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Attachment A

Baseline Workshop Joint IOU Presentation

March 22, 2019

Baseline Workshop
Joint IOU Presentations
March 22, 2019

Agenda

10:00 a.m.	Welcome and Introductions
10:15 a.m.	Review and discuss the current Commission-approved retail baselines, presented by the Utilities.
10:45 a.m.	Review and discuss the CAISO wholesale baselines, presented by the Utilities.
11:15 a.m.	Review and discuss the similarities and differences between current wholesale and retail baselines.
12:30 p.m.	Lunch
1:30 p.m.	Review and discuss the interaction between wholesale and retail baselines, presented by the Utilities.
2:15 p.m.	Review and discuss the costs for expanding baseline options and funding options as presented by the Utilities.
3:00 p.m.	Wrap Up and Next Steps.
3:30 p.m.	Adjourn

CPUC Approved Baselines

10:15 a.m.

IOU Supply Side DR Programs

✓ Only the Capacity Bidding Program (CBP) uses a retail energy baseline

✓ Except for CBP, wholesale energy baselines do NOT influence capacity payments

Supply-Side DR Programs	DRP	Retail (Tariff) [1]		Wholesale[2]	Note(s)
		Capacity	Energy	Energy	
Agricultural Pumping Interruptible	SCE	Yes	No	10-in-10 w/ Day of Adjustment (DoA) +/- 20%	Direct Load Control
Base Interruptible Program	IOUs	Yes - Firm Service Level	No	10-in-10 w/DoA +/- 20%	
Capacity Bidding Program	IOUs	Yes	Yes - (10-in-10 w/DoA +/- 40%)	10-in-10 w/DoA +/- 20%	Retail energy baseline <u>does</u> influence retail capacity payment. (PG&E only):[3] Energy payment is a pass-through from wholesale using CAISO's energy baseline.

1 - Retail performance calculation for energy is done at the customer premise level

2 - Wholesale performance calculation for energy is done at the resource aggregate level

3 - PG&E's CBP Elect and Elect + allows the aggregator to bid their energy quantity to the ISO market.

IOU Supply Side DR Programs (cont'd)

Supply-Side DR Programs	DRP	Retail (Tariff) [1]		Wholesale[2]	Note(s)
		Capacity	Energy	Energy	
SmartAC (PG&E) AC Saver (SDG&E) Summer Discount Program (SCE)	IOUs	No	No	10-in-10 w/ DoA +/- 20%	Direct Load Control

- Critical Peak Pricing (IOUs) is non-Supply Side (load modifying) program; higher energy charges during event hours in return for capacity credits.
- SCE's Smart Energy Program will be integrated into wholesale market later this year; SEP is a capacity program that does not use energy baseline.

Supply-Side DR Mechanism	DRP	RA Contracts		Wholesale	Note(s)
		Capacity	Energy	Energy	
DR Auction Mechanism	3rd Party Demand Response Providers (DRP)	Yes	No	10-in-10 w/DoA +/- 20% or *alternative baselines IOUs not privy to*	Energy payments are settled between DRP and CAISO

1 - Retail performance calculation for energy is done at the customer premise level

2 - Wholesale performance calculation for energy is done at the resource aggregate level

The 10 Day Average Baseline Methodology and the Day-Of Adjustment Option

- Each hour during the past 10 similar days prior to a Demand Response Event Day is averaged (by service account) to establish an hourly average baseline for the 10 days. The past 10 similar days excludes Event Days, weekends, and holidays.
- The 10-Day Average Baseline Calculation includes a “Day-Of” adjustment option, which may adjust a program participant’s baseline up or down.
- Some DR program participations may benefit from the Day-Of adjustment option. Those who may benefit are temperature sensitive, can pre-cool their facilities, or have the ability to shift load from the event period to the hours prior to an event.

CBP Day Of Adjustment Calculation

The Adjustment Ratio is calculated in the formula below:

$$\textbf{Adjustment Ratio} = \frac{\text{Average kWh usage of the first three of the four hours before the event (on the day of the event)}}{\text{Average kWh usage for the same three hours from the past 10 similar days (excluding Event Days, weekends, and holidays)}}$$

- This Day-Of Adjustment shall not exceed **plus or minus 40% of the Participant's calculated baseline**.
- Participants must **elect or opt-in** to receive this adjustment.
- The Participant/Aggregator may select a baseline or a baseline with a day-of adjustment for **each service account** when they nominate for the operating month.

CAISO Wholesale Baselines

10:45 a.m.

CAISO Settlements Background

The Baseline Analysis Working Group (BAWG) developed new settlements methods directed by CAISO to improve the CAISO tariff that provides a day-matching customer load 10-in-10 baseline methodology with a 20% cap to estimate the load impacts of PDR and RDRR resources.

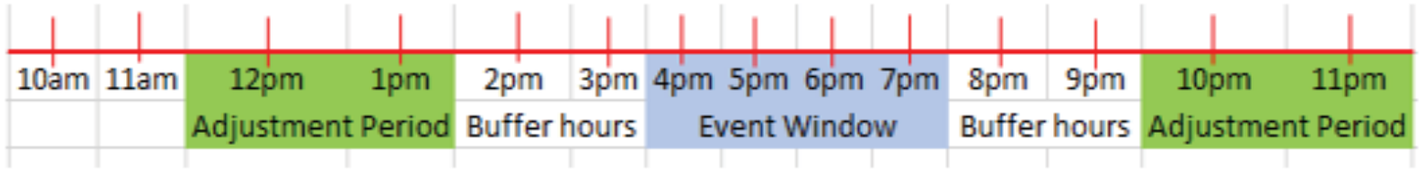
The alternative wholesale baselines had been developed through the CAISO Energy Storage Distributed Energy Resource Phase II process and approved in the summer of 2017 (D.17-12-003). The effective date was November 2018.

Types of settlement methods evaluated

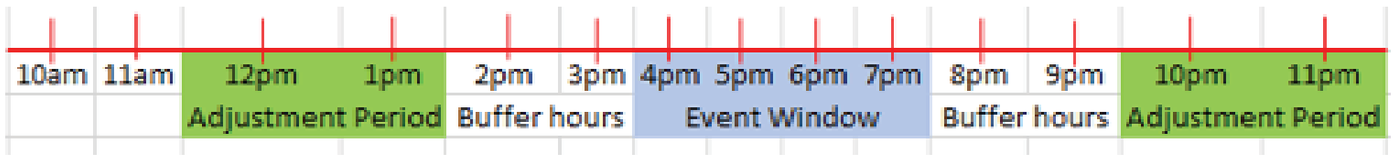
- **Settlement Methods Evaluated**
  - Baselines: Day-Matching
  - Baselines: Weather matching
  - Control groups

- **Customer Types included**
  - BIP customers (large C&I)
  - AC Cycling customers (residential and small commercial)
  - Agriculture
  - Data from all three utilities.

Day Matching Baselines - Residential Weekday Example

Eligible baseline days	10 business days (weekdays) immediately prior to event, excluding, award dates, and CAISO outage dates.
Baseline day selection criteria	Keep highest 5 of 10 eligible days. The lookback period is no more than 45 calendar days
Adjustment Period	
Same day adjustment ratio	Cap +/- 40%: Calculate the ratio between the resources load and the unadjusted baseline during the adjustment hours. $\text{Adjustment ratio} = \frac{\text{Total kWh during adjusment period on the event day}}{\text{Total kWh during adjustment period of unadjusted baseline}}$
Adjustment Limit	Cap the ratio between +/- 1.4x. If the ratio is larger than 1.4, limit it to 1.4. If the ratio is less than 1/1.4 = 0.71, limit it to 0.71
Adjusted baseline	Multiply the unadjusted baseline by the adjustment ratio to calculate the final adjusted baseline. The ratio is applied to all 24 hours of the unadjusted baseline.

Weather Matching Baselines - Residential Weekday Example

Eligible baseline days	Weekdays, excluding event days and federal holidays, in the 90 days immediately prior to the event.
Calculation of temperatures	1. Map the resource sites to pre-approved National Oceanic Atmospheric Association weather station based on zip code and the mapping 2. Calculate the participant-weighted weather for each hour of each event and eligible baseline day. That is the weather for each relevant weather station is weighted based on the share of participant associated with the specific weather station. 3. Calculate the average temperature or daily maximum temperatures across all 24 hours in both the event day and eligible baseline days.
Baseline day selection criteria	4 days with the closest daily maximum temperature. Rank eligible days based on how similar daily maximum temperature is to the event day.
Adjustment Period	
Same day adjustment ratio	Cap +/- 40%: Calculate the ratio between the resources load and the unadjusted baseline during the adjustment hours. $\text{Adjustment ratio} = \frac{\text{Total kWh during adjusment period on the event day}}{\text{Total kWh during adjustment period of unadjusted baseline}}$
Adjustment Limit	Cap the ratio between +/- 1.4x. If the ratio is larger than 1.4, limit it to 1.4. If the ratio is less than 1/1.4 = 0.71, limit it to 0.71
Adjusted baseline	Multiply the unadjusted baseline by the adjustment ratio to calculate the final adjusted baseline. The ratio is applied to all 24 hours of the unadjusted baseline.

Control Groups

Relationship between a control group and a treatment group	**Control Group** A list of at least 150 locations with similar characteristics as those in the Treatment Group DO NOT respond to CAISO dispatch **Treatment Group** List of locations that share similar characteristics as those in the Control Group DO respond to CAISO dispatch
Method for control group development	Random assignment of site, random assignment of clusters, matched control group, or other.
Validation	**1)** The end date of the historical interval data used for validation should be the registration start date minus 30 calendar days. (75-day lookback period with a 30-day buffer) So if a registration begins on 7/1/2018 then the validation period runs from 4/17/2018 (start date – 75 calendar days) through 6/1/2018 (start date – 30 calendar days). **2) Little or no bias:** beta must be between 0.95 and 1.05 **3) 90/10 Precision:** and the margin of error with 90% confidence of the CVRMSE must be less than (0.10).
Adjustment Period	
Same day adjustment ratio	Cap +/- 40%: Calculate the ratio between the resources load and the unadjusted baseline (control group) during the adjustment hours. $\text{Adjustment ratio} = \frac{\text{Total kWh during adjusment period on the event day}}{\text{Total kWh during adjustment period of unadjusted baseline}}$
Adjustment Limit	Cap the ratio between +/- 1.4x. If the ratio is larger than 1.4, limit it to 1.4. If the ratio is less than 1/1.4 = 0.71, limit it to 0.71
Adjusted baseline	Multiply the unadjusted baseline by the adjustment ratio to calculate the final adjusted baseline. The ratio is applied to all 24 hours of the unadjusted baseline.

Settlement Methods Summary

Csutomer Segment	Weekday	Baselines Recommended	Adjustment Caps	
Residential	Weekday	Control group*	+/- 40%	If the ratio is larger than 1.4, limit it to 1.4. If the ratio is less than 1/1.4 = 0.71, limit it to 0.71
		4 day weather matching using maximum temperature	+/- 40%	
		Highest 5/10 day matching	+/- 40%	
	Weekend	Control group*	+/- 40%	If the ratio is larger than 1.4, limit it to 1.4. If the ratio is less than 1/1.4 = 0.71, limit it to 0.71
		4 day weather matching using maximum temperature	+/- 40%	
		Highest 3/5 weighted day matching	+/- 20%	If the ratio is larger than 2.0, limit it to 2.0. If the ratio is less than 1/2 = 0.50, limit it to 0.50
Non-residential	Weekday	Control group*	+/- 40%	If the ratio is larger than 1.4, limit it to 1.4. If the ratio is less than 1/1.4 = 0.71, limit it to 0.71
		4 day weather matching using maximum temperature	+/- 40%	
		10/10 day matching	+/- 20%	If the ratio is larger than 1.2, limit it to 1.2. If the ratio is less than 1/1.2 = 0.83, limit it to 0.83
	Weekend	Control group*	+/- 40%	If the ratio is larger than 1.4, limit it to 1.4. If the ratio is less than 1/1.4 = 0.71, limit it to 0.71
		4 day weather matching using maximum temperature	+/- 40%	
		4 eligible days immediately prior (4/4)	+/-20%	If the ratio is larger than 1.2, limit it to 1.2. If the ratio is less than 1/1.2 = 0.83, limit it to 0.83

***Differences between CAISO tariff and BAWG report**

There is no control group adjustment on CAISO tariff but on the BAWG report there is an adjustment of 40% cap

Reference

- California ISO Baseline Accuracy Assessment Report

  by Josh Bode and Adriana Ciccone

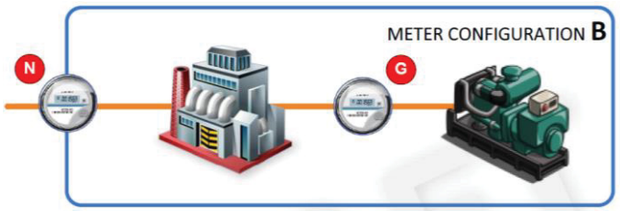
- CAISO Tariff

http://www.caiso.com/Documents/Aug17_2018_TariffAmendment-EnergyStorage_DistributedEnergyResourcesPhase2Enhancements_ER18-2242.pdf

Meter Generator Output

Meter Generator Output (MGO), as defined by NAESB, is a performance evaluation methodology, used when a generation asset is located behind the Demand Resource's revenue meter, in which the Demand Reduction Value is based on the output of the generation asset.

MGO was part of ESDER Phase 1.

	Retail Meter (ONLY Load Reduction) Existing metering infrastructure includes a retail meter with no visibility on the DER (device).	
	Retail Meter with Sub meter Arrangement provides visibility for the DER Resource.	Configuration B: relies on a combination of sub-metering and baselines to determine overall impact. B-1 (Load Reduction Only): Only the premise (facility) is registered as a DR resource (PDR/RDRR). B-2 (Generation Offset Only): Only the BTM device is registered as a DR resource (PDR/RDRR) and not the premise (facility). B-3 (Load and Generation): Both the premise (facility) and the BTM device are registered together as the DR resource (PDR/RDRR).
	Retail Meter with Separate DER Meter Arrangement separates load and DER Resource.	Utilizing configuration C forces the BTM DER into a in-front of the meter (IFTM) asset.

Wholesale vs. Retail Baselines

11:15 a.m.

Why are energy baselines important?

Certain IOU administered and operated DR program(s) rely on energy baseline to settle not only the energy delivery (payment/penalty) but the amount of capacity incentive Seller/Aggregator receives

Connection between Wholesale to Retail

For example, current PG&E Capacity Bidding Program relies on retail energy baseline methodology to calculate capacity payment.

CAISO Wholesale Market

($) Credit/Charge based on delivery

(Qty) Delivered energy based on CAISO award

PDR resource

Baseline is used to quantify energy delivery from PDR resource

10-in-10 +/- 20%

Pass-through the wholesale energy

+

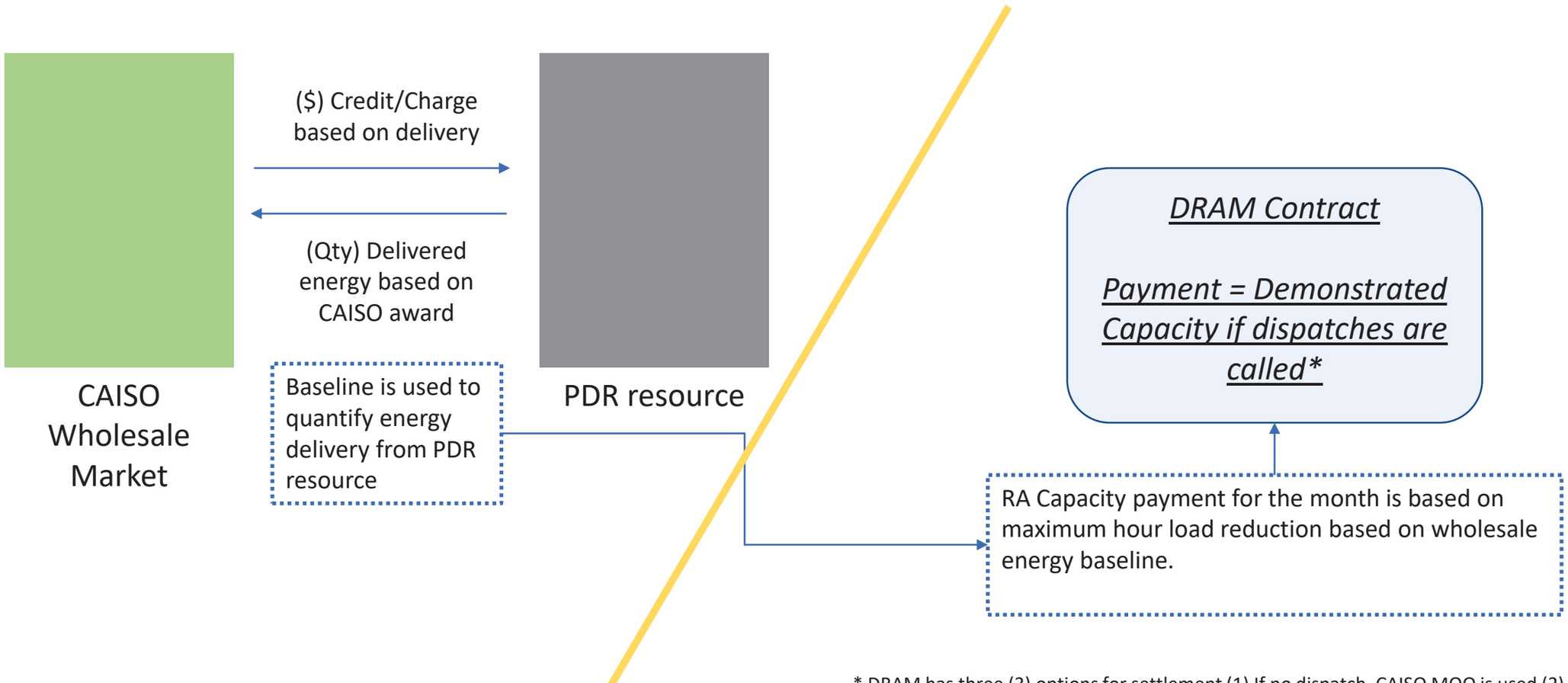
CBP Tariff

Hourly Delivered Capacity Ratio	Adjusted Hourly Capacity Payment/Penalty
≥ 1.05 (I)	Adjusted Hourly Capacity Payment = Unadjusted Hourly Capacity Payment * 1.05 (I) Adjusted Hourly Capacity Penalty = 0
≥ 0.75 (R) and < 1.05 (I)	Adjusted Hourly Capacity Payment = Unadjusted Hourly Capacity Payment * Hourly Delivered Capacity Ratio Adjusted Hourly Capacity Penalty = 0
≥ 0.60 (R) and < 0.75 (R)	Adjusted Hourly Capacity Payment = Unadjusted Hourly Capacity Payment * 50% Adjusted Hourly Capacity Penalty = 0
≥ 0 (R) and < 0.60 (R)	Adjusted Hourly Capacity Payment = 0 Adjusted Hourly Capacity Penalty = Unadjusted Hourly Capacity Payment * (0.60 - Hourly Delivered Capacity Ratio)
< 0	Adjusted Hourly Capacity Payment = 0 Adjusted Hourly Capacity Penalty = Unadjusted Hourly Capacity Payment * (0.60) (I)

RA Capacity payment determination for CBP is based on retail energy baseline **(10-in-10 +/- 40%)**

Connection between Wholesale to Retail

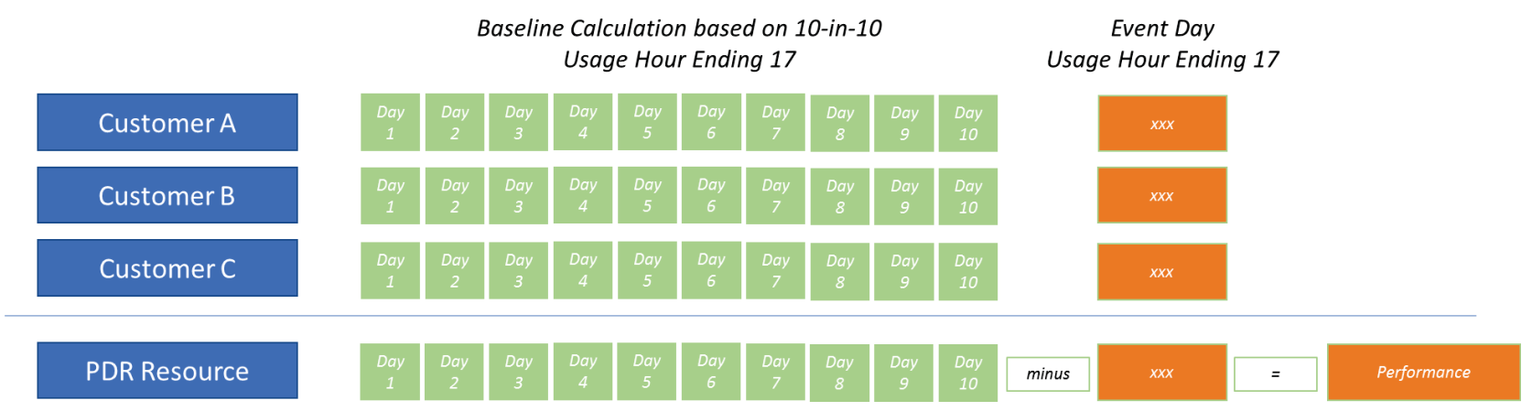
For example, current DR Auction Mechanism relies on wholesale energy baseline methodology to calculate capacity payment



* DRAM has three (3) options for settlement (1) If no dispatch, CAISO MOO is used (2) full dispatch, or (3) test dispatch

Calculation Comparison Between Wholesale – Retail

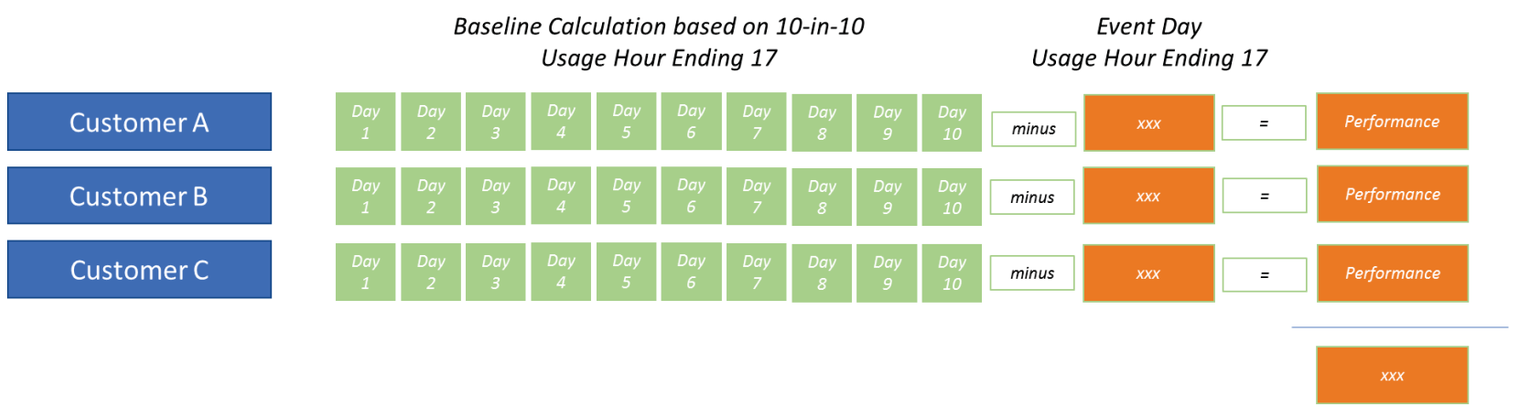
Wholesale performance is based on the aggregated resource performance.



Step 1) At the PDR resource level, identify 10 non-event business days and the corresponding event hour(s) usage for each customer that is part of the aggregation (baseline).
Step 2) Sum the hours and create an hourly average.
Step 3) Sum the event day/hours usage.
Step 4) Subtract the totalized event day usage against the hourly average (baseline) to come up with the PDR performance.

(continue) Calculation Comparison Between Wholesale – Retail

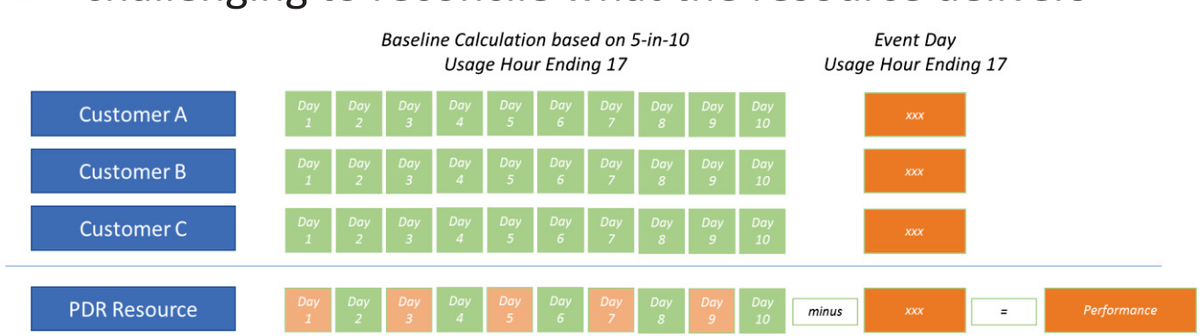
Retail performance is based on the individual customer (premise) performance

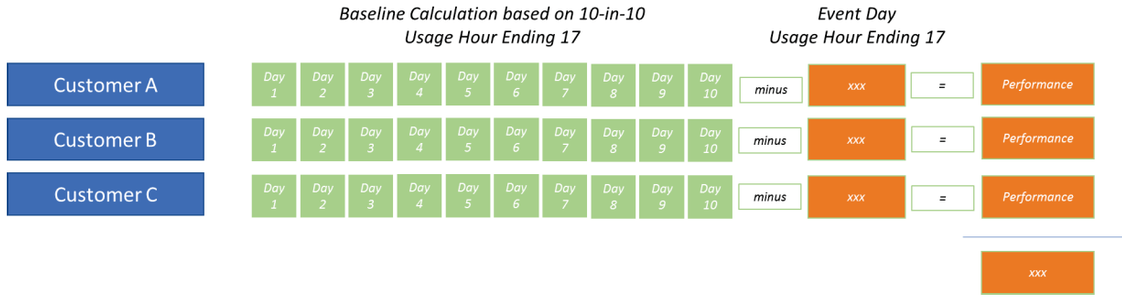


Step 1) At the customer level, identify 10 non-event business days and the corresponding event hour(s).
Step 2) Sum the customer non-event hours and create an hourly average (baseline).
Step 3) Subtract event day customer usage against the hourly average (baseline). The delta is the customer performance.
Step 4) Sum all customer performance to come up with the resource performance.

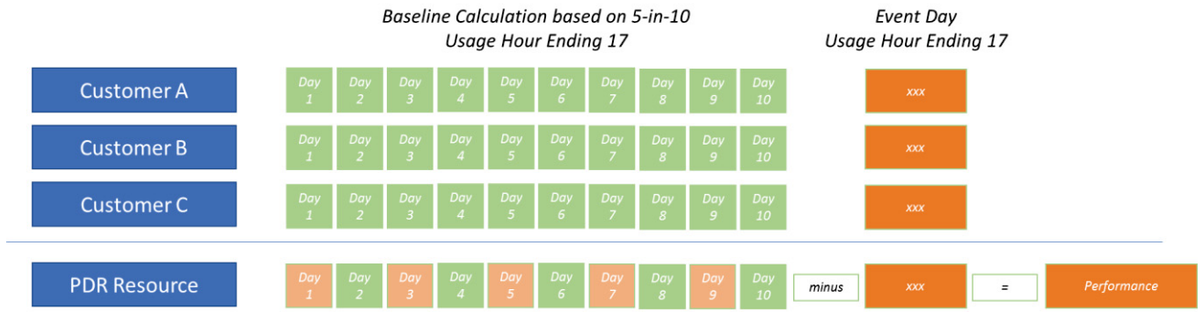
(continue) Calculation Comparison Between Wholesale – Retail

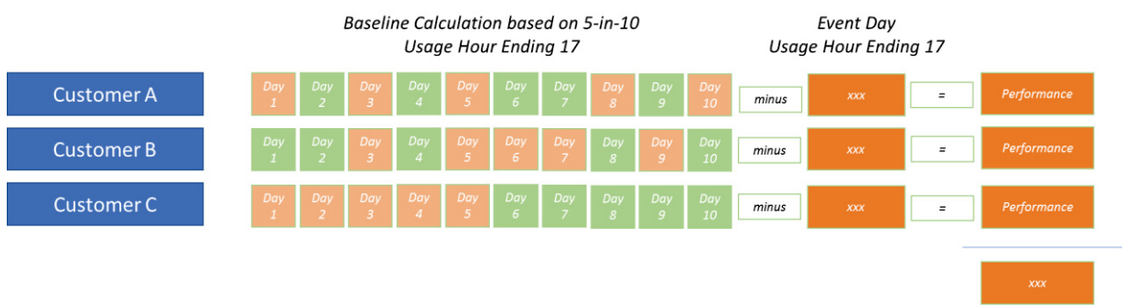
1. If DRP uses a different wholesale baseline (i.e., 5-in-10) compared to retail (i.e., 10-in-10), it would be challenging to reconcile what the resource delivers





2. Even if the DRP uses the same baseline methodology between wholesale and retail (i.e., 5-in-10), results will be off due to the calculation.





Questions

- The difference between wholesale and retail energy baseline will create mismatches. To the extent that energy baseline is a factor in calculating RA capacity payment, should wholesale and retail methodologies be the same to create consistency and uniformity?
  - Aligning wholesale and retail would assist with the feedback mechanism between Demonstrated Capacity (using baselines) and Qualified Capacity (used for Supply Plan showing)

- Should the Commission modify how retail baseline is calculated from individual to resource aggregation akin to CAISO's current calculation procedure?
  - Including alignment of day-matching limits (i.e., +/- 20% or +/- 40%)

Comparison Between Premise – Device Specific (Questions)

It's challenging to reconcile between wholesale and retail, however adding the CAISO's Meter Generator Output (MGO) would add a different element that requires additional consideration.

- Existing DR framework calls for settlements to occur at the premise (facility) retail meter.
  - MGO creates the possibility to register and settle at the individual device (DER) level.
  - MGO through the use of sub-metering and baselines raises a multitude of policy and infrastructure questions.

MGO Infrastructure – Key Issues

A non-exhaustive list of issues include:

- Sub-metering standards
  - Hardware and software
- Data needs
  - Data elements including intervals
- Communication protocols
  - Data conveyance
- IT Systems
  - Data processing including settlements
- Billing implications
  - Tie in to IOU billing systems
- Funding/Cost recovery
  - Who pays and mechanism for cost recovery

Interaction Between Wholesale and Retail Baselines

Using SDG&E Capacity Bidding Program as an example

1:30 p.m.

Retail versus Wholesale baselines

Retail:

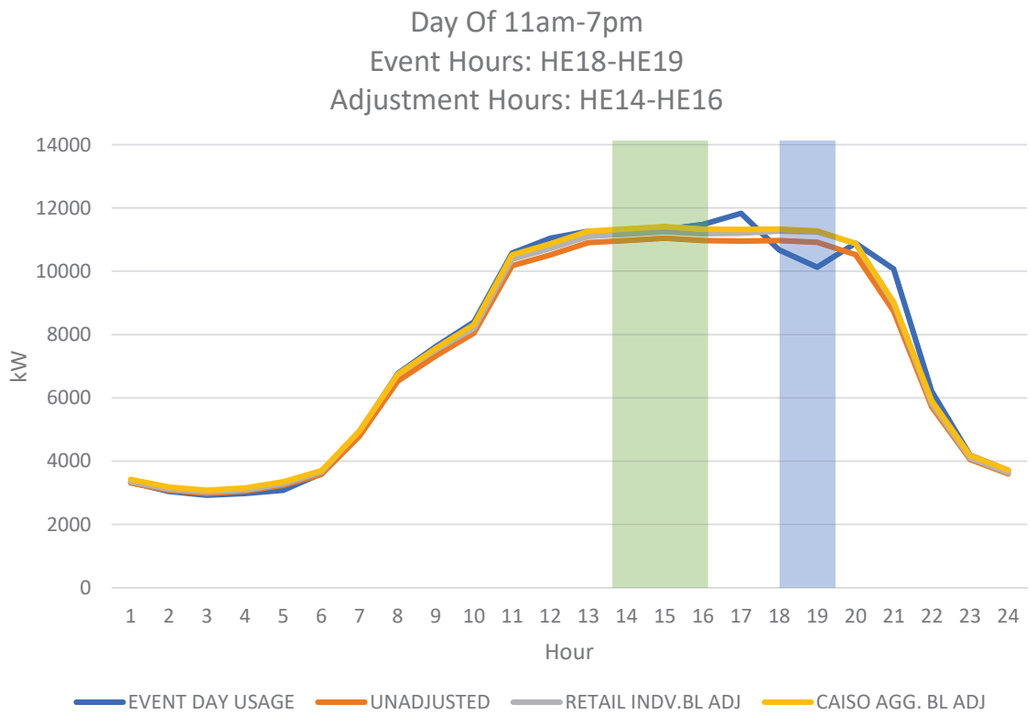
SDG&E's Capacity Bidding Program uses a retail settlement baseline at the individual level. It consists of a 10 in 10 baseline with a 40% cap. Events, SDG&E holidays and outages are excluded.

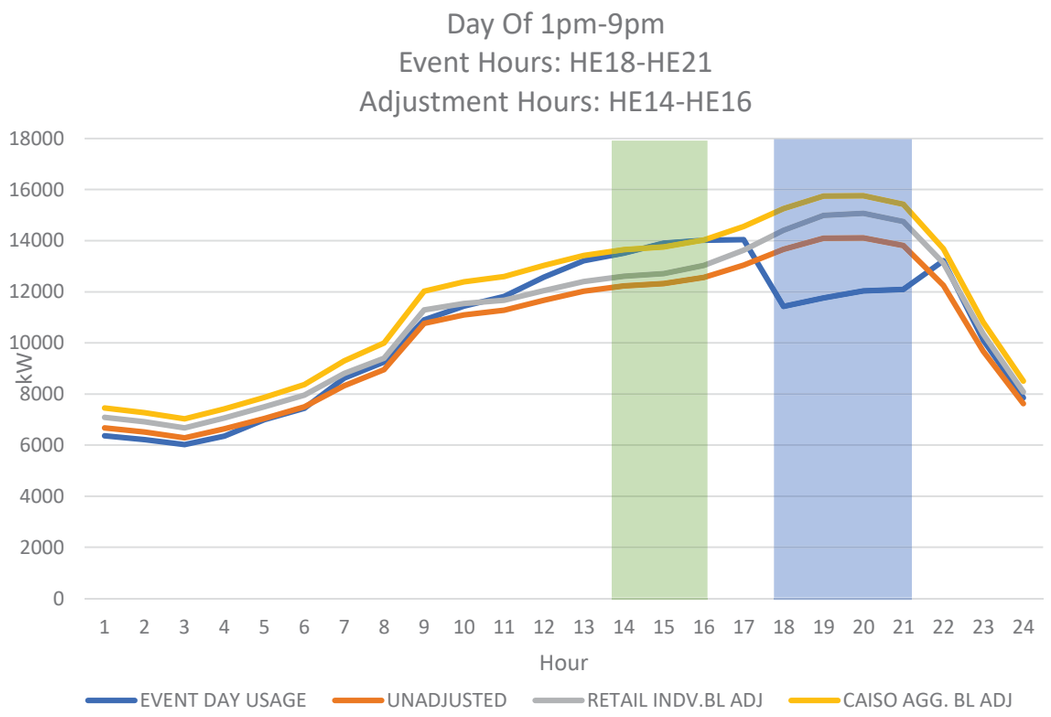
Wholesale:

The CAISO or Wholesale Baseline uses a settlement baseline at the aggregate level (by product and aggregator). The CAISO baseline is a 10 in 10 with a 20% cap. Events, SDG&E holidays, award dates and outages are excluded.

Note: SDG&E holidays used as we were unable to find CAISO holidays.

Example: Both Individual Retail and Wholesale Baselines with a +/- 20% cap



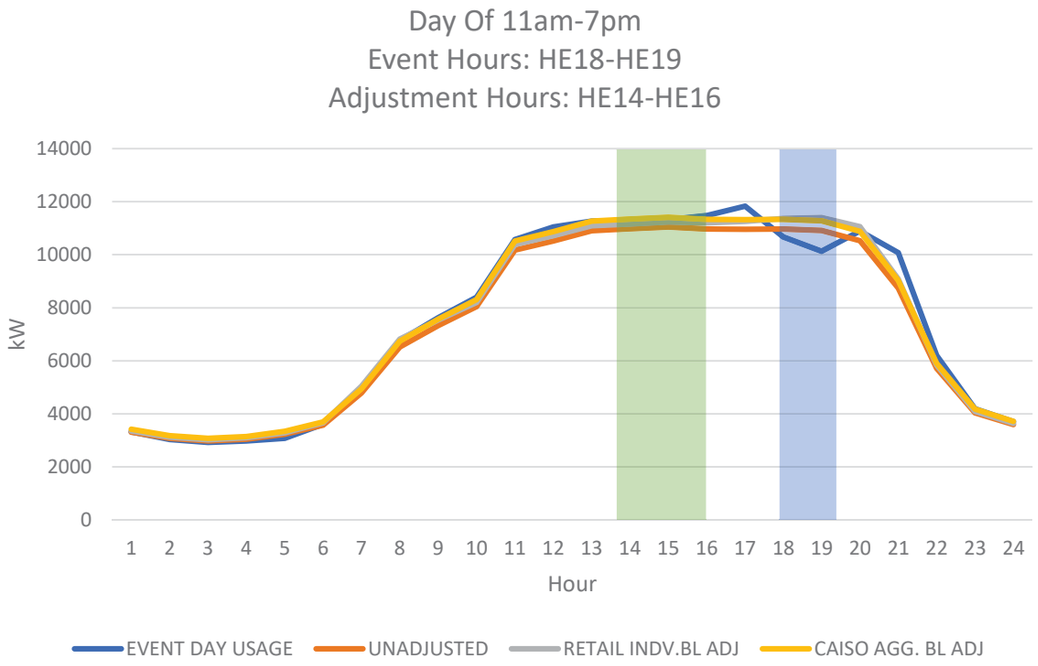


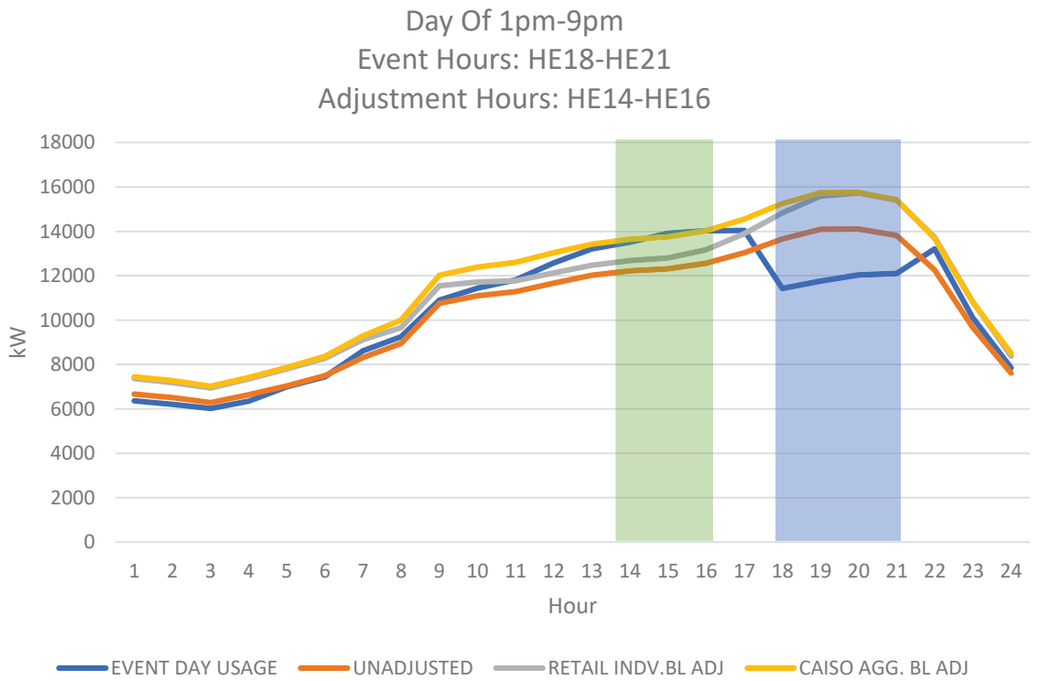
Exclusions: Events, SDG&E holidays, award dates and outages are excluded.

Currently:

Retail baseline has +/- 40% cap at the individual account level

Wholesale baselines have +/- 20 at the aggregate level





Exclusions: CAISO: Events, SDG&E holidays, award dates and outages are excluded.

SDGE: Events, SDG&E holidays and outages are excluded.

Cost and Funding

2:15 p.m.

Baseline Responsibility

- The IOUs as the Scheduling Coordinator (SC) are responsible for the baseline calculations.
- Historically calculations were handled by the CAISO, but responsibility transferred to SC under ESDER 2.
- The IOUs are the DR Provider and SC for their DR programs.

Baseline Calculations

- The ability to calculate baselines is predicated on three activities:
  - System (IT) calculations
  - Validations (automated and non-automated)
  - Historic Data storage

Complexities and Cost

- Complexity and cost varies from one methodology to the next
- System work generally has a lead time of 1-2 years (planning, scheduling, testing, implementation)
- Baseline Complexity Matrix

	Baseline Option	Cost
Least Complex	Day Matching (e.g., 10 in 10)	$
Mid-level Complexity	Weather Matching	$$
Most Complex	Control Groups	$$$

Funding

- Unclear if additional funding is within the scope of the mid-cycle review (April 2020).
- Funding may be more appropriate for the next Funding Application (Nov. 2021).
- MGO implementation funding is most likely outside of DR

Wrap Up and Next Steps

3:30 p.m.

(END OF ATTACHMENT A)