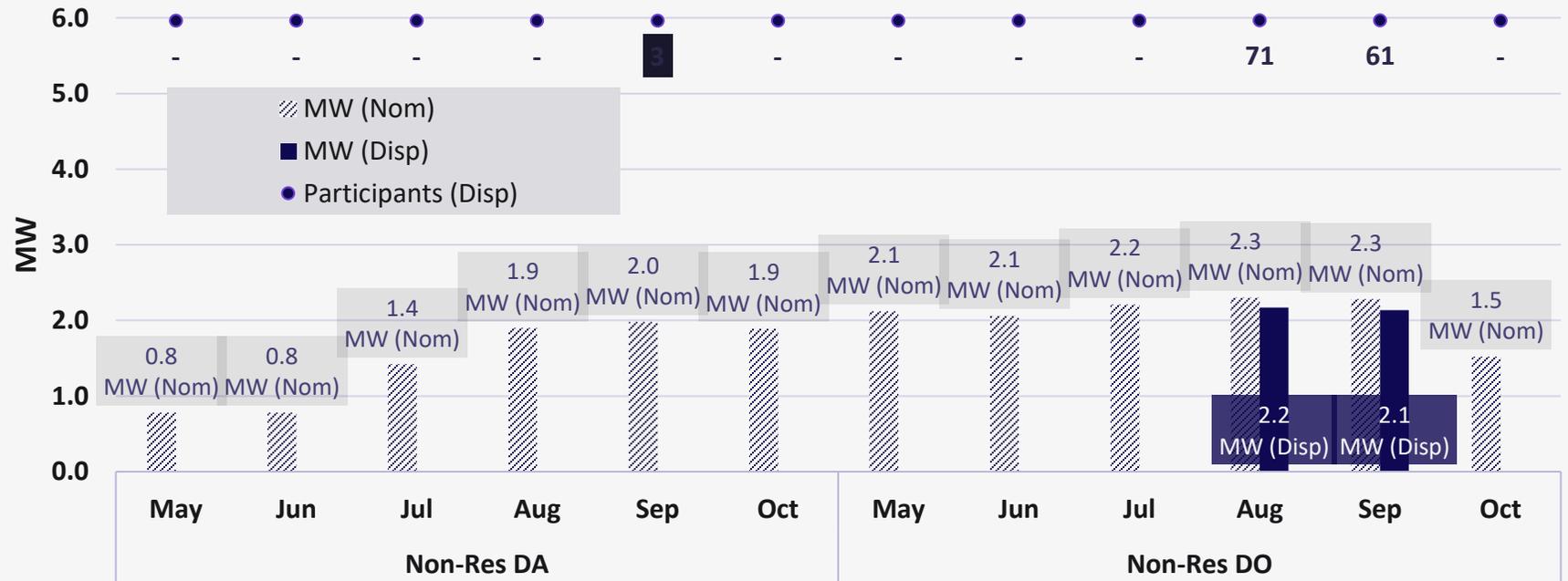
Month	Non-Residential DA		Non-Residential DO	
	Total Event Days	Total Event Hours	Total Event Days	Total Event Hours
May	-	-	-	-
June	-	-	-	-
July	-	-	-	-
August	-	-	1	2
September	3	12	5	19
October	-	-	-	-
Total Summer	**3**	**12**	**6**	**21**

Average Event Day

SDG&E

Non-Res DO ($400)

	HE12	HE13	HE14	HE15	HE16	HE17	HE18	HE19	HE20	HE21
Event 1							▓	▓		
Event 2								▓	▓	
Event 3								▓	▓	▓
Event 4			▓	▓		▓	▓	▓		
Event 5									▓	▓
Event 6							▓	▓		
Event 7								▓	▓	
Event 8							▓	▓		
Event 9							▓	▓		
Event 10							▓	▓		
Event 11							▓	▓	▓	
Event 12							▓	▓	▓	▓
Event 13								▓	▓	
Event 14						▓	▓	▓		
Event 15								▓	▓	

*Shaded blocks represent event hours dispatched.

**HE19 is the reporting hour.

SDG&E Ex-Post Load Impacts

Non-Res DO ($400)

Program	Month	Ex-Post Estimate (MW)	Dispatched		HE19 Dispatched	
			MW	% Delivered	MW	Adj % Delivered
	Avg. Event (2022)	0.3	1.1	25%	1.0	26%
Non-Res DA	Avg. Event (2021)	0.3	1.1	25%	1.0	26%
	Avg. Event (2020)	0.4	0.6	71%	-	-
	Avg. Event (2022)	1.4	2.1	65%	2.1	65%
Non-Res DO	Avg. Event (2021)	1.0	3.4	30%	3.4	30%
	Avg. Event (2020)	2.2	2.9	74%	-	-

Internal

SDG&E PY2021 Ex-Ante (For 2022) and Current Ex-Post

| Program | Estimate | # of Accounts | Aggregate (MW) | | Per-Customer (kW) | | % Impact |
			Impact	Ref. Load	Impact	Ref. Load	
Non-Res DA	**PY2021 Forecast**	**105**	**2.3**	**10.4**	**22.0**	**98.7**	**22%**
	Current Ex-Post	▮	▮	▮	▮	▮	▮
Non-Res DO	**PY2021 Forecast**	**208**	**3.5**	**20.2**	**16.9**	**97.2**	**17%**
	Current Ex-Post	**63**	**1.4**	**10.5**	**22.0**	**167.1**	**13%**

SDG&E Ex-Ante Forecast Assumptions

|	Non-Residential Day Ahead & Day Of
Program Changes**	Adding new Elect product options for the 1-9 PM dispatch window
Nomination Forecast	Solicited aggregator feedback on participation outlook for new Elect options and existing Prescribed options; this included current participants in other DR programs that will likely shift to CBP Elect options.
Enrollment Forecast	2% growth from 2023-2027 No additional growth from 2027-2033
Delivery Performance	33% for Non-Res DA and 56% for Non-Res DO, based on PY2020-22 Ex-Post
Impact Degradation Rate*	Based on PY2019-2021 historical data.
Max Load Impact	HE19 per-customer impacts from Ex-Post

*Represents how customers maintain impacts through events called for longer durations, similar to the 5-hour RA Window.
** Currently assumes existing Prescribed options are offered until 2032

Ex-Ante Hourly Load Profiles

SDG&E


Non-Res DA
SDG&E 1-in-2, August Peak Day, 2023
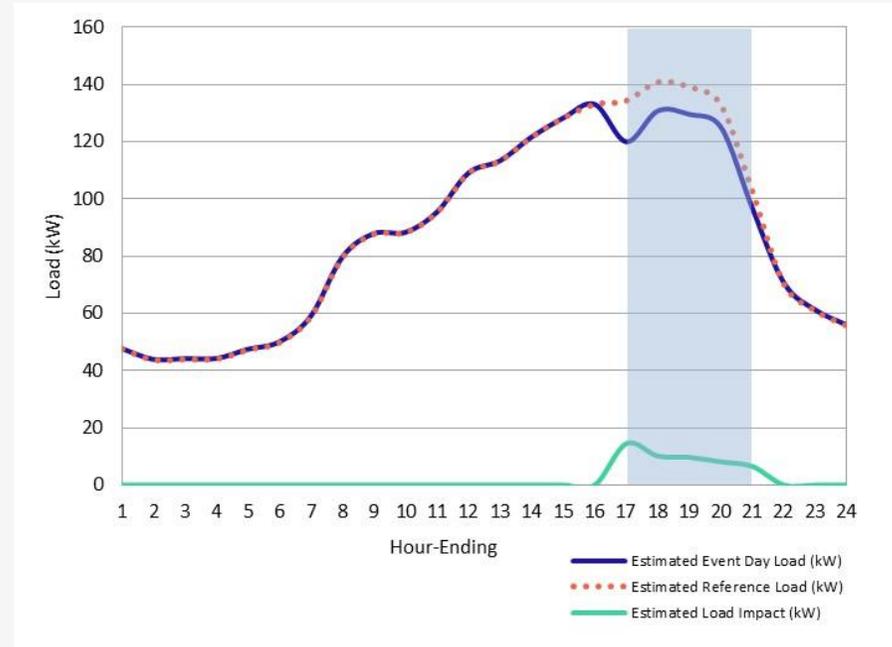
Non-Res DO
SDG&E 1-in-2, August Peak Day, 2023
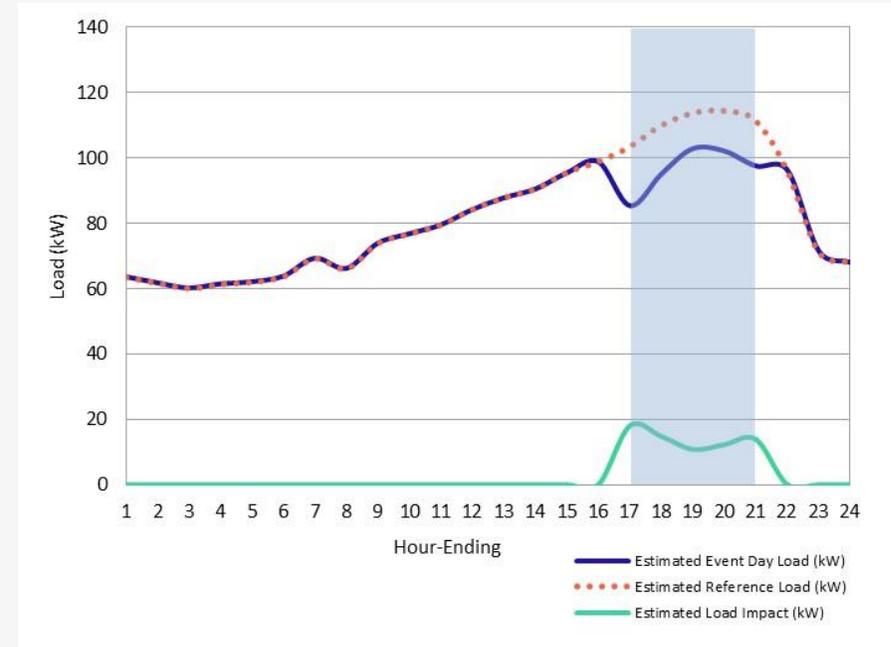
SDG&E Ex-Ante Load Impact Forecast (For 2023)
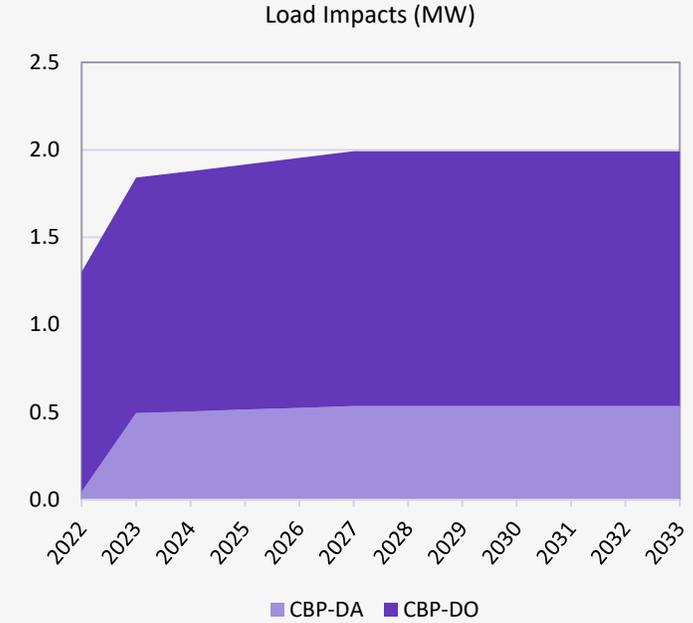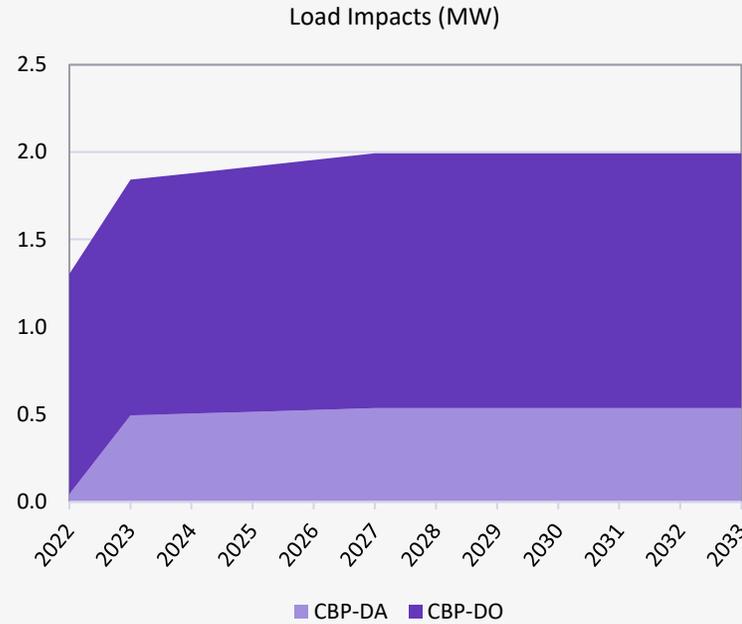
Load Impacts (MW) — CBP-DA, CBP-DO

Load Impacts (MW) — CBP-DA, CBP-DO

Program	Estimate	# of Accounts	Aggregate (MW)		Per-Customer (kW)		% Impact
			Impact	Ref. Load	Impact	Ref. Load	
Non-Res DA	**PY2022 Forecast**	**51**	**0.5**	6.6	9.7	130.0	7%
	PY2021 Forecast	**107**	**2.4**	**10.6**	**22.0**	**98.7**	**22%**
Non-Res DO	**PY2022 Forecast**	**97**	**1.3**	10.7	13.9	110.5	13%
	PY2021 Forecast	**210**	**3.6**	**20.4**	**16.9**	**97.2**	**17%**

Applied Energy Group, Inc. | appliedenergygroup.com

Internal

Key Findings

Statewide Ex-Post Impacts

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%
SDG&E	Non-res DA	**47**	1.5	■	■	■	■	■	■	■
	Non-res DO	**79**	2.1	63	2.1	63	2.1	1.4	65%	65%

*Results shown for summer months only (May through October)

Internal

Statewide System Peak Hour

Sep 6, 2022 (HE17)

	Program	Dispatched Accounts	Dispatched MW	Ex-Post Impact MW	Ex-Post % Delivered	Event Temp (F)
PG&E	Res DA	-	-	-	-	-
	Non-res DA	23	0.4	0.4	100%	75
SCE	Non-res DA	199	1.5	1.0	67%	94
	Non-res DO	126	2.8	2.2	76%	94
SDG&E	Non-res DA	-	-	-	-	-
	Non-res DO	-	-	-	-	-

Internal

Statewide Ex-Ante Impacts

Program		Enrollment Forecast			Aggregate Impact Forecast (MW)		
		2022	2023	2027-2032 (Each Year)	2023	2024	2027-2032 (Each Year)
PG&E	Res DA	1,743	1,743	1,743	0.3	0.3	0.3
	Non-res DA	980	980	980	33.5	33.5	33.5
SCE	Non-res DA	150	225	848	0.9	1.3	4.9
	Non-res DO	150	0	0	XXX	-	-
SDG&E	Non-res DA	51	52	55	0.5	0.5	0.5
	Non-res DO	97	99	105	1.3	1.4	1.5

*Results shown for summer months only (May through October)

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Thank You.

AEG
APPLIED ENERGY GROUP

Reporting Metrics for Program Performance

- **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; 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.

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

HE20 for PG&E and SCE; HE19 for SDG&E.

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