



Supply-side Pilot Introduction

July 2016

Outline



1. Design

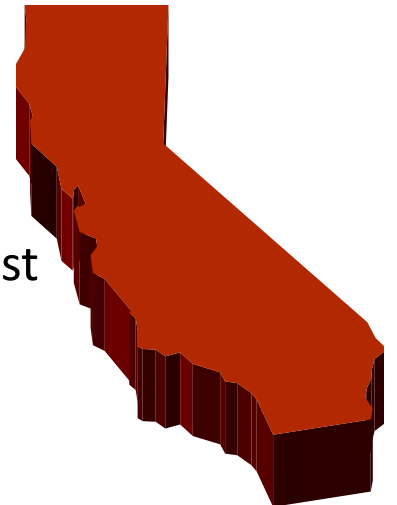
2. Products

3. Requirements

4. Settlements

CAISO Markets In a Nutshell

- Four Basic Products
 - Energy – By Interval to Balance Supply and Demand
 - Non Spinning Reserves – Off-line, 10-Minute for Grid Contingencies
 - Spinning Reserves – Immediately Dispatchable for Grid Contingencies
 - Regulation – Instantaneous Supply and Demand
- Two Basic Market Timeframes
 - Day Ahead Market (DAM)
 - 24 Separate Hourly Solutions
 - 100% of AS Requirements Procured Based on Forecast
 - Real-time Market (RTM)
 - 15-Minute Capacity and Unit Commitment
 - 5-Minute Energy



Supply-side Pilot (SSP) Design Features



SSP is a demand response pilot integrated with CAISO wholesale markets:

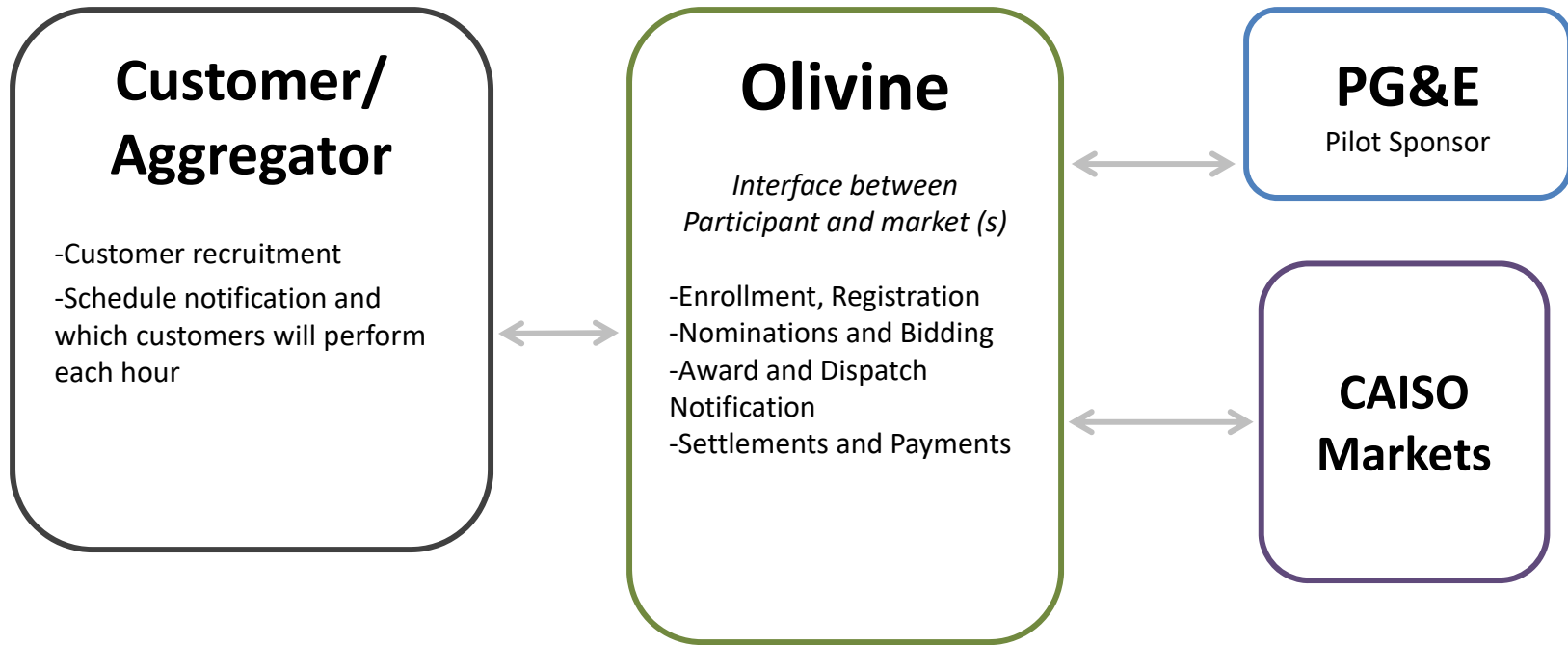
- Participants:
 - Nominate capacity into Pilot
 - Bid day-ahead energy (DA)
 - C&I: Optionally bid into real-time energy (RT) & ancillary services (A/S) markets
 - respond to market awards by reducing load
- Performance calculated by “10-in-10” baseline

Supply-side Pilot (SSP) Design Features



- Participants earn capacity + wholesale settlement payments
- \$10/kW-month capacity payment from meeting ongoing pilot requirements
- Wholesale market settlements passed along directly to participants

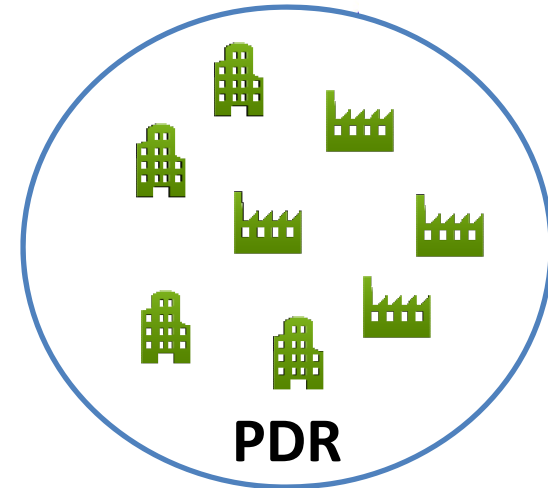
Roles



Eligibility Criteria



- One PDR per participant
- Locations cannot be speculative
- All locations in a PDR must be:
 - Served by the same LSE
 - Located in the same Sub-LAP
- Each PDR must be able to provide four **(4)** consecutive hours of 100 kW minimum load shed



Eligibility Criteria



- Underlying customers may **not** be on any other DR program for their duration on the SSP, (including SmartRate, PDP)
 - Must first de-enroll
- 30 kW “Out of Market” Option (Residential Only)
 - Approved resources from 30-100 kW may participate in the SSP without CAISO registration
 - Dispatches will occur according to CAISO price signals.
 - Participation can transition to CAISO once 100 kW achieved.

Pilot limitations



- Total capacity award may be limited
- All underlying customers must be interval metered
 - Limits on number of locations
 - Limits on registration changes
- SSP may pursue statistical sampling for larger aggregations

Timelines *(Residential Only)*



- SSP Participation *(August 2015)**
 - May 1st: Declarations of Interest Due
 - June 15th: Enrollment Packages Due
 - June-July: Enrollment process
 - August 1st: market operational start
 - August 1st, 2016: operational end

*Dates are provisional at this time

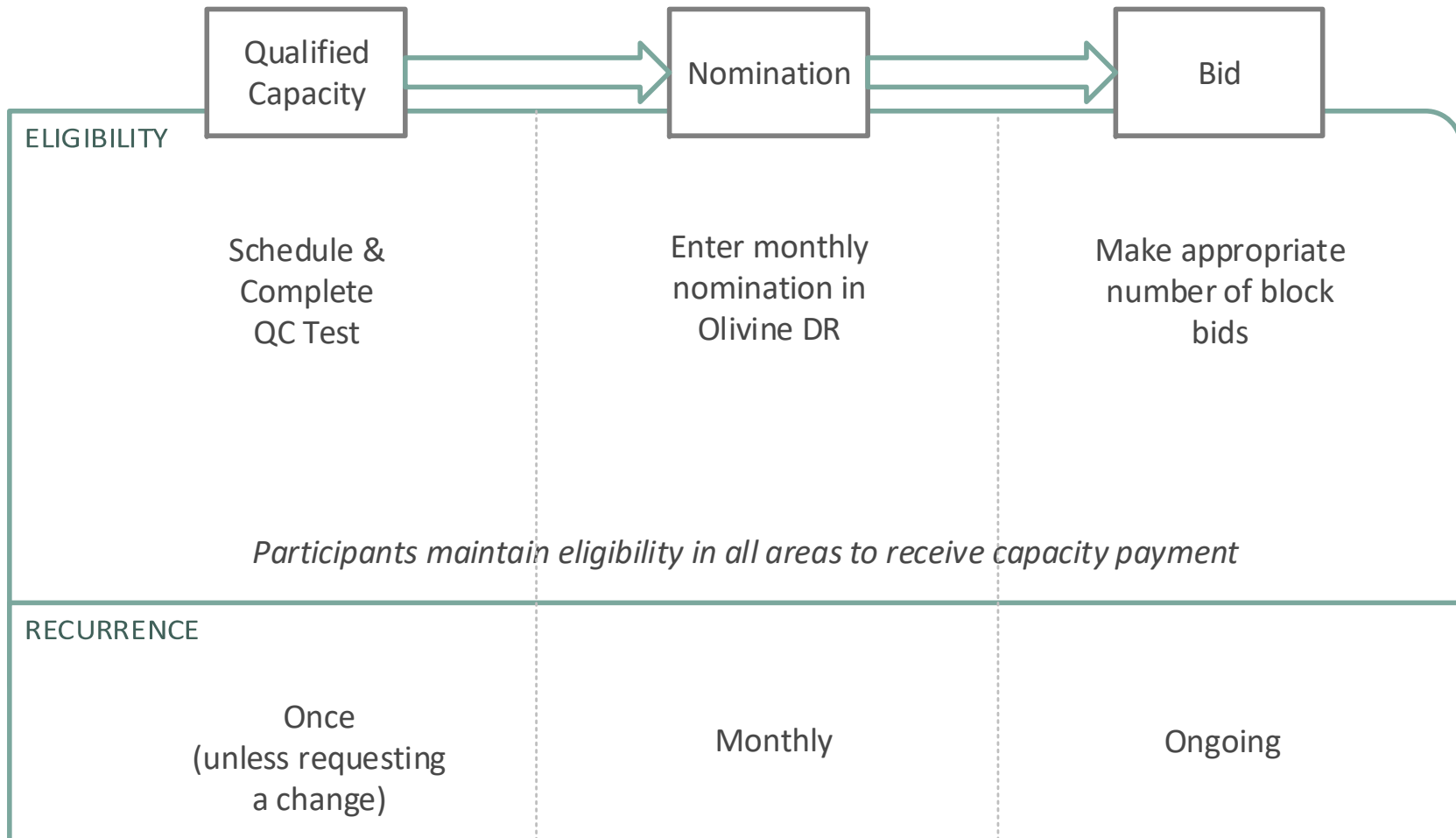
Enrollment Process	Responsible	Deadline (in Calendar time before the first trade date, T)
Declaration of Interest Form	Participant	
Enrollment Workbook, CISR Form, Customer Acknowledgement Forms (<i>Aggregators only</i>), Pilot Contact Form	Participant	T – 8 weeks
PG&E Eligibility Check	PG&E	T – 6 weeks
Participation Agreement Executed	Participant	T – 5 weeks
PDR registration at ISO	Olivine, ISO	T – 4 weeks
Pilot Training	Participant, Olivine	T – 3 weeks
Qualified Capacity Test	Participant, Olivine	T – 2 weeks
Hands-on Training	Participant, Olivine	T – 1 week
>>>Begin Market Operations		T

SSP Participation



- Bids have both a price and quantity
 - Price Floor = Net Benefits Test Value
 - Price Ceiling = \$150/MWH
- Bids & awards are hourly
- Timelines:
 - Bids: 8:30am the day before
 - Awards: by 2pm the day before (if available)
- OpenADR optional

Pilot Requirements (Overview)



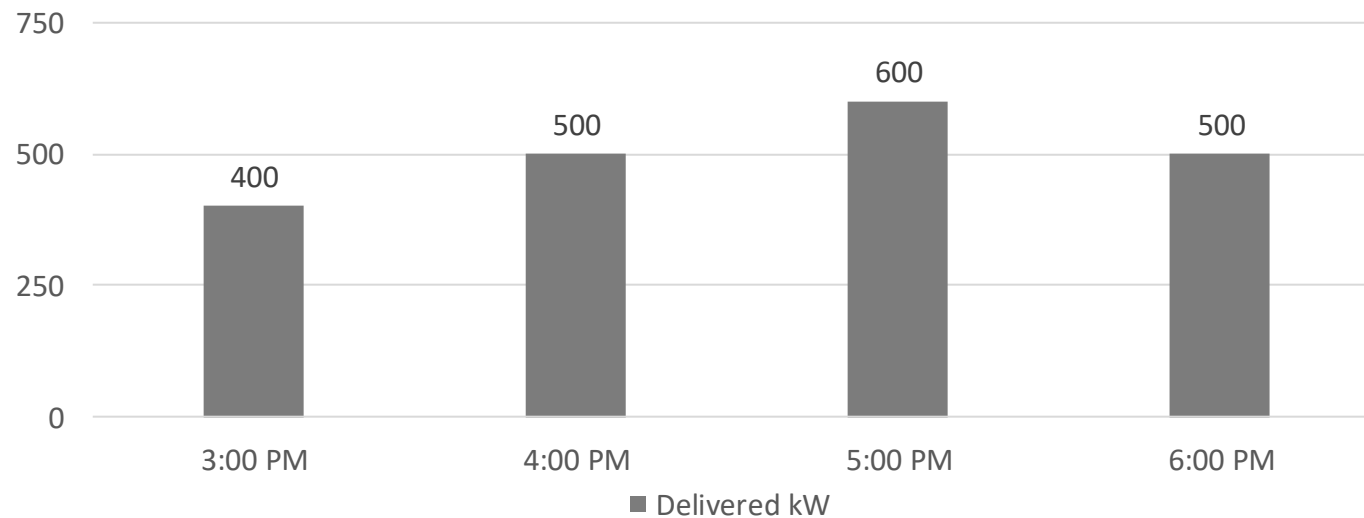
Design > Products > Requirements > Settlement

Qualified Capacity (QC)



- QC = Max quantity biddable into the market
- Test of avg. energy delivered over the period

$$(400 + 500 + 600 + 500) / 4 = 500 \text{ kW Qualified Capacity}$$



Design > Products > Requirements > Settlement

Nomination



- A monthly capacity commitment to deliver load shed for the pilot
- Forms the basis of the monthly capacity payment
- Nominations cannot exceed qualified capacity value (QC)

Bidding Requirements



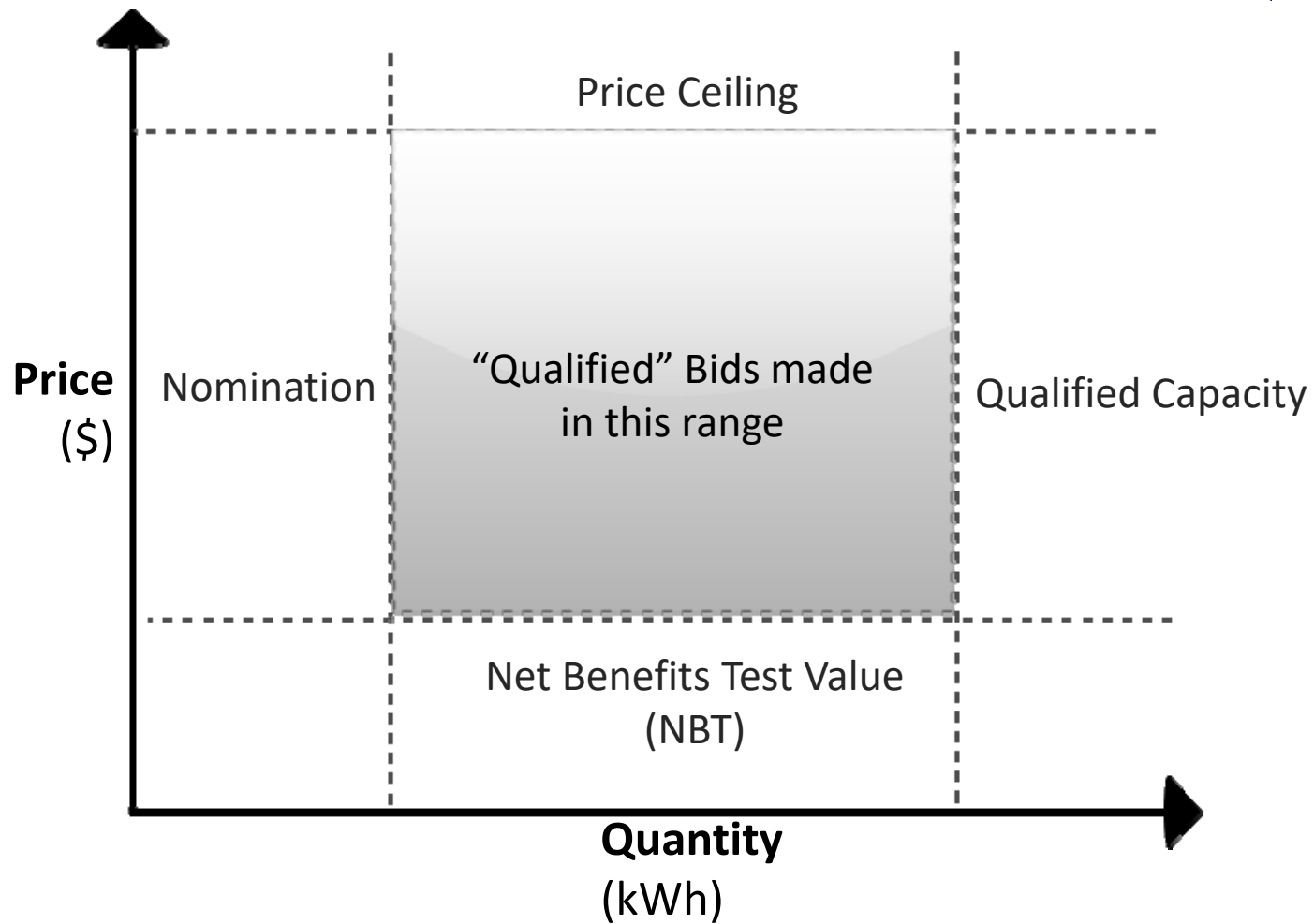
- 4-hour blocks x 18 unique days = 72 bid hours
(\$10/kW-month)
- May enter bids for any hours (24 x 7)
- Dispatchable for at least 24 awards per month

Bidding Requirements (Summary)



Bid Blocks	Total Bid Hours	Unique Days	Dispatchable at least	Capacity Payment
4-hour contiguous bid blocks	72	18	24 hours per month	\$10 kW-month

Bidding Requirements (Day-ahead)



Design > Products > Requirements > Settlement

Settlement



Two sources of revenue for SSP:

- 1. Capacity Payments:** Dependent on fulfillment of pilot requirements above
- 2. Wholesale Energy Payments:** All payments & charges from wholesale market are passed along directly to participants

How is performance measured?

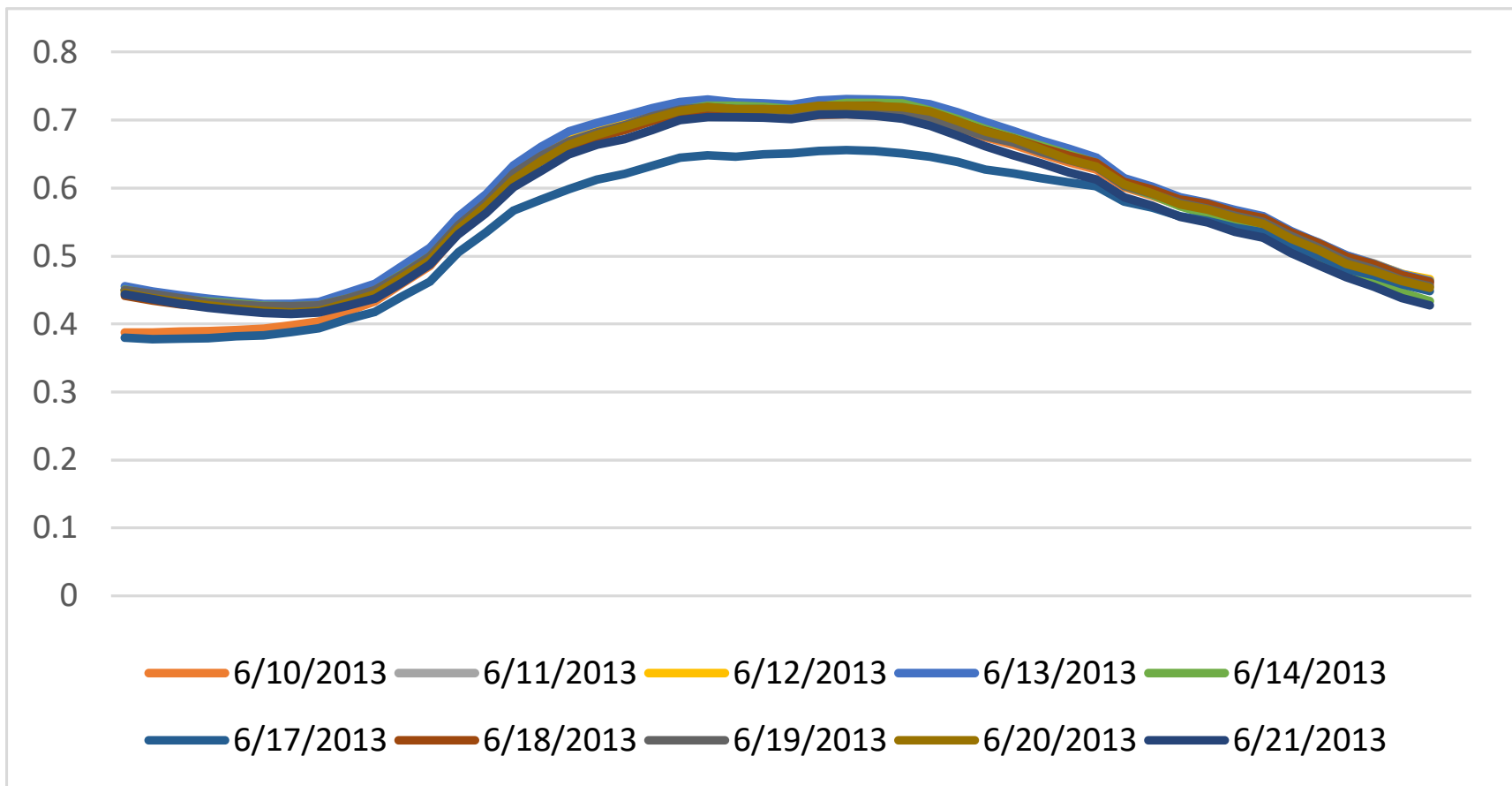


- “10-in-10” Baseline calculates an average of the **whole premises (i.e., no sub-metering)** meter data
 - Based on 10 previous similar days
 - Day-of adjustment capped at $\pm 20\%$
 - 45-day look-back period
 - Determines load reduction or “pseudo-generation”
- Applies to capacity and energy settlements

Baseline Step #1



- Identify 10 similar, non-event days

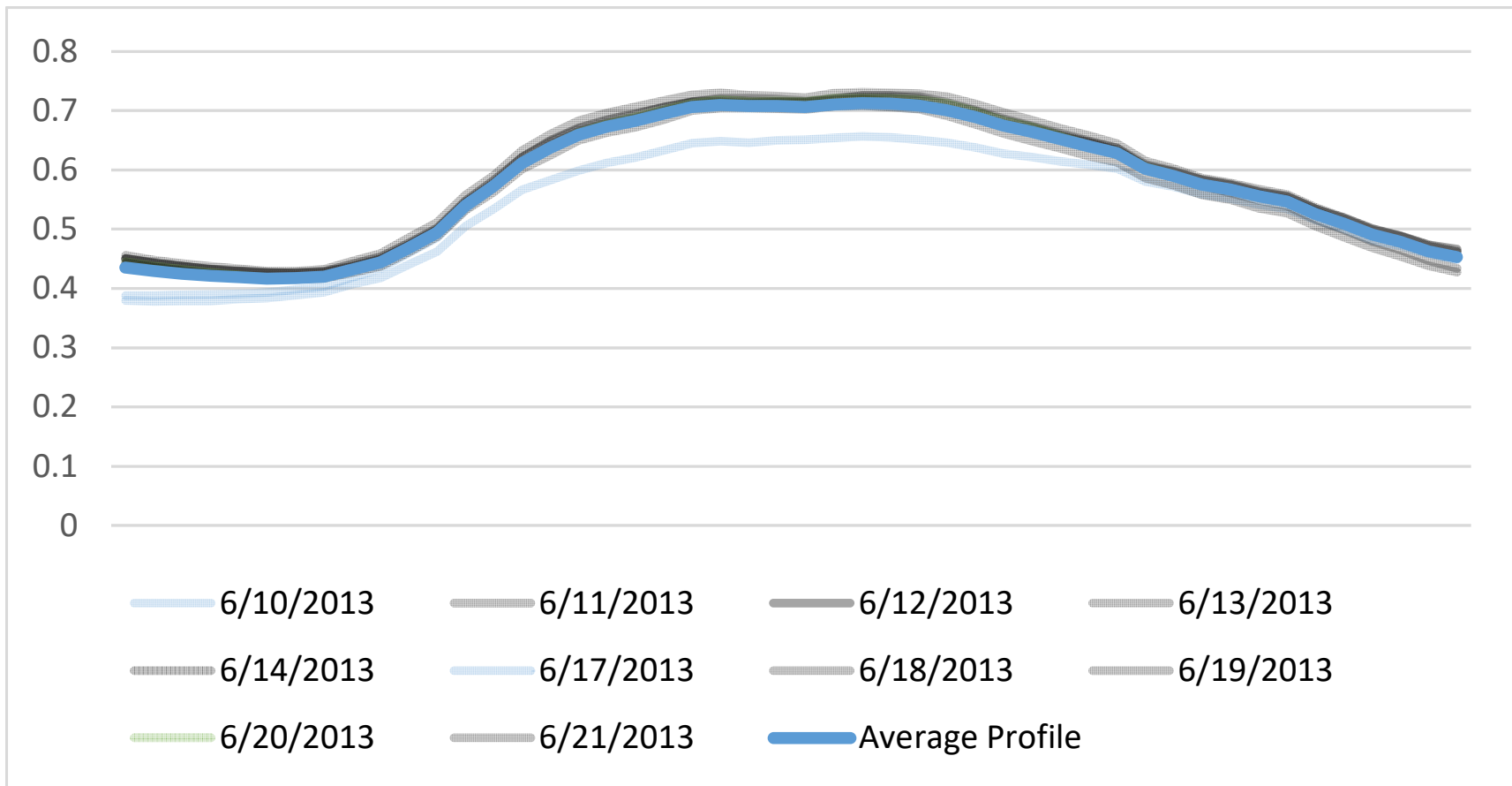


Design > Products > Requirements > Settlement

Baseline Step #2



- Calculate Average Profile

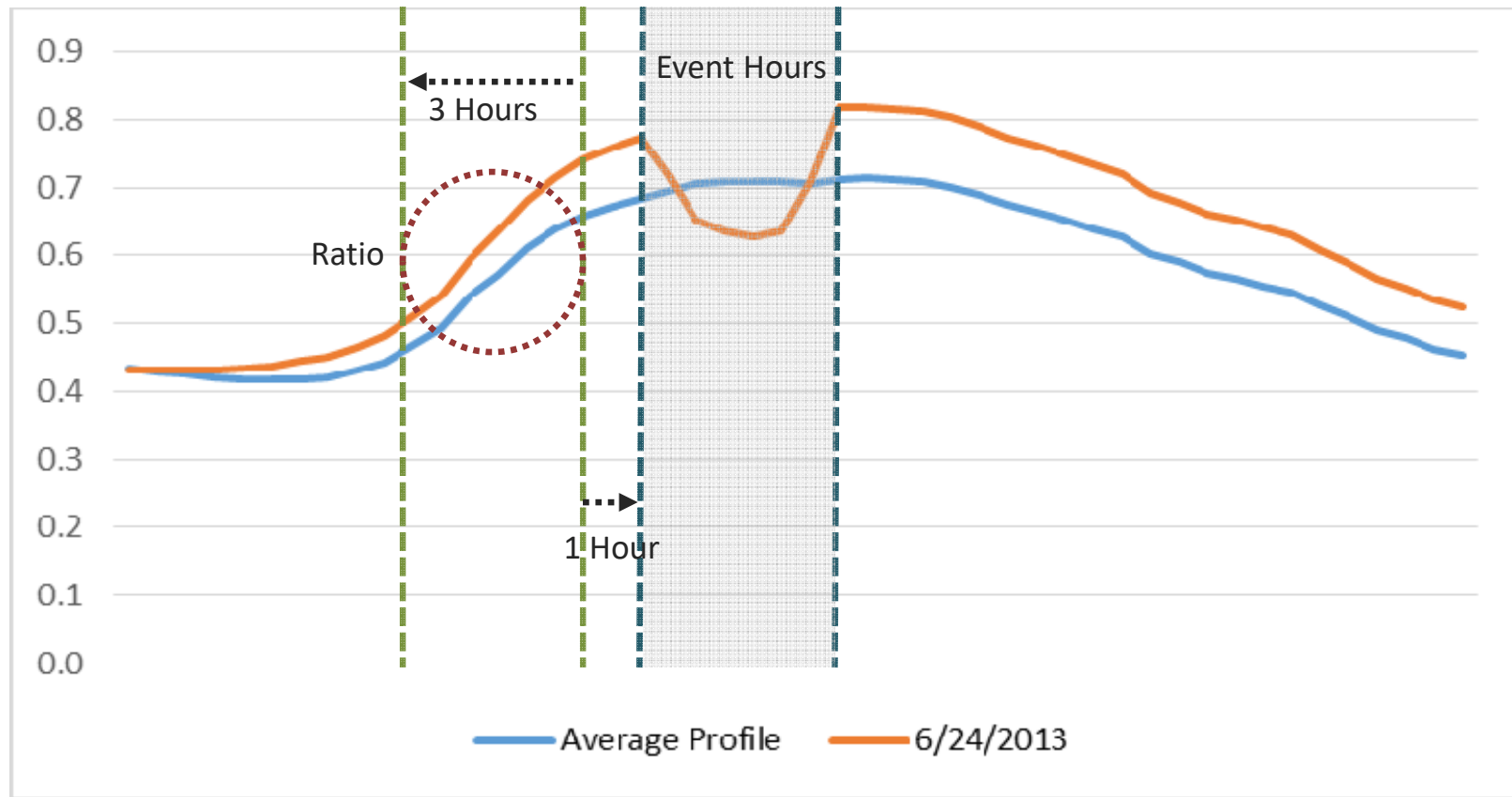


Design > Products > Requirements > Settlement

Baseline Step #3



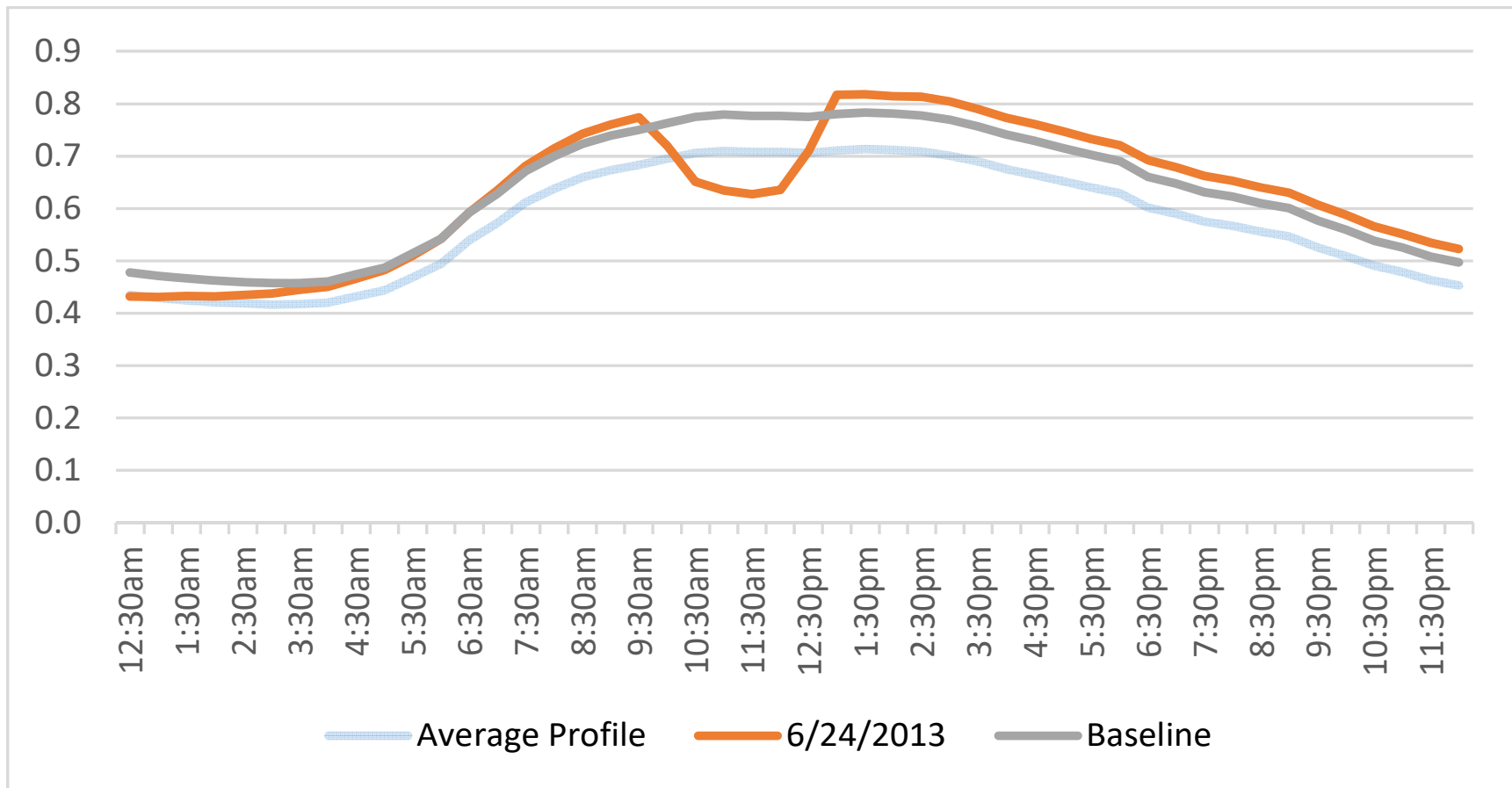
- Determine day-of adjustment



Baseline Step #4



- Apply day-of adjustment to create baseline

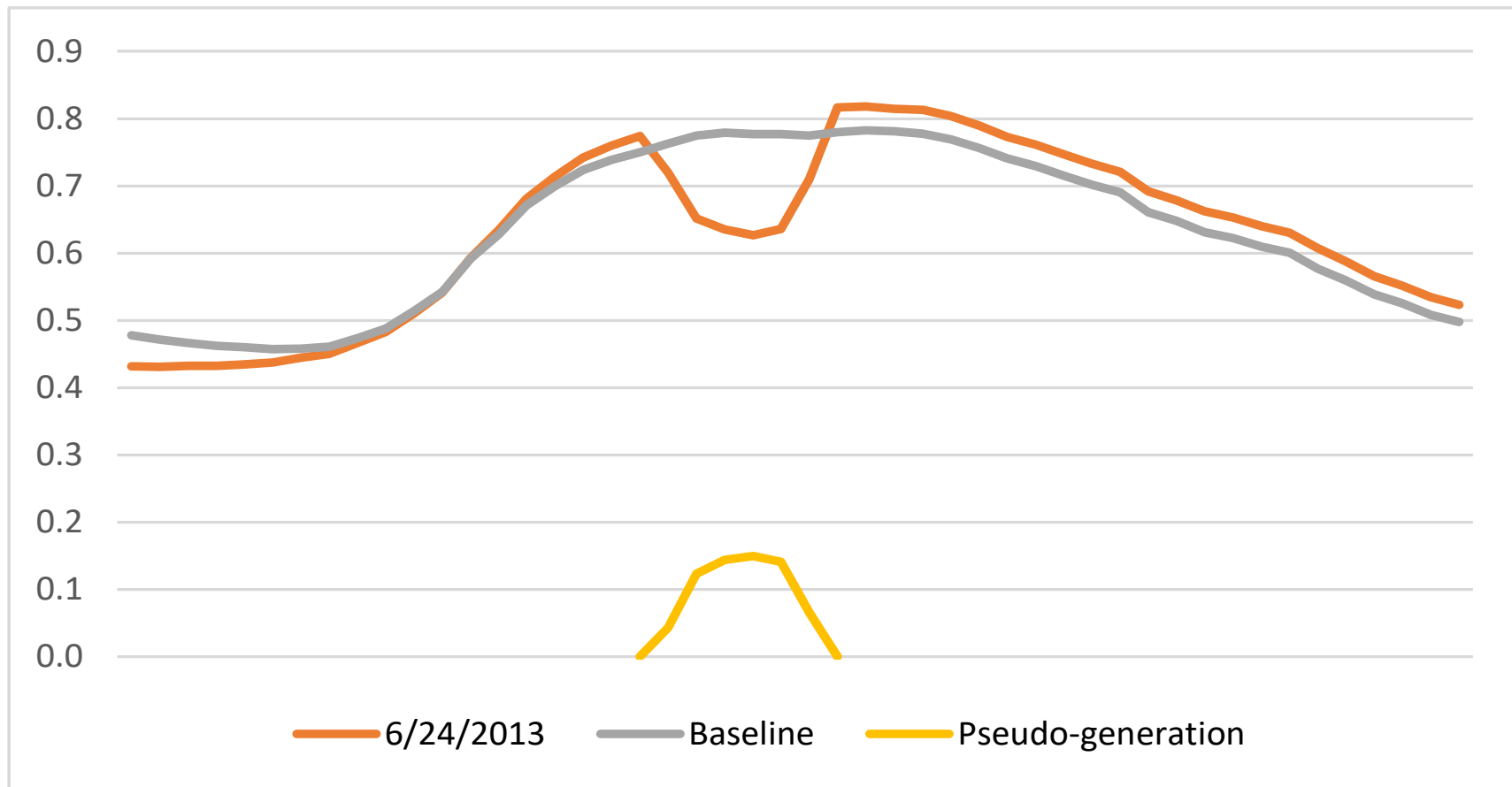


Design > Products > Requirements > Settlement

Performance Calculation



- Baseline minus event day



Design > Products > Requirements > Settlement

Capacity Payments



- If monthly pilot requirements are met, then:

Capacity payment =

[Capacity Price] x [Nomination] x [Monthly Performance]

- **Capacity Price:** \$10/kW-month
- **Nomination:** Monthly kW number chosen by participant
- **Monthly performance:** Weighted average of all hourly performance values

Hourly Performance Tiers



- Performance values rounded up for settlement:

Raw Performance	Adjusted Performance
$0.75 < x$	1.00
$0.50 < x \leq 0.75$	0.75
$0.25 < x \leq 0.50$	0.50
$0 < x \leq 0.25$	0.25
$x \leq 0$	0

Wholesale Energy Payments



- ISO Day-ahead (DA) awards settled at DA energy clearing price
- Any over-delivery and under-delivery are settled at the Real-time (RT) Uninstructed Imbalance Energy price

$$\begin{aligned} &\text{Wholesale Settlement} = \\ &\{ \text{DA energy price} \times \text{DA award} \} \\ &\pm \\ &\{ \text{Over/Under Delivery} \times \text{RT price} \} \end{aligned}$$

Design > Products > Requirements > Settlement

ISO Calculation: Example



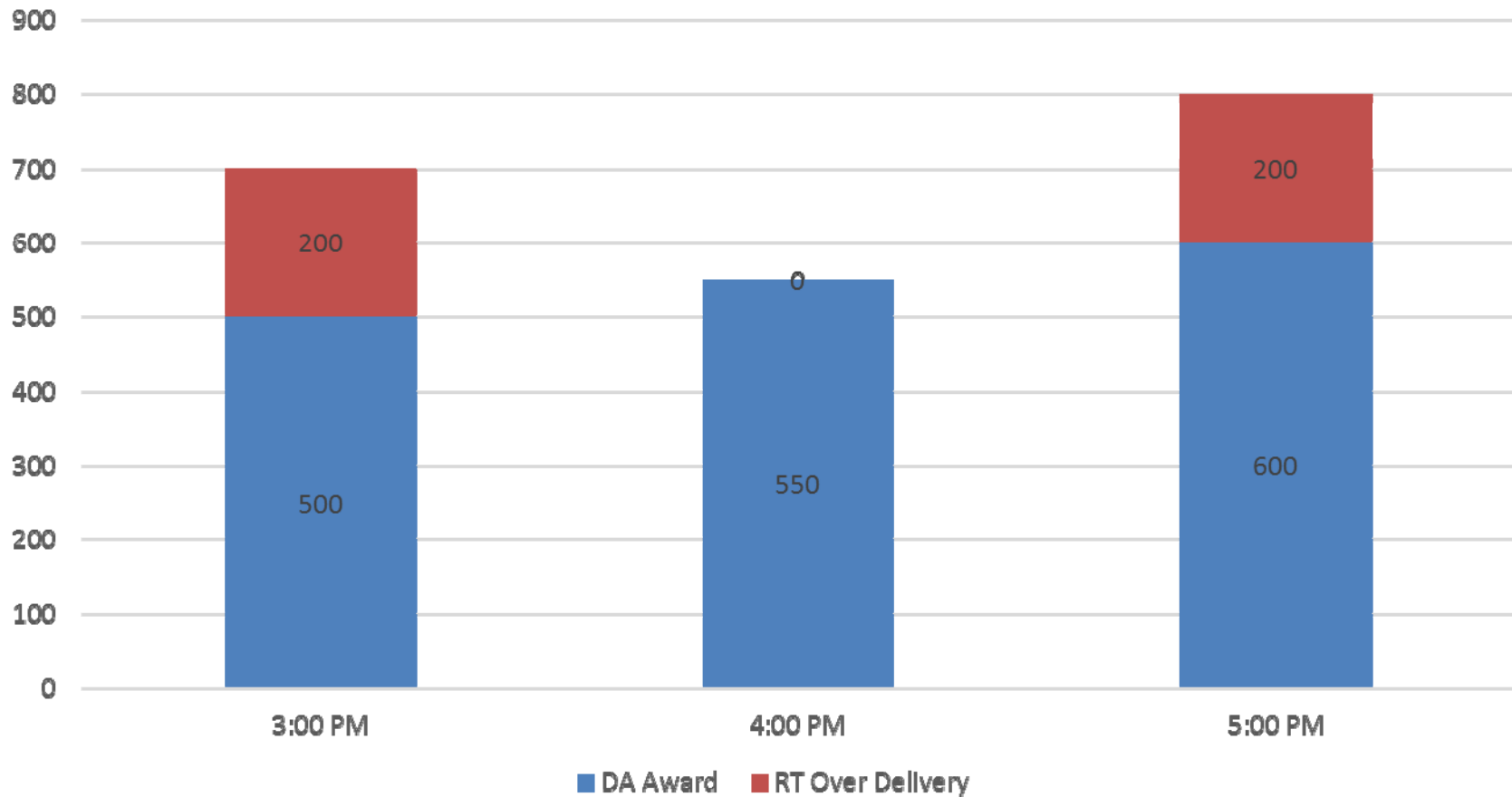
Assumptions:

- Assume award is for 3 consecutive hours
- Day-ahead energy price is \$60.00 / MWH
- Real-time imbalance energy price is \$72.00 / MWH

ISO Calculation: Over-Delivery



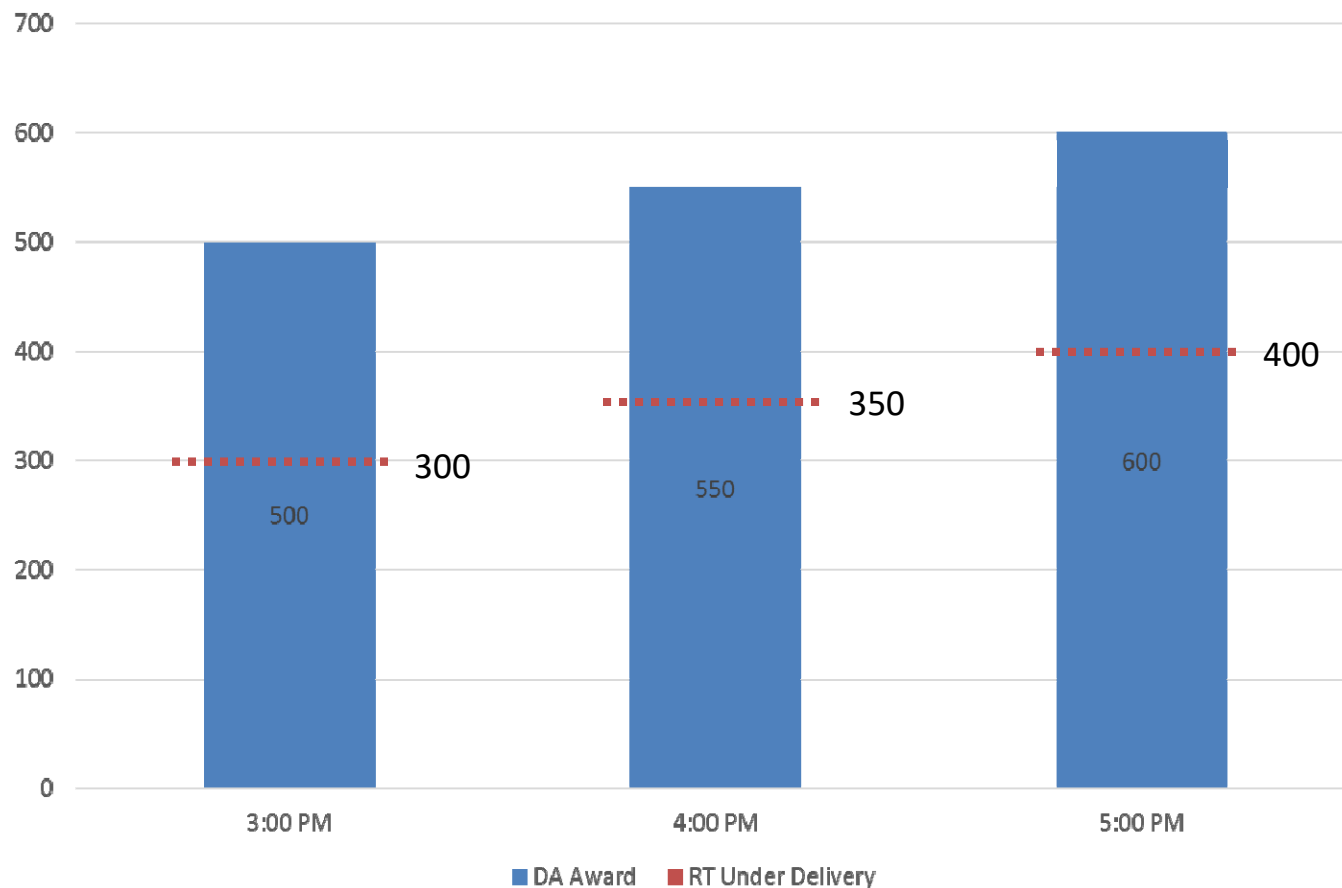
$$DA\ Award \times DA\ Price + Over\ Delivery \times RT\ Price =$$
$$1.650 \times \$60 + 0.400 \times \$72 = \$127.80$$



ISO Calculation: Under-Delivery



$$DA \text{ Award} \times DA \text{ Price} + \text{Under Delivery} \times RT \text{ Price} =$$
$$1.650 \times \$60 - 0.600 \times \$72 = \$55.80$$



Real-time (RT) & Ancillary Services (A/S)



- Both are optional
- No enablement funds available
- No additional pilot capacity payments; wholesale settlements are still passed through
- Have additional requirements
- Requires minimum three months active participation in Day-ahead (DA) SSP
- A/S requires 500 kW and longer timelines

Real-time (RT) Participation



- Requires minimum three months active participation in Day-ahead (DA) SSP
- RT Market bids are hourly
- If awarded, participant receives RT Dispatches in 5-minute intervals:
 - Requires RT Control (OpenADR); must be able to respond to dispatch signals
 - Signals come 2 ½ minutes before dispatch interval

Real-time (RT) Participation



- Bids initially entered in DA
- If no awards, must bid those hours in RT
- Participants may provide conditional bids to be sent RT or enter bids manually:
 - May insert/edit bids until 2 hours before trade hour
- RT bid prices & quantities:
 - No RT bid price ceiling
 - Hours with dispatches for bids at or above nomination count towards 24 hours

2017 Plans and Outstanding Questions



- Customer Authorizations
- Possible Rule Changes

Conclusion: *Participant Next Steps*



- Complete DOI forms as soon as possible
 - 1 resource per participant, with limits on capacity & number of locations
- Contact:
 - SSPadmin@olivineinc.com
 - <http://olivineinc.com/ssp/>