DOCKETED	
Docket Number:	22-RENEW-01
Project Title:	Reliability Reserve Incentive Programs
TN #:	266629
Document Title:	Presentation - Staff Analysis of the DSGS Program 2024 Performance Data
Description:	Slides for presenting and discussing staff's analysis of the DSGS Program performance during summer 2024, with a focus on DSGS Option 3, which is our storage Virtual Power Plant option.
Filer:	Jordan Gillmore
Organization:	California Energy Commission
Submitter Role:	Commission Staff
Submission Date:	10/16/2025 9:07:06 AM
Docketed Date:	10/16/2025

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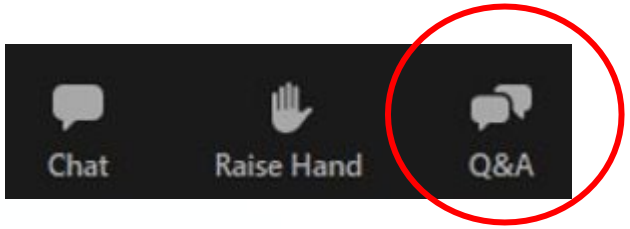
Demand Side Grid Support (DSGS) Program

- Title: Staff Analysis of the DSGS Program 2024 Performance Data
- Date: October 15, 2025

Housekeeping

- This workshop will be recorded and posted to the CEC website.
- Attendees will be muted during the presentation. Please submit your questions using the Q&A window.

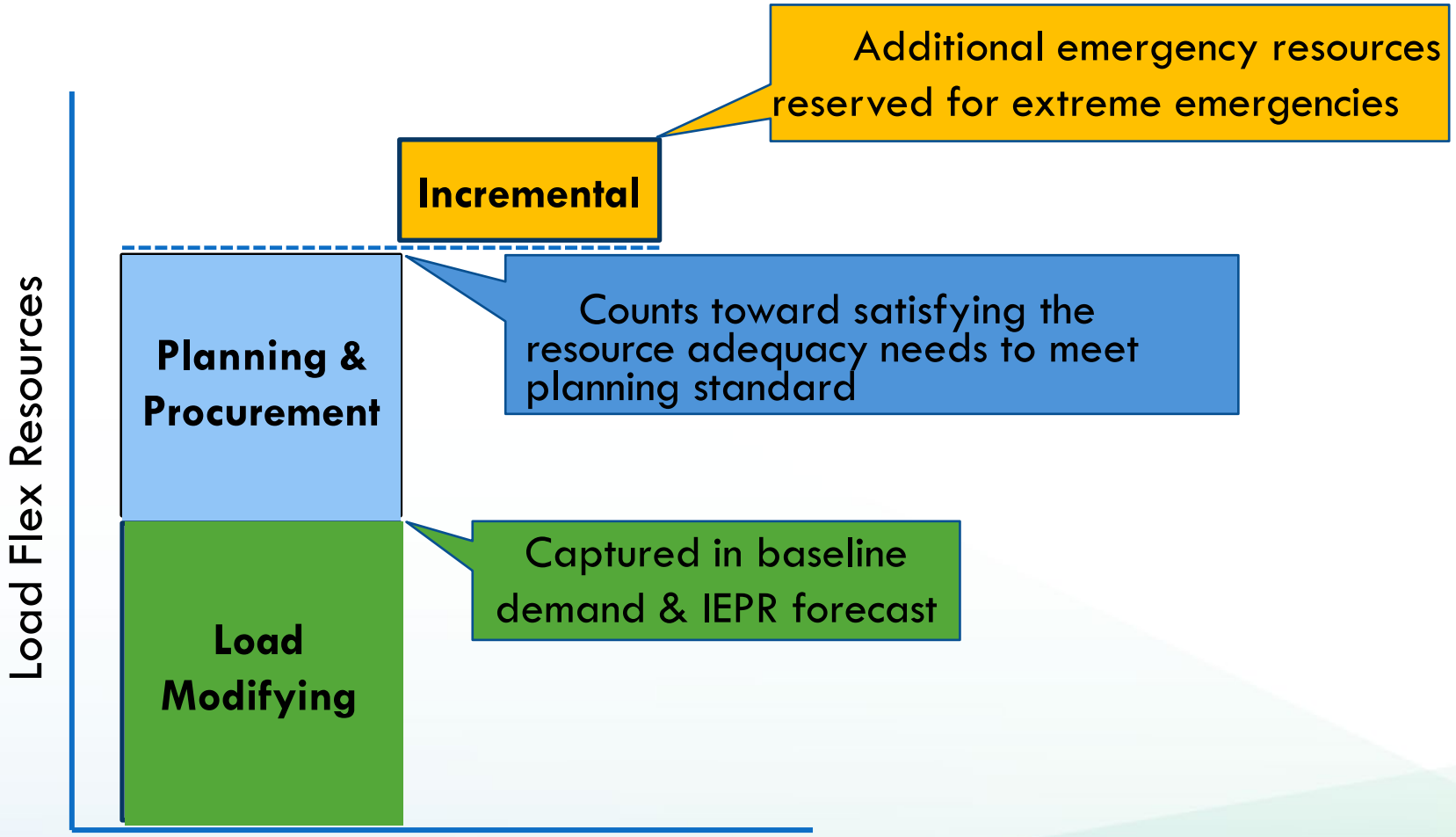


- There will be several opportunities for Q&A and public comment during this workshop.
- Workshop slides and recording will be posted at the event page for today's workshop at: https://www.energy.ca.gov/programs-and-topics/programs/demand-side-grid-support-program

Agenda

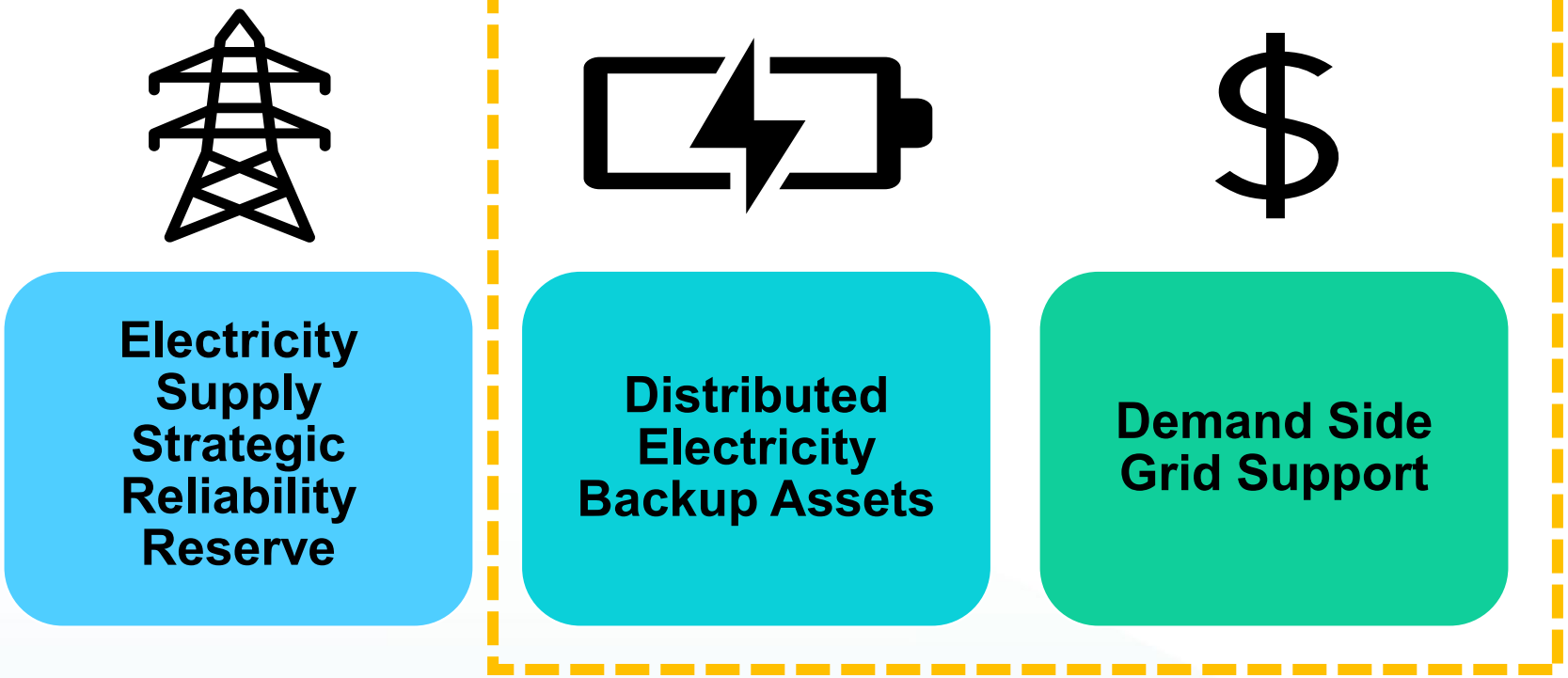
- **Program Overview**
- **Highlights (Storage VPP)**
- **Analysis & Results (Storage VPP)**
  - Event Performance
  - Baselines
  - Monthly Capacities
- **Other Observations and Next Steps**
- **Q&A**
- **Comments**

Role of Strategic Reliability Reserves



Source: California Energy Commission

Strategic Reliability Reserve Portfolio



- ➔ *Grow clean Strategic Reliability Reserves that are incremental to Resource Adequacy (RA), without interfering with RA market*
- ➔ *Pilot new initiatives to help scale demand flexibility*

DSGS Development Timeline

2022

Initial Development and Launch

2023

Simplify and Streamline Participation

Expanded Eligibility (AB 209)

More Incentive Options

2024

Refine and Clarify Requirements

Grow Clean Resources

2025 and Beyond

Scale and Grow Clean Resources

DSGS Participation Options

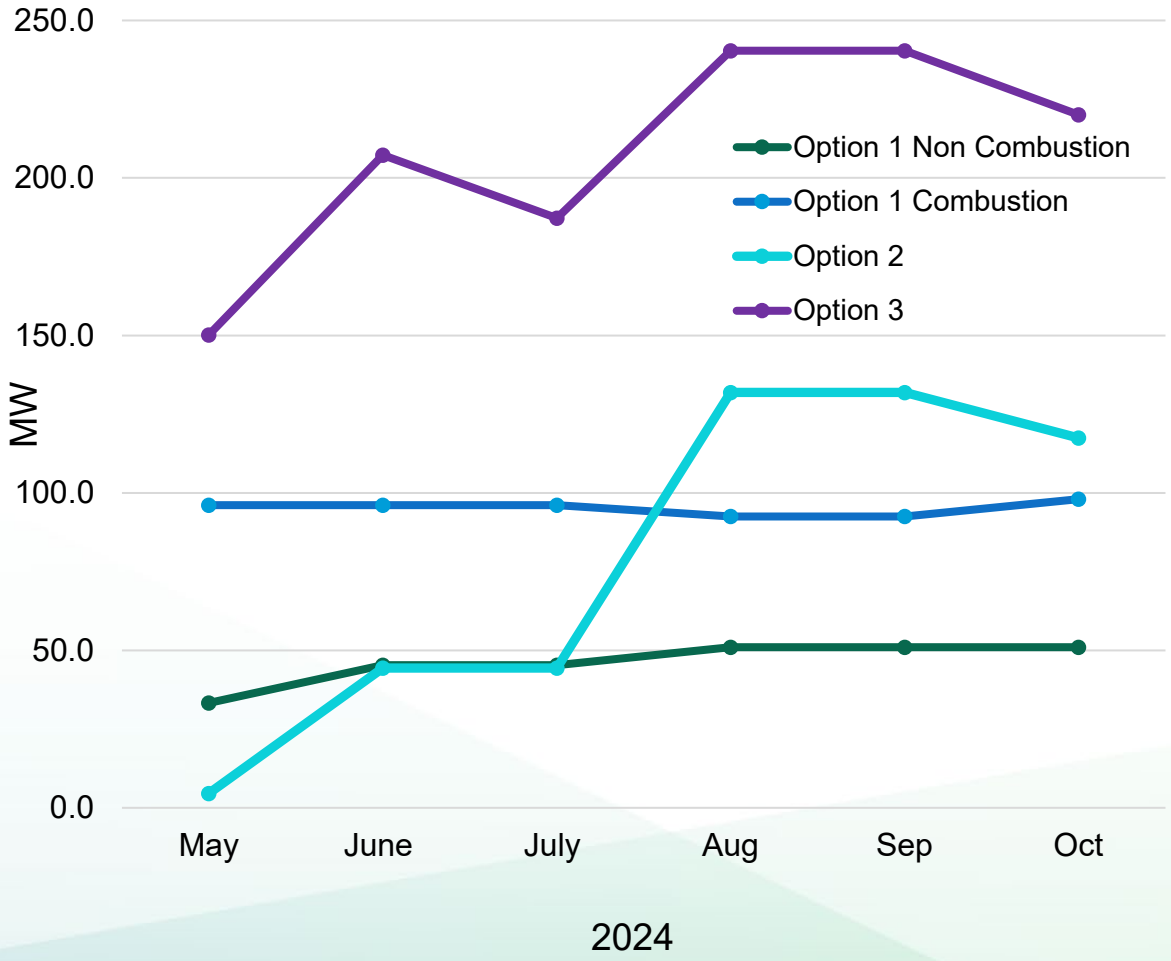
	Option 1 – Emergency Dispatch	Option 2 – Market Integrated Demand Response (DR) Pilot	Option 3 – Market Aware Storage Virtual Power Plant (VPP) Pilot	Option 4 – Emergency Load Flexibility Virtual Power Plant (VPP) Pilot
Eligible Resources	Any load reduction resource	Market-integrated demand response	Storage (batteries + V2X)	• Smart thermostats, electric water heaters, EVSE, batteries, and residential smart electrical panels • PG&E service area excluded
Event Trigger	Energy Emergency Alert (EEA)	CAISO market bidding & scheduling	CAISO day-ahead energy market locational marginal price threshold and Energy Emergency Alert (EEA)	Energy Emergency Alert (EEA)
Incentive Structure	• Energy and standby payment	• Capacity payment based on DR resource's demonstrated capacity incremental to Resource Adequacy commitments • Incentive rate varies by month, nominated duration	• Capacity payment based on VPP's demonstrated capacity • Incentive rate varies by month, nominated duration • Energy payment for day-of EEA	• Capacity payment based on VPP's demonstrated capacity • Performance-adjusted incentive payment • Incentive rate varies by month
Launched	Summer 2022	August 2023	August 2023	May 2025

DSGS Summer 2024 Enrollment Growth

DSGS Enrollment (Provider Estimated MW)

Dispatch Category	Dispatch Trigger	Oct 2023	Oct 2024
Option 1 – Load Reduction	EEA Watch	23.4	51.0
Option 1 – Combustion Resources (BUGs)	EEA 2 + Emergency Proclamation	106.4	98.0
Option 2 - Market Integrated DR	CAISO schedule/ dispatch	N/A*	117.4
Option 3 – Market Aware Storage VPP	CAISO day-ahead market / LMP ≥ $200/MWh	10.4	220.1
	Total	**140.2**	**486.5**

* DSGS Program guidelines did not require Option 2 enrollment estimates in 2023.



Source: California Energy Commission

DSGS Summer 2024 Events

Option 1: Emergency Dispatch

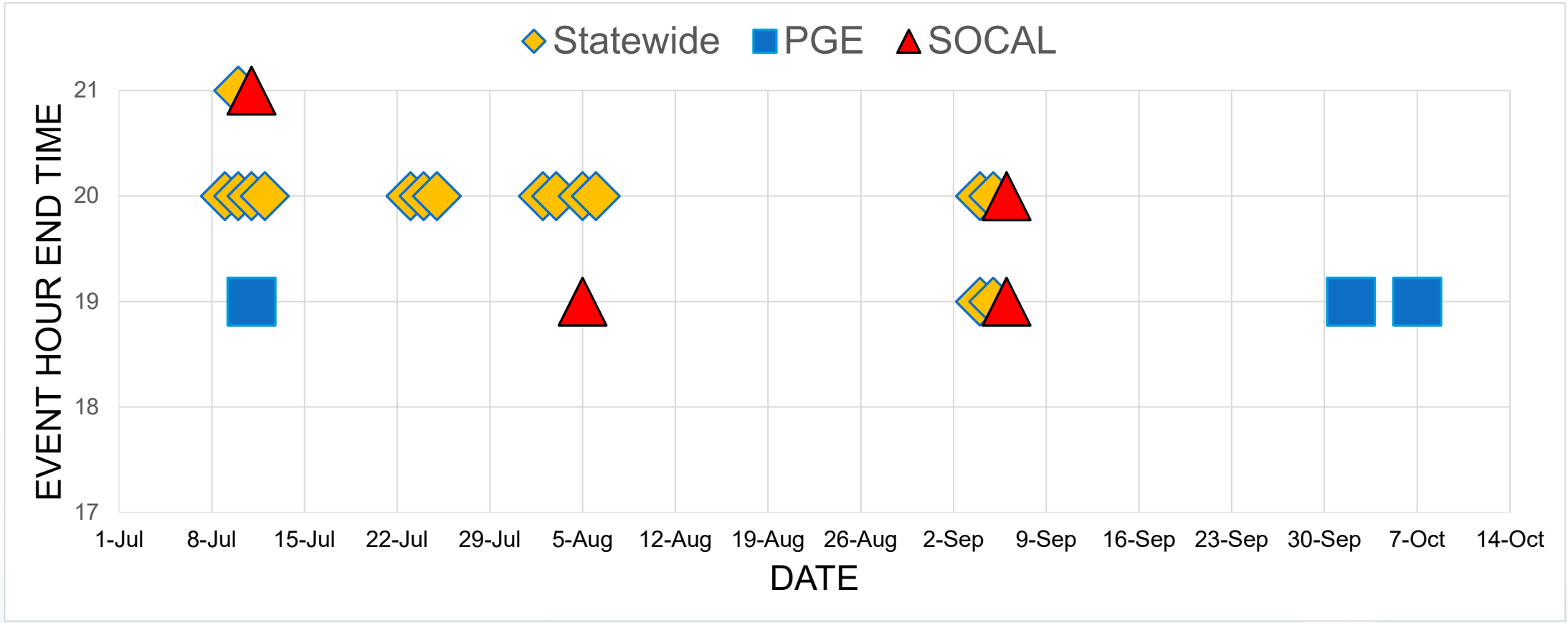
- July 24, 2024: EEA Watch, 5:25PM – 11:59PM

Option 3: Storage VPP

- There were total of 26 event hours over 16 days
  - Statewide Events: 19 hours over 13 days
  - Additional PG&E *only* DLAP Events: 2 hours over 2 days
  - Additional SCE/SDG&E *only* DLAP Events: 5 hours over 3 days

*Incentive Option 2 resources are market integrated and dispatched by CAISO
^DSGS VPP “event hour” is any hour where the CAISO day-ahead market LMP exceeded $200/MWh

LMP Events in 2024 Applicable to 2-hr VPPs



Source: California Energy Commission

1. PG&E July 11-HE19 event hour shown above is counted as a "Statewide" event hour on the previous slide as the LMP threshold was exceeded in that hour in all DLAPs. But SOCAL 2-hr VPPs were *not* dispatched in that hour (see #2 point below).
2. Event hours for *2-hour resources* (selected based on highest consecutive hourly LMPs) differed between PG&E and SoCal on 7/11.

2024 Season Highlights: Option 3/Storage VPP

- **Enrollment (as of Oct 2024):**
  - 14 providers, 37,558 customers
  - 287.9 MW total nameplate capacity

- **2x growth in VPP capacity over the season**
  - Further substantial enrollment increase in in 2025

- **September incremental capacity ~ 89 MW**

- **Cumulative incentives payout ~ $8.3M**

Some Definitions

Baselines

- PB = Prescriptive Baseline [from guidelines]
  - Residential: 0.074 * Nameplate Energy Storage Capacity (kWh)
  - Non-residential: 0.028 * Nameplate Energy Storage Capacity (kWh)

- Hourly MB = $MeasuredBaseline_h$ = MB_h = Average hourly *Discharge* in hour *h* over *all* non-event days in a month (*h* limited to 4 PM – 9 PM window)

Hourly Discharges (applicable to event hours)

- Hourly AD = $sum(Discharge_{r,h})$ across all storage resources "*r*" for event hour "*h*"
- Hourly ND = $NetDischarge_h$ = ND_h = sum($Discharge_{r,h} – PB_{r,h}$) [from guidelines]
- Hourly ID = $IncrementalDischarge_h$ = ID_h = sum($Discharge_{r,h} – MB_{r,h}$)

Monthly Average Capacities

- Monthly DC (Demonstrated Capacity) = LMP weighted hourly ND over all events in a month [from guidelines]
- Monthly IC (Incremental Capacity) = LMP weighted hourly ID over all events in a month
- Monthly ID (Incremental Discharge) = Simple average of hourly ID over all events in a month

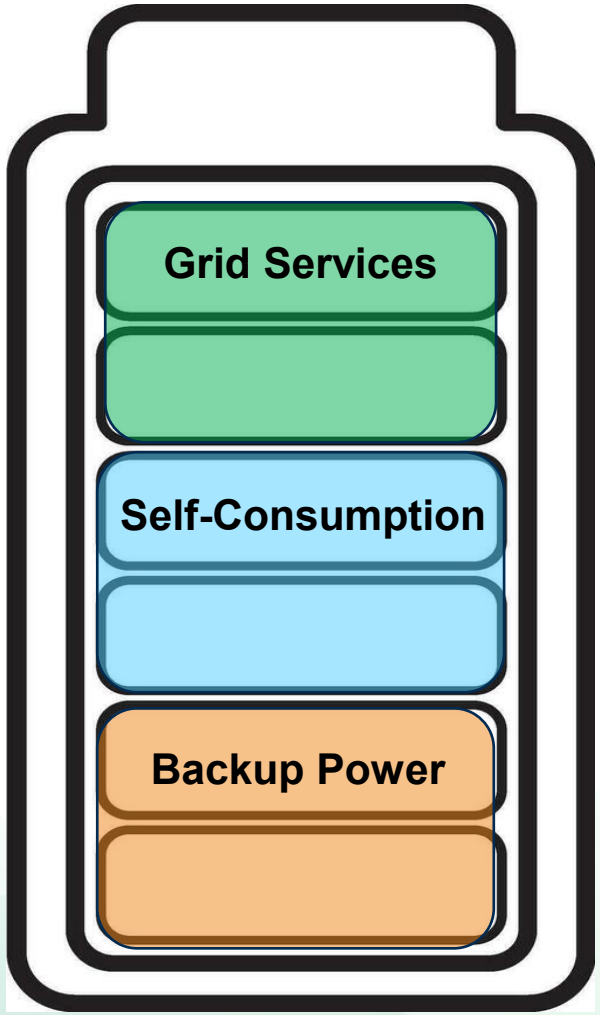
Note: All analysis discussed today is based on battery telemetry data provided by participating providers (not utility meter data).

Option 3/Storage VPP: LMP vs. Test Events

Attribute	LMP Events	Test Events
Event trigger	Day ahead CAISO LMP ≥ $200/MWh or Day-of EEA Watch+	Dispatched by a provider to meet minimum activity requirement in the absence of any full duration LMP triggered event in the calendar month
Event hour selection	Up to nominated hours: select the consecutive block with the highest DLAP average LMP	Nominated duration, scheduled during highest DLAP LMP hours within 4 - 9 PM
Number of events	Multiple events per month, up to 35 events per program year	One test event per month in the absence of a full-duration event

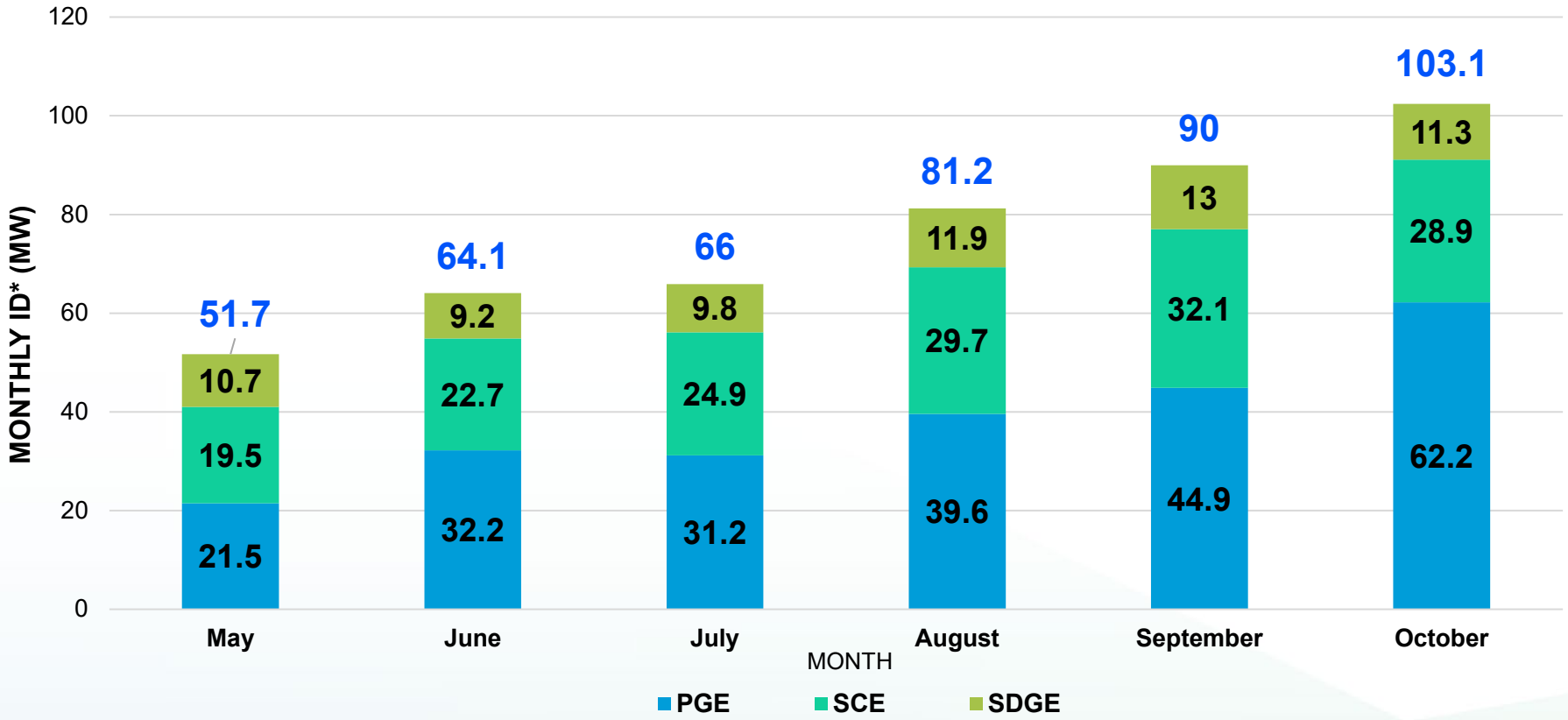
Multi-Use Battery & VPP "Performance"

- Share of battery capacity used for various applications varies by customers: backup, self-consumption, grid services
- Staff Analysis focused on quantifying/validating VPP discharge capacity delivered to the grid (as "grid services") when dispatched, incremental to other applications of the VPP batteries
- DSGS/Option 3 compensates only for the demonstrated discharge capacity (green slice) delivered to the grid when dispatched
- Actual level of the share of battery discharge capacity allocated to grid services is *not* an indicator of VPP "performance"



2024 Season: Storage VPP Growth

➔ *~2x growth from May to October^*



Source: California Energy Commission

*Monthly Incremental Discharge (ID) = Average Hourly ID relative to hourly Measured Baseline (MB) across all events in the month
^Resources in LADWP territory began participation in Oct and provided 0.7 MW of ID, which is included in the total
^Substantial additional growth in VPP capacity in 2025

Composition of Enrolled VPP Resources* - September 2024

Nameplate Capacity* (MW)		PG&E	SCE	SDG&E	LADWP**	Total (MW)	% of VPP Total (269.8 MW)	*Total Customers*
2 hour	Resi	110.6	82.1	29.5	0	222.2	**82.4%**	*35,129*
	Non-Res	18.4	13.7	9.9	0	42.0	**15.6%**	*166*
3 hour	Resi	0						
	Non-Res	0	0.3	0	0	0.3	**0.1%**	*1*
4 hour	Resi	0						
	Non-Res	0	2.8	2.5	0	5.3	**2.0%**	*15*
2 hour	Total Resi	110.6	82.1	29.5	0	222.2	**82.4%**	*35,129*
2,3,4 hr	Total Non-Res	18.4	16.8	12.4	0	47.6	**17.6%**	*182*
Total 2 hr		129.0	95.8	39.4	0.0	264.2	**97.9%**	*35,295*
Total > 2 hr		0.0	3.1	2.5	0.0	5.6	**2.1%**	*16*
	VPP Total	**129.0**	**98.9**	**41.9**	**0.0**	**269.8**	**100.0%**	*35,311*

Source: California Energy Commission

➔ **2-hr storage ~ 98% of overall VPP aggregate nameplate**

*Based on end of 2024 season data set.

**DSGS participation was not available in LADWP territory until October 2024

VPP Contribution by Customer Class/Duration

Data for September 2024 only

Duration (hours)	Customer Class	Incremental Discharge (ID), MW	Resource Nameplate Capacity, MW	Resource - % of Aggregate Nameplate (269.9 MW)	ID - % of Resource Nameplate	ID - % of Aggregate ID (90.9 MW)
2	Residential	75.50	222.2	82.4%	34.0%	83.1%
2	Nonresidential	14.90	42.0	15.6%	35.5%	16.4%
3	Nonresidential	0.04	0.3	0.1%	13.3%	0.0%
4	Nonresidential	0.50	5.3	2.0%	9.4%	0.6%
Mixed	VPP Total*	90.90	269.8	100.0%		100.0%

Source: California Energy Commission

➔ ***2-hr storage accounts for 99% of aggregate incremental discharge (and 98% of nameplate power)***

Slightly different results for September ID observed here due to rounding totals from different category breakdowns when (compared to 90 MW in an earlier slide)

Residential VPP Profile

Data for September 2024 only

	September 2024		2024 Season
	Aggregate VPP Average	Provider Level Range	Aggregate VPP Range
Nameplate storage duration (hours)	2.25	1.22 to 2.67	2.24 to 2.27
Average nameplate power per customer (kW)	6.33	4.11 to 9.66	6.11 to 6.38

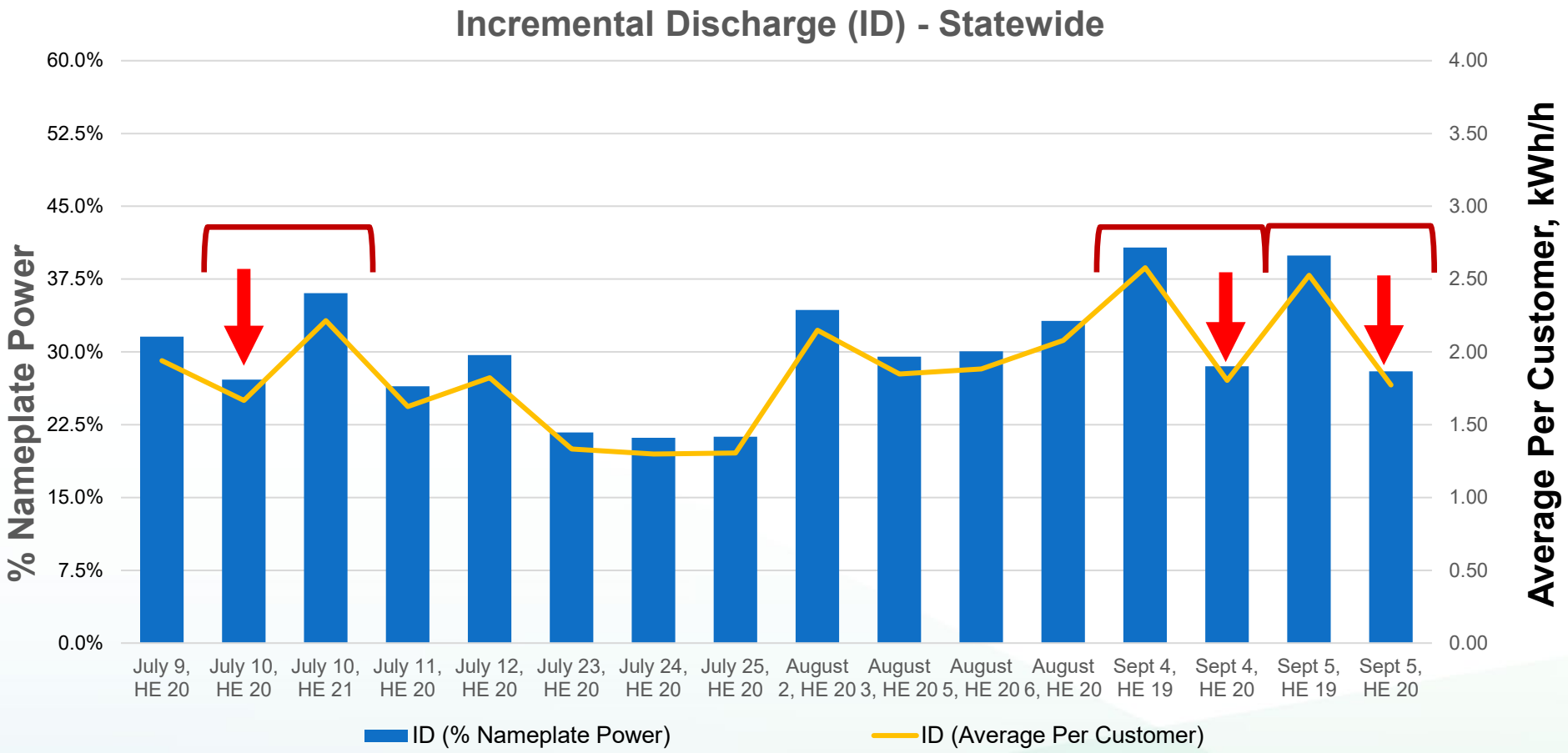
Source: California Energy Commission

Enrollment in September 2024:

- Nameplate power = 222.2 MW
- Nameplate storage capacity = 500.9 MWh
- Enrolled customers = 35,129

Incremental Discharges During Statewide Events in 2024 - Residential VPP

- Hourly ID range:
  - Per customer average ~ 1.3 to 2.6 kWh/h
  - 21% to 41% of nameplate power
- Three statewide 2-hour events (indicated by red brackets)

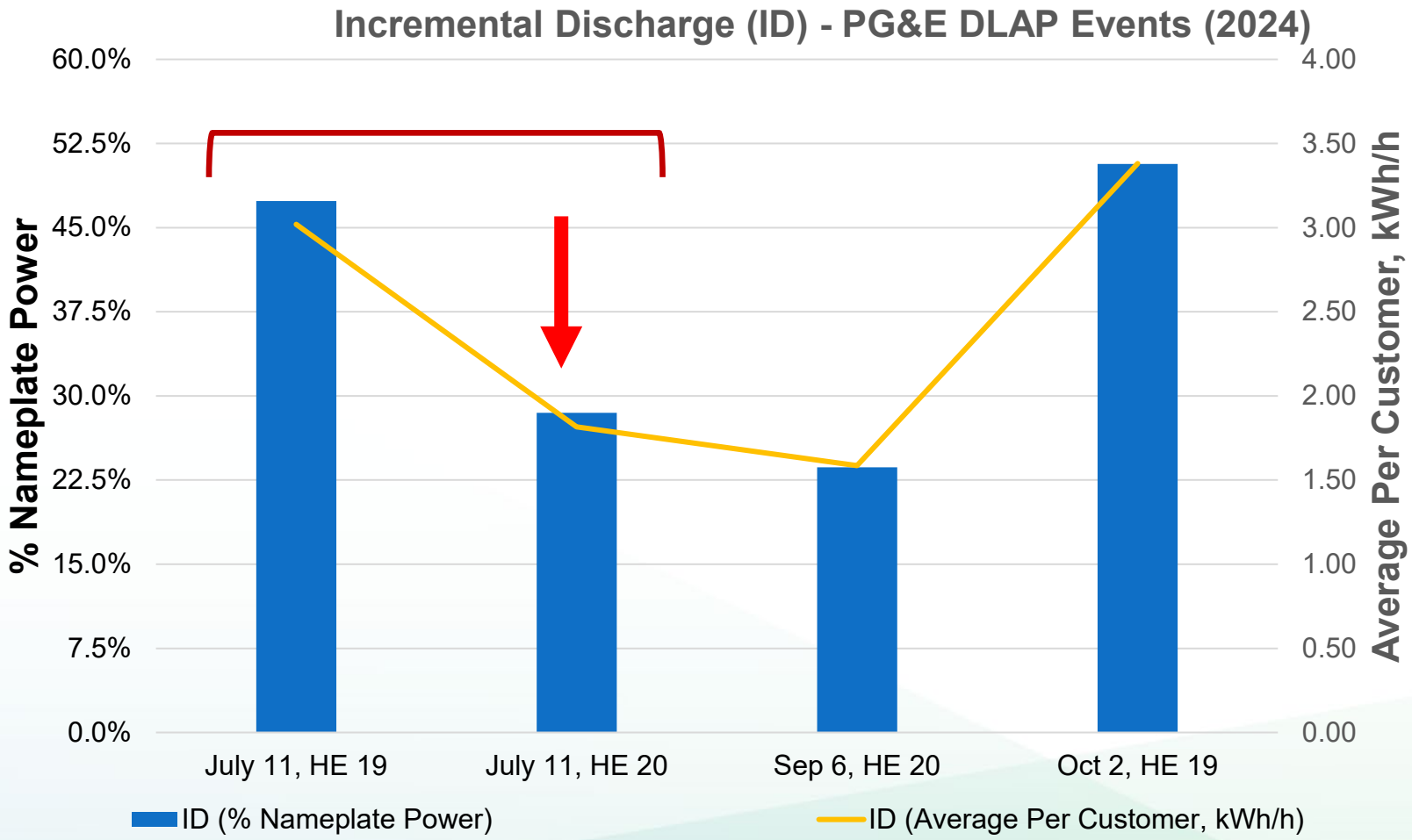


Source: California Energy Commission

Red arrow indicates event hour with highest LMP price
HE = Hour Ending

Incremental Discharges During PG&E Events - Residential VPP

- PG&E hourly discharge range appear to be higher than statewide performance
  - PG&E: 29% to 52%
  - Statewide: 21% to 41%
- July 11th 2-hour event discharge pattern opposite of LMP price pattern

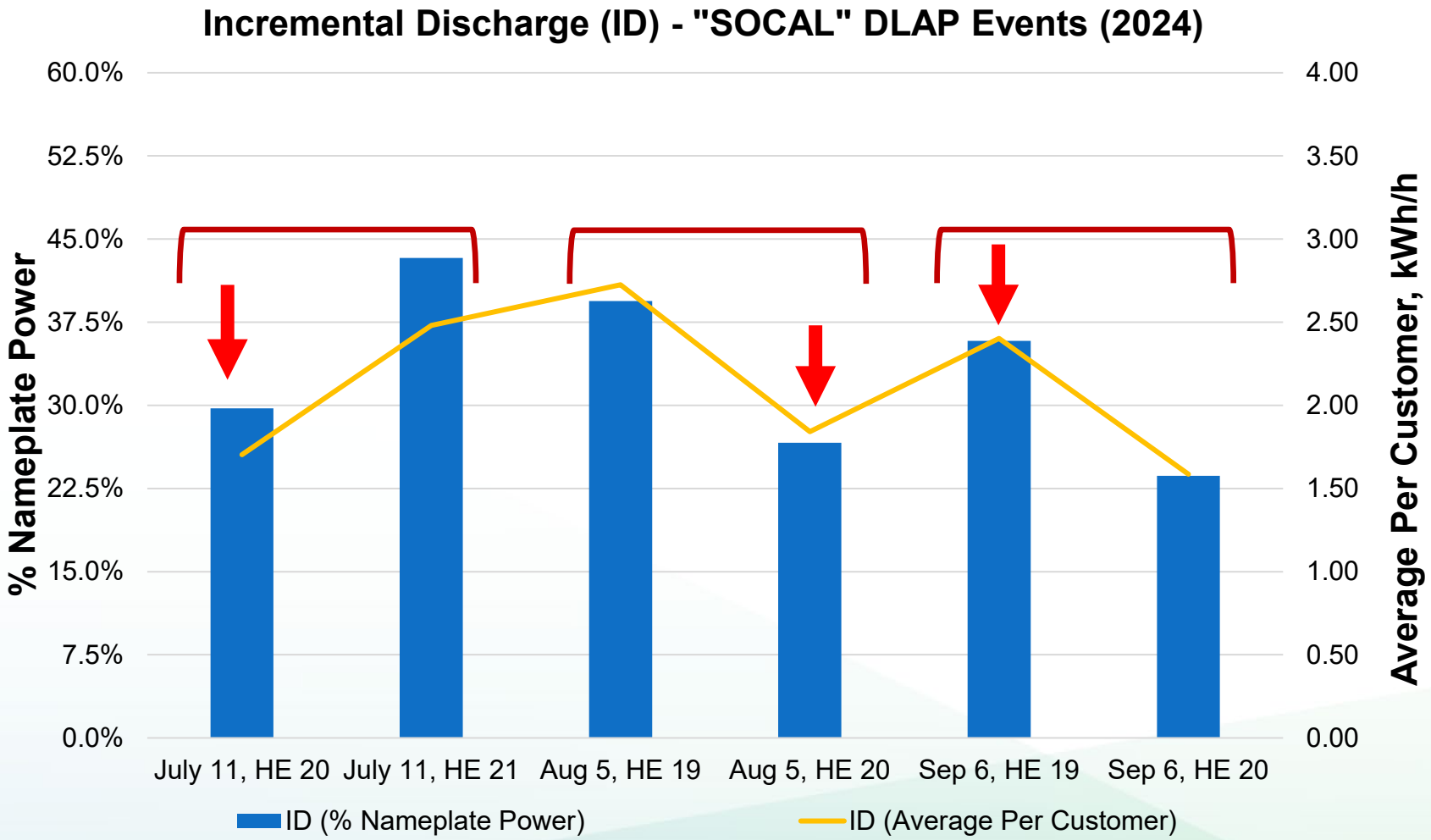


Source: California Energy Commission

Red arrow indicates event hour with highest LMP price

Incremental Discharges During “SOCAL” Events - Residential VPP

- July 11th and Aug 5th 2-hour event discharge pattern opposite of LMP price pattern
- Sept 6th 2-hour event discharge pattern consistent with LMP price pattern
  - With 2024 being the first full year of VPP pilot, providers may not have been focused on dispatch optimization around higher LMP hour.

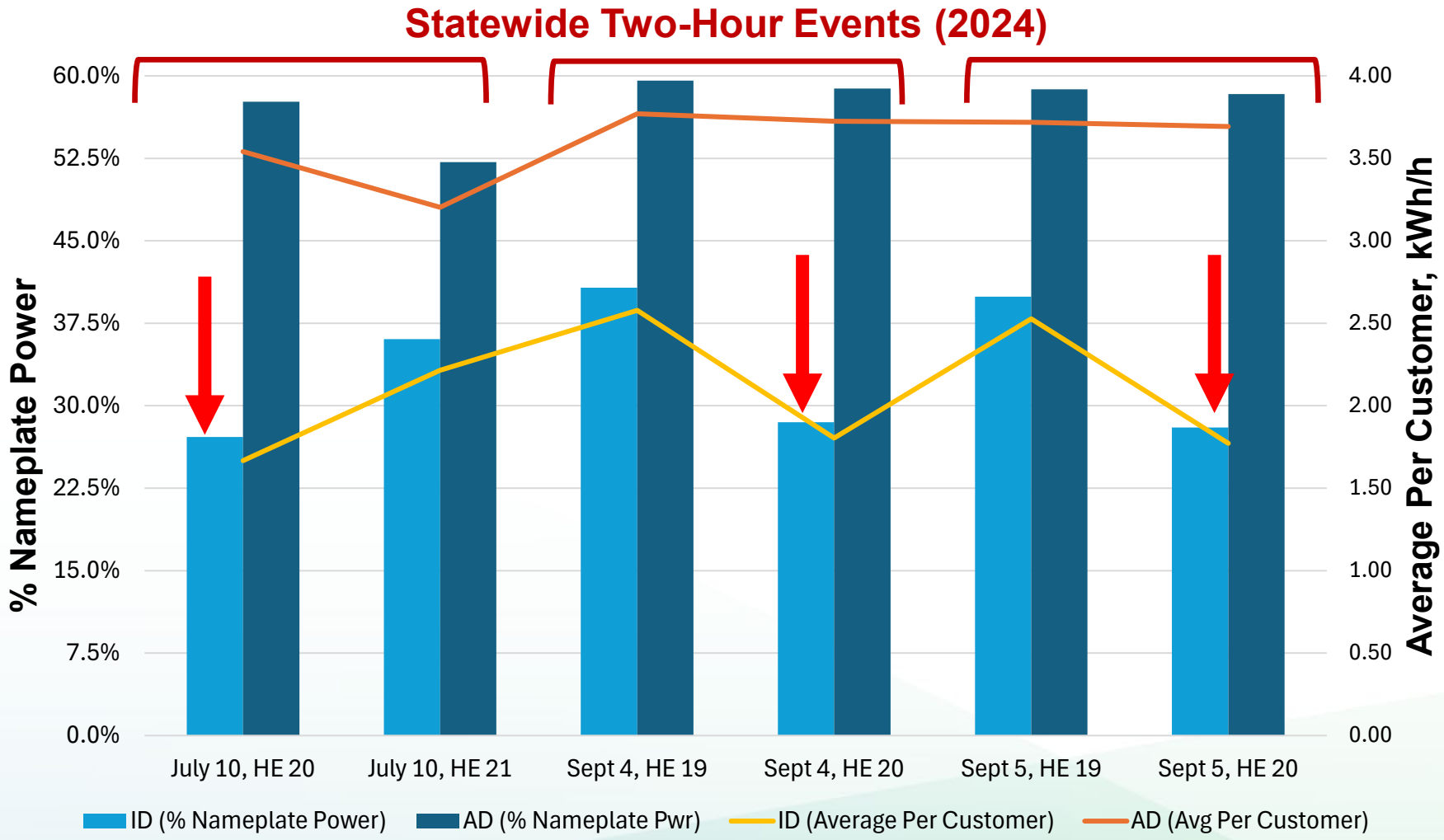


Source: California Energy Commission

Red arrow indicates event hour with highest LMP price

Analysis of Hourly Discharge vs. LMP – Residential VPP

- Aggregate Discharges (AD, dark blue bars) appear fairly level across all two-hour events
- However, in all three two-hour events, Incremental Discharge (ID, light blue bars) during HE20 appears to be lowest, even though LMP is higher in that hour (red arrow)
- Differences in discharge trend between AD and ID suggest that baselines may be a factor in explaining observed discharge patterns.



Source: California Energy Commission

HE = Hour Ending

Q & A

Zoom

- Use the “raise hand” feature to ask questions

Telephone

- Dial *9 to raise your hand
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When called upon

- Your microphone will be opened
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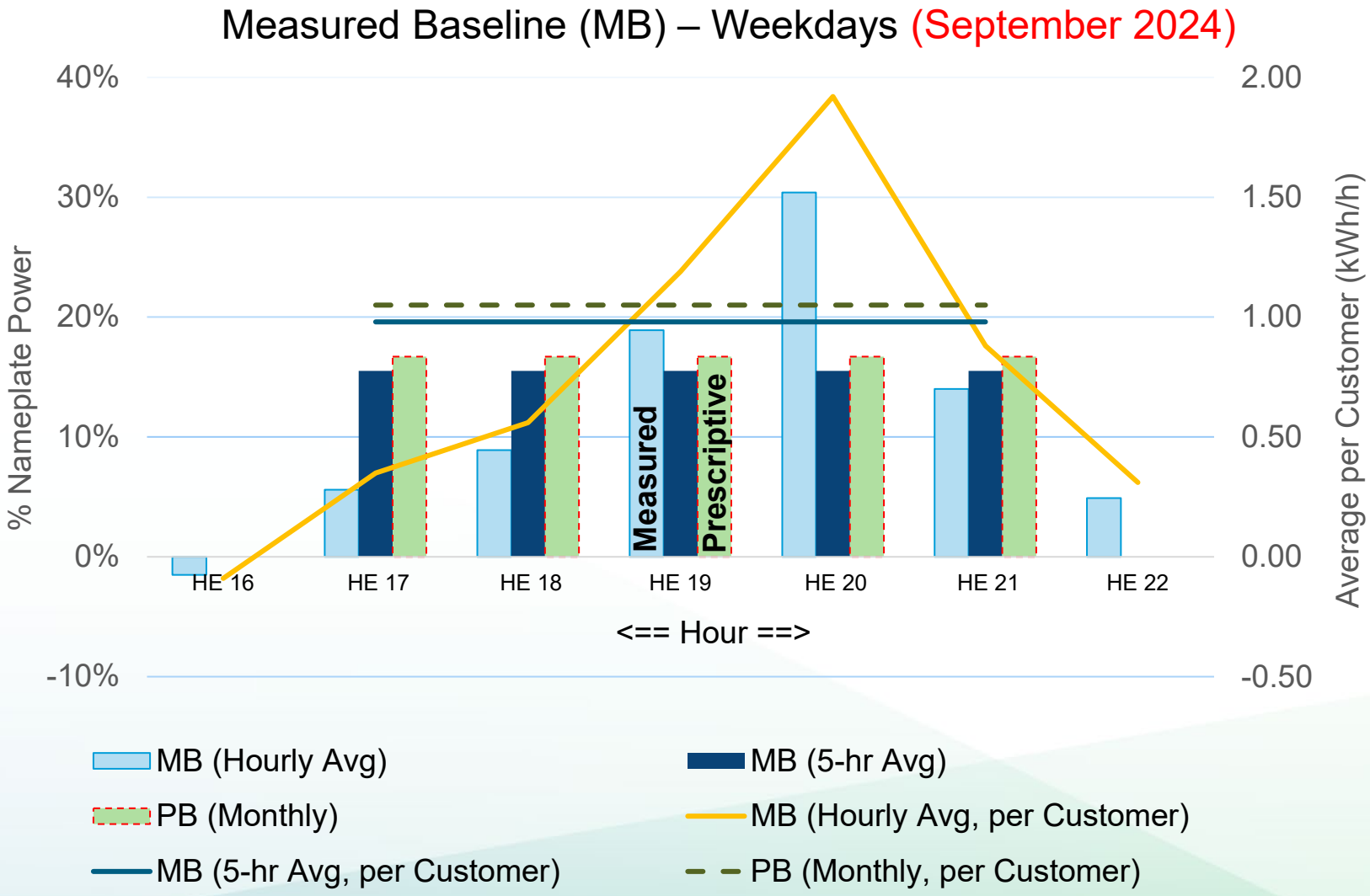
- Spell your name and identify your organization, then start your question

Measured Baseline - Residential VPP

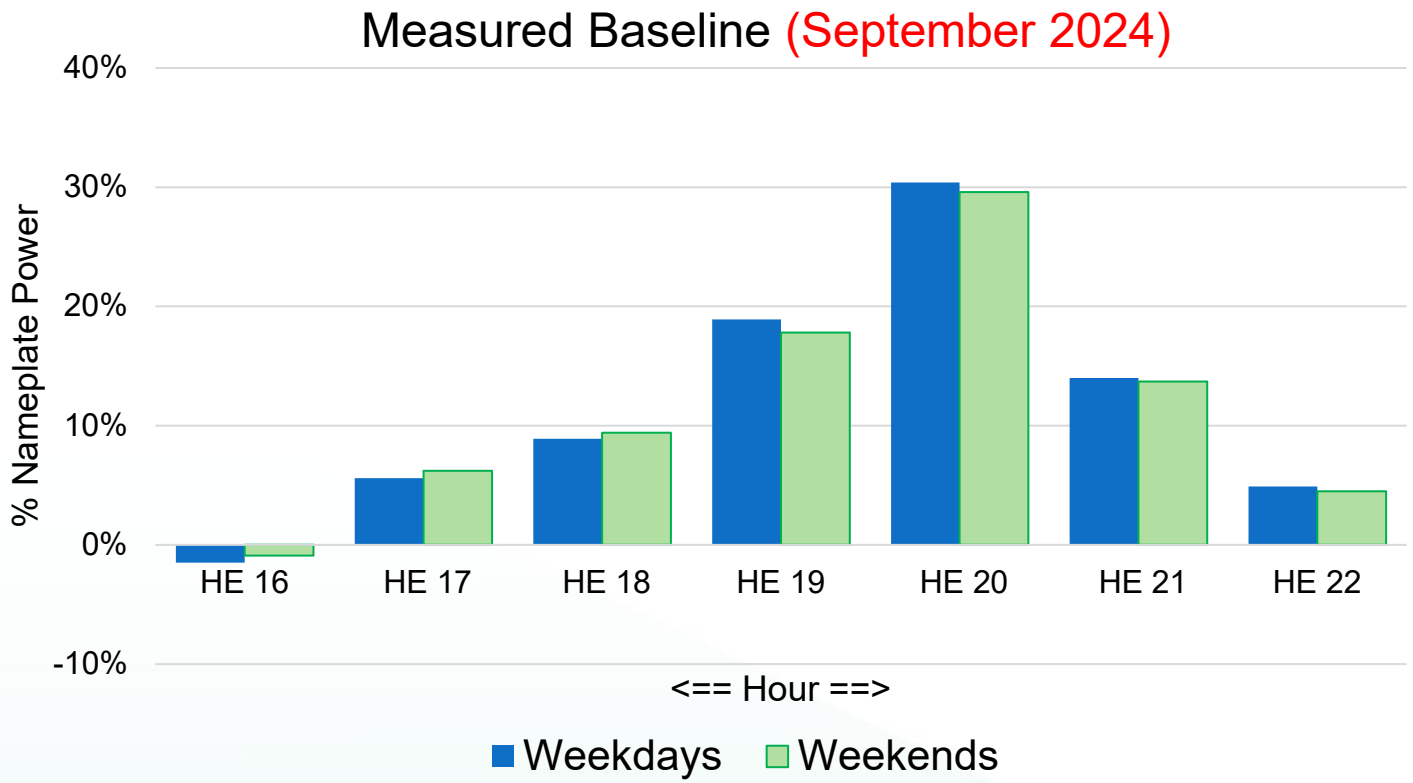
- **Measured Baseline (MB)** represents average hourly self-consumption due to the battery on non-event days.
- 4-9PM average September MB ~ 15.5% of Nameplate Power, or 0.98 kW per customer site
- Significant hourly variations observed in MB
- MB in certain hours could be below or above **Prescriptive Baseline (PB)**
- Average MB over program hours (4-9pm) is slightly less than PB



Source: California Energy Commission

Comparing Measured Baseline, Weekday vs. Weekend - Residential VPP

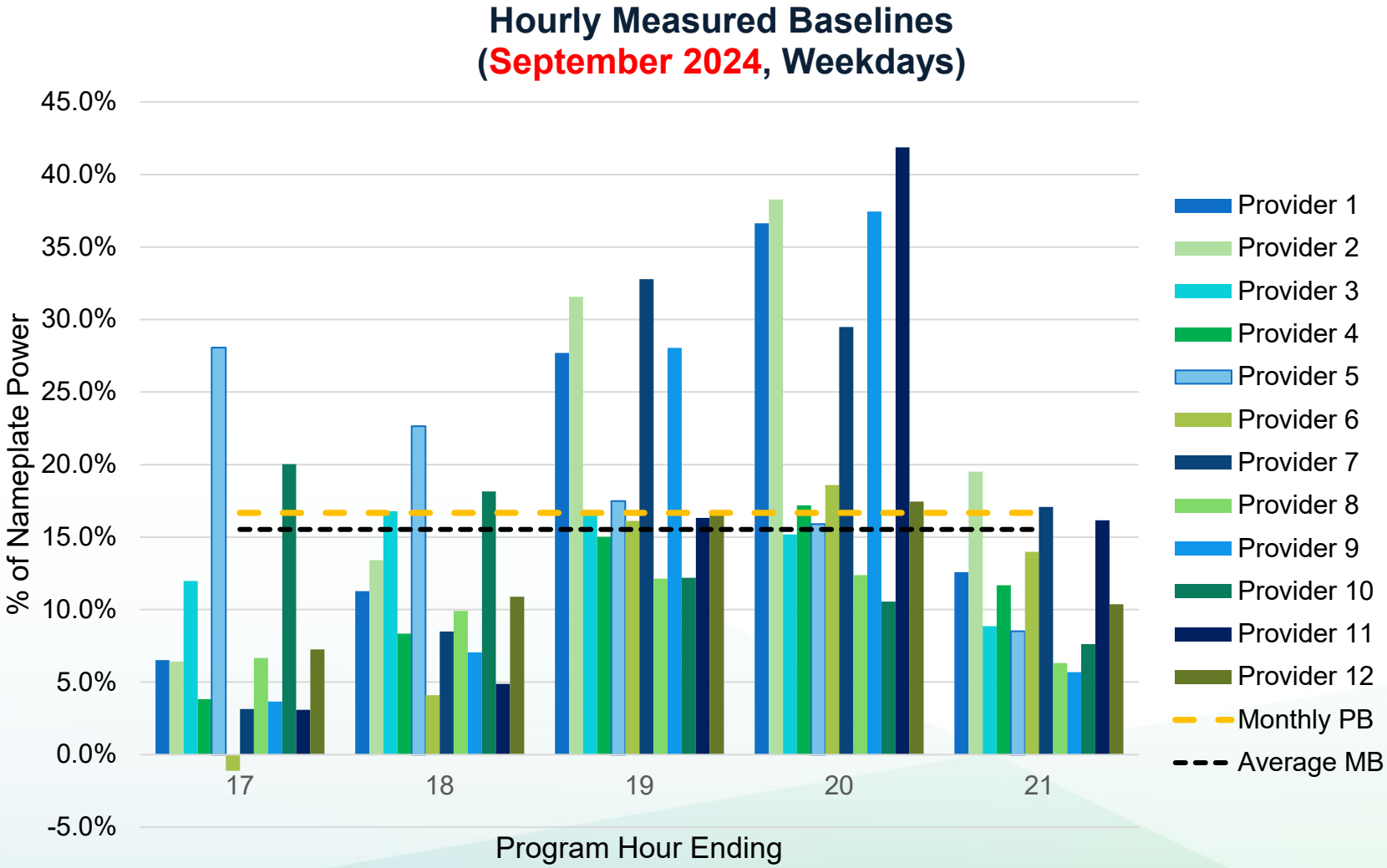
- No significant difference observed between Weekday vs. Weekend Measured Baselines



Source: California Energy Commission

Comparing Measured Baselines, All Providers – Residential VPP

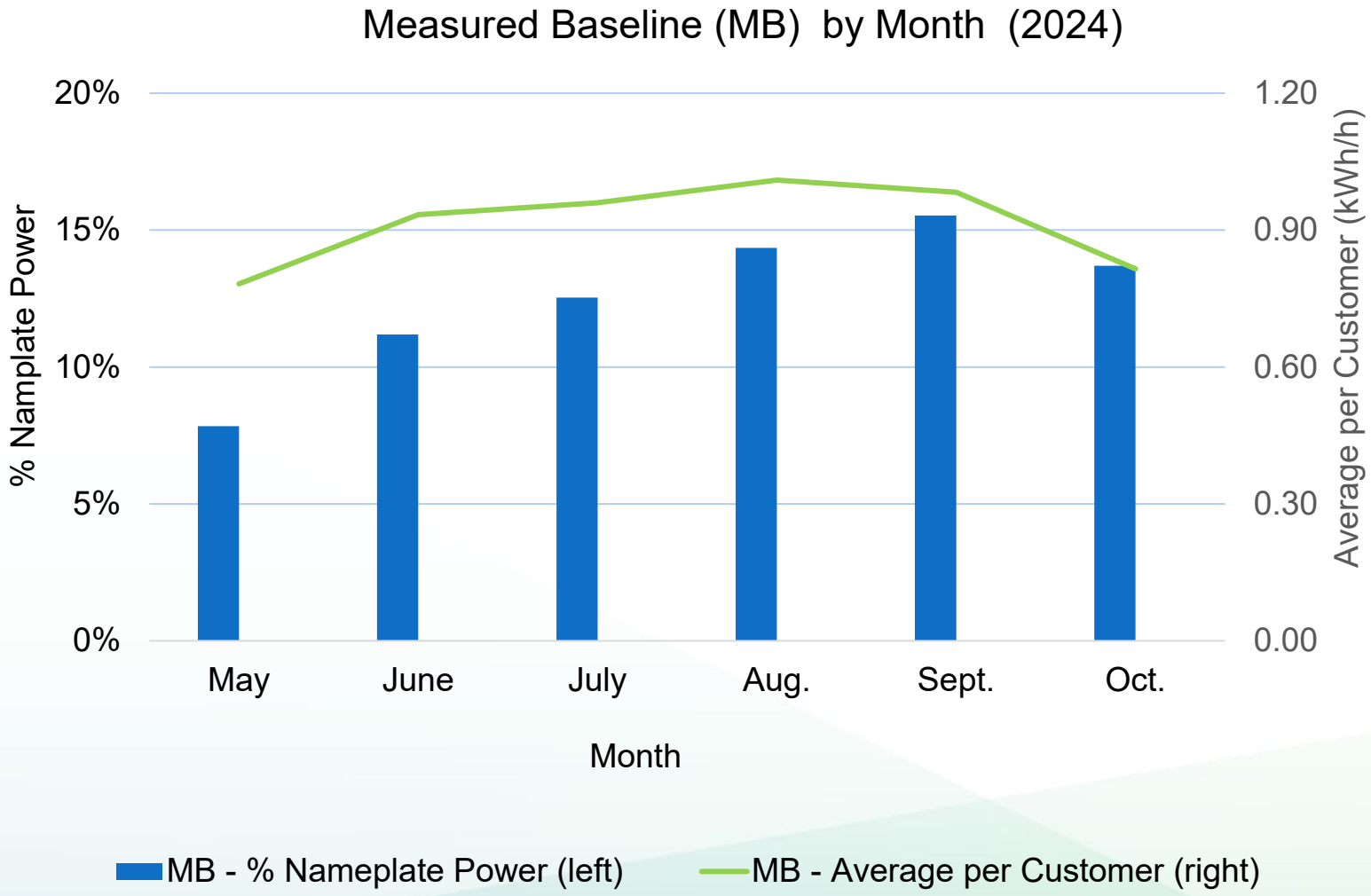
- 12 providers with 2-hr residential aggregations
- Hourly measured baselines vary across program hours and providers



Source: California Energy Commission

Measured Baseline Variations by Month – Residential VPP

- Average MB across the program hours 4 to 9 PM for each month
- Up 30% variation in average MB across the season



Source: California Energy Commission

Baseline Considerations

- **CAISO/Grid Operations:**
  - Emphasis on accuracy in reporting load impacts incremental to forecasts

- **Capacity Settlement & Compensation:**
  - Balance simplicity, predictability, accuracy, and fair compensation

Monthly Average Discharges – Residential VPP

Data for Residential VPP only

2024	May	June	July	Aug	Sept	Oct	Season Weighted Avg
Average ID per Customer (kWh/h)	1.94	2.14	1.75	2.12	2.15	2.37	2.10*
Incremental Discharge (ID) (% of Nameplate Power)	30.5%	35.0%	28.5%	33.8%	34.0%	37.3%	33.5%^
Average AD per Customer (kWh/h)	3.00	3.55	3.41	3.89	3.70	3.37	3.51*
Aggregate Discharge (AD) (% of Nameplate Power)	47.0%	58.1%	55.5%	62.2%	58.5%	52.9%	56.0%^

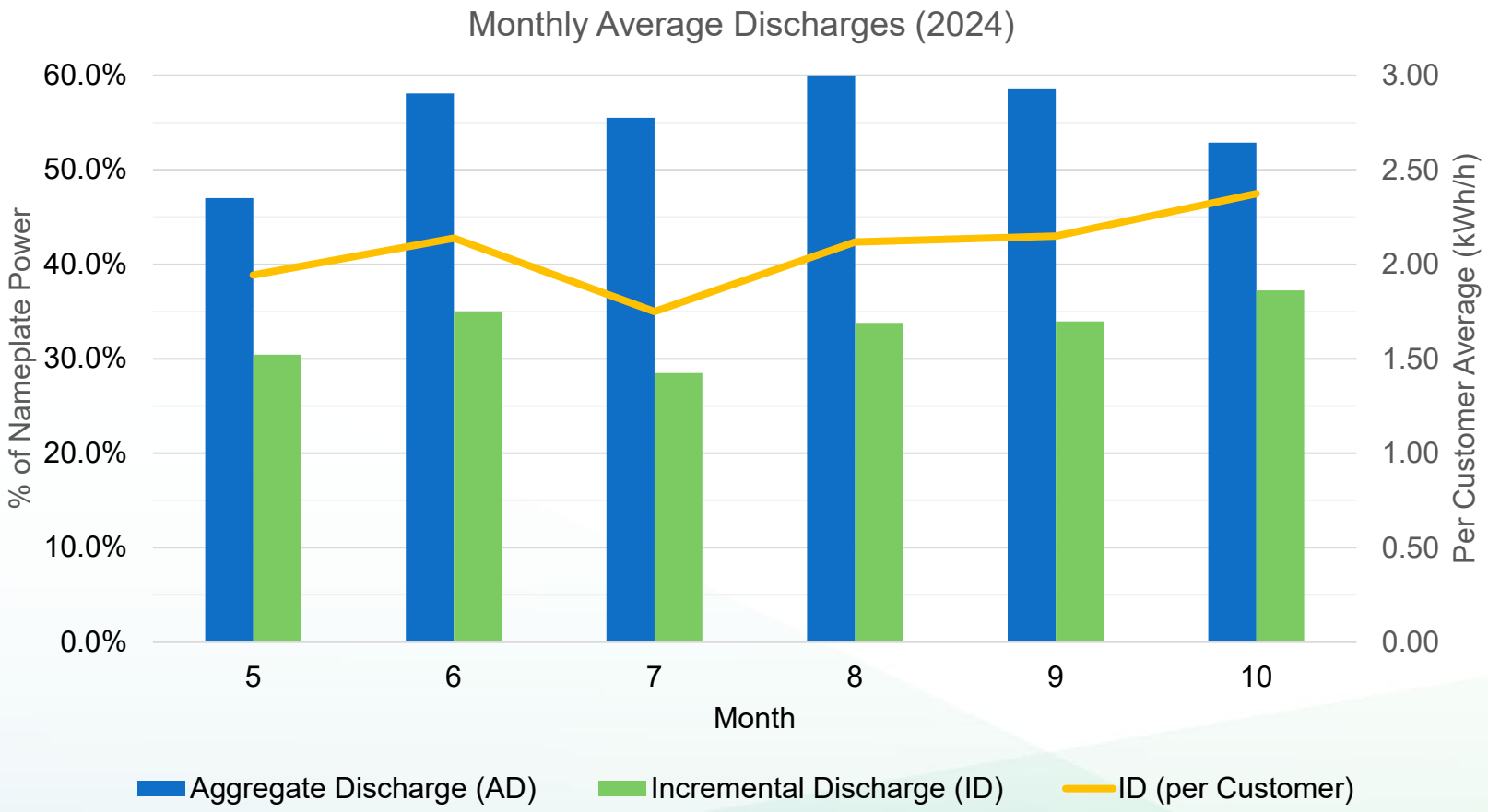
Source: California Energy Commission

* Weighted by # enrolled customers
^ Weighted by enrolled nameplate power (kW)
Note: % nameplate power *not* an analysis or indicator of VPP Performance

Monthly Average Discharges – Residential VPP (2)

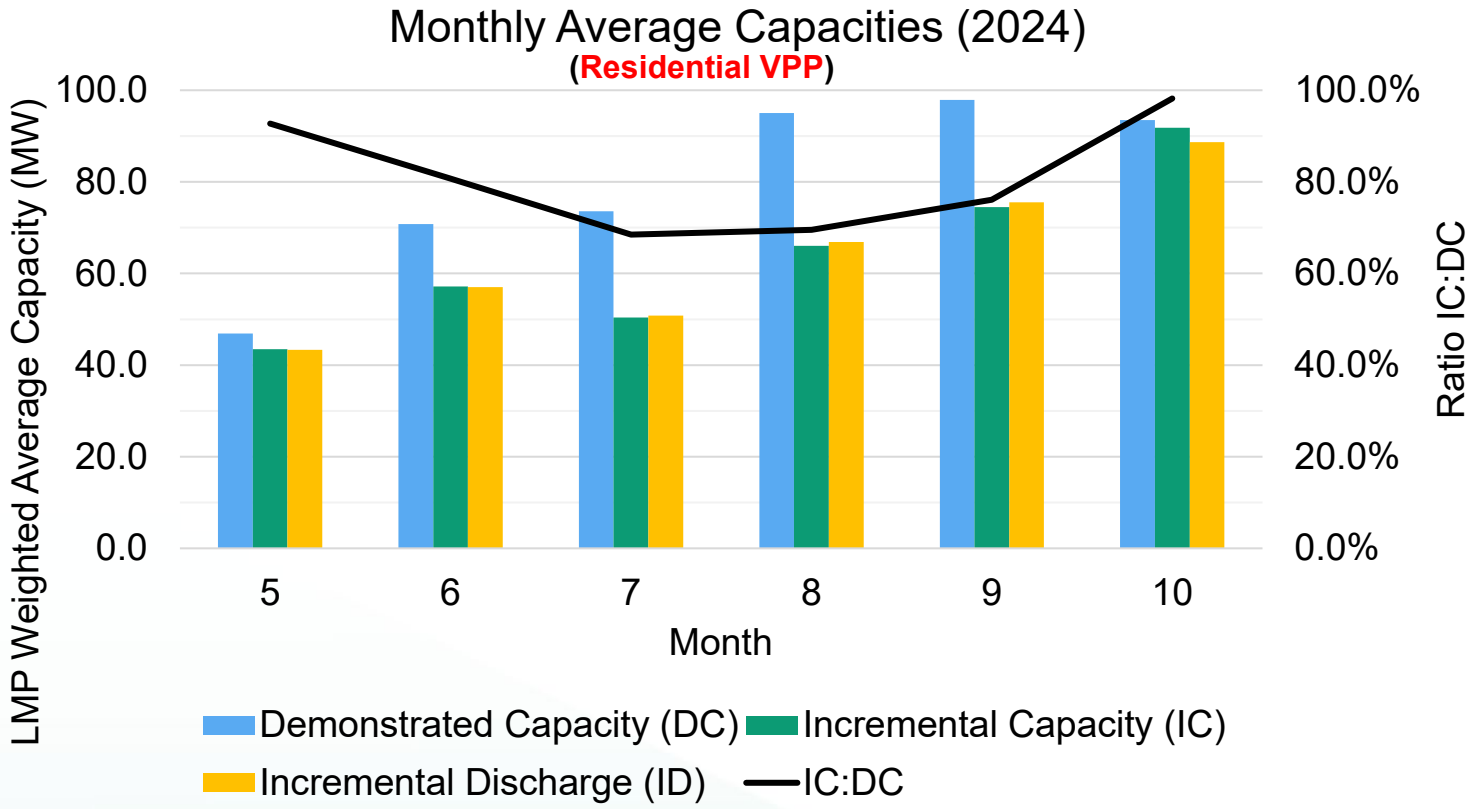
- Seasonal average for monthly incremental discharge (ID) ~
  - 33% of nameplate power, or
  - 2.08 kWh/h average per customer
  - NOT an analysis or indicator of VPP performance
- Per customer average ID (yellow graph) appears to trend up slightly

Data for Residential VPP only



Monthly Average Capacities – Residential VPP

- Monthly **Demonstrated Capacity* (DC)** generally appears to be higher than monthly **Incremental Capacity (IC)**
- Ratio of IC to DC appears lowest in mid-summer months
  - Likely because MB and LMP are highest in HE20 (most active event hour)
- Minor difference between LMP-weighted average IC and simple average ID



Source: California Energy Commission

*Monthly DC = Average hourly net discharge relative to Prescriptive Baseline (PB) across all events in the month, weighted by hourly LMP
*Monthly IC = Average hourly incremental discharge relative to hourly Measured Baseline (PB) across all events in the month, weighted by hourly LMP

Comparing Discharge by Type of Events – Residential VPP

Data for Residential VPP only - 2024

Incremental Discharge (ID)	Test			LMP			Mix		
	May	June	Avg	Jul	Sep	Avg	Aug	Oct	Avg
% Nameplate Power	30.4%	35.0%	**32.7%**	28.5%	34.0%	**31.2%**	33.8%	37.3%	**35.5%**
Average per Customer (kWh/h)	1.94	2.14	**2.04**	1.75	2.15	**1.95**	2.12	2.37	**2.25**

Source: California Energy Commission

➔ ***No significant difference in performance observed in months with Test vs. LMP events***

Q & A

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2025 Enrollment–3.5x Growth in Storage VPP

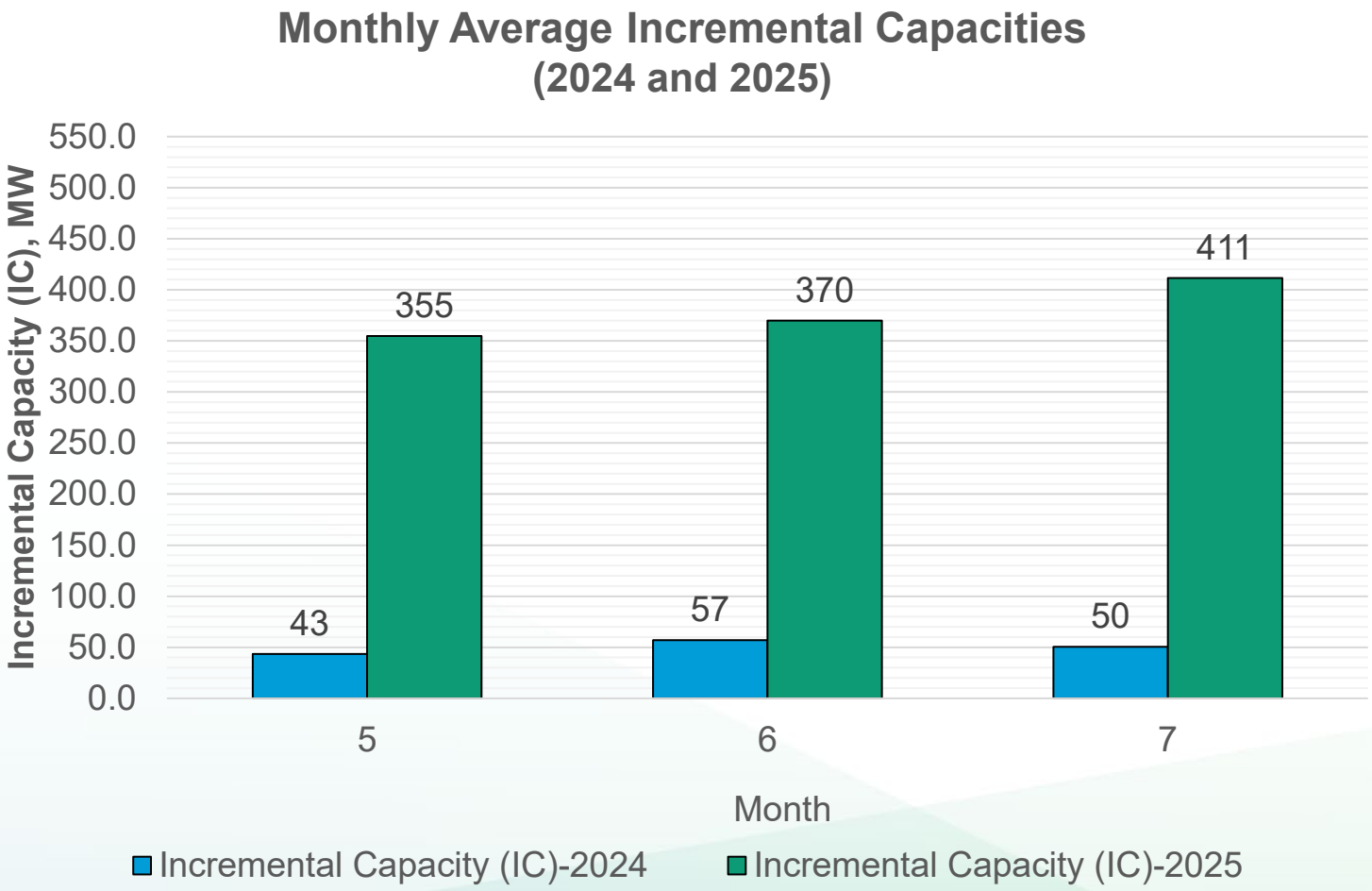
Enrollment by DSGS Incentive Option (in MW)^	Oct 2024	May 2025	June 2025	July 2025	Aug 2025	Sept 2025	Oct 2025
Incentive Option 1 – Emergency Dispatch (Non-combustion)	51.0	69.8	69.8	69.8	69.8	76.8	76.8
Incentive Option 1 – Emergency Dispatch (Combustion)	98.0	87.4	211.4	211.4	211.4	211.4	211.4
Incentive Option 2 – Market Integrated Incremental Demand Response	117.4	51.0	64.7	86.3	163.8	85.0	72.0
Incentive Option 3 – Market Aware Storage VPP	220.1	602.1	630.5	707.2	722.7	754.3	767.8
Incentive Option 4 – Emergency Load Flexibility VPP	N/A	10.3	18.5	18.1	17.7	17.4	17.1
Total	**486.5**	**820.6**	**994.8**	**1,092.8**	**1,185.4**	**1,144.9**	**1,145.0**

Source: California Energy Commission

^ Provider estimates

Monthly Average Capacities (2024 and 2025) – Residential VPP

- Monthly residential VPP incremental capacities (IC)* have increased exponentially in 2025, compared to 2024
- Currently, the residential VPP incremental capacity exceeds 400 MW



Source: California Energy Commission

*LMP-weighted average of hourly incremental discharge (ID) relative to measured baselines

Comparing 2024 and 2025 VPP Performance

Data for Residential VPPs only

Incremental Discharge	2024				2025			
	May	June	July	3-Month Weighted Avg	May	June	July	3-Month Weighted Avg
Average ID per Customer (kWh/h)	1.94	2.14	1.75	1.94*	3.69	3.62	3.68	3.66*
Aggregate ID (% of Nameplate Power)	30.5%	35.0%	28.5%	31.3%^	47.2%	46.2%	43.7%	45.6%^

Source: California Energy Commission

* Weighted by # enrolled customers
^ Weighted by enrolled nameplate power (kW)
Note: % nameplate power *not* an analysis or indicator of VPP Performance

Some Observations on Storage VPP Analysis (1)

Performance

1. VPP demonstrated the ability to deliver incremental capacity (relative to measured baseline) during event hours
   - VPP delivered substantial incremental capacity ~ 91 MW (September 2024)
   - Two-hour resources accounted for 99% of the total incremental discharge delivered by the overall VPP
   - Average incremental discharge per customer site across the 2024 season ~ 2.1 kW (residential VPP)

2. No consistent difference observed in hourly performance of one- vs. two-hour events, or test vs. LMP events (residential VPP)

3. Preliminary results from May-July 2025 suggest average residential VPP performance levels increased

Some Observations on Storage VPP Analysis (2)

Baselines

1. Measured baseline averaged across program hours is close to prescriptive baseline (in September 2024)

2. Hourly measured baselines appear to vary across program hours and from provider to provider in the same hour

3. Average monthly measured baseline trend across the season suggests some temperature dependency (and thus, VPP performance)

Some Observations on Storage VPP Analysis (3)

Residential VPP Profile (2024)

1. Per site average residential battery nameplate capacities were 6.33 kW x 2.25 hours (September)

2. Two-hour resources accounted for 98% of overall VPP aggregate nameplate capacity (September)

3. Residential resources constitute 82% of the overall nameplate capacity.

4. No residential resources with durations beyond 2 hours

5. Preliminary 2025 data suggests an increase in residential per-site average nameplate capacities between the 2024 and 2025 program seasons

Some Observations on Storage VPP Analysis (4)

Scale

1. VPP capacity grew at a rapid pace in 2024: incremental capacity delivered to the grid doubled from May to October

2. PG&E and SOCAL (SCE & SDG&E) regions were about equal in terms of aggregate residential VPP capacity

3. DSGS Storage VPP appears capable of substantial contribution to grid reliability during peak hours with several hundreds of incremental megawatts available (over 400 MW, incremental relative to measured baselines) as of July 2025

2024 Performance of Other DSGS Options (1 & 2)

	Option 1 – Emergency Dispatch	Option 2 – Market Integrated Demand Response
Providers	8	5
Participants	34	231,468
Oct Enrolled Capacity*	149 MW	117 MW
Events	1 Energy Emergency Alert	9547 event hours across 5 providers
Incentivized Performance	• 2.28 MWh incremental load reduction • 91 MWh Standby Commitment	12.5 MW incremental demonstrated capacity in Oct

*Per estimates submitted by providers
^Across four separate heat waves

DSGS Program Funding

Total Funding	$109.5 million
Subtract*	• 2022 Expenditures: $8.0 million • 2023 Expenditures: $3.2 million • 2024 Expenditures: $14.3 million • 2025 Expenditures: ~$54 million (projected)
Remaining Funding	~$30 million^

*Expenditures include admin and incentive payouts
^Preliminary estimate; subject to change

Next Steps

Target Dates (Subject to Change)	Milestone
October 15, 2025	Staff workshop on 2024 program season performance
Q4 2025	Begin public process to update program guidelines for 2026 program season
Q2 2026	Consideration of guidelines at CEC business meeting

Thank You!

Additional Questions: DSGS@energy.ca.gov

Docket No.: 22-RENEW-01

DSGS webpage: https://www.energy.ca.gov/programs-and-topics/programs/demand-side-grid-support-program

- Today's workshop materials (slides)
- DSGS/VPP battery telemetry dataset for all participating customers (2024 season)
- Program updates and announcements
- Email subscription enrollment

Q & A

Zoom

- Use the “raise hand” feature to ask questions

Telephone

- Dial *9 to raise your hand
- *6 to mute/unmute your phone line. You may also use the mute feature on your phone

When called upon

- Your microphone will be opened
- Unmute your line
- Spell your name and identify your organization, then start your question

Public Comment

- Zoom
  - Use the “raise hand” feature
- Telephone
  - Dial *9 to raise your hand
  - *6 to mute/unmute your phone line. You may also use the mute feature on your phone
- When called upon
  - Your microphone will be opened
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  - State your name and identify your organization, then start your comment

Reminder

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- Today's workshop materials (slides)
- Anonymized DSGS/VPP battery telemetry dataset for all participating customers (2024 season)
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