



California ISO

Resource Adequacy Enhancements

Karl Meeusen, Ph. D

Senior Advisor Infrastructure & Regulatory Policy

Chris Devon

Lead Infrastructure and Regulatory Policy Developer

Market Surveillance Committee Meeting

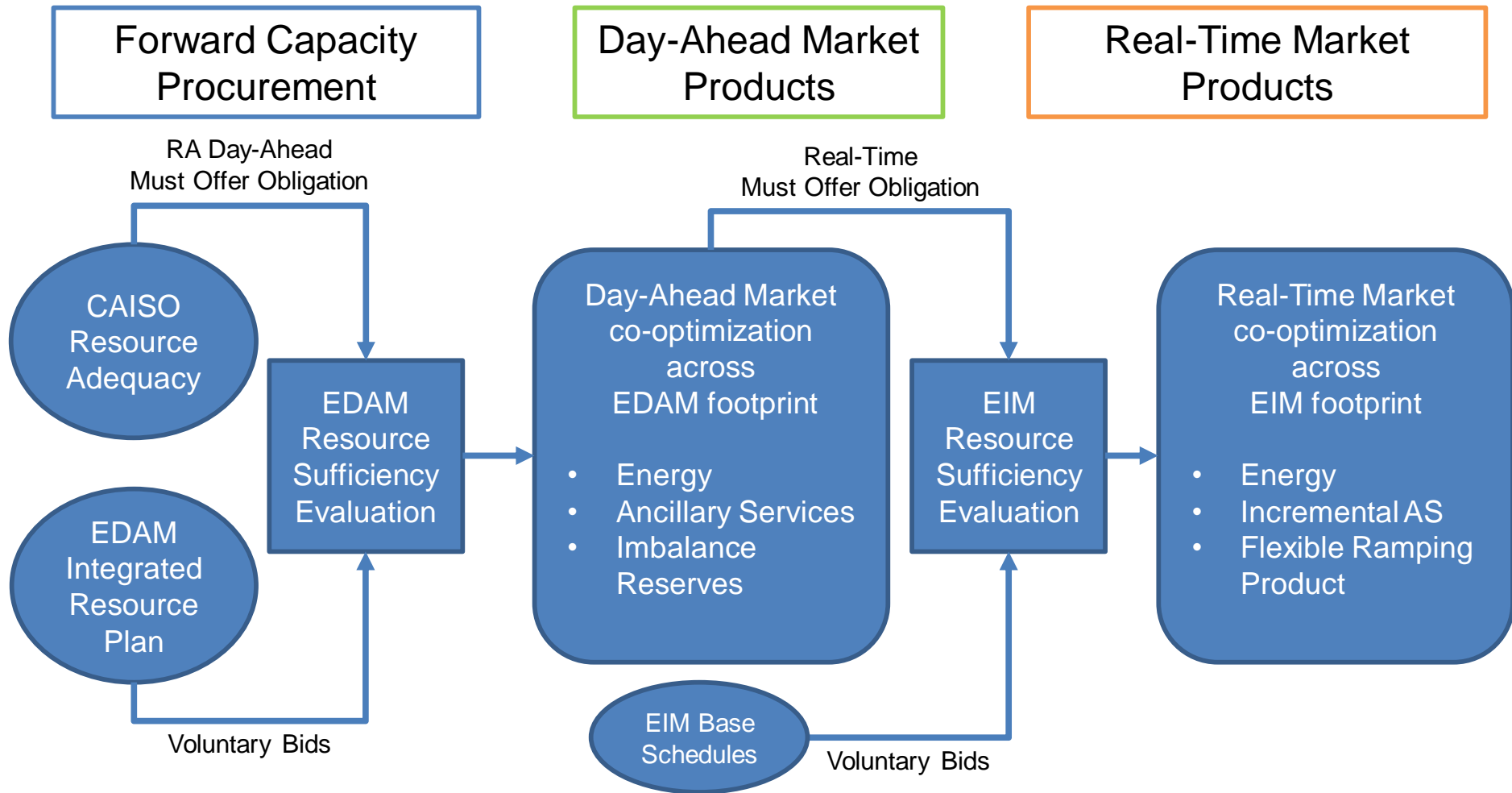
General Session

December 6, 2019

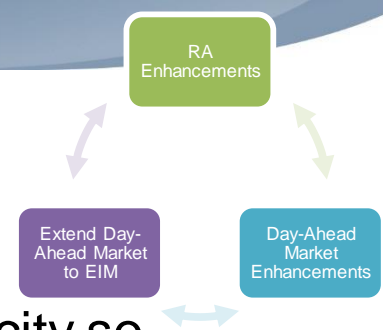
The ISO is seeking MSC input on specific elements of its RA enhancements proposal.

- Flexible RA
 - Definition of the new flexible RA product/need
 - Calculation of EFC for flexible RA resources
 - Must offer obligation quantities
- RA Imports

Overview of RA, DAME & EDAM relationship with ISO market runs



Each effort has a specific goal and purpose



Resource Adequacy ensures forward procurement of capacity so adequate supply is available and bid in to meet CAISO's load and reliability requirements

- **RA Enhancements** will align the RA requirements with the transforming needs of the CAISO grid

Day-Ahead Market co-optimizes energy and ancillary services to meet daily load and reliability requirements

- **Day-Ahead Market Enhancements** introduces imbalance reserves to meet ramping and uncertainty needs between the day-ahead and real-time markets and appropriately compensate resources to be available for real-time dispatch

Regional Markets allow multiple entities to share resources across a larger footprint to capture diversity and efficiency benefits

- **Extend Day-Ahead Market to EIM** will develop provisions to allow participation in the day-ahead market by EIM entities, e.g. recognizing different planning and procurement paradigms

FLEXIBLE RA

ISO observes two primary reasons for flexible capacity:

1. **Predictable: known and/or reasonably forecastable ramping needs**
 - Require a set of resources economically bidding into ISO's day-ahead market to properly shape the day-ahead market
 - Allows ISO to create a feasible market dispatch in the day-ahead market
2. **Unpredictable: ramping needs caused by load following and forecast error**
 - Load and generation are creating uncertainty between day-ahead and real-time markets based on forecast error and time granularity
 - ISO must rely on real-time market dispatches to account for unpredictable ramps caused by uncertainty

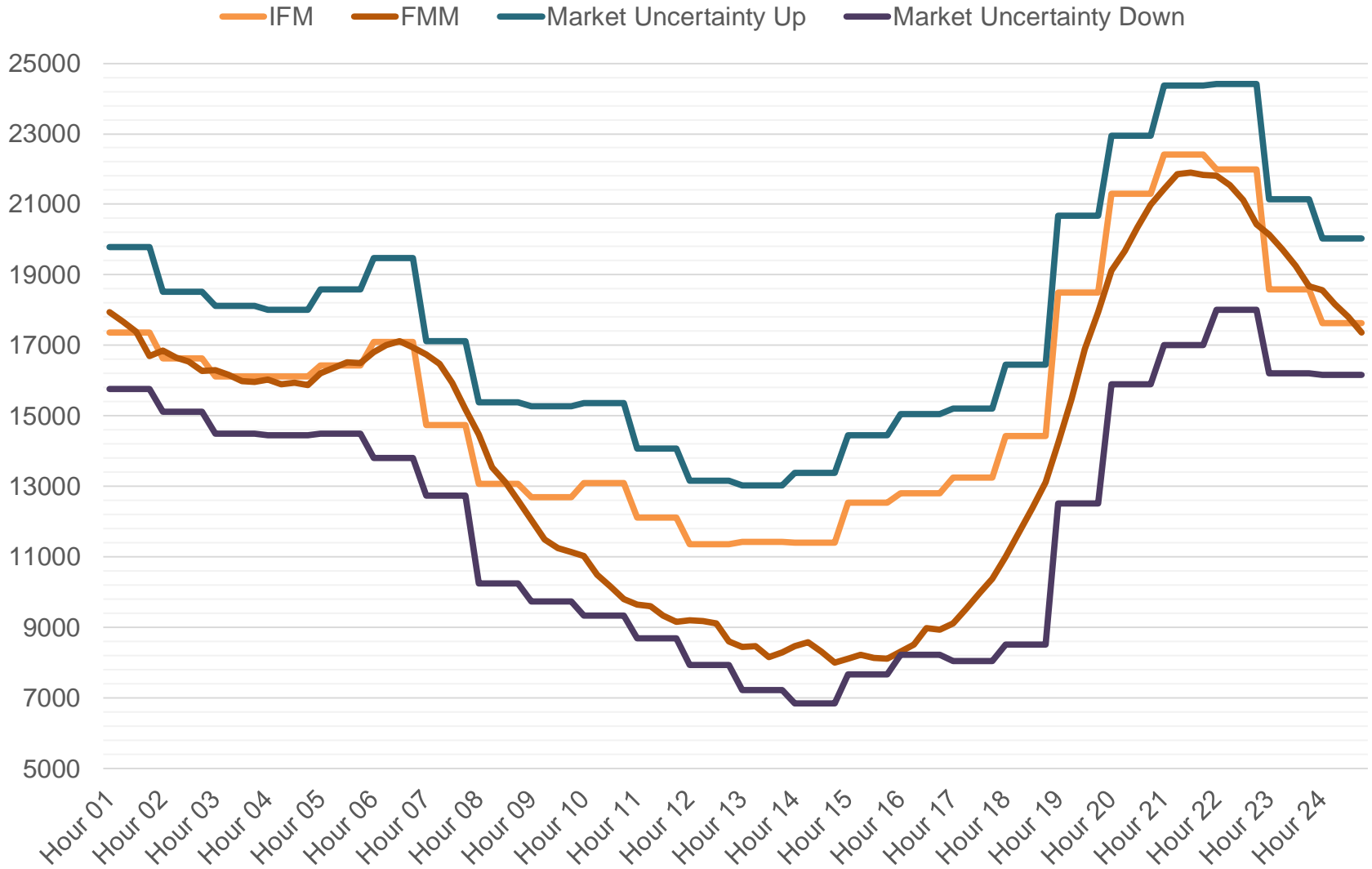
ISO proposes a single flexible RA product to connect forward procurement with market and operational needs:

- Ensure ISO has flexible capacity to address uncertainty between day-ahead and real-time markets
- Align directly with imbalance reserve product, including:
 - Requirements,
 - Flexible RA counting rules, and
 - Must-offer obligations
- Defers RPS/GHG goals to LSE procurement
- ISO will eliminate existing three-hour net load ramping requirement
 - Will not have a flexible RA product for predictable ramping needs

ISO proposes flexible RA capacity requirements to align with the proposed imbalance reserves:

- ISO is developing market rules to procure imbalance reserves as part of its day-ahead market enhancements stakeholder initiative
 - The objective is to ensure the day-ahead market has sufficient resources awarded with upward and downward ramping capabilities to address real-time imbalances
 - Captures speed need by having 15-min ramp capable capacity
 - Resources that receive an imbalance reserve award will have a must offer obligation in the real-time market
 - The energy bids associated with the imbalance reserve award will enable the real-time market to address uncertainties that materialize between the day-ahead market and real-time market through economic bids

Example of Imbalance Reserves



The ISO seeks MSC input on proposed methodology for determining flexible RA requirement.

- Flexible RA will be a single product designed to ensure adequate imbalance reserves are procured day-ahead
- ISO is proposing to use three years of seasonal historic data to determine:
 - Maximum difference between IFM and FMM forecasts, and
 - The rate of change in that difference
- ISO will combine calculated forecast error with an expected growth in wind and solar
- ISO will extrapolate the need for the uncertainty requirement for the upcoming RA year
- ISO can reexamine once there is sufficient data available from the imbalance reserves market

The ISO seeks MSC input on proposed resource eligibility criteria for providing flexible RA.

- Either be a non-use limited resource or a use-limited resource with a use limitation ISO can model in its energy market or through an opportunity cost adder
- Not be a conditionally available resource
- Be dispatchable in at least 15 minute increments (including imports)
- Not be a regulation energy management resource
- Imports that:
 - Demonstrate they are deliverable to the ISO (*i.e.* must have MIC allocation)
 - Identify its BAA of origin and interconnection point with ISO

The ISO seeks MSC input about determining the correct operational range to use for EFC values.

- ISO will calculate the EFC using the range a resource can move over a 15-minute interval capped at the resource's UCAP
 - Capping EFC at UCAP provides the same forced outage benefits for flexible RA that UCAP offers for system RA
- The ISO will no longer consider start-up time or weighted average ramp rate parameters
 - Pmin for a resource is either completely included or excluded from a resource's EFC (i.e. Pmin of the resource cannot be split)
- The ISO must determine which operational range to use for EFC calculation (*i.e.* fastest or slowest ramp rate)

The ISO seeks MSC input on the MW value must-offer obligation for flexible RA.

- Flexible RA capacity must submit economic bids for energy, ancillary services, and imbalance reserves into day-ahead market
- Must cover at least from 5:00 AM to 9:00 PM for all shown flexible RA capacity.
 - ISO is considering exceptions for wind, solar and NGR
- How much must be bid into ISO market for the ISO to have access to the flexibility that is used to determine that resource EFC?
 - i.e. EFC or whole resource

RA IMPORTS

Objectives for RA import rules modifications:

- Ensure that RA imports are backed by physical capacity and reserves with firm transmission delivery
- Ensure coordination with extended EIM and DA markets enhancements initiatives
- Create more comparable treatment to internal RA resources for RA imports

Clarifying RA Import rules concerns:

RA Imports may lead to reliability concerns in some instances

Two main issues for Import RA rules:

1. Double counting

- Provisions should ensure resources shown as import RA are not also relied upon by native BA to serve native load, be sold to a third party, or relied upon to meet capacity needs of others in addition to ISO load

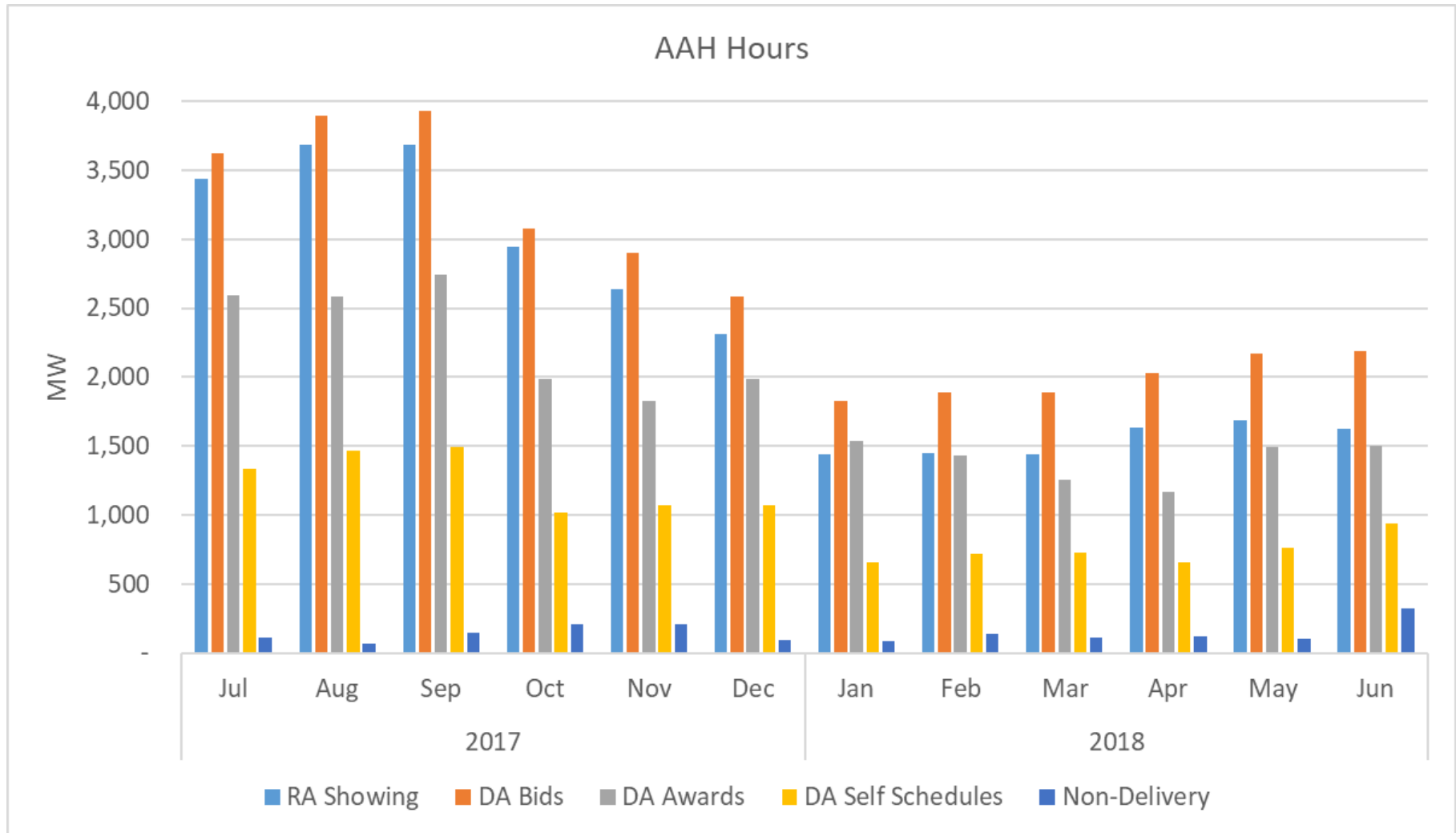
2. Speculative supply

- When RA imports shown on RA supply plans have no physical resource backing the showing or no firm contractual delivery obligation secured at time of the showing
- Provisions should foreclose, or at minimum, discourage, speculative RA import supply

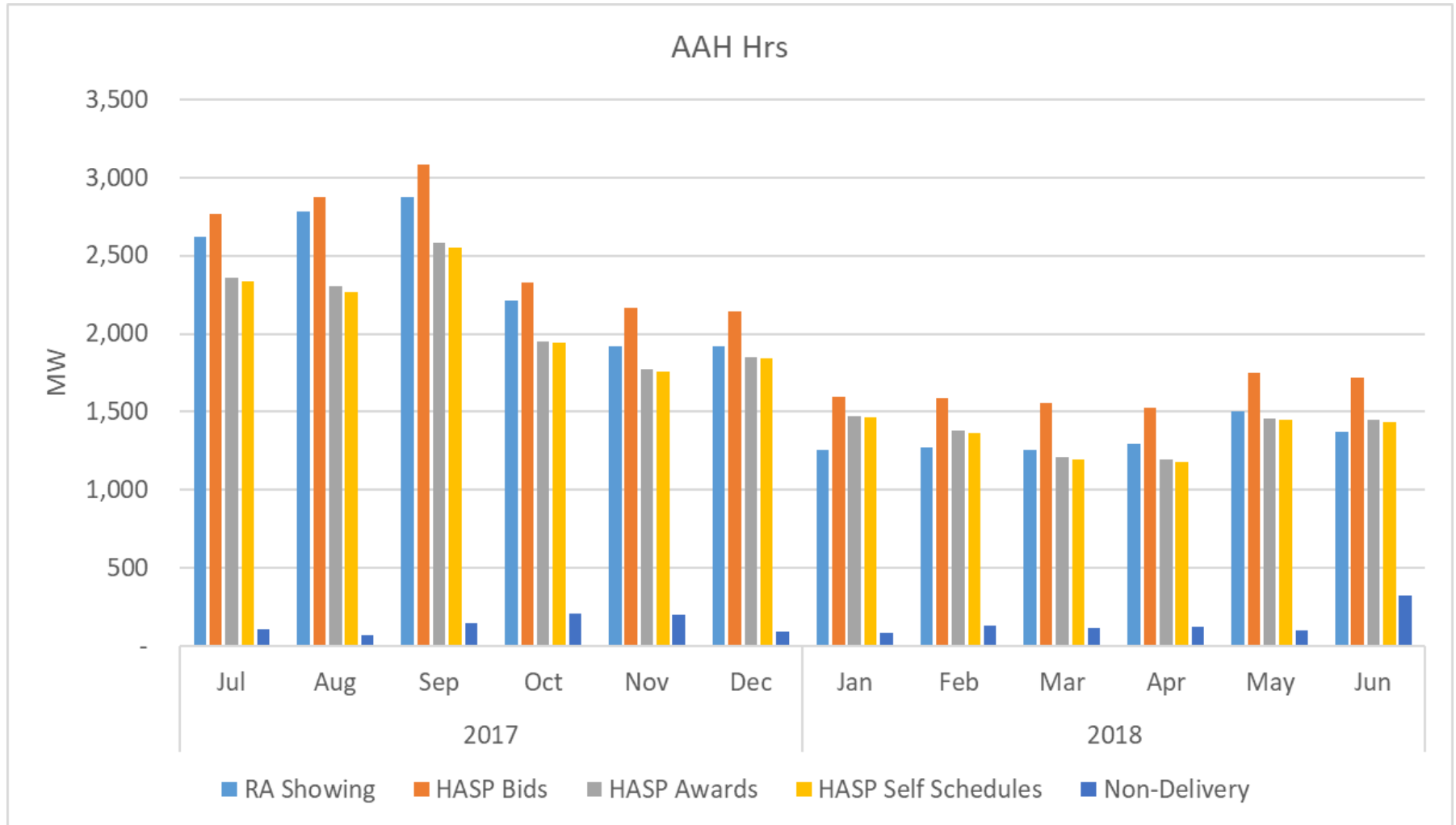
Ongoing analysis efforts updated for greater accuracy

- Analysis to determine participation behavior for RA import resources
- Updated analysis that incorporates day ahead market participation
- ISO has analyzed data on NRS-RA import behavior
- Identifies magnitude of bidding and self-scheduling compared to RA showings

Day ahead bids, awards, self-schedules, and actual non-delivery: average during AAH hours



HASP bids, awards, self-schedules, and non-delivery: average during AAH hours



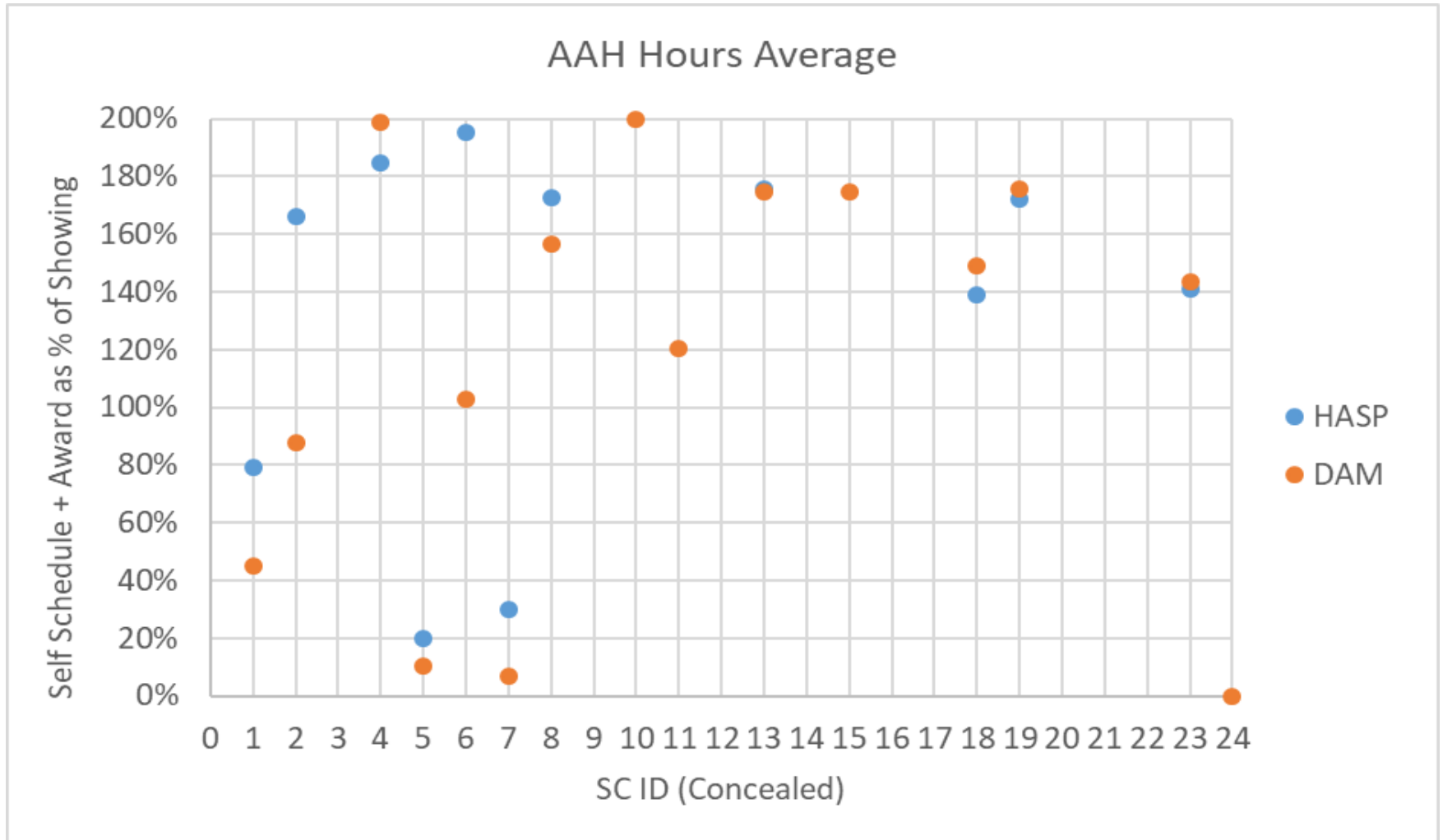
Analysis shows behavior generally consistent with requirements and expected participation by NRS-RA.

- Day ahead and HASP bidding, self-schedules and awards for AAH hours (on average)
- Most behavior is generally consistent with requirements and expected participation by NRS-RA import providers
 - Bids and self-scheduling of RA showing MWs during AAH hours
- SC level analysis also provided helps to differentiate the general statistics

SC level analysis indicates most SCs participation is consistent with expectations for NRS-RA imports.

- Most SCs providing NRS-RA imports likely provide physical capacity secured in advance with firm delivery and operating reserves
 - High ratio of awards and self-scheduled import RA to RA showings by most SCs providing NRS-RA imports
 - This analysis does not provide an indication of how far in advance supply has been secured, only that it is likely secured in advance of DA participation
- 20 out of the 24 NRA-RA import SC's awards and self-schedules – Close to, or above 100% of their NRS-RA showing amounts (on average)

SC awards and self schedules as % of RA showings: average during AAH hours (July 2017–June 2018)



Proposed RA import modifications:

- ISO proposal would require specification of the source BA for all RA imports on monthly showings
- ISO proposal would also adopt tariff provisions for RA imports to provide physical capacity backed by reserves with firm transmission delivery to ensure similar treatment among all LSEs

Specification of RA import resource balancing area source

- RA import resources are not required to be resource specific or to provide any greater certainty that they represent supply from a specific balancing area
 - Only required to be shown as sourced on a specific intertie into ISO's system
 - CPUC decision has required firm energy delivery during all hours for any NRS-RA imports provided by its' jurisdictional LSEs
- ISO proposal would require specification of the source BA for all RA imports on RA and supply plans for monthly showings
 - Needed for extended EIM sufficiency tests
 - Help ensure NRS-RA resources are not double counted

Specification of RA Import resource balancing area source

- With potential extension of day-ahead market to EIM entities, RA import resources must specify source balancing area at minimum
 - Proposed modification would allow ISO to ensure that RA imports are not double counted for EIM resource sufficiency tests
- SCs can update BA source through CIRA
 - ISO believes it should be acceptable to allow some flexibility to switch BA source through CIRA after RA showing timeframe in advance of DA participation (between T-45 and DA)
- BA source specification is needed prior to DA market to be certain that extended EIM sufficiency tests are accurate

Recent RA Import decision by CPUC requires self scheduling during the contract term hours for RA imports [D19-10-021].

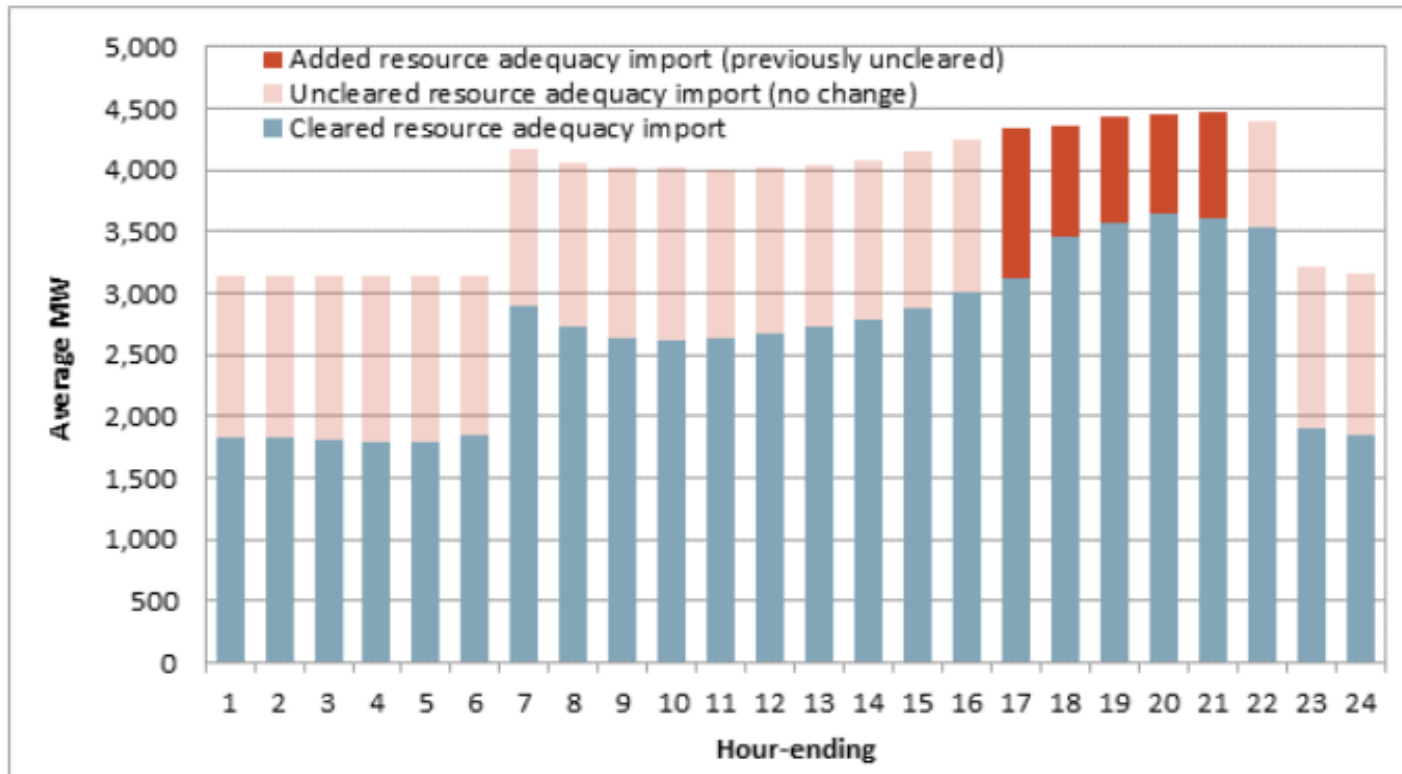
- Decision “clarifies” that resource adequacy import contracts must “self-schedule into the ISO markets, consistent with the timeframe established in the governing contract.”
- Change from prior Proposed Decision that would have only required resource adequacy imports to provide “energy delivery that flows, at a minimum, during the availability assessment hour window.”

ISO has expressed concerns regarding reduced flexibility provided by RA imports under the decision.

- Change is significant because RA import contracts are often established during the 16-hour window between hour-ending 7 and hour-ending 22
- RA imports not cleared by the ISO market are substantially higher during the midday—when solar resources are providing low-cost energy—compared to the availability assessment hours
- Self-scheduling requirement during contract term hours will likely result in ISO needing to substantially dispatch more uneconomic energy than Proposed Decision initially contemplated

ISO would receive additional 1,200-1,500 MW of self-scheduled RA imports during midday hours when solar production is at its peak and over-night.

Average hourly resource adequacy imports offered (July 2019)



Department of Market Monitoring, *Reply Comments of the Department of Market Monitoring of the California Independent System Operator Corporation*, October 1, 2019, p. 2

Requiring self-schedule during contract term hours can have significant market and bilateral trading impacts.

- Delivery required in hours when negative prices occur often
 - Problem could be exacerbated in non-summer months
 - Even if import resource adequacy is lower than summer months, because net loads during midday hours are significantly lower
- Self-scheduling requirement could have significant impacts on the bilateral capacity market
 - Could reduce the amount of forward contracting of RA imports due to price risk when there is an impending capacity shortfall in California
 - Creates uncertainty by imposing a sudden change in bidding obligations, which may cause suppliers not to contract with CPUC jurisdictional LSEs