GRIDWORKS

Load Shift Working Group

JUNE 19TH

10AM – 3PM

PG&E OFFICES (77 BEALE ST.)

https://gridworks.org/initiatives/load-shift-working-group/

Agenda

10:00 – 10:15am: Intro and Purpose (Gridworks)

10:15 AM -11:00 AM: ESDER 2 Baselines and Baseline Analysis Working Group Findings - TBD

- What was examined and developed in the BAWG Proposal and what can be applied to the LSWG?

11:00 AM-11:30 AM: Analyzing ESDER 2 Baselines and Load Increase (*10 min presentation, 20 minute discussion*) **- Sila Kiliccote, SLAC & John Hernandez, PG&E**

- What baseline issues will SLAC/PG&E study and how could it inform the product design/baseline considerations of the LSWG?

11:30 AM-12:00 PM: Putting this into practice: Lessons Learned from the Excess Supply Pilot (XSP) Baselines (*10 min presentation, 20 minute discussion*) **– PG&E**

- How did PG&E come to use the 10-in-10 baseline for the load increasing XSP? What were lessons learned from using the 10-in-10?

12:00 PM-1:00 PM Lunch

1:00 PM -2:00 PM: Baseline implications premise, device and both participating in DR *(20 minute presentation, 40 minute discussion)* - **Eric Kim, CAISO**

- What questions has the CAISO grappled with when developing the PDR-LSR baselines in ESDER 3?
- What specific considerations should the LSWG be aware of when considering baselines that are technology neutral and may need to assess typical performance of a device, premise or both?
- What implications are there for baselines and frequent use?

2:00 PM- 3:00 PM Conclusions and Next Steps (Gridworks)

- Capture conclusions and homework for 7/18
- Assess how today's session may influence the JDRP's proposal for a technology neutral and premise-level enhanced PDR product.

Introduction and Purpose

Introduction: Roll call

Purpose: Deep Dive on Baselines

ESDER 2 Baselines and Baseline Analysis WG Findings

Presenter: Kathryn Smith, SDG&E

What was examined and developed in the BAWG Proposal and what can be applied to the LSWG?

Summary of Findings of the Baseline Analysis Working Group.

CAISO Settlements Status

The CAISO currently uses a 10 of 10 baseline with a same day adjustment with a 20% cap to estimate the load impacts of PDR and RDRR resources.

The baseline analysis working group (BAWG) was tasked with developing improved settlement methods that would work for a wide range of customer types.

These new settlement methods were approved by the CAISO board in the summer of 2017.

The new settlement methods are scheduled to go into effect November of 2018.

BAWG Research Objectives

- Evaluate the effectiveness of alternative baseline methods to estimate the load impact of current demand response resources.
- Evaluate the effectiveness of control groups.
- Find ways to accurately measure load impacts of resources that are frequently dispatched.

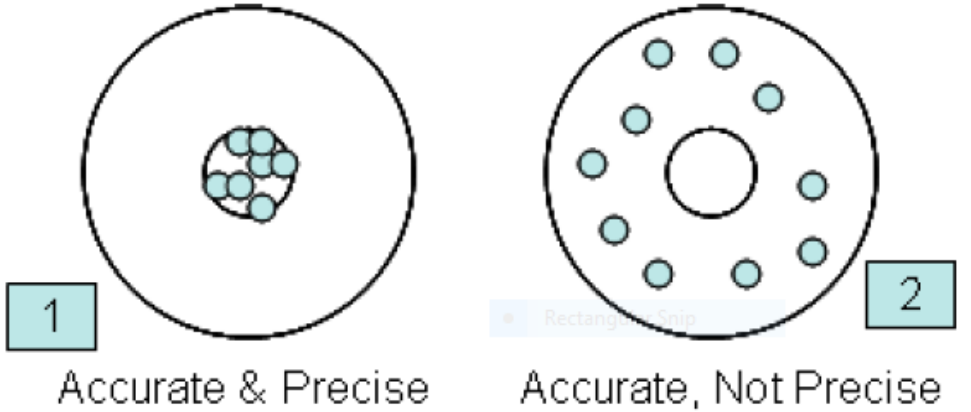
Types of settlement methods evaluated

- **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.

Qualities of Effective Settlement Methodologies

Figure 2-2: Precision versus Accuracy (Lack of Bias)

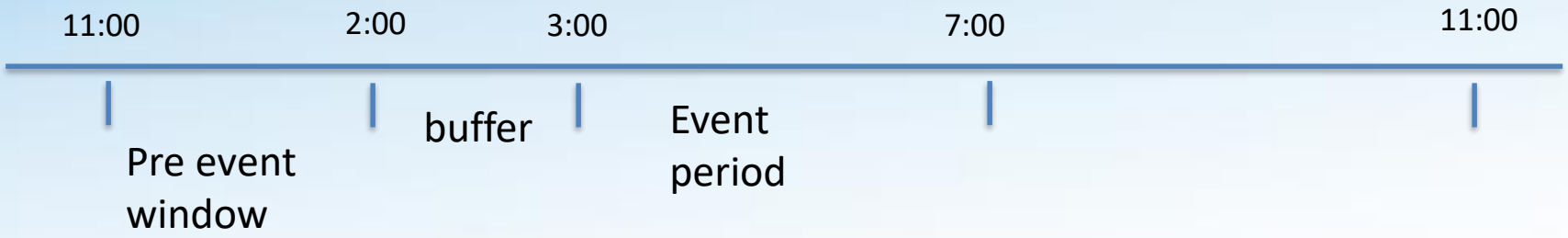


Day Matching Baselines

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2	3 Baseline Day	4 Baseline day	5 Baseline day	6 Event day	7
8	9 Baseline Day	10 Baseline Day	11 Baseline Day	12 Baseline Day	13 Baseline Day	14
15	16 Baseline Day	17 Baseline day	18 Event Day	19 Event Day	20	21

Current Adjustment Factor

- Current CAISO baseline adjustment window is first 3 of the 4 hours before the event.



$$Adjustment\ Factor = \frac{Energy\ Use\ on\ Event\ Days\ in\ the\ pre-event\ window}{Average\ Enegy\ use\ on\ baseline\ days\ in\ the\ pre-event\ window}$$

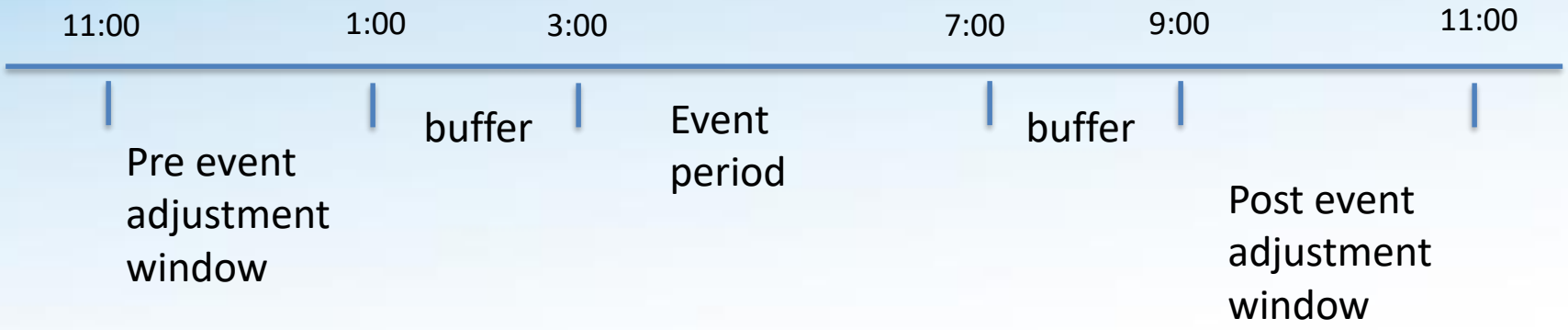
Details Day-Matching Baselines

- Tested 19 baselines types in the format take the highest X of the past Y similar days.
- For each baseline type tested no adjustment, pre-event adjustment, combined pre and post-event adjustment.
- Tested adjustment caps of 20%,30%,40%,50%, 200%, unlimited.
- Tested different adjustment window lengths between 2 and 4 hours.
- Created baselines for both weekdays and weekends/holidays.

Current Adjustment Factors

(except for commercial day-matching (10 of 10)

- Analysis showed using a combination of pre and post event data worked best to calculate the adjustment factor.



$$Adjustment\ Factor = \frac{Pre{-}Event\ Energy\ Use\ on\ Event\ Day}{Average\ Pre{-}Event\ Enegy\ use\ on\ baseline\ days}$$

Weather Matching Baselines

- Eligible baseline days: start 90 calendar days before the event. Exclude event days and non-similar days.
- Calculate the maximum participant weighted weather for the resource for each day.
- Choose the 4 days with the closest maximum temperatures to the event day.
- Average the energy use on the 4 baseline days for each hour of the event.
- Apply the same day adjustment factor using 2 hours of pre-event data and 2 hours of post event data with a 2 hour buffer on both sides.

Control Groups

- All customers in the control group must be program participants.
- SC/DRP is free to select control group participants as they see fit (random selection, random selection within strata)
- Minimum sample size of 150 accounts.
- SC/DRP must provide CAISO with a control group validation analysis based on historical data.
- Control Group calculation also uses an adjustment factor.

Control Group Validation

Little or No Bias

A good control group should not exhibit bias. It doesn't need to be perfect but bias must be small enough that it can be corrected with small same day adjustments

90/10 Precision

The margin of errors on individual days and hours must be less than 10% with 90% confidence

Minimum Sample Size of 150

Anything below is insufficient

Validation is required and needs to updated periodically for population changes or seasonal changes

Final Settlement Options Approved

Customer Segment[2]	Weekday	Baselines Recommended	Adjustment Caps
Residential	Weekday	Control group	+/- 40%
		4 day weather matching using maximum temperature	+/- 40%
		Highest 5/10 day matching	+/- 40%
	Weekend	Control group	+/- 40%
		4 day weather matching using maximum temperature	+/- 40%
		Highest 3/5 weighted day matching	+/- 40%
Non-residential	Weekday	Control Group	+/- 40%
		4 day weather matching using maximum temperature	+/- 40%
		10/10 day matching	+/- 20%
	Weekend	Control group	+/- 40%
		4 day weather matching using maximum temperature	+/- 40%
		4 eligible days immediately prior (4/4)	+/-20%

Strengths of BAWG methods for estimating load increases

Strengths

- All approved settlement methods were close to unbiased (accurate).
- All approved settlement methods have adjustment factors that go both up and down.
- All non-residential baselines and weather matching residential baselines are simple averages (x of x not highest x of y)
- Weather baselines use maximum temperature instead of cooling degree hours.
- Control Groups work even when events are frequent.

Potential concerns with estimating load increases using BAWG methods

Potential Concerns

- Load increases on the same day as a load decrease cause issues with day-of adjustment factors.
- Baselines were tested on high price days in which load decrease events typically occur.
- Starting point for the residential day-matching baseline is the highest 5 of the past 10 similar days (weekday) high 3 of 5 (weekend). However, the adjustment factors mitigate this concern.
- Frequent dispatches can pose an issues especially with the day-matching methods.

Frequent Dispatch Results

- The Working Group also analyzed instances of frequent dispatches (i.e. when there is not enough non-event days in the look back window to establish a weather-matching or load-matching baseline)
- The Working Group decided that the use of event days in the baseline is not recommended
- However, the Working Group did propose the 10-in-10 baseline methodology for Non-Res resources on weekdays, which would follow the current CAISO baseline methodology
  - The baseline is performed by gathering 10 non-event weekdays in the last 45 days
  - If 10 non-event days are not available, then the baseline will be calculated using a minimum of 5 non-event days
  - If the minimum of 5 non-event days are not available, then the baseline will be calculated using 5 event days with the highest usage during the event hours

Analyzing ESDER 2 Baselines and Load Increase

Presenters: Sila Kiliccote, SLAC and John Hernandez, PG&E

What baseline issues will SLAC/PG&E study and how could it inform the product design/baseline considerations of the LSWG?

See PDF

Lessons learned from the XSP Baselines

Presenter: Jonathan Burrows, PG&E

How did PG&E come to use the 10-in-10 baseline for the load increasing XSP?
What were lessons learned from using the 10-in-10?

See PDF

Lunch

12:00 – 1:00

Baseline implications premise, device, and both participating in DR

Presenter: Eric Kim, CAISO

- What questions has the CAISO grappled with when developing the PDR-LSR baselines in ESDER 3?
- What specific considerations should the LSWG be aware of when considering baselines that are technology neutral and may need to assess typical performance of a device, premise or both?
- What implications are there for baselines and frequent use?

Performance Evaluation Methodology for PDR-LSR

June 19, 2018

Eric Kim, Infrastructure and Regulatory Policy Specialist

PDR-LSR Performance Evaluation

- Initial question on performance evaluation
  - How to determine the incremental value of consumption provided?

- PDR-LSR Characteristics
  - Sub-metered energy storage
  - Participating under the Demand Response Provider Agreement

10 in 10 typical use calculation to determine performance value of load shift

- PDR-LSR will separately calculate for curtailment and consumption
  - Calculation will be triggered when a resource is awarded and dispatched in the ISO market
  - 10 non-event “like” days, specific to the 15-minute interval of the “event” is selected
    - “Event days” are considered as either a dispatch or outage in the ISO market
    - An “event interval” can occur on either the consumption or curtailment end

Example of 10 in 10 typical use calculation

	Day 1	Day 2	Day 3	Day 4
Curtailment	E	2	0	0
Consumption	0	0	2	E

- Simple average of 10 non-event intervals
  - Both curtailment/consumption values will be taken into account
  - For curtailment, the typical use value is capped at 0 or above
  - For consumption, the typical use value is capped at 0 or below

Considerations for baselines

- The PDR-LSR is not calculating a baseline but applying an adjustment to the directly metered energy storage device.
  - Typical use would not apply in a scenario if load shift is applied to the “premise”

- Granular meter data is needed to capture consumption/curtailment values to determine “typical use”

PDR-LSR Performance Evaluation Methodology

- Will measure and net out “typical use” to define incremental value of load shift provided

  - **LSR-curtailment**
    - $LSR_{curt} = [|G(t)| - G_{LM}]$

  - **LSR-consumption**
    - $LSR_{cons} = [G(t) - G_{LM}]$

PDR-LSR “typical use” calculations

- Typical Use Curtailment (G_{LMcurt}) : 10-in-10 CLB, using 10 non-event hours including both consumption and curtailment but only accept a value that is at or above 0.

$$G_{LM} = Max\{(G_{LMcurt} + G_{LMcons}), 0\}$$

- Typical Use Consumption (G_{LMcons}) : 10-in-10 CLB, using 10 non-event hours including both consumption and curtailment but only accept a value that is at or below 0.

$$G_{LM} = Min\{(G_{LMcurt} + G_{LMcons}), 0\}$$

Please refer to attachment
"PDR-Load Shift Resource Example"

http://www.caiso.com/Documents/PDR-LoadShiftResourceUPDATEDExample.pdf

Conclusions and next steps

- Summary
- Assess how today's session may influence the JDRP's proposal for a technology neutral and premise-level enhanced PDR product.
- Homework for 7/18 meeting.

- Future meetings:
  - July 18
  - August 22
  - September 17