



California ISO

Day-Ahead Market Enhancements Fourth Revised Straw Proposal

Stakeholder Meeting

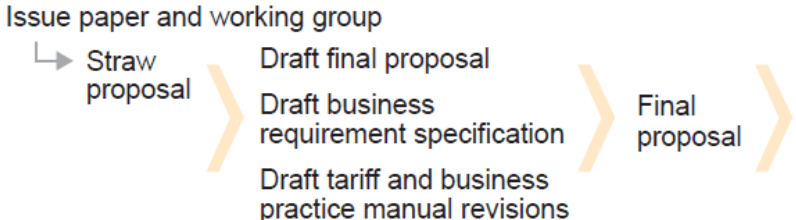
November 1, 2022

Agenda

Time	Topic	Presenter
9:00 – 9:10AM	Welcome and introductions	Isabella Nicosia
9:05 – 12:00PM	<ul style="list-style-type: none">• Overview and Objectives• Changes from Revised Straw Proposal and Responses to Stakeholder Feedback• Proposed Day-Ahead Market Enhancements	James Friedrich
1:00 – 3:50PM	<ul style="list-style-type: none">• Additional Design Considerations• Alignment between Resource Adequacy, DAME, and EDAM• EIM Governing Body Role	James Friedrich
3:50 – 4:00PM	Next steps	Isabella Nicosia

Stakeholder Process

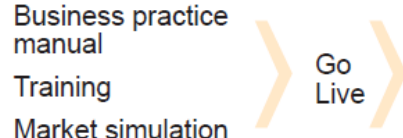
PROPOSAL DEVELOPMENT



DECISION



IMPLEMENTATION



We are here

This represents the typical process, and often stages of the process run in parallel.

Housekeeping reminders

- This call is being recorded for informational and convenience purposes only. Any related transcriptions should not be reprinted without ISO's permission.
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Day-Ahead Market Enhancements

OVERVIEW

New approach is needed to address day-ahead net load uncertainty and variability

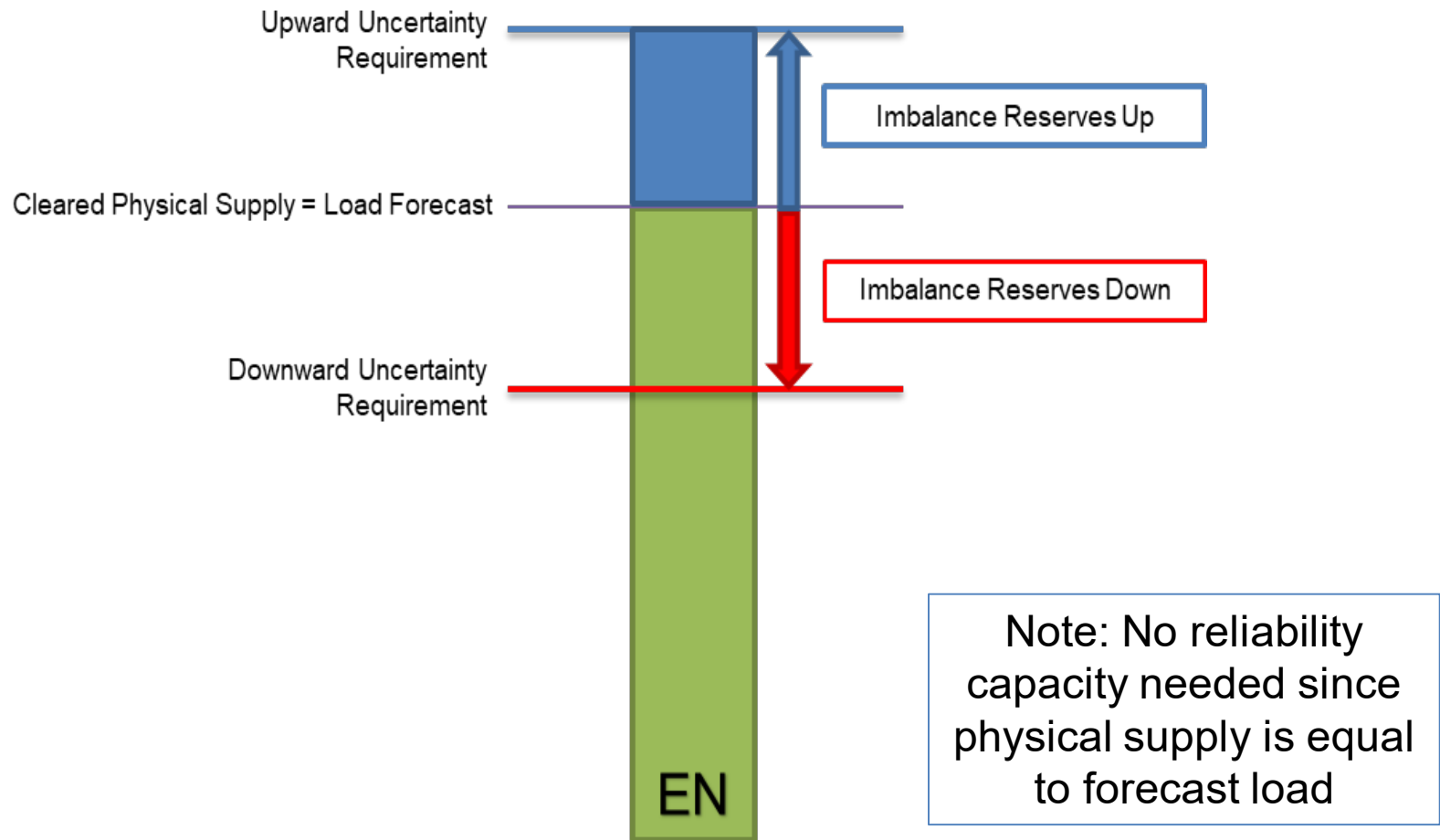
- Add imbalance reserve up and down to IFM to procure flexible reserves for intra-hour ramping and net load uncertainty
 - Addresses need for persistent out-of-market actions
 - Provides important reliability benefits by procuring deliverable reserves that ensure sufficient ramp to meet a range of system conditions
- Enhance the residual unit commitment (RUC) process
 - Procure both upward and downward dispatch capability to meet forecast demand
 - Incorporate local market power mitigation measures

Imbalance reserves increase benefits of greater West-wide diversity in the day-ahead market

- DAME proposal is being considered jointly with EDAM
 - DAME changes are foundational for EDAM
 - EDAM/DAME will be implemented at the same time
 - EDAM/DAME will be considered by CAISO/WEIM governing bodies at the same time

- Imbalance reserves increase benefits of the EDAM
 - Leverages diversity benefits
 - Provides greater confidence in transfers
 - Enables optimal scheduling of reserves and unit commitment
 - Allows consistent treatment of uncertainty

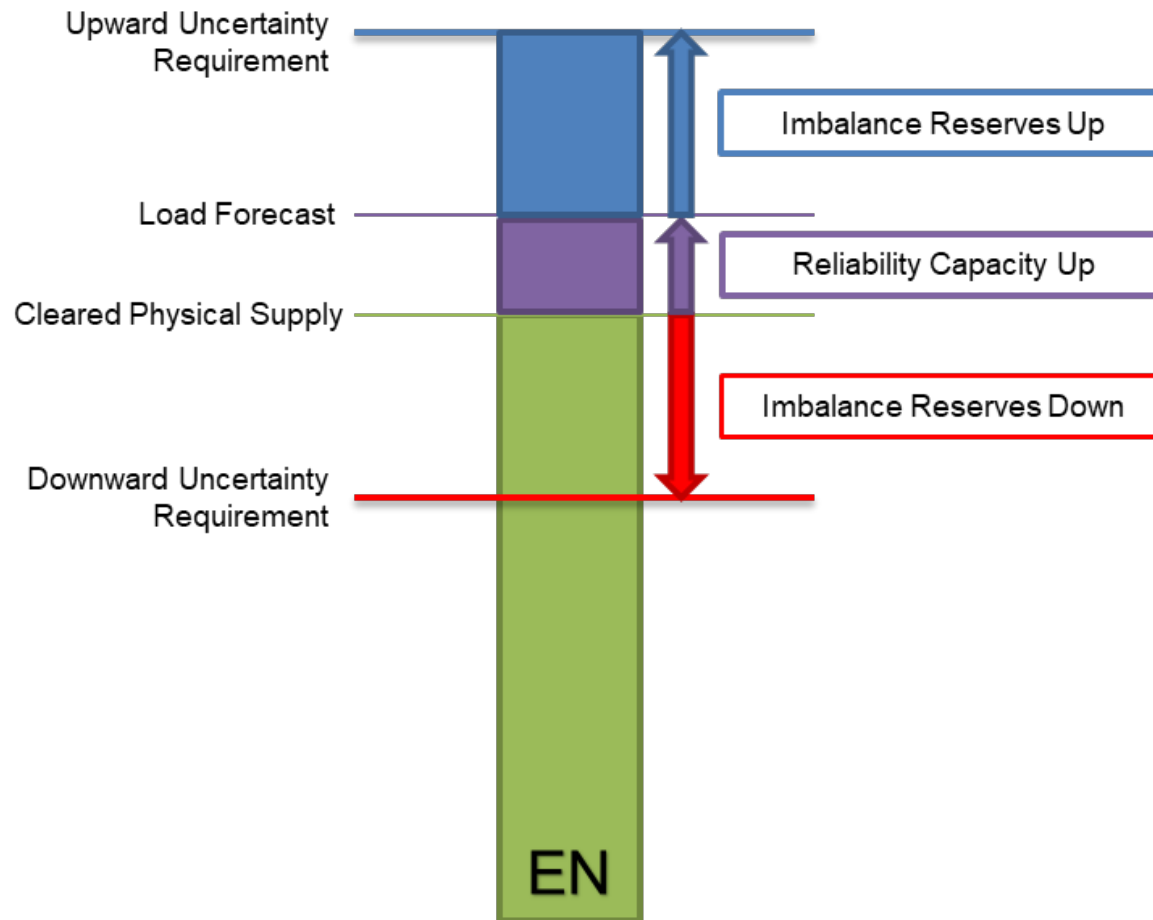
Day-ahead market products needed when load forecast is equal to physical supply



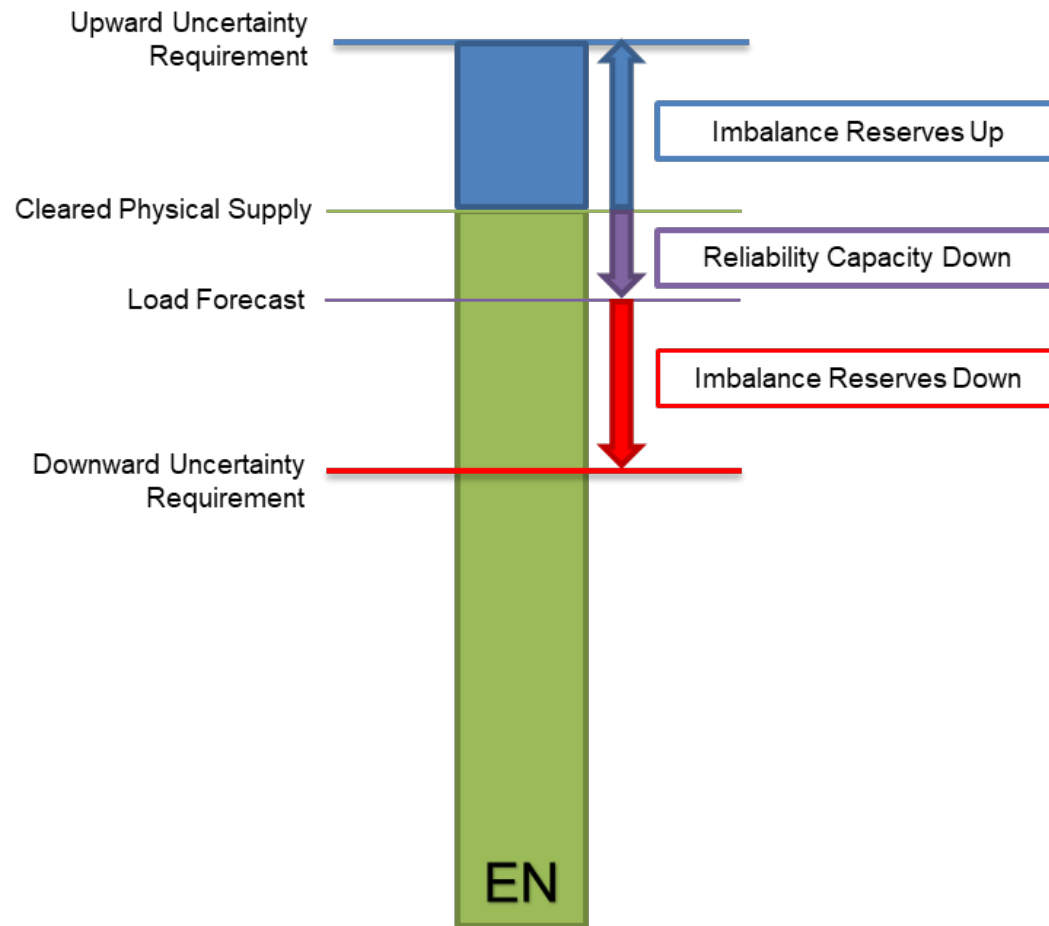
Reliability capacity is needed because physical supply may clear differently when bid-in load and virtual bids are considered

- Drivers of reliability capacity up
 - Bid-in load clears less than CAISO forecast
 - Virtual supply clears market
- Drivers of reliability capacity down
 - Bid-in load clears greater than CAISO forecast
 - Virtual demand clears market

Day-ahead market products needed when load forecast is greater than physical supply



Day-ahead market products needed when load forecast is less than physical supply



Day-Ahead Market Enhancements

CHANGES FROM REVISED STRAW PROPOSAL AND RESPONSES TO STAKEHOLDER FEEDBACK

Imbalance Reserve Quantitative Benefits

- **Stakeholder feedback:** CAISO should do more to estimate quantitative costs and benefits associated with imbalance reserves
 - Imbalance reserve benefit being analyzed in the context of EDAM
 - Results will be published when analysis is complete
 - Preliminary results show substantial benefits
 - Plan to release before DAME Draft Final Proposal

Comparing Imbalance Reserves and Reliability Capacity

- **Stakeholder feedback:** Some stakeholders suggest the market products may serve overlapping functions
 - Imbalance reserves and reliability capacity serve different and unique purposes and are procured based on different resource characteristics and system needs.
 - Reliability capacity bridges the gap between the financial and physical market; it is not intended to address net load uncertainty or intra-hour ramping needs

Day-Ahead Market Bidding Rules

- **Stakeholder feedback:** CAISO should clarify day-ahead bidding rules for imbalance reserves/reliability capacity
 - Reliability capacity bid range limited to upper economic limit (highest operating range in energy bid)
 - Resources must bid reliability capacity up the same quantity as bid into IFM (and thus considered in EDAM RSE)

Day-Ahead Must-Offer Obligations for CAISO RA resources

- **Stakeholder feedback:** CAISO should clarify RA day-ahead must-offer rules for imbalance reserves/reliability capacity
 - No change to energy and AS must-offer obligations
 - No must-offer obligation for imbalance reserves
 - Imbalance reserves will be procured separate and distinct from resource adequacy capacity
 - No longer proposing must-offer for all eligible resources or to re-configure Flex RA to procure imbalance reserve attributes
 - May be addressed in subsequent stakeholder initiative
 - Same resources that are required to offer RUC supply will be required to bid for reliability capacity

Real-Time Must-Offer Obligations for CAISO RA resources

- **Stakeholder feedback:** Imbalance reserve/reliability capacity design may too often result in real-time must offer obligations that are insufficient for meeting real-time load compared to the RA RT MOO
 - This proposal keeps the RA RT MOO in place
 - Concerns about misalignment are addressed by EDAM net export transfer constraint and inter-SC trading of imbalance reserves
 - RA resources awarded imbalance reserves/reliability capacity still required to economically bid energy in RT

“Protection” of RA capacity in EDAM

- **Stakeholder feedback:** RA must-offer obligations create a potential asymmetry in the way CAISO RA resources participate in EDAM
 - EDAM proposal includes a net export transfer constraint that will help protect RA capacity from supporting firm EDAM transfers when needed for CAISO BAA reliability
 - Available to all BAAs to encourage maximum use of available resources while allowing each BAA discretion of the amount of capacity to hold back for reliability

Local Market Power Mitigation of Imbalance Reserves and Reliability Capacity

- **Stakeholder feedback:** Mitigating imbalance reserves is unnecessary; lack of default bid increases likelihood of mitigating resources below cost
 - Proposal continues to apply LMPM measures to IRU offers
 - It is appropriate to mitigate IRU offers because suppliers can utilize their position on the grid to increase costs above competitive levels
 - Re-introduces default availability bids for imbalance reserve and reliability capacity mitigation
 - Used as a mitigation “floor” in short-term until costs to provide imbalance reserve/reliability capacity under competitive conditions can be assessed
 - Static price set based on high percentile historical spin/non-RA RUC offers
 - Proposal makes several clarifications
 - Mitigating energy in the deployment scenarios; not mitigating imbalance reserve down or non-EDAM imports offers; supply of counter-flow in the deployment scenarios

Imbalance Reserve Graduated Penalty Prices

- **Stakeholder feedback:** Previously proposed graduated penalty prices for imbalance reserves would excessively relax the requirement during tight system conditions, leading to lower confidence and higher need to continue RUC adjustments
 - Proposal reconfigures the penalty price structure to relax the requirement by a small quantity if the incremental cost exceeds the bid cap (\$247/MWh); designed to prevent large price spikes from small shortages
 - Otherwise would protect imbalance reserves awards ahead of low-priority export self-schedules

Imbalance Reserves/Reliability Capacity from Non-EDAM Imports

- **Stakeholder feedback:** CAISO should clarify the rules for non-EDAM imports providing imbalance reserves/reliability capacity
 - Must be registered in the Master File with Resource ID
 - (For imbalance reserves) must be 15-minute dispatchable
 - Allows non-RA inertie resources to participate in RUC
 - Clarifies how IRU/RCU schedules are expected to be tagged

Imbalance Reserves Settlement of Charges

- **Stakeholder feedback:** CAISO should consider settling imbalance reserve charges through a direct (nodal) settlement rather than a cost allocation
- Proposal confirms settlement via cost allocation
 - Aligns with cost causation principles of flexible ramping product
 - Would be difficult to determine which loads/resources to charge and in what proportion
 - CAISO acknowledges potential impact on CRRs

Imbalance Reserves/Reliability Capacity Duplicative Payments

- **Stakeholder feedback:** Imbalance reserve/reliability capacity payments are duplicative with RA contract payments for RA resources
- Proposal introduces inter-SC trade mechanism for imbalance reserves and reverse settlement for reliability capacity
 - Inter-SC trading is an optional settlement service that would facilitate transfer of duplicative payments that may occur
 - RA contract payments were negotiated assuming no market compensation in RUC; that cannot continue in EDAM; reliability capacity settlements would reverse for RA resources and be distributed to load

Operator RUC Adjustments

- **Stakeholder feedback:** CAISO should eliminate the practice of operator RUC adjustments; CAISO should provide more transparency around RUC adjustments
- Proposal discusses RUC adjustments in more detail
 - Imbalance reserves are expected to greatly reduce, but not completely eliminate, operator RUC adjustments
 - Operators considering adopting imbalance reserve methodology to guide RUC adjustments until imbalance reserves are implemented
 - CAISO publishes RUC adjustment quantity and reason in OASIS

Incorporating Energy Costs into Upward Capacity Procurement

- **Stakeholder feedback:** CAISO should provide more detail on methodology for setting real-time offer cap; CAISO should not restrict bid price for resources in real-time
- Proposal provides more detail on the potential methodology for setting the real-time bid cap; a companion report will be published with analysis
- Real-time bid cap for resources awarded IRU/RCU limits ability for expensive energy resources to routinely get reserve awards; it is not a mitigation measure

VER Eligibility for New Products, Reliability Capacity Cost Allocation and No Pay Settlement

- **Stakeholder feedback:** CAISO should clarify the eligibility of variable energy resources for the new day-ahead products
 - VERs will have energy + reserve awards capped to VER forecast (IFM and RUC)
 - VERs must provide reliability capacity up bids consistent with their VER forecast
 - VERs are removed from the RCU/RCD cost allocation
 - RCU/RCD no pay settlement now just rescinds the RCU/RCD payment

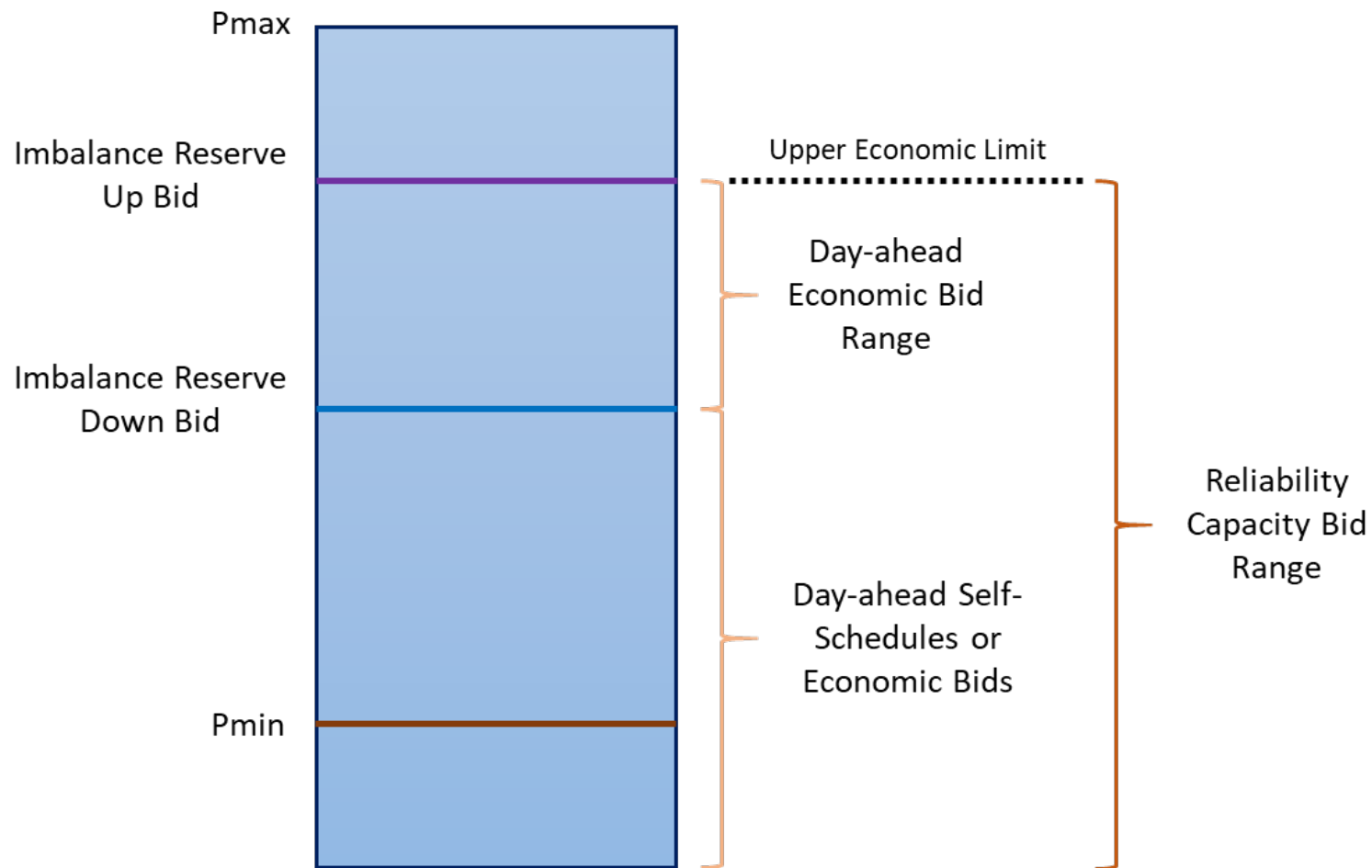
Energy Storage State of Charge Constraint

- **Stakeholder feedback:** CAISO should clarify how imbalance reserve and reliability capacity awards affect state of charge
 - Proposal considers updating state of charge constraint to consume/produce state-of-charge based on day-ahead reserve awards

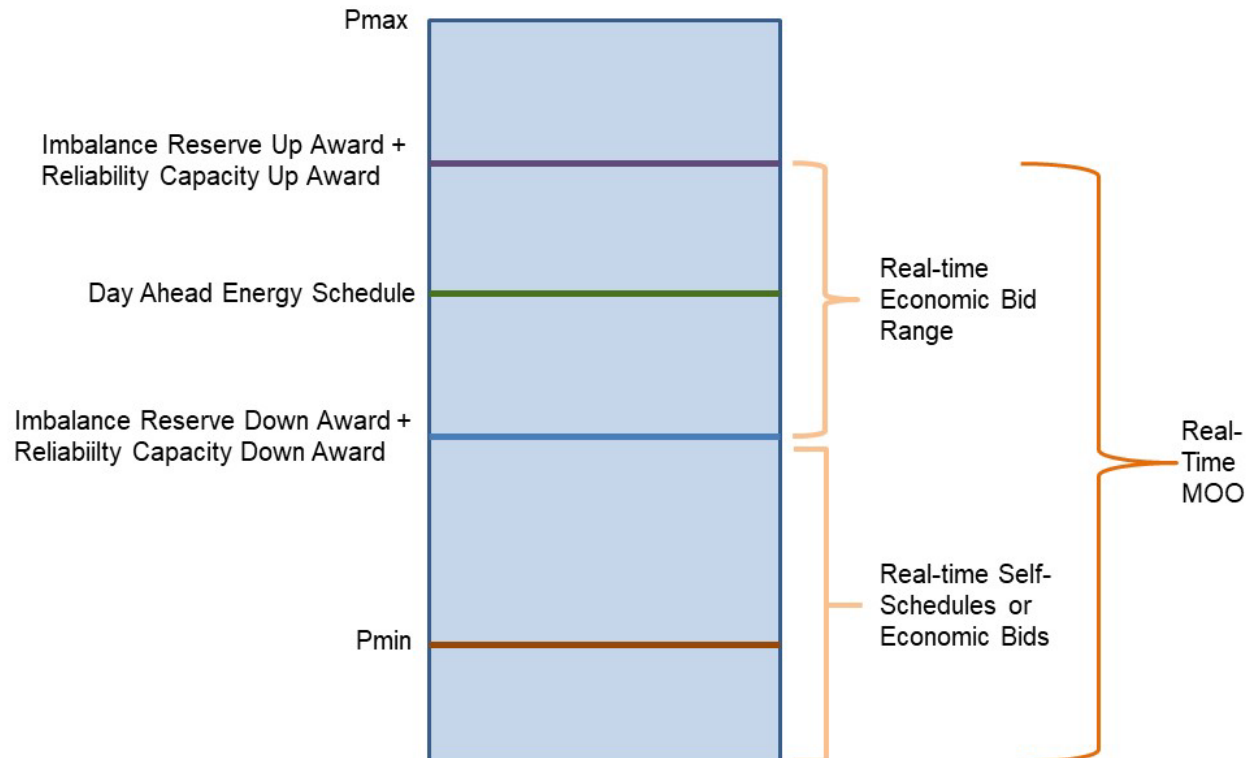
Day-Ahead Market Enhancements

PROPOSED DAY-AHEAD MARKET ENHANCEMENTS

Day-ahead bidding obligations



Real-time bidding obligations



*RA resources maintain their real-time must-offer obligations

Day-Ahead Must-Offer Obligations for RA Resources

- CAISO RA resources will continue to be required to economically bid or self-schedule their RA capacity into the day-ahead market
- RA resources with current RA obligations to submit RUC availability bids will continue that obligation for reliability capacity up/down (except no longer required to bid \$0)
- RA requirements would not be revised to facilitate a day-ahead must-offer obligation for imbalance reserves

Real-Time Must-Offer Obligations for RA Resources

- Proposal maintains the existing RA real-time must-offer obligations
- CAISO's initial concerns are addressed by:
 - Inter-SC trading of imbalance reserves to facilitate transfer of duplicative payments
 - Net export transfer constraint

Mechanism to Protect RA Capacity in EDAM

- Concerns about potential asymmetrical participation between CAISO and other EDAM BAAs addressed through proposed EDAM net export transfer constraint

Day-Ahead Market Enhancements

DAY-AHEAD MARKET PROCESSES

Imbalance Reserve Deployment Scenarios and Deliverability

- IRU/IRD deployment scenarios assume IRU/IRD awards are fully deployed as energy to meet the IRU/IRD requirements while enforcing all network constraints.
 - Base scenario and upward/downward deployment scenarios are solved simultaneously
- IRU/IRD requirements are distributed to load and VER nodes based on allocation factors derived from historical uncertainty data

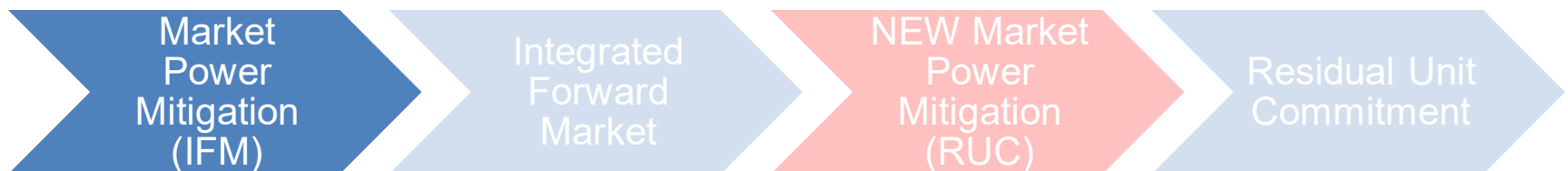
IFM Market Power Mitigation (Energy)

- IFM MPM uses unmitigated bids to clear bid-in load, bid-in supply, imports, exports, ancillary services and imbalance reserve requirements using unmitigated bids
- Resources that can provide counter-flow to an uncompetitive constraint in any scenario will have their energy bids mitigated
 - No proposed changes to DCPA or 3-pivotal supplier test to evaluate competitiveness
 - Energy marginal prices have congestion contributions from binding constraints in the deployment scenarios
- Market mitigates energy offers to the greater of default energy bid or the competitive locational marginal energy price



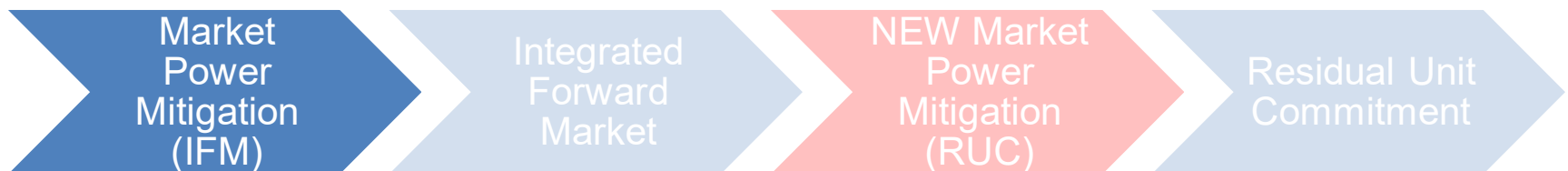
IFM Market Power Mitigation (Imbalance Reserves)

- Resources that can provide counter-flow to an uncompetitive constraint in the upward deployment scenario will also have their IRU bid mitigated
- Market will mitigate IRU offers to greater of the competitive IRU LMP and a default availability bid
 - IRU default availability bid will act as mitigation “floor” with static price for all resources and across all intervals
 - Short run - IRU default availability bid will be based on high percentile historical spin offers
 - Long run – CAISO will evaluate offers under competitive conditions and potentially re-engage stakeholders to develop a more robust methodology



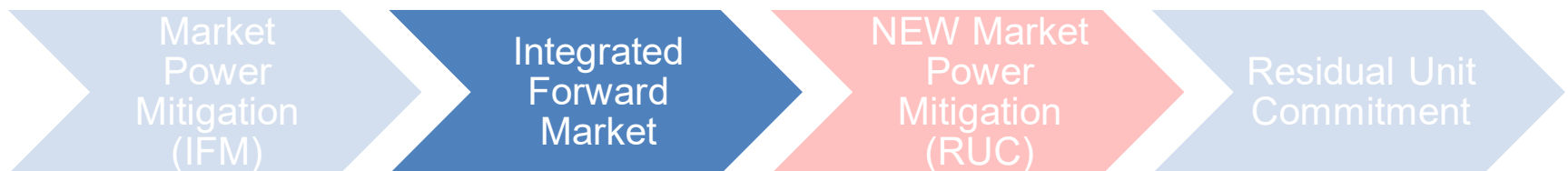
IFM Market Power Mitigation (Imbalance Reserves)

- Additional context
 - IRD bids will not be mitigated
 - IRU offers from non-EDAM intertie resources will not be mitigated
 - More technical detail will be provided in the Draft Final Technical Appendix to describe the supply of counter-flow in the deployment scenarios



Integrated Forward Market

- IFM will clear bid-in load, bid-in supply, imports, exports, ancillary services and imbalance reserve requirements using mitigated bids
 - IFM will co-optimize and procure imbalance reserves up and down based on bids to meet hourly imbalance reserve up and down procurement requirements



Imbalance Reserves

- Imbalance reserves is a new day-ahead reserve product for intra-hour ramping capability and to cover high and low imbalance scenarios to address net load uncertainty and variability
- Resources that are dispatchable in FMM are eligible for imbalance reserve awards
 - Offline resources can receive imbalance reserve up if they can start up in 15 minutes or less
- Awards are capped at resource's 15-minute ramping capability
- Results in obligation to provide economic energy bids in RTM for portion of the award above/below energy schedule

Imbalance Reserve Procurement Requirement

- Upward and downward uncertainty requirements are calculated each hour based on historical forecast errors between DAM and FMM, and the day-ahead demand, solar, and wind forecast.
- Uses a quantile regression set to 2.5/97.5 percentiles similar to FRP requirement
 - Regression percentiles will be configurable
- The imbalance reserve requirement comprises the upward and downward uncertainty portion of the EDAM RSE.

Imbalance Reserve Graduated Penalty Prices

- Proposal revises the graduated penalty price structure
- New proposal protects higher proportion of IRU from relaxation over low-priority export self-schedules but would still prevent price spikes driven by acute shortages
- CAISO is looking into aligning final relaxation values with EDAM RSE consequences for failure
- CAISO plans to incorporate penalty prices into Tariff

Scheduling run IRU relaxation (MW)	Scheduling run penalty price (\$)	Pricing run penalty price (\$)
$\leq \min(2\% \text{ of BAA IRU requirement, } 30\text{MW})$	247	247
$> \min(2\% \text{ of BAA IRU requirement, } 30\text{MW})$	1200	1000

Imbalance Reserves from Non-EDAM Intertie Resources

- 15-minute or dynamic intertie resources could offer imbalance reserves if they are certified
 - Intertie resources would have to register in the CAISO Master File with a resource ID
 - No imbalance reserve offers would be accepted from generic imports using only a transaction ID
- IRU schedule must be tagged after RUC with a transmission profile equal to (EN + IRU)

Imbalance Reserve Bids

- Imbalance reserve bids can have different hourly price/quantity pairs but only a single price/quantity pair in each hour.
- Resources that do not submit the required real-time bids based on their imbalance reserve award will have economic bids inserted for them at their Default Energy Bid.

Imbalance Reserve Payments

- Resources that receive an imbalance reserve up award will be paid the locational marginal price for imbalance reserves up.
- Resources that receive an imbalance reserve down award will be paid the locational marginal price for imbalance reserves down.

Imbalance Reserve Charges

Imbalance Reserve charges settled using following cost allocation:

Imbalance Reserves Up

Tier 1

- **Generation:** $\text{MAX}(0, \text{Day-ahead energy schedule} - \text{FMM upper economic limit as affected by de-rates and reduction in VER forecast (if applicable)})$
- **Load:** Negative uninstructed imbalance energy
- **Imports:** $\text{MAX}(0, \text{Day-ahead energy schedule} - \text{FMM upper economic limit as affected by e-Tag transmission profile})$
- **Exports:** $\text{MAX}(0, \text{FMM self-schedule} - \text{Day-ahead energy schedule})$

Tier 2

- Metered demand

Imbalance Reserves Down

Tier 1

- **Generation:** $\text{MAX}(0, \text{FMM lower economic limit as affected by rerates or self-schedules} - \text{Day-ahead energy schedule})$
- **Load:** Positive uninstructed imbalance energy
- **Imports:** $\text{MAX}(0, \text{FMM self-schedule} - \text{Day-ahead energy schedule})$
- **Exports:** $\text{MAX}(0, \text{Day-ahead energy schedule} - \text{e-Tag transmission profile})$

Tier 2

- Metered demand

Imbalance reserve Unavailability No Pay

- **Imbalance reserves up:** Resources with an upper economic limit in FMM that does not support their day-ahead energy + IRU award less the 5-minute ramp capable portion will be charged the higher of the RTPD FRU price, the RTD FRU price, or the IRU price.
- **Imbalance reserves down:** Resources with a lower economic limit in FMM that does not support their day-ahead energy - IRD award plus the 5-minute ramp capable portion will be charged the higher of the RTPD FRD price, the RTD FRD price, or the IRD price.

Inter-SC Trading of Imbalance Reserves

- Proposal extends existing inter-SC trading (IST) functionality to include imbalance reserves to facilitate transfer of duplicative payments that may occur as a result of imbalance reserve market settlements
- Max physical quantity to be traded would be agreed by both parties (actual IST settlement quantity determined by market awards)
- IST settlement price is IRU/IRD LMP minus opportunity cost portion determined by comparing energy bids to energy LMPs
- IST settled proportionately to MW quantity of submitted ISTs for resources contracted with multiple LSEs

Bid Cost Recovery and Grid Management Charge

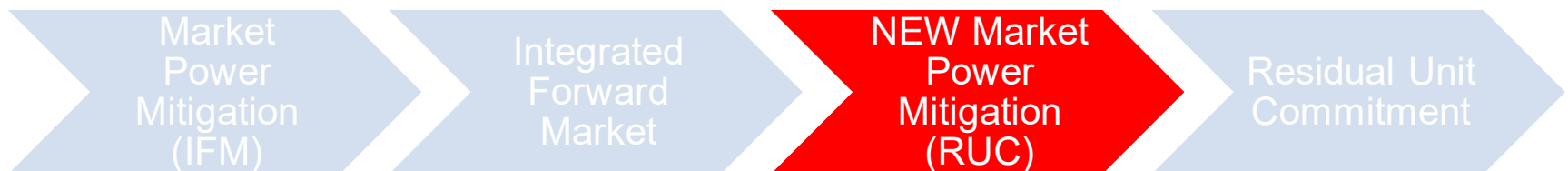
- Revenues and bid costs from imbalance reserve awards will be included in day-ahead BCR.
- Market services charge will apply to imbalance reserve awards.

Exports and Imbalance Reserves

- Imbalance reserves should greatly reduce RUC adjustments that increases risk of export reduction in RUC.
- Non-RA capacity could simultaneously support a PT export and receive an imbalance reserve award
 - PT export validation only requires sufficient energy bids
 - Optimal solution could be to award a “supporting resource” imbalance reserves and support the export with a different resource in the bid stack
- Non-RA capacity supporting a PT export must bid reliability capacity up to the export self-scheduled quantity.

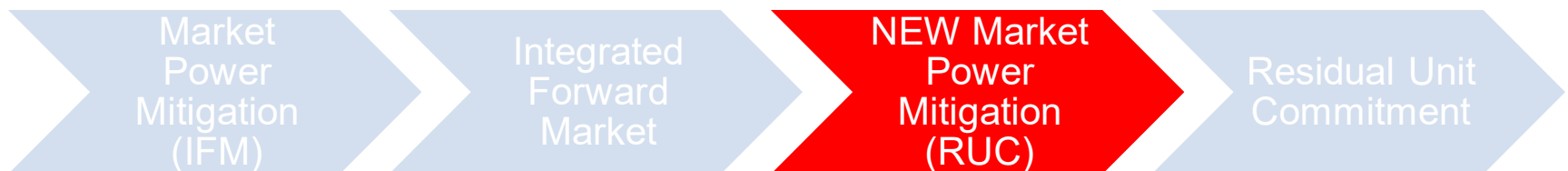
Market Power Mitigation for RUC

- Holds IFM schedules fixed and uses unmitigated reliability capacity bids to procure reliability capacity to meet BAA's demand forecast
- RUC optimization considers transmission constraints
- Resources that can provide counter-flow to uncompetitive constraints will have their RCU bids mitigated
 - Extends DCPA and 3-pivotal supplier test to evaluate competitiveness



Market Power Mitigation for RUC

- Market will mitigate RCU offers to the higher of the competitive RCU LMP or default availability bid
 - RCU default availability bid will be based on high percentile historical non-RA RUC supply offers
 - Same price for all resources and in all market runs
 - Acts as mitigation “floor” in the short run until CAISO can assess RCU offers under competitive conditions. May later re-engage stakeholders to develop a more robust methodology.
- CAISO unconcerned about market performance and solve time



Residual Unit Commitment

- Holds IFM schedules fixed and procures incremental supply (reliability capacity up) or decremental supply (reliability capacity down) based on how IFM schedules physical energy compared to BAA demand forecast
- Transitions MSG resources in the downward direction (but not turn them off) and establish their binding configuration



Reliability Capacity (RCU/RCD)

- RUC awards reliability capacity up as either an incremental supply on an already-committed resource or by committing additional resources.
- RUC awards reliability capacity down as decremental supply on units with energy schedules; does not de-commit units
- Results in obligation to provide economic energy bids in RTM for portion of the award above/below energy schedule
- Reliability capacity awards limited to a resource's 60-min ramp capability

Multi-Stage Generating (MSG) Resources

- MSG configurations are currently committed in the IFM
- RUC will transition MSGs in the downward direction but not shut down
- MSGs transitioned down in RUC can still support a PT export

Market Operator Adjustments to RUC Demand Forecast (“RUC Adjustments”)

- Market operators reference an “upper confidence” demand forecast that assesses the maximum demand expected under current weather conditions to guide RUC adjustments
- Implementation of imbalance reserves expected to greatly reduce reliance on (but not eliminate) RUC adjustments
- RUC adjustments at times are used to cover other operational risks, such as wildfire
- CAISO publishes RUC adjustments and reason in OASIS

Reliability Capacity and Intertie Resources

- Non-EDAM intertie resources are eligible to provide reliability capacity up/down if they are certified
 - Intertie resources would have to register in the CAISO Master File with a resource ID
 - No reliability capacity offers would be accepted from generic imports using only a transaction ID
- Requires changing rules preventing non-RA imports from participating in RUC
- Intertie schedule must be tagged after RUC with a transmission profile equal to (EN + RCU)
- Hourly exports can offer reliability capacity up with obligation to provide decremental energy bids to dispatch down export schedule in FMM

Reliability Capacity Bids

- Reliability capacity bids can have different hourly price/quantity pairs but only a single price/quantity pair in each hour.
- CAISO RA resources can bid any price for RCU/RCD
- CAISO will insert reliability capacity bids for the portion of the resource's capacity that is subject to a DA MOO
 - If partial bid, use submitted bid price
 - If missing bid, use \$0 bid price
- Resources that do not submit the required real-time bids based on their reliability capacity award will have economic bids inserted for them at their Default Energy Bid.

Reliability Capacity Payments

- All resources (including CAISO RA resources) that receive a reliability capacity up or down award will be paid the locational marginal price for reliability capacity in the upward or downward direction, respectively.

Reliability Capacity Cost Allocation

Reliability Capacity Up

Tier 1

- **Net virtual supply:** Max of (a) zero or (b) scheduling coordinator net virtual supply awards
- **Under-scheduled load:** Net negative metered demand

Tier 2

- Metered demand

Reliability Capacity Down

Tier 1

- **Net virtual demand:** Max of (a) zero or (b) scheduling coordinator net virtual demand awards
- **Over-scheduled load:** Net positive metered demand

Tier 2

- Metered demand

*Costs no longer allocated to over/under-schedule VERs

Reliability Capacity No Pay

- **Reliability capacity up:** Resources with an upper economic limit that does not support their day-ahead energy + RCU award will be charged back the RCU price.
- **Reliability capacity down:** Resources with a lower economic limit that does not support their day-ahead energy - RCD award will be charged back the RCD price.

Reverse Settlement of Reliability Capacity for Resource Adequacy Resources

- Approach needed to “reverse” reliability capacity payments to RA resource to prevent double payment
- RA resource’s RCU/RCD awards will be stacked above/below the resource’s IFM schedules to determine the overlap with RA capacity.
- Settlements will reverse the RCU/RCD payments for the RCU/RCD awards that overlap with RA capacity and distribute to metered demand based on load ratio share.
- ISO seeks feedback on whether to include a sunset provision or create optionality for future RA resources with renegotiated RA contracts that do not include provisions to bid into RUC with \$0/MWh bids

Bid Cost Recovery and Grid Management Charge

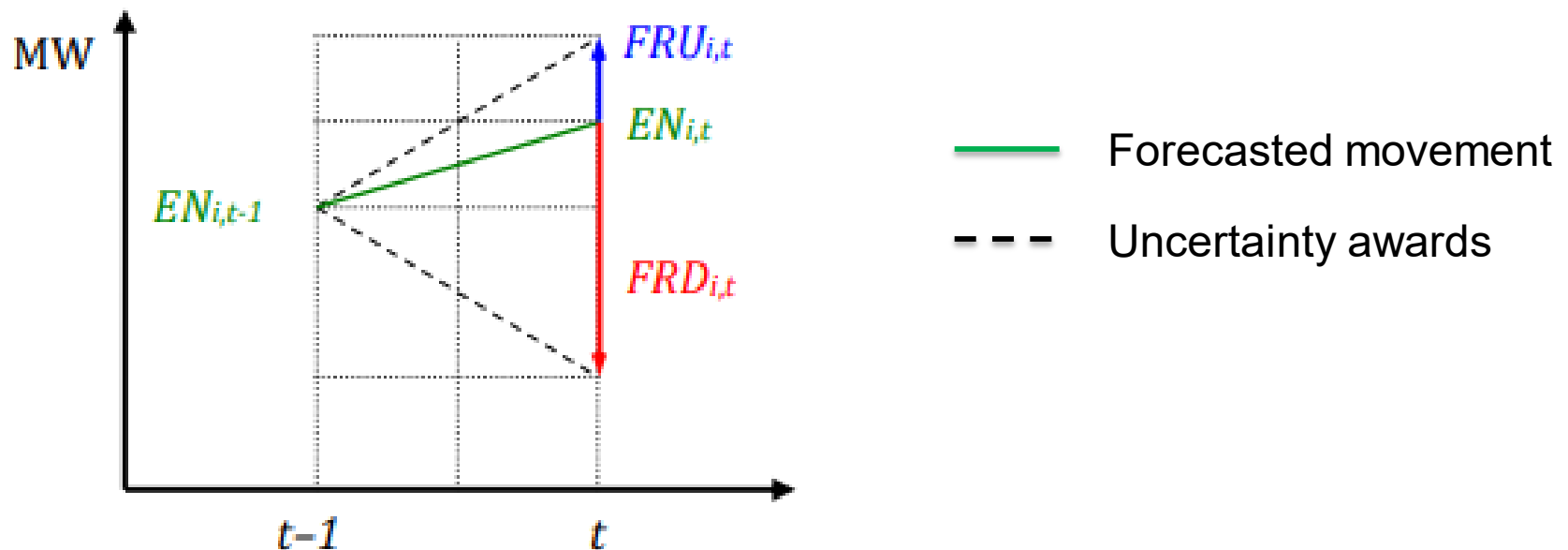
- Reliability capacity revenue and cost will be netted together with RTM bid cost recovery over the day
- RUC BCR costs will be allocated to net virtual supply, under-scheduled load, in alignment with RCU cost allocation.
- Market services charge will apply to reliability capacity awards

Day-Ahead Market Enhancements

ADDITIONAL DAY-AHEAD MARKET ENHANCEMENT DESIGN CONSIDERATIONS

4.1 Real-Time Market Ramp Deviation Settlement

- Ramp is composed of ...
 1. *Forecasted movement* is the change in energy schedules between intervals in same market run
 2. *Uncertainty awards* are additional ramp capability held back to meet changes in net load between market runs



Differences between Imbalance Reserves and Flexible Ramping Product

- Differences between imbalance reserves and flexible ramping product make a direct deviation settlement infeasible

Imbalance Reserves	Flexible Ramping Product
Single settlement (uncertainty awards)	Dual settlement (uncertainty awards and forecasted movement)
Awards based on resource's 15-min ramp capability	Awards based on resource's 5-min ramp capability
Marginal clearing price based on bids and opportunity cost	Marginal clearing price based only on opportunity cost

Problems that can occur without a ramp deviation settlement

- Double payment of opportunity costs
 - Opportunity cost is part of marginal price of both imbalance reserves and FRP
- Double payment of forecasted movement
 - Forecasted movement is embedded in IFM energy LMP but is a side payment in RTM
- Unavailable ramp drives up real-time prices
 - Resources that do not provide the ramp they are obligated to should settle those deviations at prices reflecting real-time conditions.

Summary of ramp deviation settlement of forecasted movement and uncertainty awards

	Ramp Settlement
IFM Forecasted Movement	No side payment, paid energy price
IFM Imbalance Reserve Award	Pay award
FMM Forecasted Movement	Settle deviation from IFM 15-minute forecasted movement
FMM FRP Uncertainty Award	Settle deviation from embedded 5-minute ramp within IR award
RTD Forecasted Movement	Settle deviation from FMM 5-minute forecasted movement
RTD FRP Uncertainty Award	Settle deviation from FMM
Imbalance Reserve No Pay	Charge if 15-minute ramp above 5-minute deviations is unavailable

Impacts to WEIM from Ramp Settlement

- Forecasted movement is included in WEIM base schedule changes similar to CAISO day-ahead schedules
 - Deviation settlement will apply between base schedule and FMM schedule
- No imbalance reserve awards are included in WEIM base schedules to meet uncertainty in FMM
 - No deviation settlement for uncertainty, all FRP uncertainty awards are incremental

Impact to Convergence Bidding from Ramp Settlement

- Convergence bids are settled at the day-ahead price and liquidated in FMM
- Forecasted movement is settled in the IFM energy price but is a side payment in FMM
- Virtual supply and demand will have a forecasted movement deviation settlement at the FMM FRP prices

Congestion Revenue Rights

- No changes are proposed to the existing CRR nomination and auction processes to account for imbalance reserves.
- Imbalance reserve costs are settled through allocation instead of direct locational settlement, which may cause CRR shortfalls because congestion revenue will not be collected on the imbalance reserve flows
- CAISO will monitor and be prepared to act

Accounting for Energy Offer Cost in Upward Capacity Procurement (1 of 3)

- Market does not differentiate between two resources with same capacity bid but different energy bid costs when awarding upward capacity products
- Greater concern for IRU/RCU because there is a higher likelihood of being dispatched for energy in RTM
- Objective is to prevent opportunities for high energy cost resources from routinely being awarded IRU/RCU when the resources will rarely be dispatched for energy in the RTM

Accounting for Energy Offer Cost in Upward Capacity Procurement (2 of 3)

- Proposes a real-time energy bid price cap consistent with the expected system price if the entire upward uncertainty requirement materialized
- Only applies to resources awarded IRU/RCU for the quantity of their awards
- Bid cap would be published in advance of DAM close
- Resources with energy costs above cap must incorporate financial risk into IRU/RCU bid → higher bids for RCU and IRU → less likely to be awarded → meets policy objective

Accounting for Energy Offer Cost in Upward Capacity Procurement (3 of 3)

- CAISO recently presented preliminary analysis on methodology to set real-time bid cap
- Analysis is testing multiple combinations of inputs, regressions, and outputs to see which combination best aligns with objectives
 - Companion document will be published
- Based on the options tested to date, recommend a single variable, quantile regression on natural gas prices to calculate an hourly bid cap.
 - More analysis is being done to test the methodology over the summer 2022 period
- Propose to implement functionality to turn off bid cap during pre-defined tight system conditions

Variable Energy Resource (VER) Eligibility to Provide New Products

- VERs should be eligible to provide IRU/IRD and RCU/RCD since they are technically capable
 - However, ISO is concerned with awarding VERs reserves above their forecast
- All VERs will have energy + reserve awards capped to VER forecast (IFM and RUC)
- VERs must provide reliability capacity up bids consistent with their VER forecast
- Proposes to alleviate concern around VERs providing IRU/RCU by requiring their High Sustainable Limit (HSL)

Energy Storage Modelling Enhancements

- Proposed Energy Storage Resource (ESR) model allows storage resources to submit bids based on incremental or decremental state-of-charge
- ESRs will need to ensure their RT energy bids reflect a SOC that is consistent with their obligations based on IRU/IRD or RCU/RCD awards

Impact of Capacity Awards on State of Charge (1 of 2)

- A resource's state of charge in the current interval is defined as the state of charge in the previous interval +/- the current interval charging or discharging schedule.

$$SOC_{i,t} = SOC_{i,t-1} - (EN_{i,t}^{(+)} + \eta_i EN_{i,t}^{(-)})$$

- The sum of upward capacity awards cannot exceed the quantity between the resource's current state of charge and its minimum state of charge.

$$\left. \begin{array}{l} \underline{SOC}_{i,t} + RU_{i,t} + SR_{i,t} + NR_{i,t} + IRU_{i,t} \leq SOC_{i,t} \\ SOC_{i,t} \leq \overline{SOC}_{i,t} - \eta_i (RD_{i,t} + IRD_{i,t}) \end{array} \right\}, \forall i \in S_{LESR} \wedge t = 1, 2, \dots, T$$

Impact of Capacity Awards on State of Charge (2 of 2)

- Current constraints do not account for state of charge consumed/produced through deployed reserve awards
 - Dilutes value of reserve services
 - Creates disconnect in ways storage resources are incentivized to participate and how they can be most useful to the system
- $$SOC_{i,t} = SOC_{i,t-1} - (EN_{i,t}^{(+)} + a_{RU}RU_{i,t} + a_{SR}SR_{i,t} + a_{NR}NR_{i,t} + a_{IRU}IRU_{i,t} + \eta_i(EN_{i,t}^{(-)} - a_{RD}RD_{i,t} - a_{IRD}IRD_{i,t}))$$
- “a” would be configurable coefficients between 0 and 1 intended to reflect the expectation that some energy would be produced/consumed for positive/negative capacity services.
- Proposal initially considers the coefficients for the IRU and IRD variables to be set to “1”, which reflects full deployment of these reserves, consistent with deployment scenarios.

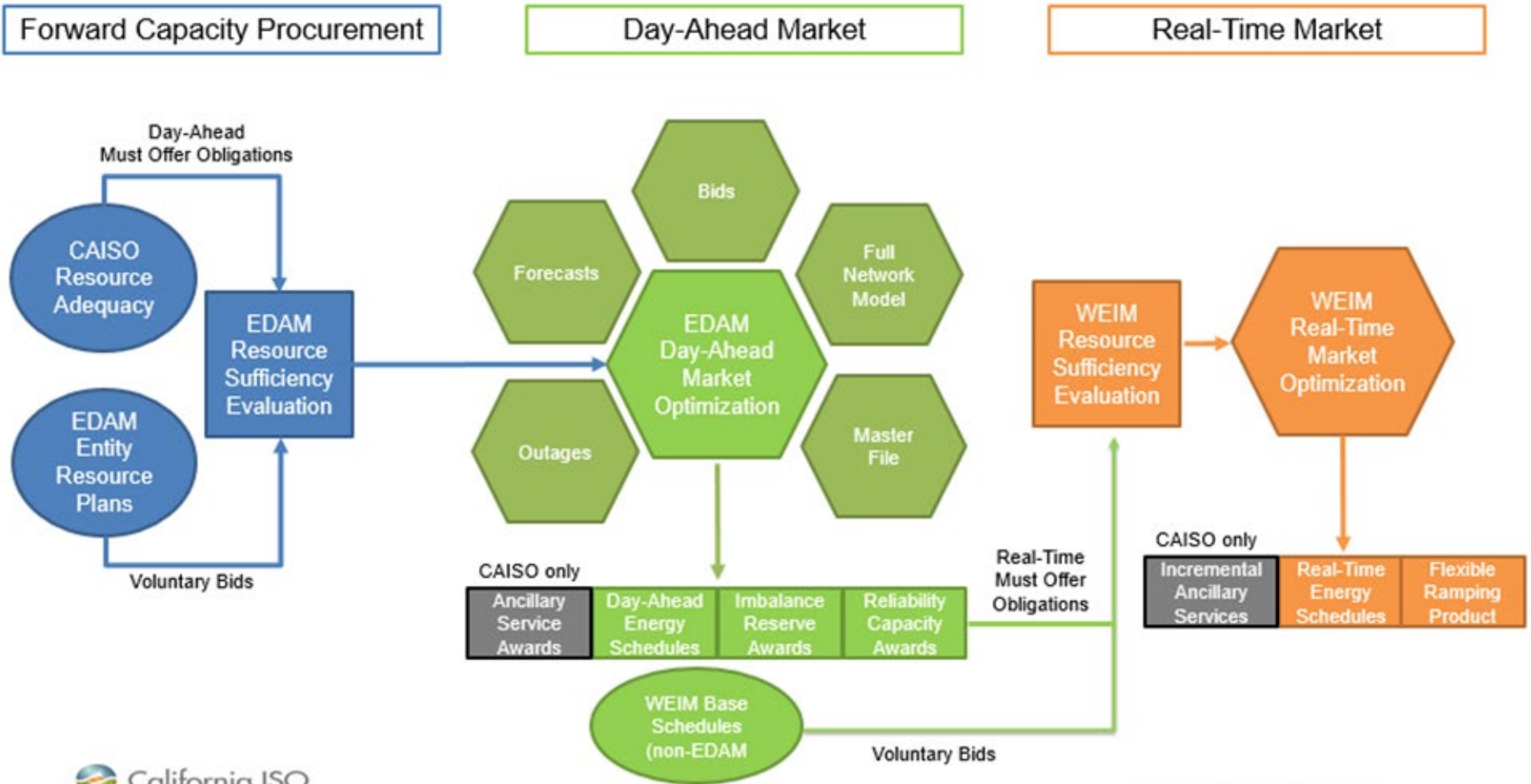
Treatment of Metered Subsystems, Existing Transmission Contracts, and Transmission Ownerships Rights

- No changes proposed from previous proposals

Day-Ahead Market Enhancements

ALIGNMENT BETWEEN RESOURCE ADEQUACY, DAME, AND EDAM

Relationship between DAME, EDAM and RA Enhancements



Day-Ahead Market Enhancements

WEIM GOVERNING BODY ROLE

WEIM Governing Body Role

Proposal	WEIM Governing Body Authority
Financial settlement of flexible ramping product, to remove the double payment of forecasted movement (§ 4.1)	Joint authority
Other changes to the financial settlement of flexible ramping product (§4.1)	Advisory role
Real-time energy bidding rules for resources that received awards in the day-ahead market to provide imbalance reserve up or reliability capacity up (§ 3.3)	Advisory role
Bidding obligations for resources that have day-ahead schedules for imbalance reserve or reliability capacity (§ 3.1)	Advisory role
Remainder of initiative	No role

WEIM Governing Body Role (2 of 2)

- Some stakeholders support this classification, while others propose that joint authority should apply to some or all of the remainder of the proposal
 - Such a classification would depart from current rules
- Such a departure would require Board approval, similar to proposal the Board has made for a joint authority classification for EDAM.
- Stakeholders are encouraged to comment on whether and to what extent a departure from the current rules would be advisable here, and on any other aspect of this proposed decisional classification.

Day-Ahead Market Enhancements

INITIATIVE SCHEDULE AND NEXT STEPS

Next Steps

Milestone	Date
4 th Revised Straw Proposal	October 26, 2022
Stakeholder Meeting	November 1, 2022
Comments Due	November 15, 2022
Draft Final Proposal	November 28, 2022*
Stakeholder Meeting	December 5, 2022*
Market Surveillance Committee Meeting	December 12, 2022
Comments Due	December 19, 2022*
ISO Board of Governors and WEIM Governing Body joint meeting	February 1, 2023*
Implementation	Fall 2023

**Dates are tentative and subject to change.*

Comments

- Please submit written comments on the fourth revised straw proposal by November 15 using the template on the initiative webpage:
<https://stakeholdercenter.caiso.com/StakeholderInitiatives/Day-ahead-market-enhancements>
- Contact Isabella Nicosia at inicosia@caiso.com or ISOStakeholderAffairs@caiso.com if you have any questions.