



# Load Impact Evaluation: *Base Interruptible Program*

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# Presentation Outline

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2. Ex-Post Methodology
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4. Ex-Ante Methodology
5. Enrollment Forecasts
6. Ex-Ante Load Impacts
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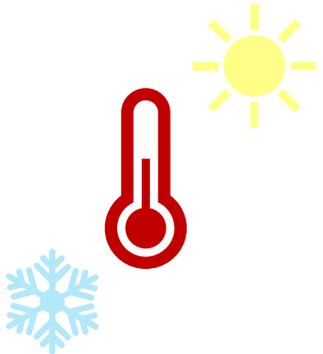
# 1. BIP Program Description

- Emergency DR program for non-residential customers, events triggered by CAISO or local system emergencies
- Customers receive a monthly capacity credit in exchange for a commitment to reduce energy consumption to their Firm Service Level (FSL)
  - The FSL represents the customer's minimal operational requirements
- 15, 20, or 30-minute notice of events
- Failure to reduce load to the FSL can result in:
  - excess energy charges,
  - an increase in the FSL (& commensurate reduction in capacity credits),
  - re-test events,
  - or de-enrollment from the program
- Program specifics vary by utility

## 2. Ex-Post Methodology



- Individual regressions were used to estimate BIP ex-post load impacts
- This method was chosen for two reasons:
  - Difficulty in finding adequate control-group customers
  - Some customers have volatile loads, so even customers that match reasonably well on average may not have a comparable load on a specific day



- Customer-specific specification search conducted to:
  - Determine if each customer has a weather-sensitive load
  - Find the best fitting weather and shape variables by groups defined by weather sensitivity and industry group

## 2. Ex-Post Methodology (2)

- BIP load impacts generally do not change significantly with temperatures because the biggest responders do not have weather-sensitive loads
- However, there are weather-sensitive customers in BIP that cause the program reference load to change somewhat with temperatures
- Separate weekday versus weekend regression specifications are used, when applicable
  - In PY2022 analysis Monday, September 5<sup>th</sup> was treated as a weekend event (Labor Day)

# 3. Ex-Post Load Impacts: *Events*

Date	Day of Week	PG&E	SCE	SDG&E
9/5/2022	Monday	Transmission Emergency 7:15 – 9:18 p.m.	Transmission Emergency 6:30 – 8:12 p.m.	
9/6/2022	Tuesday	Transmission Emergency 6:00 – 8:38 p.m.	Transmission Emergency 5:00 – 8:43 p.m.	
9/7/2022	Wednesday	Transmission Emergency 7:15 – 8:02 p.m.	Transmission Emergency 6:15 – 8:12 p.m.	

- For modelling purposes, September 5<sup>th</sup> is treated as a Sunday and September 6<sup>th</sup> is treated as a Monday because loads on those days reflect the selected day types
- All events occurred during a heat wave occurring from September 1<sup>st</sup>-9<sup>th</sup>

# 3. Ex-Post Load Impacts: *Events (2)*

Utility	Hours of Availability	Hours of Actual Use	No. of Available Dispatches	No. of Actual Dispatches
PG&E	180 / year 4 / day	5.5	10 / month 1 / day	3
SCE	180 / year 6 / day	7.5	10 / month 1 / day	3
SDG&E	120 / year 4 / day	0	10 / month	0

# 3. Ex-Post Load Impacts: Summary

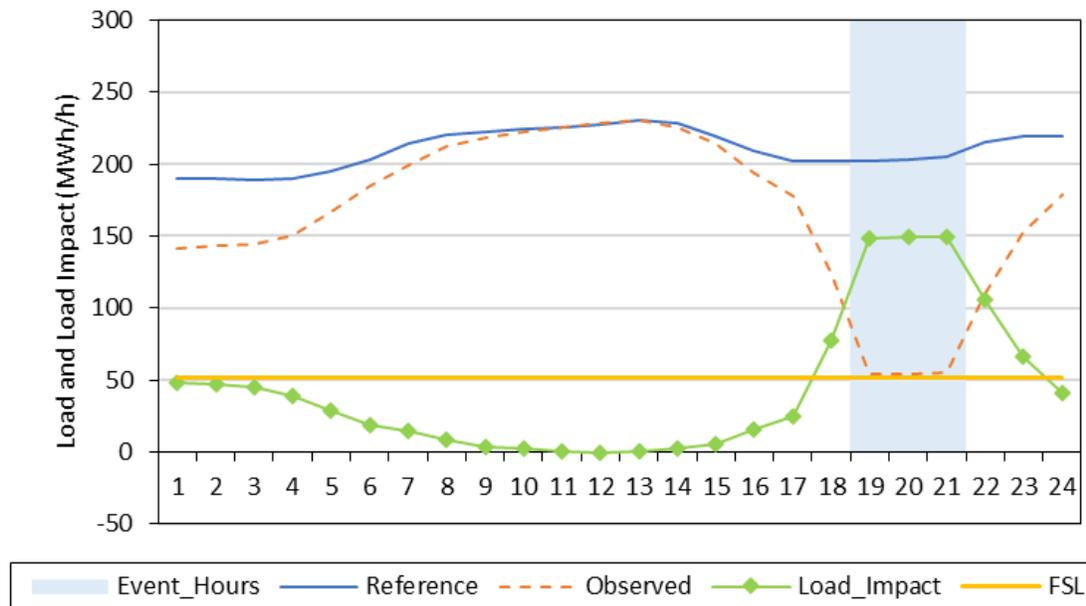
## PG&E

Event	Date	Day of Week	# Service Agreements	Estimated Load Impact (MWh/h)	% LI	Estimated LI / LI at FSL
1	9/5/2022	Mon.	258	109	68%	100%
2	9/6/2022	Tue.	258	149	73%	98%
3	9/7/2022	Wed.	258	163	74%	96%
<b>Typical Event Day</b>			<b>258</b>	<b>149</b>	<b>73%</b>	<b>98%</b>

## SCE

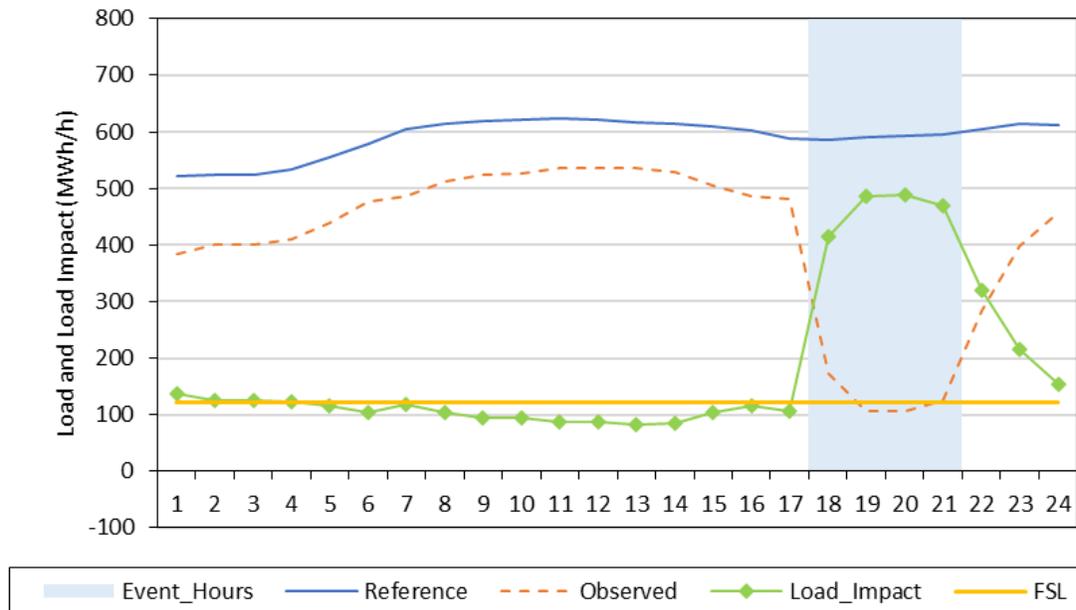
Event	Date	Day of Week	# Service Agreements	Estimated Load Impact (MWh/h)	% LI	Estimated LI / LI at FSL
1	9/5/2022	Mon.	343	341	76%	105%
2	9/6/2022	Tue.	343	463	78%	99%
3	9/7/2022	Wed.	343	490	82%	103%
<b>Typical Event Day</b>			<b>343</b>	<b>463</b>	<b>78%</b>	<b>99%</b>

### 3. Ex-Post Load Impacts: *PG&E September 6<sup>th</sup> Typical Event Day*



- Event from 6:00 to 8:38 p.m.
- 258 customers enrolled
- 258 customers called
- Ref. Load = 203 MW
- Load Impact = 149 MW
- % Load Impact = 73%
- FSL = 51 MW
- FSL Achievement = 98%
- Top 15 responders account for 64% of the total load impact

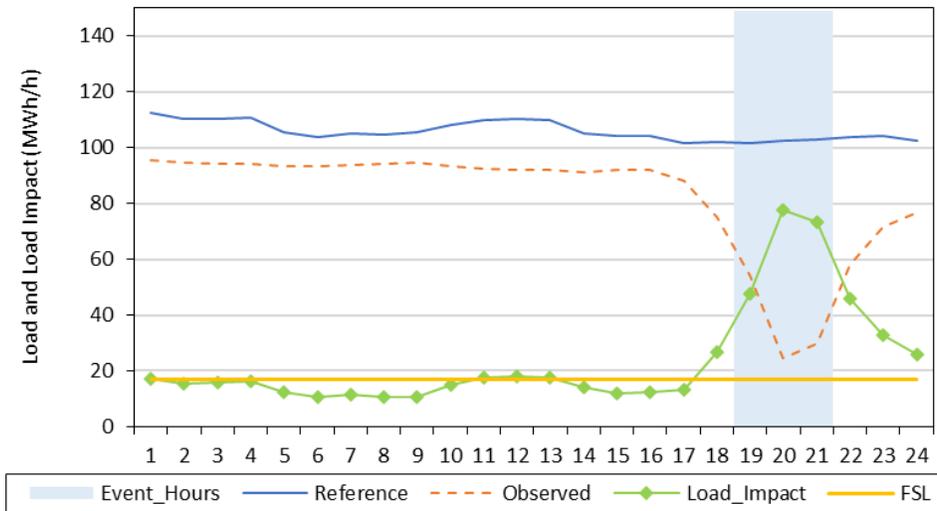
# 3. Ex-Post Load Impacts: *SCE September 6<sup>th</sup> Typical Event Day*



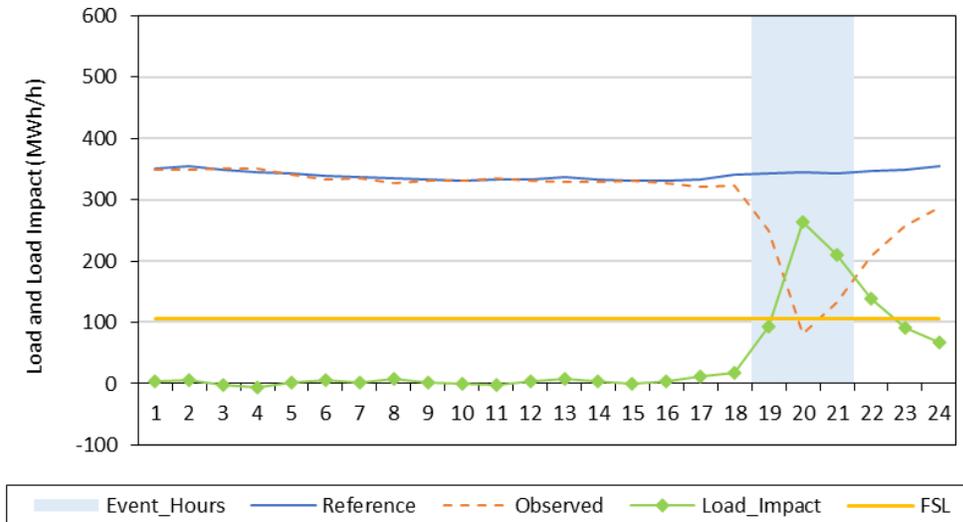
- Event from 5:00 to 8:43 p.m.
- 343 customers enrolled
- 343 customers called
- Ref. Load = 590 MW
- Load Impact = 463 MW
- % Load Impact = 78%
- FSL = 122 MW
- FSL Achievement = 99%
  - First hour = 89%
  - Remaining hours = 103%
- Top 15 responders account for 54% of the total load impact

# 3. Ex-Post Load Impacts: *SCE Voluntary Load Reductions*

September 5<sup>th</sup> for Voluntary Reduction Customers



September 5<sup>th</sup> for Normal Customers



- SCE asked 19 customers to provide voluntary load reductions during September 1-9 heat wave
- Reductions were not counted against BIP program performance
- 17 customers provided voluntary reductions on September 5<sup>th</sup> (shown above left)
  - September 5<sup>th</sup> voluntary reduction roughly 20 MW

# 3. Ex-Post Load Impacts: *SDG&E*

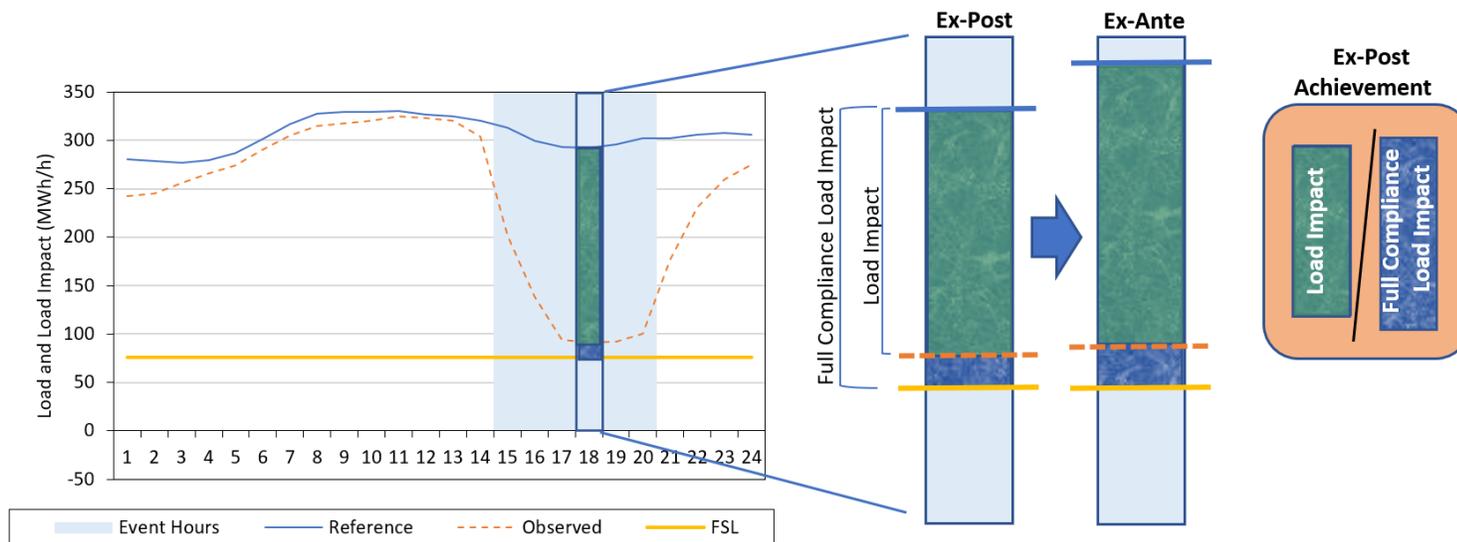
- SDG&E had 0 customers enrolled in BIP in PY2022
- SDG&E called 0 events in PY2022

# 4. Ex-Ante Methodology

- Customers who have left BIP are not included
- Reference loads are simulated using the following:
  - Customer-specific regressions to obtain effect of weather and time period indicators on usage
  - Ex-ante day types and weather conditions  
(e.g., August peak month day in a utility-specific 1-in-2 weather year)
  - Biggest responders do not tend to have weather-sensitive loads
- Ex-ante load impacts are based on the most recent full or test / M&E event day for which customer's reference load was above their FSL, by customer

# 4. Ex-Ante Methodology (2)

- Each customer's ex-ante load impact is set to its ex-post FSL achievement rate:
  - Ex-post Achievement =  $\text{Ex-post Load Impact} / (\text{Ref.} - \text{FSL})$
  - Ex-ante Impact =  $\text{Ex-post Achievement} \times (\text{Ref.} - \text{FSL})$



### Additional Details

- Load impact is zero if FSL is above the reference load
- Customers who have joined BIP are assigned the program-level FSL achievement rate (applied to their own reference loads and FSL, if available)
- Load impacts display little to no relationship with weather conditions

# 5. Enrollment Forecast

- The table below shows August enrollment in each year of the forecast
  - PG&E & SCE forecast flat enrollment

Utility	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
PG&E	240	240	240	240	240	240	240	240	240	240	240
SCE 15-min	43	43	43	43	43	43	43	43	43	43	43
SCE 30-min	289	289	289	289	289	289	289	289	289	289	289

**\*Note:** SDG&E enrollment forecast and ex-ante results are confidential

# 6. Ex-Ante Load Impacts: *by Year and Weather Scenario*

PG&E

Year	Weather	# SAIDs	Load Impact (MW)	Temp. (°F)	FSL (MW)
Aug. 2023	PG&E 1-in-2	240	168.7	94	57
	PG&E 1-in-10		169.2	100	
Aug. 2033	PG&E 1-in-2	240	170.8	94	57
	PG&E 1-in-10		171.4	100	

Change over forecast period related to the end of ELRP

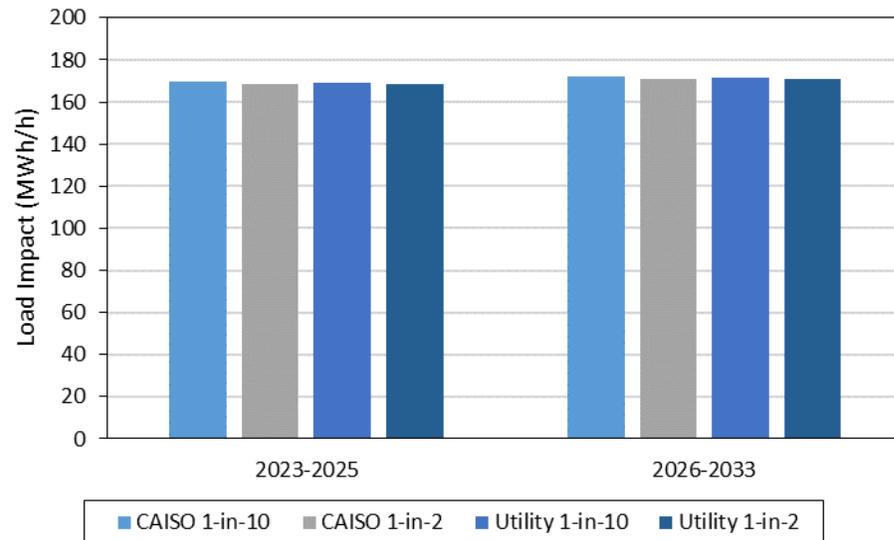
SCE

Year	Weather	# SAIDs	Load Impact (MW)	Temp. (°F)	FSL (MW)
Aug. 2023	SCE 1-in-2	332	500	89	118
	SCE 1-in-10		501	92	
Aug. 2033	SCE 1-in-2	332	500	89	118
	SCE 1-in-10		501	92	

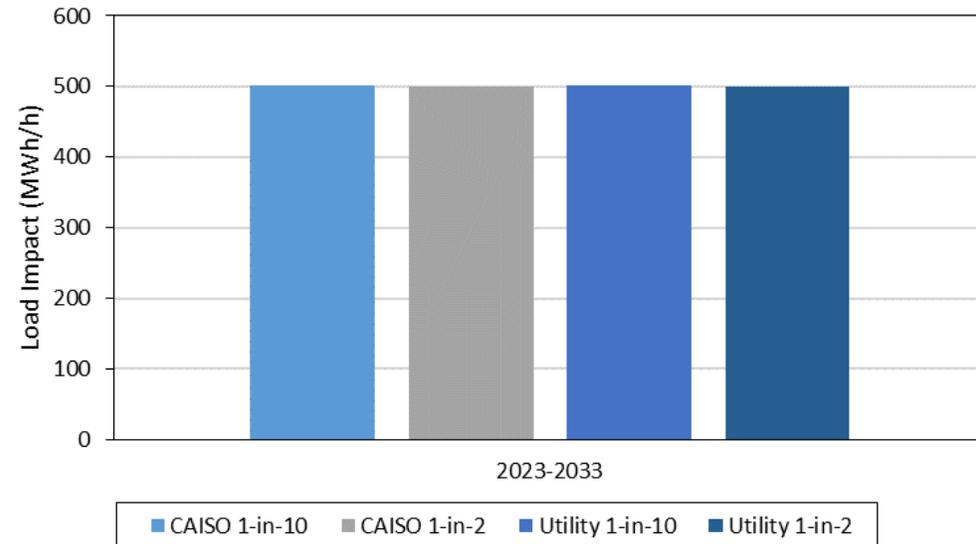
No changes over forecast period

# 6. Ex-Ante Load Impacts: *by Year and Weather Scenario (2)*

PG&E



SCE



# 7. Reconciliations:

## *PG&E Current Ex-Post vs. Ex-Ante*

Ex-post / Ex-ante	Date / Scenario	# SAIDs	Reference Load (MW)	Load Impact (MW)	Temp. (°F)	FSL (MW)	FSL Achievement
Ex-post	September 6 <sup>th</sup> Event	258	203	149	96	51	98%
Ex-ante	August 2023 Typical Event Day	240	231	169	93	57	97%

- Per-customer reference loads and load impacts are higher in ex-ante because of customers that remained on the program
- Some large customers joined BIP in 2023, contributing to increased reference load and load impacts
- **Note:** All ex-ante forecasts from this point forward reflect the utility-specific 1-in-2 peak day

# 7. Reconciliations: PG&E Previous vs. Current Ex-ante 2023

When Created	# SAIDs	Aggregate			Per-customer	
		Reference Load (MW)	Load Impact (MW)	FSL (MW)	Reference Load (kW)	Load Impact (kW)
Following PY2021 (Previous)	278	245	175	56	880	628
Following PY2022 (Current)	240	231	169	57	961	702

- Reference load and load impact decreased by 14 MW and 6 MW, respectively. Factors include (arrows indicate direction of load impact):
  - Enrollment forecast decreased by 38 customers ↓
  - FSL increased from 56 MW to 57 MW ↓
  - FSL Achievement Rate increased from 93% to 97% ↑
- Per-customer reference load and load impacts higher
  - Customers that remained are larger, on average
  - Multiple large customers joined the program after PY2022

# 7. Reconciliations:

## *PG&E Previous Ex-Post vs. Current Ex-Post*

When Created	# SAIDs	Aggregate			Per-customer	
		Reference Load (MW)	Load Impact (MW)	FSL (MW)	Reference Load (kW)	Load Impact (kW)
Ex-Post (Previous)	293	238	155	53	813	531
Ex-Post (Current)	258	203	149	51	787	577

- Reference load and load impact decreased by 35 MW and 14 MW, respectively.  
Factors include (arrows indicate direction of load impact):
  - Fewer customers on the program ↓
  - FSL decreased from 53 MW to 51 MW ↑
- Per-customer reference loads are lower, but load impacts are higher
  - Customers that remained are similar in size
  - Last year 68 customers had late notifications which drove load impacts down
  - Increased FSL achievement rate in PY2022

# 7. Reconciliations: *PG&E Previous Ex-Ante vs. Current Ex-Post*

When Created	# SAIDs	Aggregate			Per-customer	
		Reference Load (MW)	Load Impact (MW)	FSL (MW)	Reference Load (kW)	Load Impact (kW)
Following PY2021 (Previous)	268	236	170	54	881	633
Ex-Post (Current)	258	203	149	51	787	577

- Reference load decreased by 33 MW and load impact decreased by 21 MW. Factors include (arrows indicate direction of load impact):
  - Smaller reference loads due to consecutive event day following a labor day ↓
  - Fewer customers on the program ↓
- Per-customer reference load and load impact are both lower
  - Customers who remain on program have lower reference loads (for reasons listed above) but higher FSL achievement

# 7. Reconciliations: *SCE Current Ex-Post vs. Ex-Ante*

Ex-post / Ex-ante	Date / Scenario	# SAIDs	Reference Load (MW)	Load Impact (MW)	Temp. (°F)	FSL (MW)	FSL Achievement
Ex-post	September 6 <sup>th</sup> Event	343	590	463	89	122	99%
Ex-ante	August 2023 Typical Event Day	332	611	500	89	118	101%

- Compositional Changes:
  - Similar number of customers entering and leaving the program
  - Customers who remained on the program are larger on average than those who left
- Ex-post typical event day similar to a Monday
  - Lower reference loads and total load impacts
- Longer ex-ante RA window leads to higher load impacts

# 7. Reconciliations: SCE Previous vs. Current Ex-ante 2023

When Created	# SAIDs	Aggregate			Per-customer	
		Reference Load (MW)	Load Impact (MW)	FSL (MW)	Reference Load (kW)	Load Impact (kW)
Following PY2021 (Previous)	341	624	511	112	1,828	1,499
Following PY2022 (Current)	332	611	500	118	1,840	1,507

- Reference load and load impact decreased by 13 MW and 11 MW, respectively. Factors include (arrows indicate direction of load impact):
  - Enrollment forecast decreased by 9 customers ↓
  - Customers increased load impacts from previous year ↑
  - FSL increased to 118 MW ↓
  - FSL Achievement Rate increased from 100% to 101% ↑
- Per-customer reference load and load impacts similar in size between years (slightly larger)

# 7. Reconciliations: SCE Previous Ex-Post vs. Current Ex-Post

When Created	# SAIDs	Aggregate			Per-customer	
		Reference Load (MW)	Load Impact (MW)	FSL (MW)	Reference Load (kW)	Load Impact (kW)
Ex-Post (Previous)	344	551	409	115	1,603	1,188
Ex-Post (Current)	343	590	463	122	1,721	1,349

- Reference load and load impact increased by 39 MW and 54 MW, respectively. Factors include (arrows indicate direction of load impact):
  - Enrollment decreased by one customer ↓
  - FSL increased from 115 to 122 ↓
  - FSL Achievement Rate increased from 94% to 99% ↑
  - Customers who remained on the program increased impacts by roughly 50 MW ↑
- Per-customer reference load and load impacts increased
  - Most customers who left were smaller on average
  - A handful of customers significantly increased usage

# 7. Reconciliations: SCE Previous Ex-Ante vs. Current Ex-Post

When Created	# SAIDs	Aggregate			Per-customer	
		Reference Load (MW)	Load Impact (MW)	FSL (MW)	Reference Load (kW)	Load Impact (kW)
Following PY2021 (Previous)	341	614	502	112	1,800	1,471
Ex-Post (Current)	343	590	463	122	1,721	1,349

- Reference load and load impact decreased by 24 MW and 39 MW, respectively. Factors include (arrows indicate direction of load impact):
  - Enrollment increased by 2 customers 
  - Customers who remained on the program increased usage and load impacts 
  - Low event day loads (day after Labor Day) 
  - FSL Achievement Rate slightly decreased from 100% to 99% 
- Per-customer reference load and load impacts lower

# Questions?

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