Resource Adequacy Enhancements: Third Revised Straw Proposal Stakeholder Meeting

January 7-8, 2020

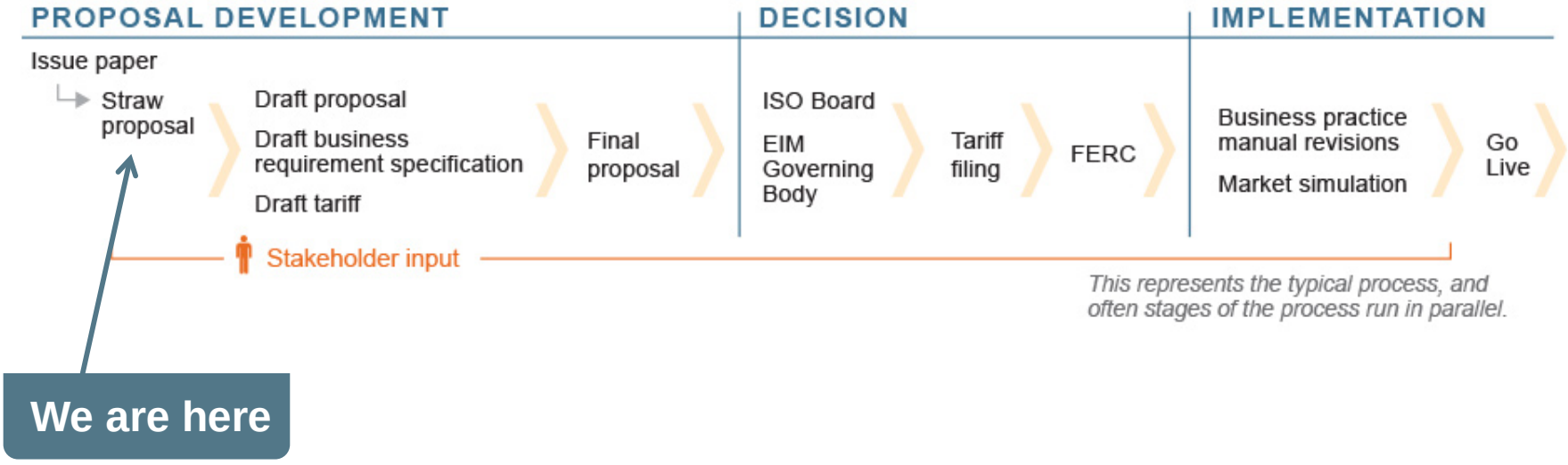
Agenda – January 7 (Day 1)

Time	Agenda Topic	Presenter
10:00-10:05AM	Welcome and Introduction	Isabella Nicosia
10:05-10:15AM	Principles & Objectives	Karl Meeusen
10:15-10:45AM	Determining System RA Requirements	Karl Meeusen
10:45AM-12:00PM	Unforced Capacity Evaluations	Chris Devon
12:00-1:00PM	LUNCH	
1:00-1:45PM	System RA Showings and Sufficiency Testing	Karl Meeusen
1:45-2:30PM	Must Offer Obligation and Bid Insertion Modifications	Lauren Carr
2:30-3:15PM	Planned Outage Process Enhancements	Karl Meeusen
3:15-4:00PM	RA Import Provisions	Chris Devon

Agenda – January 8 (Day 2)

Time	Agenda Topic	Presenter
9:00-9:05AM	Welcome and Introduction	Isabella Nicosia
9:05-10:30AM	Operationalizing Storage Resources	Gabe Murtaugh
10:30AM-12:00PM	Flexible RA	Karl Meeusen
12:00-1:00PM	LUNCH	
1:00-2:00PM	Local RA	Karl Meeusen
2:00-3:30PM	Backstop Capacity Procurement Provisions	Gabe Murtaugh
3:30-3:45PM	Next Steps	Isabella Nicosia

Stakeholder Process



PRINCIPLES AND OBJECTIVES

Principle: The resource adequacy framework must reflect the evolving needs of the grid

- As fleet transitions to clean, variable, and energy-limited resources traditional resource adequacy must be revisited
- Including assessment of more than simply having sufficient capacity to meet peak demand
- RA requirements and assessments must reflect evolving needs
- RA framework must accurately evaluate and value resources that can meet CAISO's operational and reliability needs all hours of the year

Principle: RA counting rules should promote procurement of most dependable, reliable, and effective resources

- Both RA and non-RA resources should be recognized and rewarded for being dependable and effective at supporting system reliability
- Transparent information on quality of resources available to load-serving entities will improve procurement
- Allow for the most reliable, dependable and effective resources to sell their capacity

Principle: RA program should incentivize showing all RA resources

- Modifications to existing RA structure should encourage showing as much contracted RA capacity as possible and not create disincentives or barriers to showing excess RA capacity
- CAISO must balance the impact that incentives may have on an LSE's willingness to show all contracted RA capacity

Principle: LSE's RA resources must be capable of meeting load requirements all hours

- RA targets should be clear, easily understood and based on reasonably stable criteria applied uniformly across all LSEs
- Traditional accounting approaches such as current summation of NQC values in a LSE's portfolio do not equate to resource adequacy alone
  - This approach does not assure an LSE can satisfy its load requirements all hours of the year
- RA also encompasses LSEs meeting their load requirements all hours of the year, not just meeting peak demand

Objectives – RA Enhancements

- Update RA framework to assess forced outage rates for resources
  - Incorporate forced outages into procurement process upfront in planning horizon
- Conduct RA adequacy assessments based on unforced capacity of resources and RA portfolio's ability to ensure CAISO can serve load and meet reliability standards
  - Incorporating forced outages into RA assessment will help inform which resources are most effective and reliable at helping California decarbonize its grid
- Simplify existing RA provisions that are complex and interrelated to extent possible while considering impacts to resulting incentives

Objectives – RA Enhancements

- Modifications must be coordinated and remain aligned with the CPUC process and decisions
- However, solely relying on installed-capacity-based PRM as the only basis for resource adequacy is not sustainable given the transforming grid
  - Increasing reliance on more variable, less predictable, and energy limited resources may show sufficient capacity to meet traditional PRM measures, but may not have sufficient capability to meet reliability needs and load requirements in all hours
- Utilization of both installed capacity (NQC) and unforced capacity (UCAP) values in CAISO's RA processes
  - Resulting Must Offer Obligations need to be tied to RA showing NQC values to accomplish these important changes

SYSTEM RESOURCE ADEQUACY

Overview of System RA Topics

- Determining System RA requirements
- Forced Outage Rates and RA capacity counting
- System RA Showings and sufficiency testing
- Must Offer Obligation and Bid Insertion modifications
- Planned Outage Process enhancements
- RA Import provisions
- Operationalizing Storage Resources

DETERMINING SYSTEM RA REQUIREMENTS

System UCAP requirement proposed to more adequately address forced outage risks

- CAISO has observed impacts of forced outages exceeding resource margins established by existing planning reserve margin requirements during some periods
  - This is a potential reliability concern
- To better address this risk posed by forced outages CAISO is proposing to establish a system unforced capacity (UCAP) requirement to more directly account for forced outages
  - Develop a minimum system UCAP requirement that all LSEs must meet and show as RA

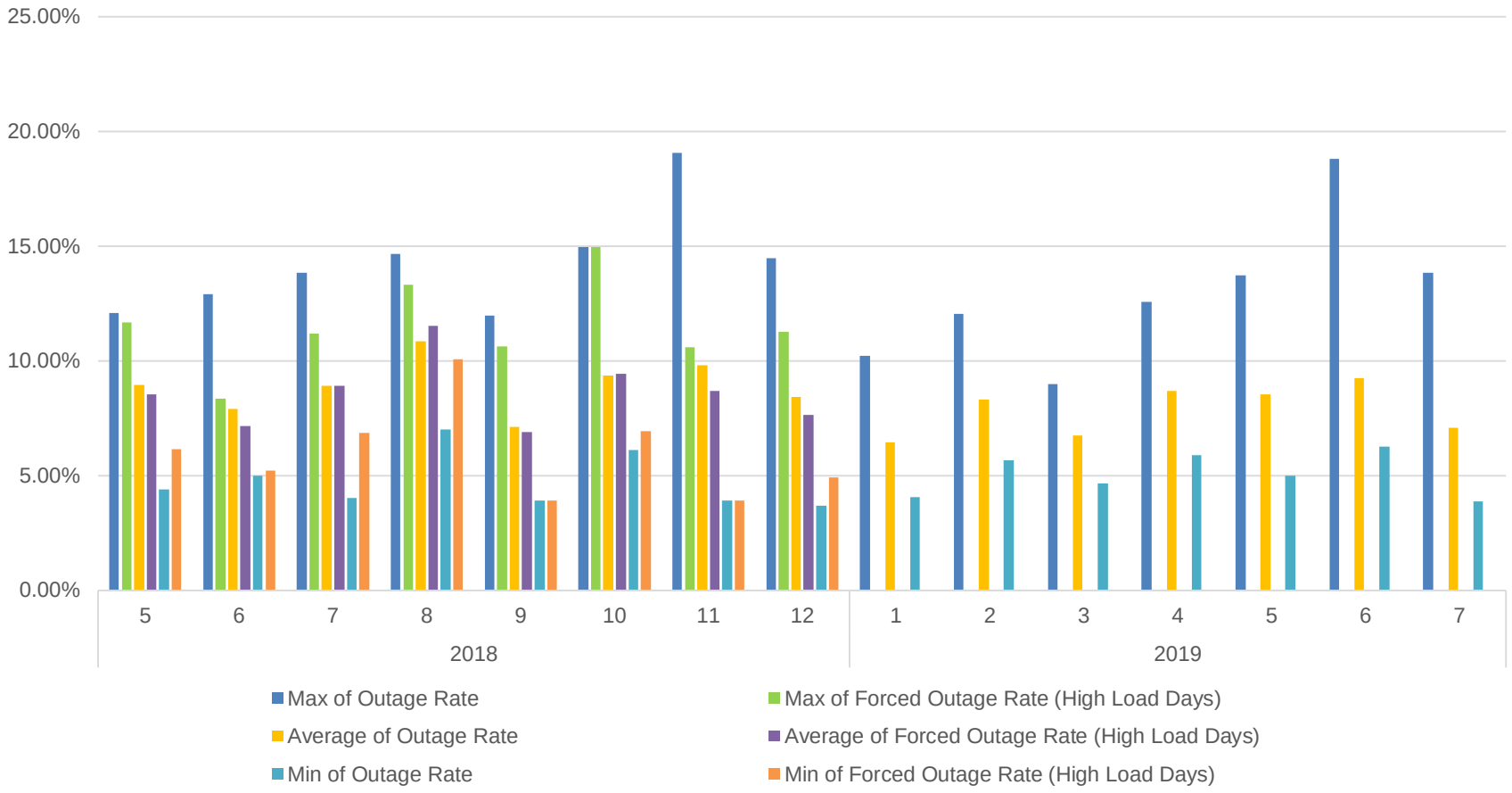
Current RA requirements may be insufficient to address forced outages

- Current structure is designed to cover
  - peak forecasted load,
  - operating reserves,
  - forced outages, and
  - demand forecast error

Data shows numerous instances of available RA capacity falling well below the minimum RA need

- On just over 17.5 percent of the days, CAISO would not have adequate RA capacity to meet its planning targets
  - Assumes that 100 percent of all RA credits are available at the fully credited level (i.e. over 1000 MW of credited demand response)
- Increases to 25 percent of days if 500 MW of credited capacity is not available or responsive for any reason
- LRA setting a planning reserve margin that accurately and thoroughly accounts for forced outages should include at least a 10-15 percent range on top of the forecasted peak demand

Forced outage rates regularly exceed ten percent



CAISO has examined a top-down and bottom-up approach to setting UCAP needs

- Top down approach establishes an NQC requirement and converts convert to a UCAP requirement
  - Problematic if there is a wide distribution of forced outage rates and/or potential portfolio mixes
- Bottom up looks at forecasted load need, including load, reserves, and forecast error
  - Relies on an accurate forecast or one that adequately covers the risk of forecast error
  - Individual resource outage rates have no impact on need
- CAISO believes the bottom-up approach is best to establish a minimum system UCAP requirement
  - Ensures minimum RA requirements are achieved

Proposed CAISO system UCAP requirement

- CAISO believes bottom-up approach to establish a minimum system RA UCAP requirement is appropriate
  - Will help ensure minimum resource adequacy requirements are achieved system-wide for all LSEs
  - Multiple LRAs and potential variance in LRA PRM targets drives need for bottom up system UCAP requirement
  - Also mitigates potential for capacity leaning by LRAs and their respective LSEs
- CAISO is closely considering how to best ensure coordination of these important system RA modifications with CPUC and other LRA's RA programs

Regardless of approach, more conservative load forecast should be used

- Forecast error can be addressed by using a higher load forecast
  - Higher load forecast ensures more diverse load profiles can be addressed by RA procurement
- Does not address the fundamental and underlying issue of forced outages
- Minimum UCAP requirement must determine how to address under-forecasting risks
  - 1-in-10 = no additional error included in need
  - 1-in-2 = all additional error included in PRM

CAISO believes that the UCAP requirement should be set at a minimum of 110 percent of forecasted peak

- Accounts for forecast load, reserves, and forecast error
- Value for forecast error from comparing the low, mid, and high load forecasts from the CEC's 2018 final IEPR
  - Mid load forecast 1-3 percent higher than the low load forecast
  - High load forecast 4-7 percent higher than the low load forecast
- To account for forecast error, the planning reserve margin likely would need an additional two to six percentage points
  - The CAISO has selected four percent as a reasonable starting point

UNFORCED CAPACITY EVALUATIONS

CAISO is proposing to evaluate the reliability and availability of resources to account for forced outages

- Current CAISO and CPUC RA framework does not account for system resources on forced outage beyond margins included in established planning reserve margin requirement
  - Instead, CAISO relies on substitution rules and Resource Adequacy Availability Incentive Mechanism (RAAIM)
- CAISO has proposed new rules to account for probability of forced outages and derates that will eliminate need for complicated replacement capacity rules
- Applying unforced capacity evaluations to RA values is intended to provide certainty CAISO will receive adequate reliability from resources to be available in advance

Several advantages for integrating forced outages and derates into resource RA capacity values

- Recognizing individual resource's potential contribution to reliability enables each resource to be compared and contrasted to the reliability of other resources
- Promotes procurement of better performing resources with improved operational reliability and availability
- Information on availability and reliability of resources can help buyers avoid risks and make better informed decisions when making bilateral trades or when procuring replacement RA capacity

Resource specific NQC and UCAP determinations

- CAISO proposes to calculate and publish monthly NQC and UCAP values for all resources annually
  - Once per year a unit will have a distinct NQC and UCAP value determined for each month of the upcoming year
- NQC process will remain similar to current approach with no major proposed changes
- CAISO proposes that the calculation of each resource's UCAP will be limited at a resource's NQC value and will consider the resource's forced outages and derates
- UCAP values will not be affected by CAISO approved planned outages

CAISO has updated proposal for UCAP evaluations

- CAISO will develop and utilize a seasonal availability factor based approach for UCAP determinations
- Resource availability factors will incorporate historical derates and forced outages
  - Excludes planned outages and force majeure outages and transmission outages including wires or fuel deliverability – deemed “outside of management control” will also be excluded from the availability factor calculation
- CAISO believes this updated UCAP determination proposal, based on seasonal availability factors, is best applied to the following resource types:
  - Thermal, Hydro, and Storage resources
  - For resources with QC values calculated using an ELCC methodology: CAISO will use ELCC value as the UCAP value

CAISO proposes to calculate resource availability on a seasonal basis

- CAISO proposes to calculate seasonal availability factors for UCAP determination purposes
- CAISO proposes to utilize two seasons for UCAP evaluations
  - On-peak: May-September (summer)
  - Off-peak: October-April (winter)
- Considers different impacts of availability during seasons across the year to better reflect unit reliability

UCAP evaluation process

- CAISO will establish a process to determine summer and winter average availability factors that will be used to calculate the seasonal UCAP values for each resource
- CAISO will calculate an hourly availability factor for each resource during the tightest system supply cushion hours
- Evaluating historical performance of resources during a subset of tight supply cushion hours is intended to capture the correlation of the resource's availability and capability with all other system factors that drive the tight supply cushion hours

Supply cushion is a measure of real-time system resource adequacy risk

- A large supply cushion indicates less real-time system resource adequacy risk because more energy remains available to respond to unplanned market events
- A low supply cushion indicates the system has fewer assets available to react to unexpected outages or load increases, indicating a high real-time system resource adequacy risk
- The cushion provided by the RA supply compared to load conditions will define tight supply conditions
  - CAISO proposes to determine the 100 tightest supply condition hours during each summer and winter season based upon available RA for each hour compared to hourly loads

Proposed UCAP calculation steps

- CAISO will determine each resource's Hourly Availability Factor (HAF) for each of the 100 tightest supply cushion hours per season

$$\textbf{Hourly Availability Factor} = \frac{\textbf{Derates} + \textbf{Forced Outage Impacts}}{\textbf{NQC}}$$

- CAISO will utilize the average of Hourly Availability Factors (HAF) for each season for each of the past five years to create a Seasonal Average Availability Factor (SAAF) for each resource

$$\textbf{Seasonal Average Availability Factor} = 1 - \frac{\sum \textbf{Hourly Availability Factors}}{\textbf{Number of Observed Hours}}$$

Proposed UCAP calculation steps (continued)

- CAISO also proposes a weighting method for determining a resource's UCAP values
- CAISO proposes the following percentage weights for the availability factor calculation by year from most recent to most historic: 30-25-20-15-10
- In other words, the following percentage weights will be applied to the seasonal availability factors:
  - 30% weight for the most recent year's seasonal availability factor
  - 25% weight on the second year
  - 20% on the third year
  - 15% on the fourth year
  - 10% weight on the fifth and most historical seasonal availability factor

Proposed UCAP calculation steps (continued)

- Seasonal Average Availability Factors (SAAF) will be calculated for each of the five prior historical years (for both on-peak and off-peak seasons)
- SAAFs will based on each Hourly Availability Factor (HAF) derived by assessing forced outages and derates compared to the annual NQC value for each resource
- CAISO will then apply proposed weighting to each of the five previous annual periods (for each on-peak and off-peak season) to create Weighted Seasonal Average Availability Factors (WSAAF)

$$\textbf{Weighted Seasonal Average Availability Factor} = \textbf{Annual Weighting} * \textbf{Seasonal Average Availability Factor}$$

Proposed UCAP calculation steps (continued)

- Once the Weighted Seasonal Average Availability Factors (WSAAF) are established for each season of each of prior 5 years CAISO will sum the factors and apply them to each resource's NQC to determine the resource's seasonal UCAP ratings

$$\textbf{On Peak UCAP} = \sum \textbf{Weighted Seasonal Average Availability Factors}^{\textbf{Summer}} * \textbf{NQC}$$

$$\textbf{Off Peak UCAP} = \sum \textbf{Weighted Seasonal Average Availability Factors}^{\textbf{Winter}} * \textbf{NQC}$$

Summary of UCAP process steps

1. Determine Hourly Availability Factors (HAF) for each 100 tightest system supply condition hours each season
2. Determine Seasonal Average Availability Factors (SAAF) using HAFs for each season of prior year
3. Determine Weighted Seasonal Average Availability Factors (WSAAF) using proposed weighting approach
4. Apply WSAAFs for each season of the prior 5 annual periods to determine monthly UCAP (On-peak and Off-peak) values for each resource

UCAP determination example: HAFs

$$\textbf{Hourly Availability Factor} = \frac{\textbf{Derates} + \textbf{Forced Outage Impacts}}{\textbf{NQC}}$$

Example resource NQC = 100MW

Tight Supply Hour	Forced Outage MWs	Derate MWs	Hourly Availability Factor
1	0	10	.1
2	0	12	.12
3	100	0	1
4	25	12	.37
5	25	0	.25
6	10	0	.10
7	50	3	.53
8	10	7	.17
9	0	5	.05
10	0	0	0
…			
100	0	8	.08

UCAP determination example: SAAFs

$$\textbf{Seasonal Average Availability Factor} = 1 - \frac{\sum \textbf{Hourly Availability Factors}}{\textbf{Number of Observed Hours}}$$

Tight Supply Hour	Hourly Availability Factor
1	.1
2	.12
3	1
4	.37
5	.25
6	.10
7	.53
8	.17
9	.05
10	0
…	
100	.08
Sum of HAFs	**2.7**

SAAF = 1 - (2.7 / 11) = .754545

Number of Observed Hours	Seasonal Average Availability Factor
11	.75455
Note: 11 hours is used for example, 100 tightest supply condition hours per season will be used in actual process	In other terms, the resource was 75.455% availability during the hours used in the determination

UCAP determination example:

$$\text{UCAP} = \sum \text{Weighted Seasonal Average Availability Factors}^{\text{Season}} * \text{NQC}$$

Year	Summer SAAF	Annual Weight	Weighted SAAF (Summer / On-Peak)
5	0.87	10%	0.087
4	0.98	15%	0.147
3	0.79	20%	0.158
2	0.85	25%	0.2125
1	0.9	30%	0.27
		Total = 100%	0.8745

Year	Winter SAAF	Annual Weight	Weighted SAAF (Winter / Off-Peak)
5	0.85	10%	0.085
4	0.73	15%	0.135
3	0.75	20%	0.15
2	0.88	25%	0.22
1	0.97	30%	0.291
		Total = 100%	0.8555

Sum of Weighted SAAFs (Summer)	Sum of Weighted SAAFs (Winter)	NQC	On-Peak UCAP	Off-Peak UCAP
0.8745	0.8555	100MW	87.45 MW	85.55 MW

UCAP transitional phase-in approach

- UCAP values for resources without five years of operating history will also be subject to an availability factor calculation
- Until a full 5 years of operating history is available, the CAISO will use a class-average approach
- CAISO proposes to apply class-average data based on operating data for similarly designed resources of the same technology type

UCAP transitional phase-in approach

- The class-average will be based on availability factors observed during the 100 tightest supply cushion hours each season (summer and winter) per year for the previous five years
- CAISO will calculate class-average capacity factors for each of the previous five years
- As new resources begin to build an operational history, CAISO will blend their actual performance data with class average data for any observed tightest supply condition hours that a resource was not yet operational during the previous 5 years

Forced outage and derate data and transitional approach

- Forced outage and derate data is the key information necessary to calculate the expected value (in terms of MWs) of a resource's unforced capacity
- To determine resource availability factors CAISO is considering two potential data sources
  - CAISO's Outage Management System
  - NERC Generation Availability Data System (GADS)
- Given outage reporting differences between GADS and OMS, a perfect estimate of UCAP in year one is unlikely
- CAISO is considering a transitional approach that creates a reasonable estimate of resources' forced outage rates

CAISO proposes requiring all resources to submit five years of GADS data, or as many years of GADS data the resource has available

- CAISO would then use the GADs data to generate resource specific UCAP values and class average UCAP values for purposes of the phase-in of UCAP
- CAISO proposes to reconfigure its OMS system or to develop an alternative system to accurately track resource's forced outages and derates to generate resource specific UCAP values once the process has been established using the available GADS data to begin the initial UCAP implementation process

CAISO is also considering an alternative option to require all resources to submit annual GADS data on to calculate UCAP values instead of updating OMS

- CAISO must balance the cost and benefits of creating a new or revised system to calculate forced outage rates
- OMS will require system modifications to accurately track resource outage data on a comparable basis
- A number of resources may fall below the 20 MW GADS reporting requirement and the misalignment this could cause between NERC and OMS outage reporting
  - CAISO is hesitant to rely strictly on GADS data as a long-term solution
  - May require all sizes of resources to submit GADS data to CAISO regardless of NERC 20MW requirement

For resources with QC values calculated using an ELCC methodology: CAISO will use ELCC value as the UCAP value

- CAISO will rely on an ELCC methodology when applicable
- ELCC will establish UCAP values for wind and solar resources
- Currently, the CPUC only applies this methodology to wind and solar resources, but could expand it to cover other variable energy resources such as weather sensitive or variable output DR

CAISO will use ELCC value as the UCAP value for two main reasons

1. Other ISOs equate wind and solar UCAP values with a statistical assessment of resources' output
2. ELCC already takes into account the probability of forced outages for wind and solar resources

- By using ELCC, these technologies have already had QCs reductions for expected forced outages and derates
- CAISO understands there are some shortcomings of this approach but believes this is the most appropriate option for the application of UCAP for these resource types

Resources that do not have ELCC based QC methodology but have a need for alternative UCAP determination approach

- For DR and QF resources their availability is often variable or limited to certain periods dictated by program hours or end-use customer needs
  - CAISO believes these resources should be assessed in a different manner to establish their UCAP values
- If LRAs do not adopt an ELCC based QC methodology for these variable and availability-limited resources, CAISO will apply an alternative UCAP determination

DR and QF resource: alternative performance based UCAP determination

- For DR and QF resources CAISO will evaluate resource performance relative to their dispatch instructions for periods when they received market awards
- CAISO will track each resource's historical performance over the prior 3 years and compare their market dispatches to their actual performance during those periods to establish the availability that will be applied to their UCAP value

For DR providers, the CAISO is also contemplating the need to apply this approach at an SC-level

- For DR providers, CAISO may need to apply this approach at an SC-level, rather than an individual resource level to mitigate the potential for gaming or manipulation by simply creating new DR resource IDs
- This SC-level approach is intended to avoid the potential that poorly performing DR providers receive class-average UCAP values simply by changing or creating a new resource IDs that have no historical data

Removing Forced Outage Replacement and RAAIM application to forced outage periods

- RAAIM is not providing adequate incentive to provide substitute capacity for forced outages
- Potential causes include:
  - Costs already incorporated into capacity pricing
  - Penalty not high enough
  - Spreading benefits too thin to motivate substitution
  - Costs and benefits mitigated across SC portfolio effects (*i.e.*, an SC receives similar RAAIM charges and incentives)
  - Too many RAAIM exclusions/exemptions
  - The dead band applying for the first outages

Very little substitute capacity is being provided to the CAISO in response to forced outages

- CAISO believes a superior approach is to establish incentives to conduct resource maintenance to avoid outages and to procure capacity that is more reliable in the first instance
  - It is reasonable to eliminate RAAIM once an alternative solution is in place
- UCAP provides the proper incentives, while still allowing LSEs to procure the most cost effective capacity needed to meet their procurement obligations
- CAISO will eliminate RAAIM once UCAP is implemented
  - UCAP relies on the upfront and transparent accounting of resource availability and reliability

SYSTEM RA SHOWINGS AND SUFFICIENCY TESTING

CAISO will conduct two sufficiency tests for system capacity

1. Individual deficiency test

2. Portfolio deficiency test

Designed to ensure:

- Adequate UCAP to maintain reliability for peak load, and
- Portfolio of resources work together to provide reliable operations during all hours when combined and considered together

CAISO will conduct an assessment of LSE RA showings and resource supply plans

- Ensure there is sufficient UCAP shown to meet identified reliability needs
- LSEs and resources need only submit and show UCAP
  - Once shown, CAISO will consider each resource UCAP value to conduct UCAP assessment
- Partial RA resources will receive a proportional UCAP value reflecting proportion shown for RA purposes
  - For example: A 100 MW resource with a 10 percent forced outage rate that has been shown for 50 MW of NQC will be assessed as being shown for 45 MW of UCAP RA

LSEs cannot simply procure only the unforced capacity from a resource

- Cannot buy 90 MW of NQC and UCAP from a 100 MW resource with a 10 percent forced outage rate
  - UCAP accounting method relies on the probability that some resources will be out at various times to eliminate substitution requirements
  - In CAISO's review of best practices in other ISO's such practices are not permitted

LSEs that fail to meet the UCAP requirement will be notified of the deficiency, provided an opportunity to cure, and may be subject to backstop cost allocation or UCAP deficiency charges if the deficiency is not cured

CAISO will conduct a portfolio deficiency test of only RA resources under various conditions

- Objective of a portfolio analysis is to assess if CAISO can serve load with shown RA fleet
  - CAISO will test forecasted gross, net-load peaks, and all other hours
  - CAISO will also test the ability to maintain adequate reserves and load following
- Need for this assessment is similar in concept to collective deficiency test CAISO conducts for local RA
  - CAISO must assess how the shown RA fleet works collectively to meet system needs
- Assessments conducted only on monthly RA showings
  - Only showing that provides 100 percent of the system, local, and flexible RA capacity requirements

Objective of a portfolio analysis is to assess if CAISO can serve load with shown RA fleet

- Assessment will focus on monthly showings only
  - Cannot conduct a meaningful test of annual showings

	Iteration*	Load	Wind/solar	Other Generators
Net Load Deterministic	One	Known	Known	A generator forced outage schedule determined randomly prior to the assessment
Generator Stochastic	One or several	Known	Randomly determined for each iteration with fixed installed capacity	A generator forced outage schedule determined randomly prior to each iteration
Full stochastic	Several	Random draws	Randomly determined for each iteration with fixed installed capacity	A generator forced outage schedule determined randomly prior to each iteration

* One iteration is defined a predetermined interval. This is interval can be a single day, a week, or a full month.

CAISO is still assessing the feasibility of each option as well as merging elements from each

- CAISO favors net load deterministic model at this time
  - Provides the best balance of time constraints, complexity, and data output
- Processing time is critical
  - CAISO must conduct this assessment and provide feedback within 10 days of receiving RA showings
- CAISO will be the first to conduct such an assessment
  - It reasonable to start with the less complicated option and learn to walk before we run

CAISO will model only RA resources in this portfolio analysis

- Additional energy provided in DA or RT markets represent energy substitutes in those markets
  - Not needed in portfolio assessment to determine if RA fleet is adequate
- Must establish baseline inputs into assessment
  - CEC 1-in-2 hourly load forecast
  - CAISO will also include load following requirements
  - Wind and solar production profiles will be generated prior to running the production simulation
    - Profiles will not be considered must take capacity and actual use may be lower than the profile
  - Generator availability will be determined through Monte Carlo draw using resource forced outage rates

CAISO must establish the proper metric to determine the adequacy of the portfolio

- Each approach provides different metrics
  - Different metrics can be interpreted differently in evaluating whether the RA portfolio meets CAISO's operational needs
- CAISO explored two primary metrics:
  - Serving load and
  - Loss-of-load expectation
- CAISO proposes to use serving load
  - Initial test is largely deterministic, there is insufficient information to generate a meaningful LOLE
  - Must maintain load, AS, and load following requirements for all days and all hours
  - If any of these requirements is not met, CAISO will identify a portfolio deficiency

If any of these requirements is not met, CAISO will identify a portfolio deficiency

- If portfolio is adequate, no additional action taken
- If the portfolio is unable to serve load, CAISO will:
  - Declare a collective deficiency,
  - Provide a cure period, and
  - Conduct backstop procurement using the CPM CSP if deficiency left uncured

MUST OFFER OBLIGATION AND BID INSERTION MODIFICATIONS

RA resources are obligated to bid shown RA capacity into the CAISO market

- Must offer obligations (MOOs) must be set at the resource's shown NQC value
  - For example: A resource shown for 100 MW of NQC with a 20% forced outage rate (providing 80 MW of UCAP), would have a MOO to bid 100 MW of capacity into CAISO markets when not on outage
  - If a resource shows a portion of its NQC as RA the must offer obligation is set at the portion of the NQC shown as RA, not the full amount
- Allows CAISO to simplify forced outage substitution
  - By using UCAP-based RA counting and NQC-based resource bidding obligations, the RA fleet effectively provides its substitute capacity upfront
  - CAISO proposes to eliminate the existing forced outage substitution rules in favor of UCAP proposal

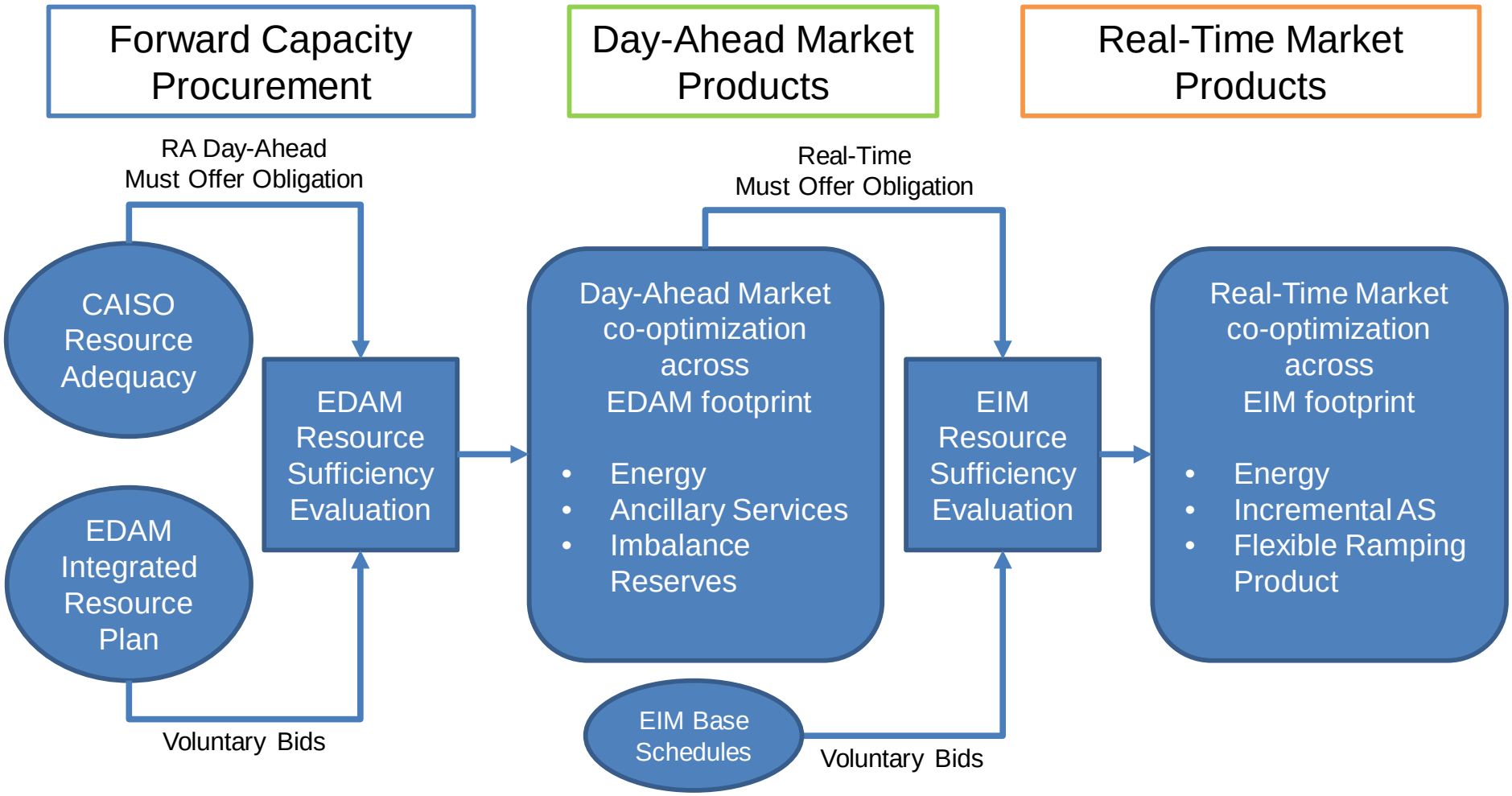
Resource adequacy resources will have a day-ahead must offer obligation (1 of 2)

- The CAISO proposes RA must offer obligations into the day-ahead market only, with limited exceptions
- To simplify offer obligations, the CAISO proposes a standard MOO that would apply to all RA resources, unless specified by the CAISO:
  - **Standard 24 by 7 MOO into day-ahead market:** Economic bids or self-schedules for all RA capacity for all hours of the month the resource is not on outage
    - Refers to both planned and forced outage

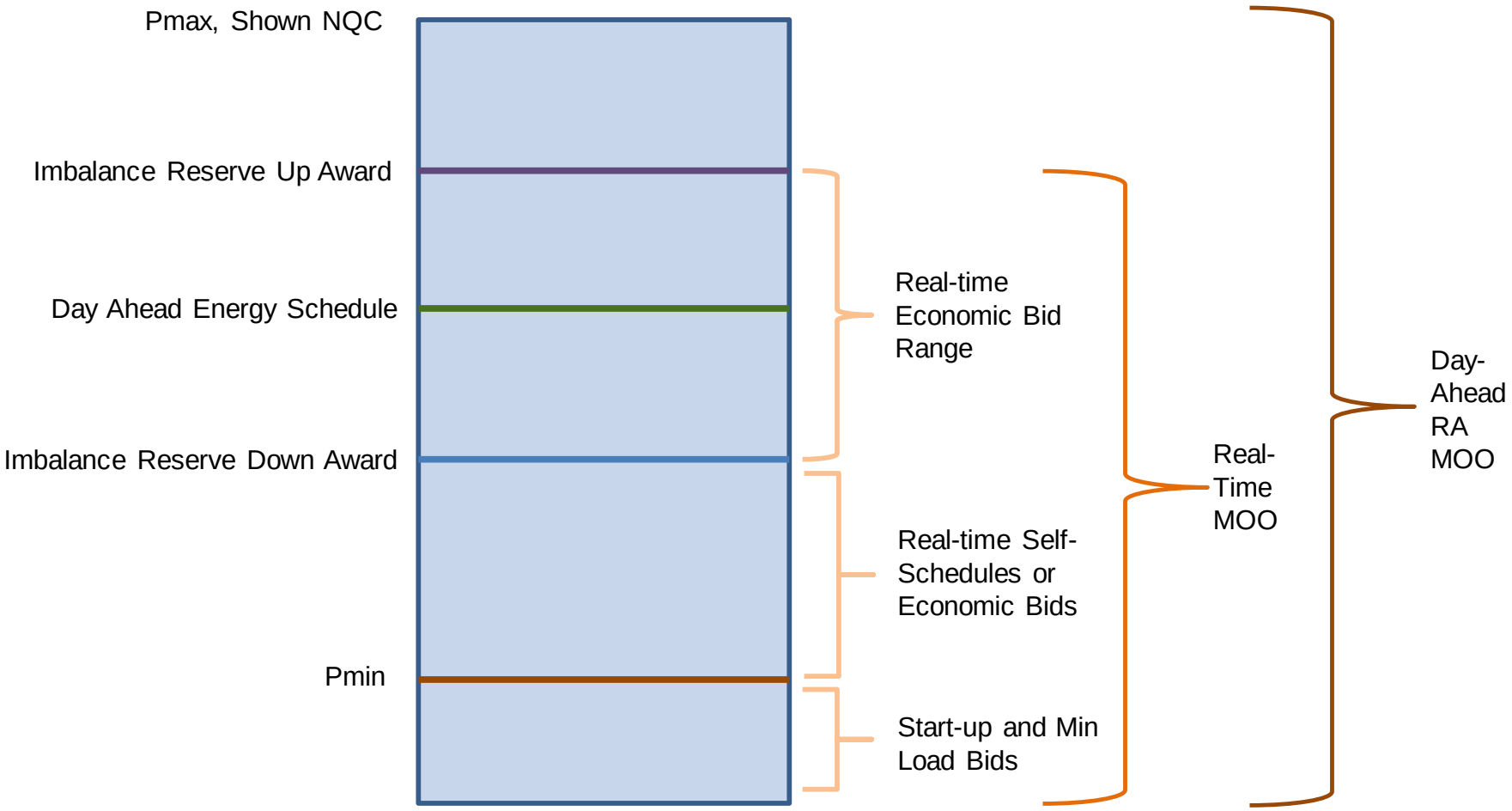
Resource adequacy resources will have a day-ahead must offer obligation (2 of 2)

- With the introduction of imbalance reserves in the Day-Ahead Market Enhancements, commitments will be made in day-ahead to ensure sufficient upward and downward ramp and re-dispatch capability
- Resources awarded in the day-ahead will have a real-time must offer obligation up to their day-ahead award
  - Shifts the basis of real-time must offer obligation from resource adequacy to DA market awards
- RA resources **must still be available for exceptional dispatch after the conclusion of the day-ahead market** whether or not they receive a day-ahead award

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



Illustrative Must Offer Obligations



Some stakeholders suggest the 24 by 7 day-ahead MOO does not align with the future makeup of the RA fleet, which is increasingly use- and availability-limited

- The CAISO recognizes certain resources require exemptions, or variations, to the standard MOO
- However, the standard MOO into the day-ahead market remains 24 by 7 for most resource types, such that resources bid into the day-ahead market for all hours the resource is not on outage
  - Allows a resource to have bids in all hours it is available, such that the day-ahead market can determine when the resource is needed over the course of the day and schedule it appropriately

Working with LRAs to establish modified MCC buckets could more appropriately address the increased amounts of use-limited RA resources

- In its OIR in the RA proceeding, the CPUC lists modifications to the MCC buckets as an option to consider in response to the rapidly changing resource fleet
- Redefining the MCC buckets, coupled with a 24 by 7 must offer obligation into the day-ahead market could be beneficial because:
  - Resources with limited availability could contribute to RA needs consistent with their energy limitations, while still providing the CAISO market the ability to determine the hours the resource is needed over the course of the day
  - This approach would also provide more upfront guidance into resource attributes needed to increase the possibility of passing the portfolio assessment

CAISO proposes to apply bid insertion to all resources that are not use-limited and to registered use-limited resources

- CAISO allows certain resources to register as use-limited to include approved opportunity costs in their market bids
  - Designed to ensure more effective and efficient use of resources with use limitations
- Bid insertion rules enhance the CAISO's ability to identify forced outages and provides reliability to CAISO by ensuring bids in the market
  - Resources would need to submit an outage to avoid dispatch
- Exemptions required for certain resources
- Conditionally available resources will not be exempt from the standard MOO or bid insertion, and should use available outage cards to manage use

CAISO proposes exemptions to the 24x7 MOO and bid insertion rules for certain resource types (1 of 2)

- For a list of proposed exemptions, see table 5 in section 5.1.4 of the Third Revised Straw Proposal
- Specific proposed modifications to existing exemptions:
  - RDRR: Bid insertion at bid cap in real-time only (currently, no bid insertion for RDRR in DA or RT)
  - Regulatory Must Take (RMT): For any portion of the resource that is RA and RMT, resource must provide documentation of availability and bid per documented availability. For any portion of the resource that is RA and *is not* RMT, resources must bid per the standard MOO
  - Demand Response: CAISO is considering modifications to must offer obligations for variable-output DR in the ESDER 4 initiative

CAISO proposes exemptions to the 24x7 MOO and bid insertion rules for certain resource types (2 of 2)

- Specific proposed modifications to existing exemptions (cont.):
  - NGR: Resources participating under NGR must reflect charge and discharge capabilities (currently, MOO is only on the charging portion)
  - NGR: Resources must register under the non-REM option to provide generic RA
  - Non-dynamic, non-resource specific import RA: Resources may not submit block bids or block self-schedules greater than one hour
    - If resources need to reflect operational attributes (e.g. minimum run times, transition times, etc.), the resource should be modeled as resource specific
    - Allows the CAISO to shape resources hour by hour to meet predictable ramping needs over the course of the day

Some RA resources must continue to have a real-time must offer obligation due to program design or forecasting needs

- Reliability Demand Response Resources (RDRR)
  - Only required to participate in real-time when the CAISO declares a warning or emergency, optional to bid in day-ahead
- Variable resources, including VERs and run-of-river hydro
  - Day-ahead market enhancements proposes to schedule VERs in day-ahead at their day-ahead forecast
  - CAISO proposes run-of-river hydro submit forecasted output to the CAISO
  - Updated real-time forecasts inform resource availability and ensure feasible dispatches for resources whose output can change between day-ahead and real-time and between bid submission and dispatch interval

PLANNED OUTAGE PROCESS ENHANCEMENTS

Stakeholder feedback

- All stakeholders agreed with the CAISO's proposal to eliminate the "comparable" capacity requirement
- There was not consensus among stakeholders with respect CAISO's new proposed timeline and process
  - MRP, CalCCA, and PG&E express support
  - SDG&E and Calpine believe the CAISO's proposal will not achieve the stated objectives
  - NCPA states that the CAISO proposal needs to better reflect the operational realities of planned outages
- The CAISO will explore two options for planned outage replacement

Stakeholder feedback

- SCE asks the CAISO clarify that any planned outage turns into a forced outage will not be considered a tariff violation
  - The CAISO clarifies that it is not proposing changes to its current policy
- Wellhead and Calpine recommend that the CAISO allow for short-term opportunity outages
  - This is consistent with the proposed MOOs
  - This type of outage will be allowable but remains subject to CAISO discretion

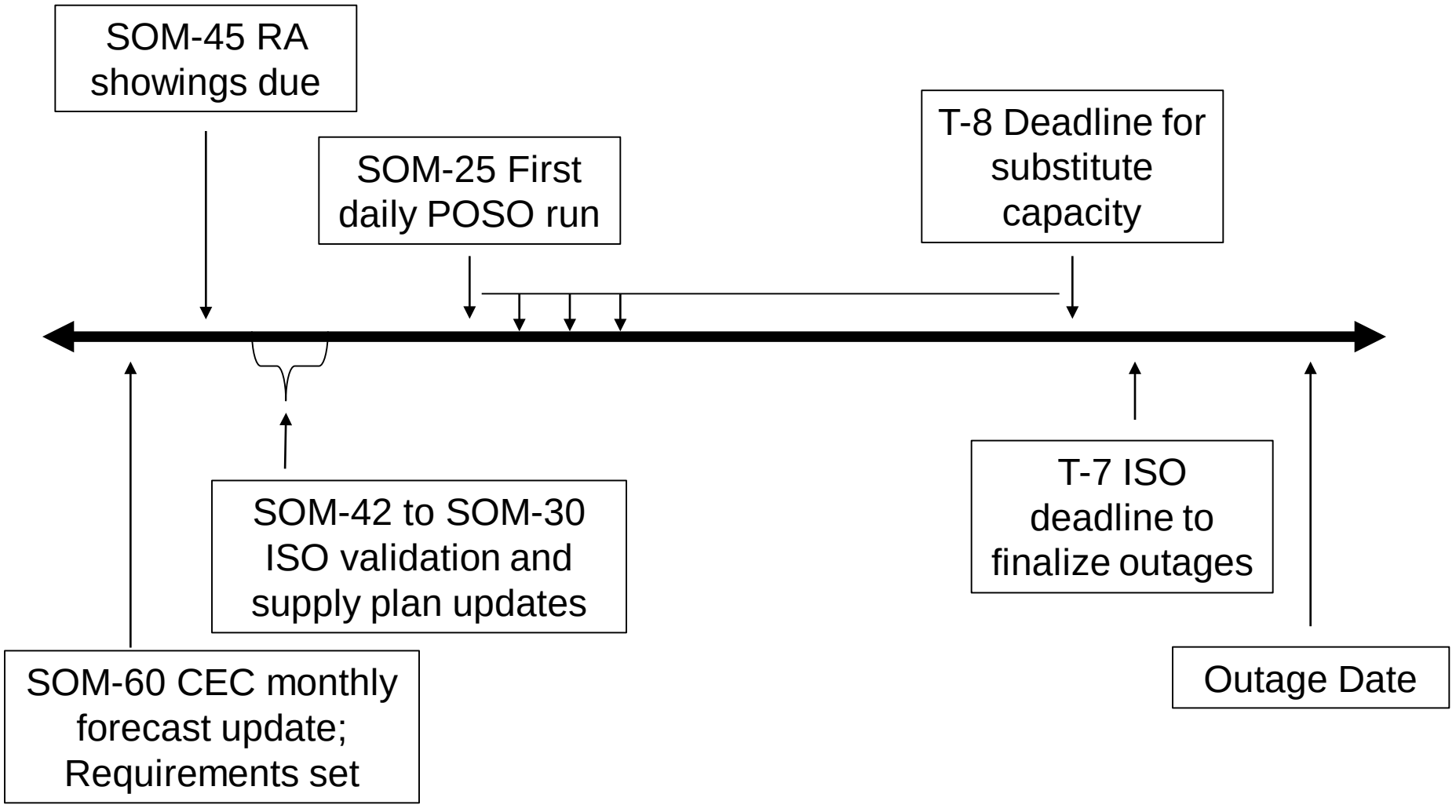
CAISO currently uses POSO for planned outages

- RA resources currently enter planned outages into the CAISO outage system
- CIRA runs a daily POSO report with determination for a planned outage need for substitution
- Resources may submit outages between 25 and 8 days before for POSO consideration
- POSO compares the total amount of operational RA Capacity to the total system requirement
  - Requirements are established by CEC forecasts and are updated 60 days prior to the start of the month
  - Considering outages, if less capacity is available than requirements, CAISO assigns substitution obligations

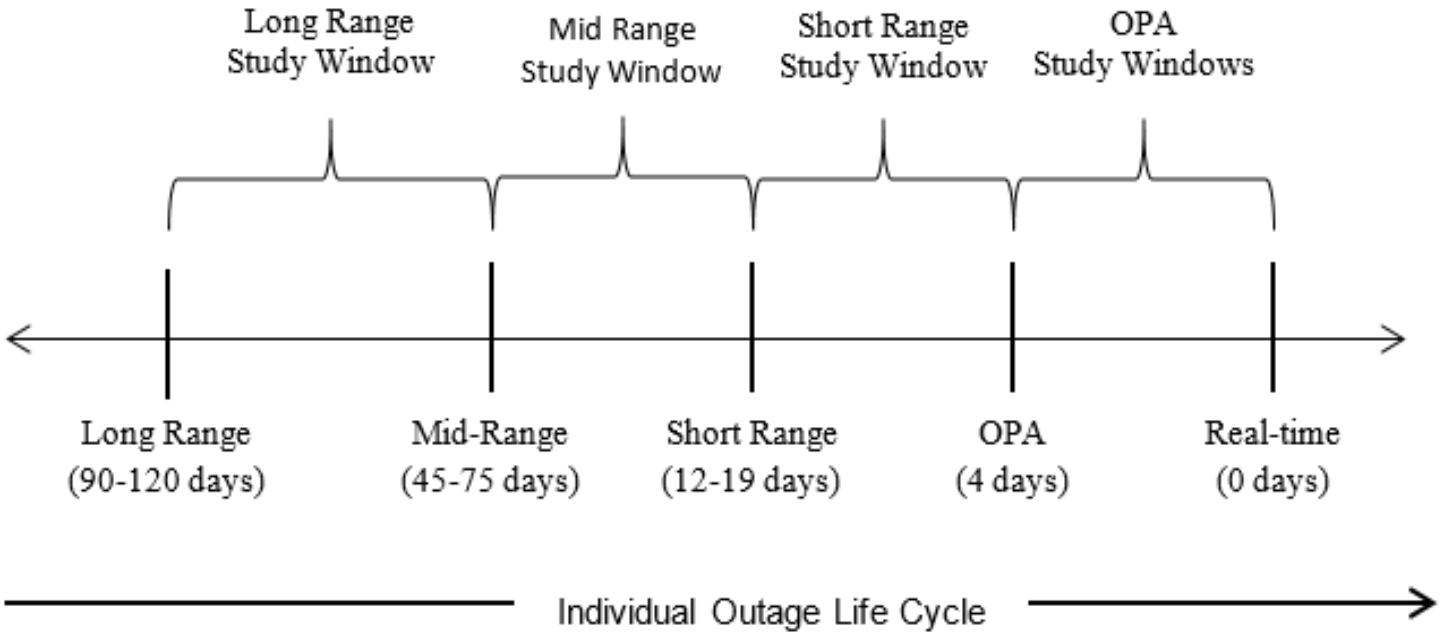
Planned outage process modifications

- Stakeholder feedback requested changes to the current planned outage system
- Most stakeholders were interested in redesigning the current framework around the following principles:
  - Encourage resource owners to enter outages early
  - Generally not cancel approved planned outages
  - Identify specific replacement requirements for a resource
  - Allow owners to self-select replacement capacity
  - Include CAISO system for procuring replacement capacity

Current planned outage substitution obligation timeline



CAISO proposes to revise the RA planned outage process to align with Outage Management BPM



The CAISO is considering two options for planned outage replacement

1. Modify the opportunities and definitions for planned outage opportunities
2. Substitute capacity would always be required for planned outages

Option 1: CAISO would redesign the planned outage process

- Allow internal resources to be shown for subsets of a month
- Include an RA adequacy test before approving some planned outages
- Development of a planned outage calendar
- Development of a substitute capacity bulletin board

Option 1: CAISO proposes to modify the opportunities and definitions for planned outage opportunities

- CAISO proposes three different types of outages:
  - Planned outages – outages submitted at least 45 days prior to the RA month
  - Opportunity outages – outages submitted between 44 days prior to the month and eight days prior to the outage
  - Forced outages – outages taken seven or fewer days prior to the outage
- Each outage type will have different approval criteria and treatment on RA showings and supply plans

Option 1: Planned outages must be submitted at least 45 days prior to the month

- Aligns with the timeline of mid-range planned outages in Outage Management BPM
- Resource may not be on supply plan for planned outage days
  - Internal resources may be shown for RA for a subset of the whole month
  - Essentially are not providing RA capacity on those days
  - CAISO will still require all days have adequate RA capacity
- Resource SC must work with the LSE to provide capacity needed to address RA
- Outage approved or denied based on the existing CAISO reliability check
- Resources will also be excluded from the CAISO's portfolio analysis

Option 1: Resources taking planned outages cannot extend a planned outage after 45 days prior to the month

- Outages expected to last beyond initially submitted outage dates must
  - Submit extension request prior to 45 before the month
  - Have the extension assessed as an opportunity or as forced outage and apply the appropriate standard
- If approved, outages will not be included in forced outage calculations
  - If denied, additional outage time will be considered forced and included in the resource's forced outage rate
- CAISO will notify the resource of a discrepancy if it is still on an RA showing, then the and give an opportunity correct
  - If not corrected, the CAISO could:
    1. Cancel the planned outage (not preferred)
    2. Account for the planned outages in the RA adequacy assessment (i.e. identify RA deficiency) (preferred)

Option 1: Planned outages opportunities may arise from after RA showings have been made

- Outage submitted between 44 days prior to the month and 8 days prior to the outage will be considered opportunity outages
- CAISO will approve these outages if:
  - There is sufficient available RA capacity (i.e. no daily RA deficiency)
  - Outage approved through the CAISO reliability check
- These conditions will be assessed sequentially

Option 1: All outages requested seven days or less prior to the outage will be treated as forced

- Outages will be included in the resource's forced outage rate
- Incentivizes a resource to either
  - Notify CAISO as soon as possible it is going on outage or
  - Complete the planned outage within the CAISO-approved window
- Outages after that time have already been considered with the RA UCAP requirements
  - CAISO runs the final reliability check eight days prior to the operating day

Planned outages will be rejected without running the reliability check if outage causes deficient RA capacity

- Resource may provide substitute capacity to resolve RA deficiencies
- CAISO will run the reliability check only if
  - There are no RA deficiencies or
  - All deficiencies are resolved
- The CAISO will run the reliability check with replacement capacity
  - Outage approved only if reliability check is passed
- If outage approved, the new resource takes on RA MOO
  - RA MOO transfer lasts for duration of approved outage
  - If outage rejected, RA MOO reverts back to original resource
- Requested extensions must be made more than eight days prior to the last day of the approved outage window
  - If approved, outages will not be considered forced outages
  - Extensions made after that date will be treated as forced

Option 1 may cause unintended consequences

- CAISO proposed to allow internal resources to be shown for subsets of a month for planned outages
- Conversations with stakeholders have demonstrated that this could
  - Make RA contracting more complicated for resources and LSEs
  - Complicate RA showings for LSEs
  - Lead resources to hold outage requests until after monthly RA showings
- Unlikely to provide the certainty resources need

Option 2: Substitute capacity would always be required for planned outages

- Replacement obligation would be the responsibility of the resource SC taking the planned outage
- LSEs may show resources for days the resource has an approved planned outage
  - Applies to planned outages prior to t-45 days to the month (*i.e.*, prior to RA showings)
- Resource SC required to provide the CAISO with a notice of substitute capacity as part of its supply plan.
  - CAISO will utilize the substitute capacity in its portfolio assessment
  - CAISO must address instances where substitute capacity is not provided: cancel the outage or treat it as forced

Option 2: Substitute capacity would always be required for planned outages (cont.)

- RA resources submitting requests for planned outage any time after t-45 must also include sufficient substitute capacity to cover the loss of the RA capacity
- CAISO must still determine that the substitute capacity is adequate in the CAISO reliability assessment
  - Applies even if the substitute capacity is sufficient to cover the outage of the RA capacity
  - If the CAISO fails the reliability assessment, then the planned outage will be denied
- If approved, the source may take the planned outage without it counting against its outage rate

Option 2: Provides a cleaner process in terms of RA contracting and showings

- More stringent replacement obligation than option 1
  - Provides greater assurance approved outages will not be cancelled
- Replacement obligation can result in capacity withholding from the bilateral RA market to ensure replacement capacity is available
- The CAISO must weigh these pros and cons in order to determine which option is superior

CAISO seeks stakeholder feedback regarding these two options or if an alternative option is needed (including no change)

Outage calendar offers visibility into shown resource adequacy compared to requirements

- Proposing to develop a calendar that shows potential availability of additional system headroom on daily basis
  - This headroom may allow resources to take planned outages without specifying substitute capacity
  - If the calendar shows no available headroom, then any RA resource requesting planned outage on those dates will be required to show substitute capacity
- Exploring providing a daily MW value for UCAP headroom in excess of the RA requirements

CAISO proposes to allow short-term opportunity outages after day-ahead market run

- Outages may only be requested after the day-ahead market closes and are subject to the CAISO review and approval
- If approved, no replacement capacity is required for these outages
- Because no replacement is required, these outages are only permitted for a single day
  - Resource must participate in the subsequent day-ahead market

RA IMPORTS PROVISIONS

Objectives for RA import rules modifications

- Modify RA import provisions to ensure that RA imports are backed by physical capacity and reserves with firm transmission delivery
- Create more comparable treatment for RA imports to internal RA resources: The current provisions provide less rigorous requirements for RA imports
- Coordinate import provisions with any related modifications being proposed through CAISO's extended EIM and DAME initiatives

Clarifying RA Import rules concerns

- RA Import provisions may cause reliability concerns
- Two main issues for Import RA rules:

1. Double counting
   - CAISO should be able to ensure resources shown as import RA are not also relied upon by native BA to serve native load or otherwise be sold to a third party or relied upon to meet capacity needs of others in addition to CAISO load – not possible to be sure today
2. Speculative supply
   - Speculative RA import supply occurs 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
   - RA import provisions should foreclose (or at a minimum, discourage) speculative RA import supply

Proposed RA Import modifications

- CAISO proposes to require specification of the Source BA for all RA imports on monthly showings
- CAISO also proposes to adopt and codify provisions similar to current CPUC RA program rules and regulations for RA imports to provide physical capacity and firm transmission in CAISO tariff to ensure similar treatment among all LSEs

- Reconsidering resource specification requirement for RA imports

Specification of RA Import resource Balancing Area source

- RA import resources are not required to be resource specific or to provide any greater certainty they represent supply from a specific Balancing Area
  - Only required to be shown as sourced on a specific intertie into CAISO's system
- CAISO proposes to require specification of the Source BA for all RA imports on RA and Supply Plans for monthly showings
  - Will help to ensure that NRS-RA resources are not double counted
  - Also needed for Extended EIM sufficiency tests

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 CAISO to ensure that RA imports are not double counted for EIM resource sufficiency tests
- SCs can update BA source through CIRA
- BA source specification is needed prior to Day-Ahead market to be certain that EIM sufficiency tests are accurate

Reconsidering resource specification requirement for RA Imports

- CAISO has previously discussed this specification of the source of RA imports in the initial straw proposal for RA enhancements but withdrew it primarily due to stakeholder opposition
- CAISO did not receive overwhelming support for its scaled back proposals for bolstering RA import provisions throughout this stakeholder process
- Double counting and speculative supply concerns continue in the face of ever tightening system conditions in the broader Western region

Reconsidering resource specification requirement for RA Imports

- CAISO responded to stakeholder feedback by developing a proposal recognizing that many non-specific RA importers are behaving generally as expected and are providing reliable RA import supply
- However, CAISO has also observed market performance and bidding behaviors that could indicate even a limited number of RA imports may not be backed by physical supply or may represent speculative supply or double counted resources and that possibility is still problematic
- CAISO welcomes feedback and other suggested options regarding the need for the specification of RA import resource sources

Incorporating documentation into RA import provisions

- Requirement LSEs provide documentation to reflect unspecified imports being used to meet RA requirements have physical capacity with operating reserves behind them and firm transmission
  - Documentation can be contract language or an attestation from import provider that confirms RA import is supported by physical capacity and operating reserves
- CAISO believes it is appropriate to incorporate documentation provisions for RA imports in its tariff
  - ALL SCs must submit supporting documentation for any unspecified RA import resource being shown on RA and Supply plans has physical capacity and reserves backing them and firm transmission at the time of showing

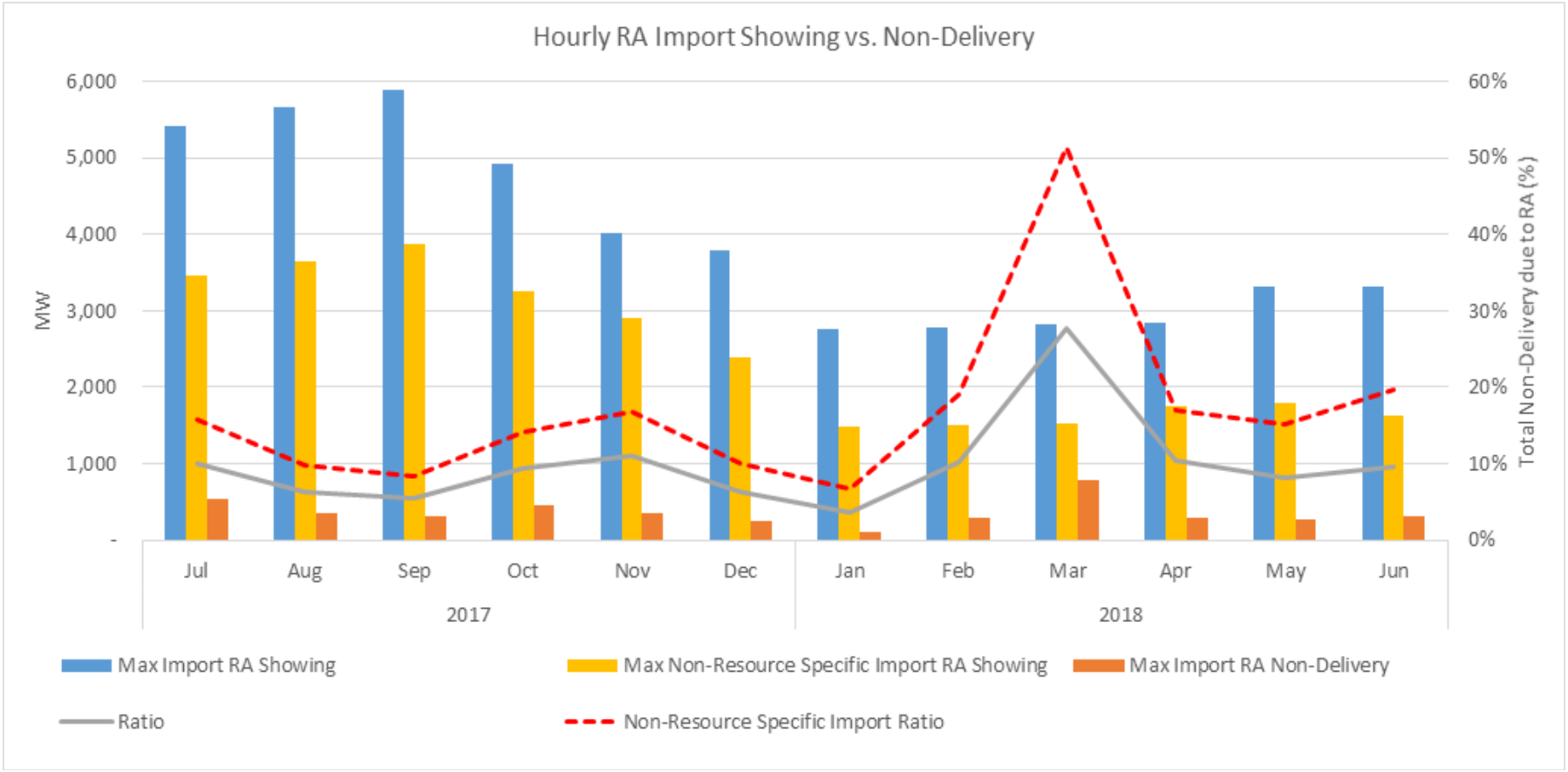
Proposed modifications will provide greater certainty that unspecified imports represent physical supply

- Establishing documentation requirements should help ensure that imports have physical capacity and reserves and are not double counted and will be provided with firm transmission delivery
- CAISO does not believe new or modified E-tagging requirements are necessary to support the proposed documentation at this time
  - Seeking additional input on the need to include changes to e-tagging requirements
  - Some feedback suggested day-ahead tagging requirement would be helpful to support objectives – pros and cons?

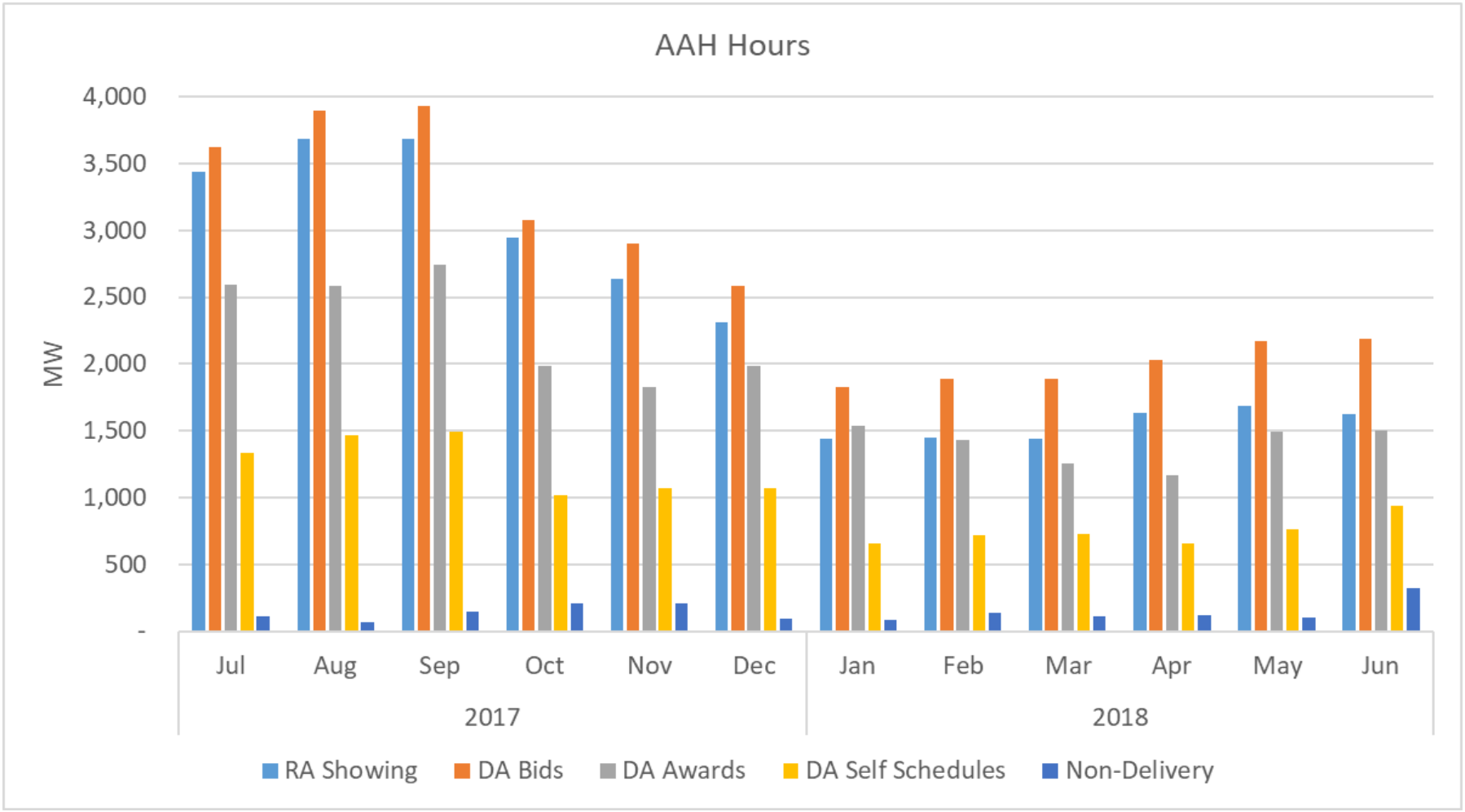
Analysis previously provided on RA Imports

- Analysis to determine delivery patterns and behavior for import RA resources
- Updated analysis that incorporates day ahead market participation
- CAISO has provided analysis on NRS-RA import RA showings and participation behavior
  - DA bids and awards, HASP bids and awards and real-time RA delivered/non-delivered quantity
- Identifies magnitude of bidding and/or self-scheduling compared to RA showings and also shows non-delivery magnitude

Observed undelivered NRS-RA import resources accounts for about 17% of RA showings (average of monthly maximum observations)



Day Ahead bids, awards, self-schedules, and actual 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)
  - Charts indicate non-delivery is relatively low, and generally consistent with expected forced outage rates of internal RA resources
- NRS-RA import behavior is generally consistent with requirements and expected participation by NRS-RA import providers – bidding and/or 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

- Chart shows 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
- 20 out of the 24 NRA-RA import SC's awards and self-schedules were all at or near 100% of their NRS-RA showing amounts, on average
- Appears a few SCs may be providing NRS-RA imports that could represent speculative supply and/or imports not backed by sufficient reserves or firm transmission necessary to support delivery at time of showing

END DAY 1