



# PY2017 LOAD IMPACT EVALUATION OF AGGREGATOR DEMAND RESPONSE PROGRAMS: CBP AND AMP

2018 DRMEC Load Impact Workshop • May 4, 2018

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# AGENDA

- Program Descriptions
- Modeling Approach
- Confidentiality
- Ex Post Impacts
- Ex Ante Impacts
- Key Findings

# PROGRAM DESCRIPTION

## Capacity Bidding Program (CBP)

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- **IOUs:** PG&E, SCE, and SDG&E
- **Program Basics:**
  - Statewide aggregator-managed DR program
  - Operates May-Oct for PG&E and SDG&E and year-round for SCE
  - Customers must meet eligibility requirements to participate
  - Aggregators receive monthly capacity payments based on nominated load + energy payments based on kWh reductions during events
  - Capacity payment may be adjusted based on aggregated performance
  - If no events called, aggregators receive the monthly capacity payment according to nomination
  - Aggregators only receive energy payment if there are events
  - Aggregators pay incentives to participating customers based on their own agreements
  - Dual enrollment in energy-only DR program with a different notification type is allowed
- **Events:**
  - Triggered by IOU or CAISO market award
  - Day-ahead (DA) and day-of (DO) notice options
  - Event durations of 1-4, 2-6, and 4-8 hours in 2017 and forecast
  - Up to 30 event hours/month SCE and PG&E; 44 hours/month for SDG&E
  - 11 a.m. to 7 p.m. non-holiday weekdays

# PROGRAM DESCRIPTION

## Capacity Bidding Program (CBP)

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- **Program Changes:**
  - **PG&E:**
    - Adding additional operating hours of 1pm-9pm on an optional basis.
    - Residential customers are now eligible for CBP starting 2018.
    - Day-Of (DO) product is being eliminated in favor of Day-Ahead (DA) only.
  - **SCE:**
    - Trimming CBP offerings from 6 products to 2 products.
    - The operating hours are moving from 11am-7pm to 1pm-7pm.
    - Monthly event limit is set to a maximum of 5.
  - **SDG&E:**
    - Reducing number of CBP products from 9 to 4:
      - DA 2-4 hours, 11am-7pm and 1pm-9pm
      - DO 2-4 hours, 11am-7pm and 1pm-9pm
    - Adding products with operating hours of 1pm-9pm.
    - Pending: changing the trigger from price and heat rate to price only.

# PROGRAM DESCRIPTION

## Aggregator Managed Portfolio (AMP)

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- **IOUs:** SCE
- **Program Basics:**
  - 3<sup>rd</sup> party aggregators contract with IOUs
  - Aggregators create own DR programs and contract with customers
  - Operational months vary
  - Customers must meet eligibility requirements
  - System and local dispatch pre-integration; dispatch by Sub-LAP post-integration
  - Penalties for not delivering committed load reduction
  - Customers may dually enroll in other DR programs (CPP, DBP, OBMC)
- **Events:**
  - Triggered by IOU or CAISO market award
  - Only DO notification contracts in 2017
  - Number of events and hours varies for SCE

# PROGRAM DESCRIPTION

## Aggregator Managed Portfolio (AMP)

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- **Program Changes:**
  - SCE's AMP was discontinued at the end of PY2017.
    - Some accounts are expected to move into CBP in PY2018.
  - AMP is no longer included in the ex-ante forecast as no IOUs are planning to offer it.

# CUSTOMER-SPECIFIC REGRESSION APPROACH

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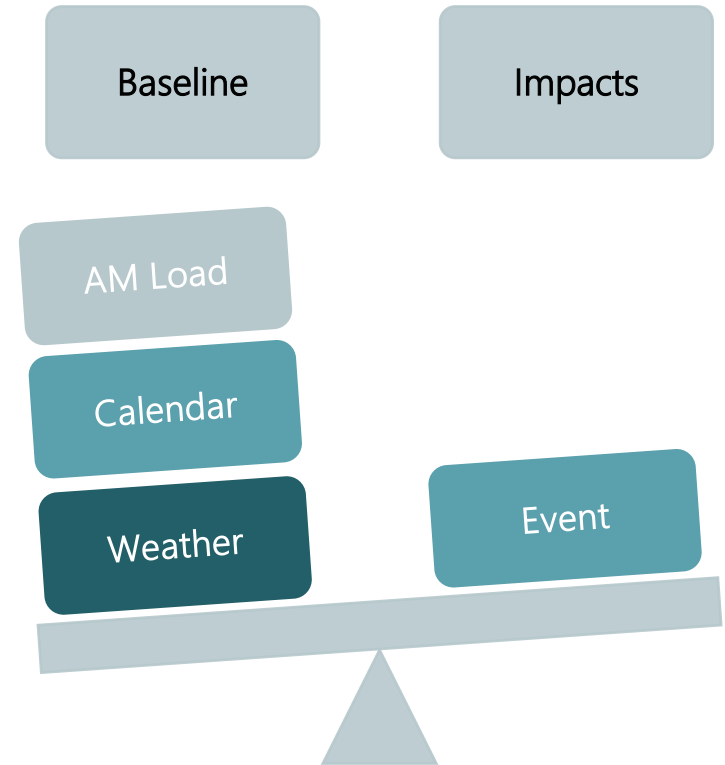
- Program participants are very large commercial and industrial customers and they consume energy very differently from each other
  - Wastewater treatment
  - Large Office Buildings
  - Industrial Facilities
- Instead of pooling participants into a single group, we estimate individual models for each participant
  - A pooled model may be too “noisy” to isolate changes related to impacts
- This is a valid method for estimating the counter-factual without a matched control group, which is difficult to develop for these customers

# CUSTOMER-SPECIFIC REGRESSION APPROACH

1

Develop a set of candidate models using building blocks set up in logical groups

- ~35 Candidate Models

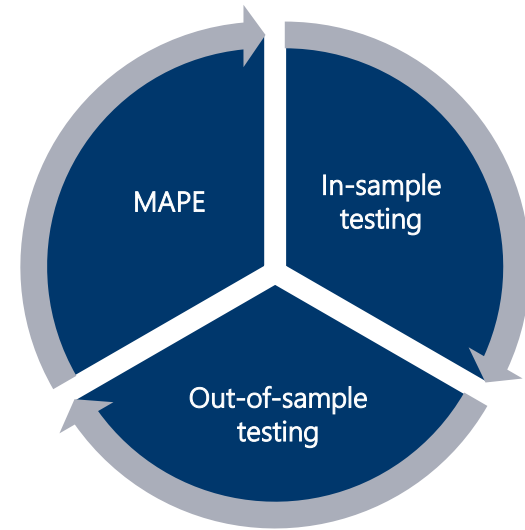




# CUSTOMER-SPECIFIC REGRESSION APPROACH

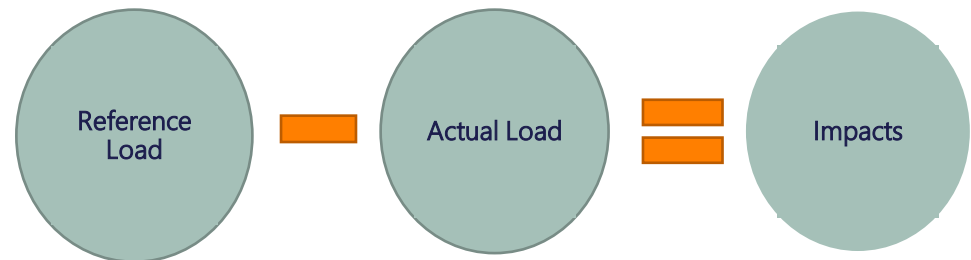
2

Testing and optimization process that minimizes error and bias to select the best model for each participant



3

Model the actual load  
 Model the reference load  
 Calculate the impacts



# CONFIDENTIALITY

- A lot of the impacts for PG&E and SCE continue to be confidential.
- Redactions are compliant with the 15/15 Rule (*PUC § 583 D. 14-05-016*)
  - Fewer than 15 customers in a group or subgroup
  - One customer makes up more than 15% of the total load in a group or subgroup
- Information is also redacted if there is only one aggregator in the group or subgroup (*General Order 66-C, Section 2.2(b) D.06-06-066*)
- The purpose of the redactions is to protect customer and/or aggregator confidentiality
- SDG&E shows all program level impacts
  - This is a result of guidance from SDG&E attorneys concluding that program level impacts are not confidential.

# EX POST IMPACTS

## Program Dispatch and Event Summary

Program	IOU	Day-Ahead			Day-Of		
		Number of event days	Hours of Availability	Actual Hours of Use	Number of event days	Hours of Availability	Actual Hours of Use
CBP	PG&E	22	180	68	25	180	76
	SCE	47	360	96	46	360	101
	SDG&E	20	264	69	9	264	29
AMP	SCE	-	-	-	<i>Confidential</i>		

- PG&E: Both products saw an increased number of events compared to 2016. Many events were focused on individual Sub-LAPs this year.
- SCE: DA events were down slightly compared to 2016 while DO dropped by over half as a result of Resolution E-4819 which added price triggers to CBP dispatch.
- SDG&E: DA saw an increase in the number of events while DO was relatively flat.

# EX POST IMPACTS

## Average Summer Event, Average Event Hour

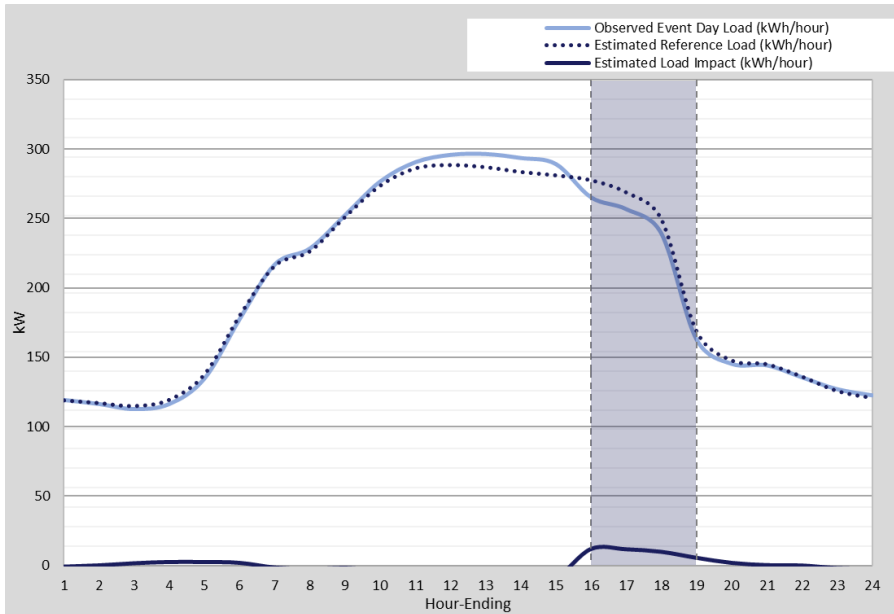
Program	IOU	Day-Ahead			Day-Of		
		Aggregate Impact (MW)	Nominated Capacity (MW)	Event Temp (°F)	Aggregate Impact (MW)	Nominated Capacity (MW)	Event Temp (°F)
CBP	PG&E	<i>Confidential</i>		91	21.8	19.5	91
	SCE	<i>Confidential</i>		90	<i>Confidential</i>		90
	SDG&E	0.7	0.3	77	3.2	4.8	86
AMP	SCE	-	-	-	<i>Confidential</i>		90

- PG&E: 2017 impact exceeded nominated capacity, whereas 2016 had fallen short.
- SCE: Overall CBP impact met nominated capacity, despite the DA 4-8 product falling short.
- SDG&E: CBP DO aggregate impacts fell short of nominated capacity, while DA exceeded it.

# EX POST IMPACTS

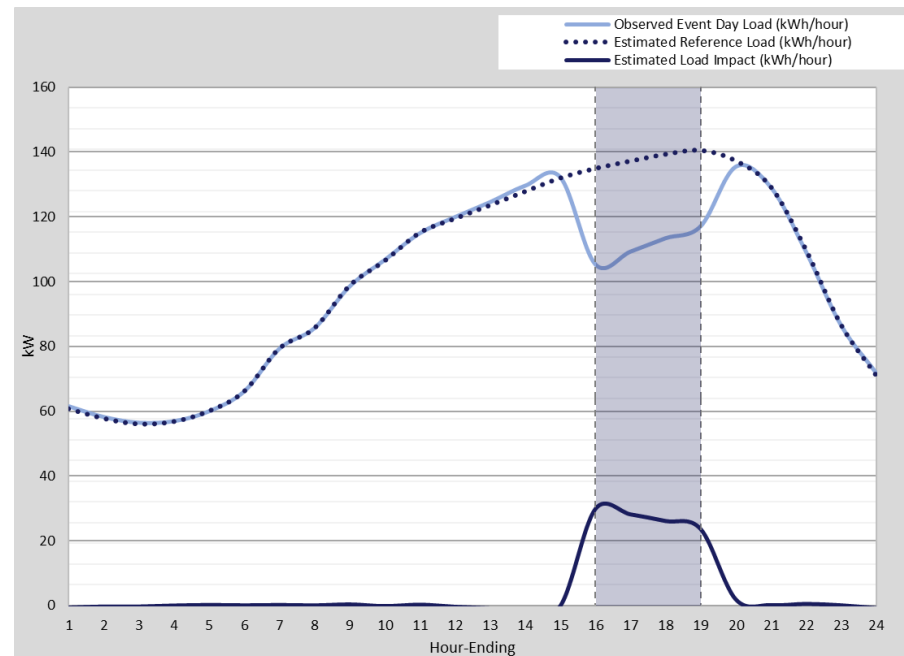
## Example Load Profiles and Impacts

SDG&E CBP Day-Ahead: Average Hourly Per-Customer Impact



Average Summer Event Day 2017

PG&E CBP Day-Of: Average Hourly Per-Customer Impact



# EX POST IMPACTS

## Utility System Peak Hour

Program	IOU	Day-Ahead		Day-Of	
		Aggregate Impact (MW)	Event Temp (°F)	Aggregate Impact (MW)	Event Temp (°F)
CBP	PG&E	4.6	105	25.0	103
	SCE	<i>Confidential</i>	100	<i>Confidential</i>	97
	SDG&E	1.4	87	2.8	92
AMP	SCE	-	-	<i>Confidential</i>	97

Results are for the 2017 utility system peak hour.

- PG&E’s CBP program has the highest overall impact among all programs at 29.6 MW.
- PG&E’s Peak: 09/01/2017 (HE 18); SCE’s Peak: 08/30/2017 (HE 17); SDG&E’s Peak: 09/01/2017 (HE 17)

# EX POST IMPACTS

## Statewide System Peak Hour

Program	IOU	Day-Ahead		Day-Of	
		Aggregate Impact (MW)	Event Temp (°F)	Aggregate Impact (MW)	Event Temp (°F)
CBP	PG&E	6.0	106	30.5	104
	SCE	<i>Confidential</i>	104	<i>Confidential</i>	102
	SDG&E	1.4	87	2.8	92
AMP	SCE	-	-	<i>Confidential</i>	100

Results are for the 2017 statewide system peak hour.

- Product-level impacts range from 1.4 MW to 30.5 MW
- PG&E’s CBP program has the highest impact at 36.5 MW
- CAISO Peak: 09/01/2017 (HE16)<sup>1</sup>

<sup>1</sup> <http://www.caiso.com/documents/californiaisopeakloadhistory.pdf>

# EX ANTE IMPACTS

## Methodology

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- Use customer-specific regression models from ex post analysis
- Predict per-customer weather-adjusted impacts for all subgroups
  - Apply Utility and CAISO weather scenarios
- Use enrollment forecasts from IOUs to forecast aggregate impacts
  - Enrollment was derived based on
    - 2017 ex post per-customer impacts
    - Contractual MW
    - Historical performance



# EX ANTE IMPACTS

## Non-Residential Enrollment Forecast, Month of August

		Number of Service Accounts										2023-2028 (each year)		
Program	Utility	Notice	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	
CBP	PG&E	DA	700										700	
		DO												
	SCE	DA	90											90
		DO	1,250											1,250
	SDG&E	DA	69	71	+3%	73	+3%	75	+3%	78	+3%	78		78
		DO	171	183	+7%	196	+7%	209	+7%	224	+7%	224		224

### Drivers

- PG&E forecasts steady CBP enrollment throughout forecast horizon. DO discontinued at end of PY2017.
- SCE forecasts an increase in enrollment for CBP DO beginning in 2018 due to elimination of AMP.
- SDG&E forecasts CBP DA and DO enrollment will increase 3% and 7% per year (2019-2022), respectively, due to program improvements. The forecast between 2022 and 2027 is flat.

# EX ANTE IMPACTS

## Comparison of current and previous non-residential forecast

Program	Utility	Notice	Previous Forecast, 2018		Current Forecast, 2018		
			Accounts	Aggregate Impact (MW)	Accounts	Aggregate Impact (MW)	
CBP	PG&E	DA	50	6.9	700	21.0	↑
		DO	611	13.6	0	0	↓
	SCE	DA	90	4.7	90	6.2	↑
		DO	1,250	45.1	1,250	23.1	↓
	SDG&E	DA	70	0.9	69	0.7	↓
		DO	199	5.1	171	3.2	↓

Results are average event-hour impacts for August peak day in 2018; Utility Peak 1-in-2 weather conditions.

- CBP DA
  - PG&E increase – increased enrollment.
  - SCE increase – higher per-customer impacts.
  - SDG&E decrease – lower per-customer impacts.
- CBP DO
  - PG&E decrease – product not offered.
  - SCE decrease – smaller impacts per customer.
  - SDG&E decrease – fewer customers with lower per-customer impacts.

# EX-ANTE IMPACTS

## Residential CBP impact forecast

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- Due to the expected influx of residential customers
  - PG&E: constant 4 MW aggregate load impact through the forecast horizon starting 2019
  - SCE: constant 3 MW aggregate load impact through the forecast horizon starting in 2023

# KEY FINDINGS

## Ex Post Analysis

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On average event day

- Impacts relative to nominated capacity
  - PG&E: CBP impacts exceeded nominated capacity.
  - SCE: Overall CBP impact met nominated capacity, despite the DA 4-8 product falling short.
  - SDG&E: CBP DO aggregate impact fell short of nominated capacity, while DA aggregate impact exceeded nominated capacity – a reversal from last year.
- Notice type
  - DO products had higher enrollment and greater aggregate impact than DA products
- Comparison with 2016
  - PG&E and SCE: Overall CBP enrollment and aggregate impacts were higher in 2017
  - SDG&E: Overall CBP enrollment and aggregate impacts were lower in 2017
- AutoDR/TATI customers generally underperformed their load shed test results

# KEY FINDINGS

## Ex Ante Analysis

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On August 2018 peak day

- Enrollment forecast
  - PG&E: current CBP enrollment forecast for 2018 is higher than previous (given higher enrollment observed in 2017)
  - SCE: forecast is flat to LY
  - SDG&E: current CBP enrollment forecast for 2018 is lower than previous (given lower enrollment observed in 2017)
- Aggregate impacts
  - PG&E: CBP aggregate impacts are comparable at ~21 MW
  - SCE and SDG&E: CBP aggregate impacts decrease

# PROJECT CONTRIBUTORS



## IOU Contributors

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