



California ISO

Price Formation Enhancements


Working Group Session #17

April 23, 2024

Housekeeping reminders

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- This collaborative working group are intended to stimulate open dialogue and engage different perspectives.
- Please keep comments professional and respectful.
- Please try and be brief and refrain from repeating what has already been said so that we can manage the time efficiently.
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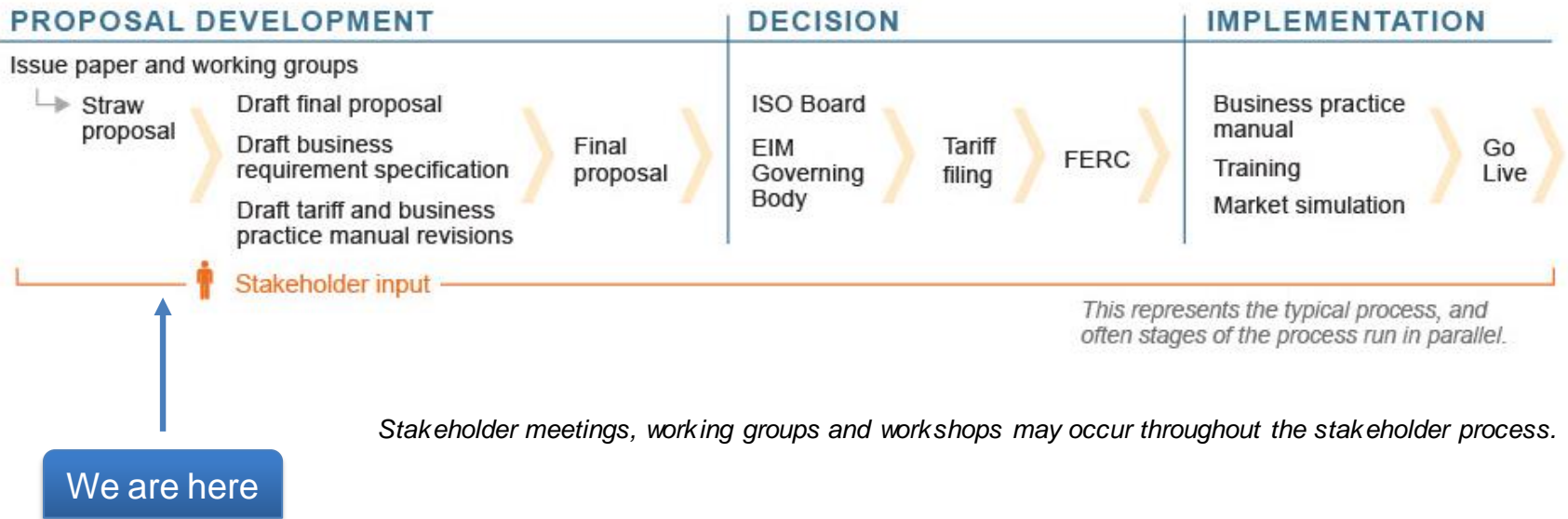
Instructions for raising your hand to ask a question

- If you are connected to audio through your computer or used the “call me” option, select the raise hand icon  located on the bottom of your screen.
 - **Note:** #2 only works if you dialed into the meeting.
 - Please remember to state your name and affiliation before making your comment.
- You may also send your question via chat to Brenda Corona or to all panelists.

Today's Working Group Agenda

Time	Topic	Presenter
9:00 – 9:05	Welcome, Today's Agenda, Stakeholder Process Overview	Brenda Corona
9:05 – 9:15	Today's Goals	Juan Buitrago
9:15 – 11:30	Feasibility Analysis/ISO Recommendation of Phased Solution Development	Sylvie Spewak
11:30 – 11:55	Open Discussion: Stakeholder Feedback on Solution Trade Offs	Juan Buitrago
11:55 – 12:00	Next Steps	Brenda Corona

ISO Policy Initiative Stakeholder Process



- Straw Proposal and Feasibility Assessment Posted on Apr 22, 2024

Goals of Today's Working Group Session

The Working Group structure is meant to embrace flexibility to allow organic and robust conversation on the topics at hand – it is still key for us to drive towards solutions collaboratively

- **ISO Presentation of Feasibility Assessment and Straw Proposal**
 - Presentation of Feasibility Assessment based off Stakeholder feedback from Working Group conversations and Issue Paper + Stakeholder Recommendation comments
- **Stakeholder discussion on Trade Offs of proposed Phased solution development**
 - Opportunity to discuss the proposed phased solution development, associated risks and trade offs, in preparation for next step of solution design



California ISO

Rules for bidding above the soft offer cap: Feasibility Assessment and Straw Proposal

Sylvie Spewak

Senior Policy Developer

April 23, 2024

Agenda

- Stakeholder feedback on the Issue Paper
 - Appendix A contains highlights to help stakeholders contextualize the policy assessment
- What went into the feasibility assessment
- Feasibility Assessment
 - Appendix B contains the full analysis overlaying proposals on historical days conditions were triggered to raise the bid ceiling
- Recommended solution development timeline
 - Next steps

Governance Classification

WEIM Governing Body has joint authority with the Board of Governors over the proposed change. the Board and the WEIM Governing Body have joint authority over any:

proposal to change or establish a tariff rule applicable to the WEIM/EDAM Entity balancing authority areas, WEIM/EDAM Entities, or other market participants within the WEIM/EDAM Entity balancing authority areas, in their capacity as participants in WEIM/EDAM... The scope of this joint authority excludes, without limitation, any other proposals to change or establish tariff rule(s) applicable only to the CAISO balancing authority area or to the CAISO-controlled grid.

This proposed classification reflects the current state of this initiative and could change as the stakeholder process moves ahead. Stakeholders are encouraged to submit a response in their written comments to the proposed classification of as described above, particularly if they have concerns or questions.

Recommendation for phasing solution development

For August 1

Summer Solutions

- **Today, we're considering three stakeholder proposals the ISO has assessed as relatively lower risk for summer implementation**

For remainder of 2024

Near term working group solution discussion

- Develop a plan for monitoring, reporting, and ongoing assessment
- Identify opportunities to improve utilization of existing tools
- If necessary, develop enhancements for summer 2025

For later implementation

Comprehensive Policy development

- Enhance the reference level change request process for non-gas resources

STAKEHOLDER FEEDBACK

Stakeholder Problem Statements

- **Problem statement 1:** Resources with intra-day opportunity costs may not be able to reflect a bid high enough to preserve their SOCs, and limited energy, for highest price hours.
- **Problem Statement 2:** Resources with intra-day opportunity costs may be unable to hold their day-ahead market schedules when prices rise above \$1,000/MWh in real-time.

Stakeholder Proposals described in the issue paper

Approach 1: Allow resources to bid up to pre-determined cap.

- Eliminate the \$1000 cap on DEBs
- Modify the bid cap so that resources with opportunity cost-based costs can bid up to the MIBP, or \$2000

Approach 2: Leverage existing tools to hold day-ahead schedules in real-time, prevent reliability issues

- End-of-hour state of charge, self-schedule (base schedule for WEIM entities)
- Enhanced exceptional dispatch tool

Approach 3: Enhance resources' ability to use the reference level change request process.

- Modify DEB calculations to better capture intra-day opportunity costs
- Modify the reasonableness threshold to allow for DEB adjustments

Stakeholders largely support an in-market solution for Summer 2024

- Stakeholders support an interim solution that would directly modify the logic used to cap bids:
 - Remove the \$1000 soft offer cap applied to the DEB.
 - Consider allowing resources with opportunity costs to bid up to either the MIBP or \$2000 in real-time.
- Most stakeholders also support a robust policy process to consider enhancements to the process the ISO built for resource-specific cost-verification consistent with FERC Order No. 831, but acknowledge this approach may not yield an immediate solution.

➤ **The ISO assessed the full scope of stakeholder proposals for summer implementation feasibility**

Some stakeholders have expressed concerns with proposals to modify the bid cap

- Some stakeholders do not support an interim solution modifying the bid cap:
 - They observe that this approach does not demonstrate cost-verification, and is not consistent with FERC Order No. 831.
 - The CPUC Public Advocates Office is concerned that stakeholder proposals conflate opportunity-cost-based supply with emergency capacity.
 - Some stakeholders support the idea of an interim solution but highlight trade-offs associated with proposals to modify the bid cap:
 - Potential high regulatory risk without demonstrated cost-verification
 - Does not solve the root problem without DEB modifications.
 - Could create unpredictable outcomes, lack of transparency, and volatility similar to the current design.
- **Today's discussion will provide stakeholders with an opportunity to assess these trade-offs, and make informed recommendations to minimize risk**

Stakeholders have made clear that this is a priority and have asked for an assessment and expected timeline

- Stakeholders urge the ISO to provide a feasibility assessment including:
 - A development timeline for stakeholder recommended proposals.
 - Level of risk associated with FERC review, and an outline of the recommended FERC approval path.
- Some stakeholders have asked for an expedited FERC review process to ensure implementation by July 1.

➤ **This presentation assesses each stakeholder proposal in terms of policy, regulatory, and implementation risk**

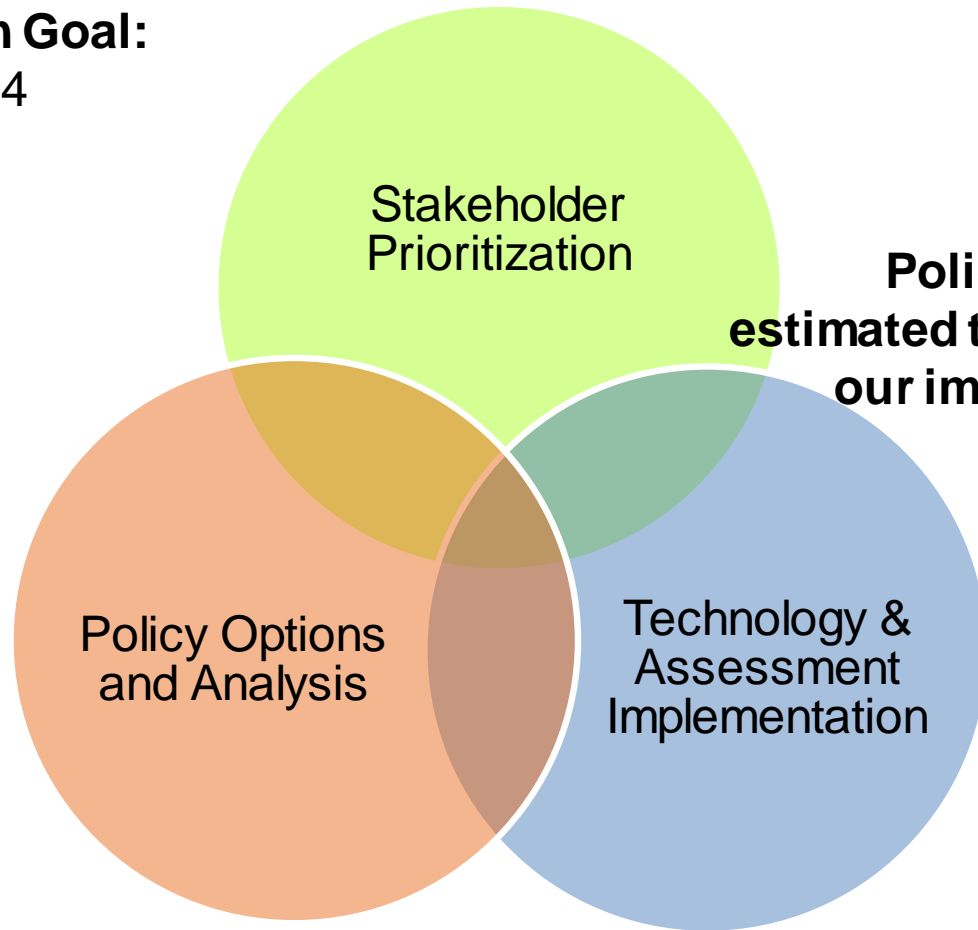
FEASIBILITY ASSESSMENT

Feasibility assessment and recommended timeline for proposal development

- This presentation will explain how each stakeholder proposal was assessed, and provide a recommended timeline for development.
- Stakeholders should have full transparency into the technology, policy trade-offs the ISO has identified to make a risk informed decision about next steps.
- Take lessons learned from interim solution development into consideration for planning more permanent approach
 - Stakeholders and the ISO agree that further discussion is necessary to achieve a robust and durable approach

What went into the feasibility assessment?

Implementation Goal:
by August 1 2024



**Policy and technology
estimated the risk of missing
our implementation goal**

Schedule for Policy Development

Date	Milestone
April 22	PRC
April 22, 3pm	Straw Proposal slides
April 23, 9-12	Straw Proposal working group call
April 24, 2-5pm	Market Surveillance Committee discussion
May 1, 2024	Target Draft Final Proposal
May 2	Draft Final Proposal working group hold
TBD	Market Surveillance Committee Opinion
May 8	Target Final Proposal
May 21-23	Board Week
May 24, 2024	Target File at FERC
July 25, 2024	Target Hear back from FERC
TBD	Market Simulation
August 1	Target Implementation Timeline

*This schedule assumes a regular 60 day FERC review

Technology & Implementation Assessment

- The ISO mapped out how to implement each stakeholder proposal to identify and assess regulatory and implementation risks
- In some cases, the ISO proactively explored multiple versions of stakeholder proposals to give stakeholders the opportunity to assess different trade-offs
- Technology risk is described as low, medium, and high:
 - High risk involves more system integration and system impacts
 - This should be interpreted as the baseline level of risk associated with proposals.

Policy and Analysis assessment

- Proposals that represent a significant shift from policy today may signal greater risk in terms of
 - Regulatory risk, i.e. FERC acceptance of the proposed changes
 - observed impacts may be associated with trade-offs and unintended consequences that would warrant further stakeholder consideration
- Analysis based on historical conditions shows how proposals may over- or under-estimate real-time prices on days between 2021-2024 when conditions were triggered to raise the bid ceiling
- Strong stakeholder alignment can reduce risks, but have limited time to assess trade-offs

Stakeholder Proposals described in the issue paper

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Approach 2: Leverage existing tools to hold day-ahead schedules in real-time, prevent reliability issues

- End-of-hour state of charge, self-schedule (base schedule for WEIM entities)
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Approach 3: Enhance resources' ability to use the reference level change request process.

- Modify DEB calculations to better capture intra-day opportunity costs
- Modify the reasonableness threshold to allow for DEB adjustments

Summary of feasibility assessment

- **Approach 1 Changes to the DEB and bid capping logic:** Some variation of proposals under approach 1 **may** be feasible by August 1. Stakeholders will still need to consider:
 - How to define and identify the applicable resources classes
 - Trade-offs between policy and technology risk
- **Approach 2: Leverage existing tools to hold day-ahead schedules in real-time, prevent reliability issues**
 - No implementation required
- **Approach 3 Enhancements to the reference level change request:** Proposals in this category are **infeasible** for August implementation.

Approach 2: Leverage existing tools

- The ability to use the EOH SOC constraint may have impacts with the storage resources aggregate capability constraint (ACC)
 - Off grid charging limit will not be relaxed for stand alone use (ACC takes priority), but will be relaxed if used as part of a sub-ACC (EOH SOC take priority)
- ED SOC tool, already implemented as part of Energy Storage Enhancements, nonetheless provides reliability backstop
- Ultimately, the ISO and stakeholders are in full agreement that the best option is to develop enhancements that allow resources to more accurately, and flexibly, reflect opportunity costs in the market

PDR bid caps are not within scope for summer 2024 implementation

- PDR resources may have opportunity costs. The CAISO understands these costs are different than the temporal opportunity costs due to energy limitations
 - Would need to consider forgone usage of energy in derivation of opportunity cost
- The ISO believes significant additional policy discussion is required to define and vet these operating costs, which is beyond what is possible for this summer

Comparing Approaches 1 and 3

- Approach 3 was assessed to be relatively higher risk for summer than Approach 1 from a policy and technology perspective, but stakeholders expressed a preference for Approach 3
 - Stakeholder highlight the importance of DEB adjustments to a solution
- The ISO believes a variation of Approach 1 can have the same effect as stakeholder preferred proposals
- Today's discussion will start with the assessment of approach 3 to provide a benchmark against which to assess trade-offs

Approach 3: Enhance resources' ability to use the reference level change request process.

- Several stakeholders support calculating the DEB based on the current operating hour and utilizing the automated reference level change request process to adjust resource-specific reasonableness thresholds.
- Some stakeholders propose specific formulas for calculating reasonableness thresholds for storage and hydro resources, such as:
 - Storage reasonableness threshold: $(\text{MAX}(\text{MIBP}, \text{Highest-Priced Cost Verified Bid}) / \text{Round Trip Efficiency}) \times 110\%$
 - Hydro short term component of the reasonableness threshold: $\text{MAX}(\text{MIBP}, \text{Highest-Priced Cost Verified Bid}) \times 110\%$

Proposals in order of incremental change from today's policy

	DEB calculation	Modify the reasonableness threshold	Effective bid cap	Technology Risk
Today	DEB	Variable cost DEB * scalar	\$1000	N/A
A	DEB	Resource specific DEB	Uncapped DEB	High
B	DEB	Existing DEB with a scalar	DEB + headroom	High
C	Storage DEB	Highest DA MEC with a scalar	Uncertain	High
D	Storage, Hydro DEB	Max value of the MIBP (of \$2000)	Uncertain	High

Approach 3 technology considerations

- The MIBP is an hourly value, but the reasonableness threshold is a single daily value
 - The ISO modified Variation D to be the max value of the MIBP for real-time
- The highest cost-verified bid for real-time may not be known pre-market when the reasonableness threshold is calculated since resources cost-verify hourly in real-time. Cost-verified bids from DA are known, but triggered and stored in a different system
 - New integration would be required to accommodate reasonableness threshold calculations based on market outputs like LMPs, or bids above \$1000
- The storage DEB option, or any DEBs calculated with IFM inputs, is not known pre-market in the DA so cannot request DEB adjustments

Approach 3 policy and analysis considerations

- If a storage or hydro resource SC attempted to submit an automated RLCR today, it might receive an adjusted DEB below their existing DEB
 - The process might be improved to align with its intended use by modifying each resource's reasonableness threshold to reflect the resource's DEB
- It's possible that some resources' DEBs could be greater than a reasonableness threshold that based on a system wide metric, like the SMEC or MIBP
 - A hydro or storage resource's DEB might be adjust down if verified against the MIBP
- The reasonableness threshold is intended to provide SCs with the flexibility to account for differences between expected and actual costs, and should ultimately be correlated with the resource-specific cost defined in their DEBs

Key takeaways

- A resource specific reasonableness threshold based on a resource's DEB would allow resources to reflect costs no less than the value of their unadjusted DEB. This would allow resources to reflect costs above \$1000 when the uncapped DEB is calculated to be greater than \$1000
 - the ISO believes a variation of Approach 1 has lower implementation risk and can have the same effect as stakeholder preferred proposals
- Absent a scalar or scalar equivalent value, the reasonableness threshold would only be useful for re-validating costs already embedded in the DEB
- The scalar should also be resource specific, or based on observations or known variations between actual and expected marginal costs
 - CAISO has limited evidence that a system-wide metric correlates with resource-specific short run marginal costs
 - Modifying the DEB based on a system wide metric is a big policy change and carries a high regulatory risk

Next steps for Approach 3

- Stakeholders have asked the ISO to commit to defining and calculating intra-day opportunity costs such that a process could be built to validate and reflect those costs in the market.
 - The ISO recommends continuing to discuss these options for later implementation

Approach 1: Allow resources to bid up to a pre-determined cap

- Eliminate the \$1000 cap on DEBs
- Allow resources with opportunity cost-based offers to bid up to
 - \$2,000/MWh when the bid cap is raised to \$2,000/MWh
 - The higher of the highest MIBP and highest cost-verified offer received/calculated over the entire day
 - The higher of the MIBP and cost-verified offer received/calculated in that hour (i.e., applying the same treatment as non-resource specific RA imports)

Proposals to modify the bid cap logic in order of incremental change from today's policy

	Cap on DEB	Modification to the bid cap logic	Technology Risk
Today	\$1000	Bids above \$1000 are capped by the higher of \$1000 and the DEB	n/a
A	Uncapped DEB calculation	Bids above \$1000 are capped by the higher of \$1000 and the uncapped DEB	Medium
B	Uncapped DEB calculation	and the highest DA MEC with a scalar	High
C	Uncapped DEB calculation	And the higher of the MIBP or highest cost-verified bid for that hour	Medium - High
D	Uncapped DEB calculation	And the price of the highest priced hour of the MIBP	Medium - High

Cost-verification above \$1000 raises penalty prices to \$2000

- Today, resource-specific resources can only bid above \$1000 if the bid has been verified through the RLCR process. The trigger to increase penalty prices from \$1000 to \$2000 is a resource-specific bid above \$1000.
- Because a bid above \$1000 from a resource-specific resource would trigger \$2000 penalty prices, any uncapped DEB value above \$1000 has the potential to trigger \$2000 penalty prices.
- If the bid cap logic includes, “highest-cost verified bid”, any uncapped DEB value above \$1000 or bid up to the MIBP can also set the cap for all resource-specific resources this logic applies to
 - In other words, *from a technology perspective*, any bid above \$1000 is a cost-verified bid

Triggering \$2000 penalty prices

- If there is a bid above \$1000, we need penalty prices to rise to \$2000
 - This triggers the logic allowing unspecified imports to bid up to the higher of the MIBP or cost-verified bid
 - Any bid above \$1000 resulting from proposals under Approach 1 will be considered ‘cost-verified’ even if they aren’t verified through the RLCR process
- Opportunity costs above \$1000 embedded in the DEB are the trigger for \$2000 penalty prices
 - Bids above \$1000 and above the DEB would not be considered cost-verification from a policy perspective
- Should we let the highest cost-verified bid set the cap for all opportunity cost resources?

Approach 1 technology considerations

- The logic that caps DEBs is separate from the logic that caps bids. Generally, DEBs are capped by the system that calculates them which requires:
 - Modifications to the ECIC and IFM
 - DMM would need to update processes and FERC filings
- Modifications to SIBR rules that apply the soft offer cap to resource-specific bids need to be targeted at the right resources:
 - Generally, a more narrowly targeted solution has more complex system impacts
 - Using the Masterfile to identify applicable resources limits us to technology type
 - The ISO explored the impact of identifying resources by opportunity-cost-based DEBs

Approach 1 policy considerations

- Approach 1 does not modify DEB calculations
 - If subject to market power mitigation, DEBs would reflect costs as defined by today's policies
- Removing the DEB cap on all DEBs would
 - Allow non-gas resources to bid above \$1000 when their DEB is calculated to be above \$1000
 - Not change the ultimate outcome for gas resources, who today can bid above \$1000 when the variable cost DEB rises above \$1000
 - Not need to be unwound to support enhancements

Proposal: Remove the existing \$1000 cap on DEBs, and consider bid cap modifications

DEB modification	Bid cap modification to a subset of resources	Policy Trade-offs
<p>1. Remove the \$1000 cap on all DEBs</p> <ul style="list-style-type: none"> • Would apply to all resources • The reference level change request would still be required to make adjustments to the DEB beyond it's calculated value • Foundational step for enhancements 	<p>2. Highest value of the real-time max import bid price (MIBP)</p> <ul style="list-style-type: none"> • Apply to resources with opportunity-cost-based DEBs 	<p>Pro: Recommended by and supported by most stakeholders</p> <p>Cons: Some stakeholders are concerned about the liquidity of bilateral indexes and accuracy and shaping factors of the MIBP calculation itself.</p>
	<p>3. The highest day-ahead marginal energy cost (MEC)</p> <ul style="list-style-type: none"> • Apply to resources with opportunity-cost-based DEBs 	<p>Pro: Opportunity cost estimate is based on a more liquid market result, and an hourly granularity improves precision.</p> <p>Con: Additional technology complexity and implementation risk.</p>

None of these options are low risk

	Stakeholder Priority	Policy risk	Technology Risk	Regulatory Risk
1. Remove the \$1000 cap on <u>all DEBs</u>	Medium-high	Low	Medium	Baseline
2. Option 1 <u>and</u> Allow resources with opportunity cost-based DEBs to bid up to the highest DA MEC	TBD	Medium	High	Medium-High
3. Option 1 <u>and</u> Allow resources with opportunity cost-based DEBs to bid up to the MIBP	High	Medium-High	Medium-High	High

The ISO seeks stakeholder feedback on analysis

- The MIBP and highest DA MEC may over- or under-estimate real-time opportunity costs
 - In contrast to Approach 3, embedding these values in the bid cap logic would not bind the DEB
 - However, none of these options guarantee a resource's ability to hold SOC
 - Both options have trade-offs that stakeholders will need to consider
- The ISO has included an analysis and seeks feedback from stakeholders on what value best represents real-time opportunity costs

Recommendation for phasing solution development

For August 1

Summer Solutions

- **Consider three stakeholder proposals**
- ED SOC tool as backstop for reliability

For remainder of 2024

Near term working group solution discussion

- Develop a plan for monitoring, reporting, and ongoing assessment
- Identify opportunities to improve utilization of existing tools
- If necessary, develop enhancements for summer 2025

For later implementation

Comprehensive Policy development

- Enhance the reference level change request process for non-gas resources
- Consider solutions for PDR
- Enhance DEBs
- Consider extending the real-time market horizon

Next steps

- Questions?
- Review Analysis

APPENDIX A: ISSUE PAPER HIGHLIGHTS

FERC Order No. 831 requires bids above \$1000 to be cost-verified

- FERC Order No. 831 requires that each resource's incremental energy offer is capped at the higher of:
 - \$1,000/megawatt-hour (MWh) or
 - that resource's verified cost-based incremental energy offer

The soft offer cap and hard offer cap groups represent two distinct categories of resources and bidding rules

- Today, resource-specific resource bids are capped by the higher of
 - \$1000 or
 - That resource's verified cost-based incremental energy offer (which is also capped at \$1000)
- Rules that apply to the hard offer cap group, or non-resource-specific resources, are not intended to meet the standards of the soft offer cap group's cost verification requirements, but provide an incremental level of protection from exercise of market power.

The ISO's cost-verification process today builds on the process for calculating default energy bids

- The DEB is intended to ensure competitive outcomes in conditions where participants might have market power by reflecting a resource's marginal costs in the market
- The ISO's cost-verification process today, called "reference level change request (RLCR)", builds on the process for calculating DEBs and for requesting DEB adjustments
- This process fulfills FERC Order No. 831 requirements that cost-verification work in conjunction with market power mitigation procedures

SCs can update their DEBs, or cost information used by the ISO, to reflect the best available information

- CAISO has a process called “reference level change request (RLCR)” intended to provide SCs options for making DEB adjustments.
 - There is both a “manual” and “automated” version of this process.
- The manual RLCR process allows SCs to submit their actual/expected fuel costs directly to the ISO for manual review
 - The recalculated DEB is active for the entire day, but it remains static throughout the day.
- The automated RLCR process allows SCs to request an adjusted DEB based on a “reasonableness threshold”
 - This process allows for hourly variation, but SCs must verify the change for each applicable hour.

Clarification based on stakeholder feedback: the automated RLCR process

- The manual RLCR requires manual review of supporting documentation before 8:00am of the relevant trade-day
- The automated RLCR process offers automated review and validation of requests
 - SCs still have to retain supporting documentation and are subject to audit
- Unlike the manual process, automated reference level change requests
 - Can be made at any time and would be immediately validated or rejected
 - Are submitted directly through SIBR

The DEB is intended to ensure competitive outcomes by reflecting a resource's short-run marginal costs

- SC's may choose a DEB option developed by the ISO and stakeholders to more accurately capture the distinct opportunity costs of certain resource types
 - The storage DEB option defines opportunity costs using LMPs from the IFM
 - The hydro DEB option defines opportunity costs as bilateral buying power in the short, medium, and long-term
- For all resources, the DEB is a static value, calculated pre-market and applies to the full trade-day, but we expect some deviations between actual and expected costs

Today, gas resources can adjust their DEB to a higher value and successfully bid above \$1000

- The reasonableness threshold is a gas resource's DEB, the variable cost DEB, which serves as a reasonable benchmark for a resource's short run marginal costs

DEB Type	Reasonableness Threshold
Variable cost DEB	Variable cost DEB
$1.1 * \text{Incremental fuel cost} + \text{O\&M} + \text{GMC}$	$1.1 * (\text{Incremental Fuel cost} * 1.1) + \text{O\&M} + \text{GMC}$

- A scalar, set at 110 or 125% of the fuel or fuel equivalent cost, provides headroom based on variation observed in the gas market to account for the expected and actual fuel costs that go into the DEB calculation

APPENDIX B: ANALYSIS

831 BID CAP ANALYSIS

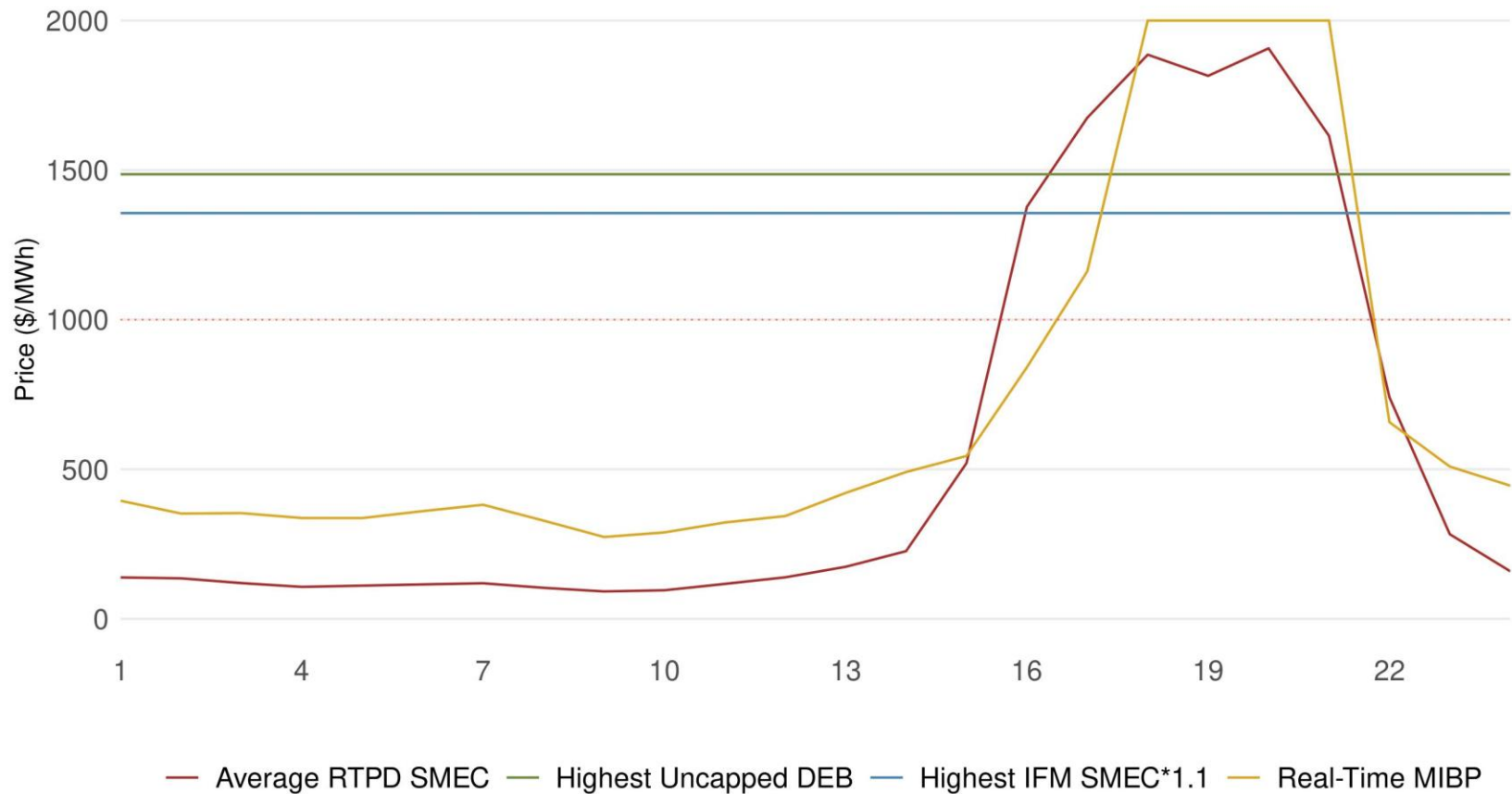
Katie Wikler, Sr. Market Engineering Specialist
Market Performance & Advanced Analytics

Scope of high-level metrics covered

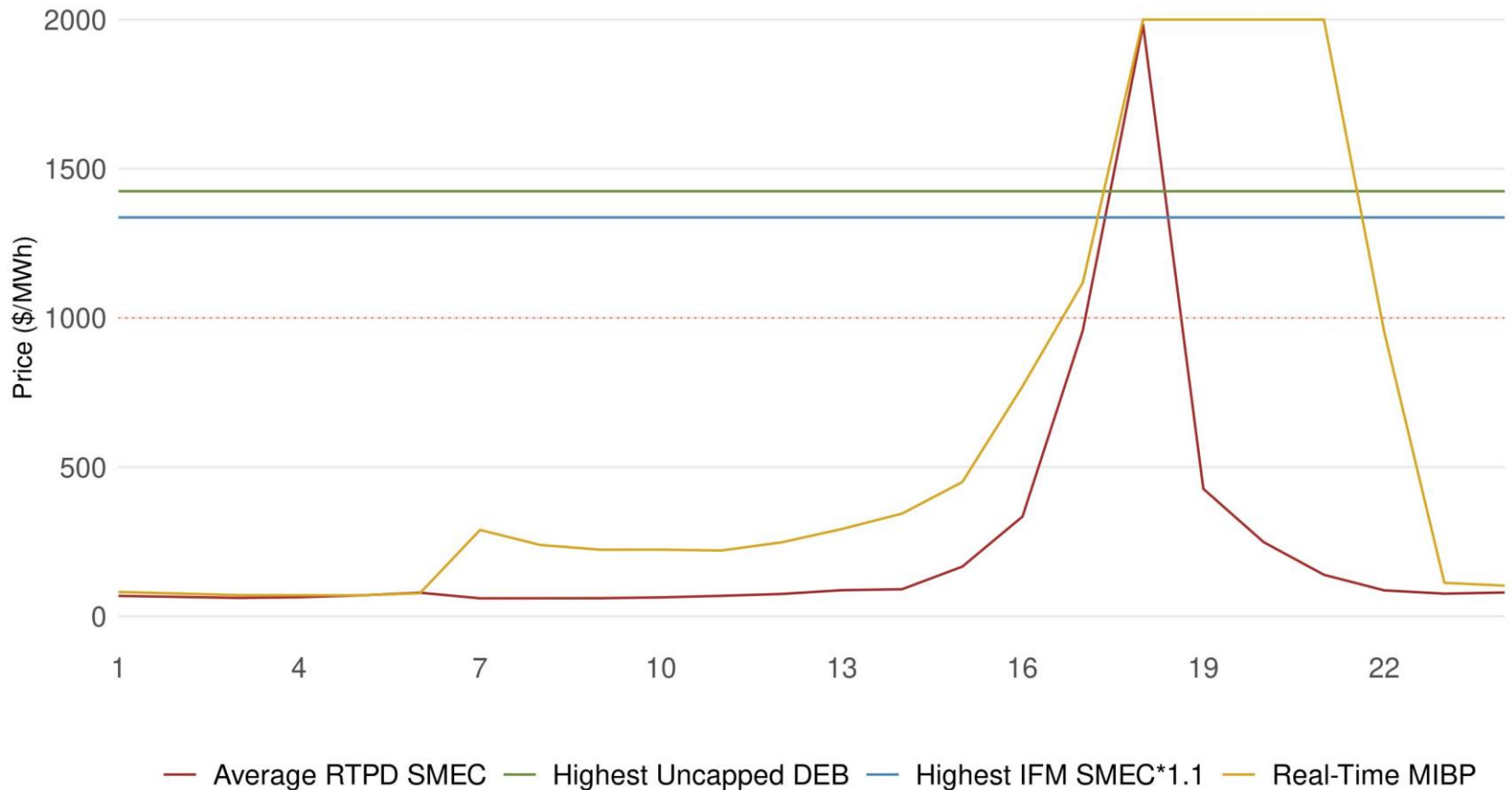
Metrics are captured for a smaller subset of days when the bid ceiling was raised to \$2,000/MWh (“831 days”)

- Charts show proposed capping options overlaid against average RTPD SMEC for comparison
 - Highest uncapped (storage/hydro) DEB assumed as equivalent proxy for highest “cost-verified” bid
- Bid price duration curve for sample peak hour(s)
 - Illustrative example of the quantity of resource bids hitting \$1000 cap

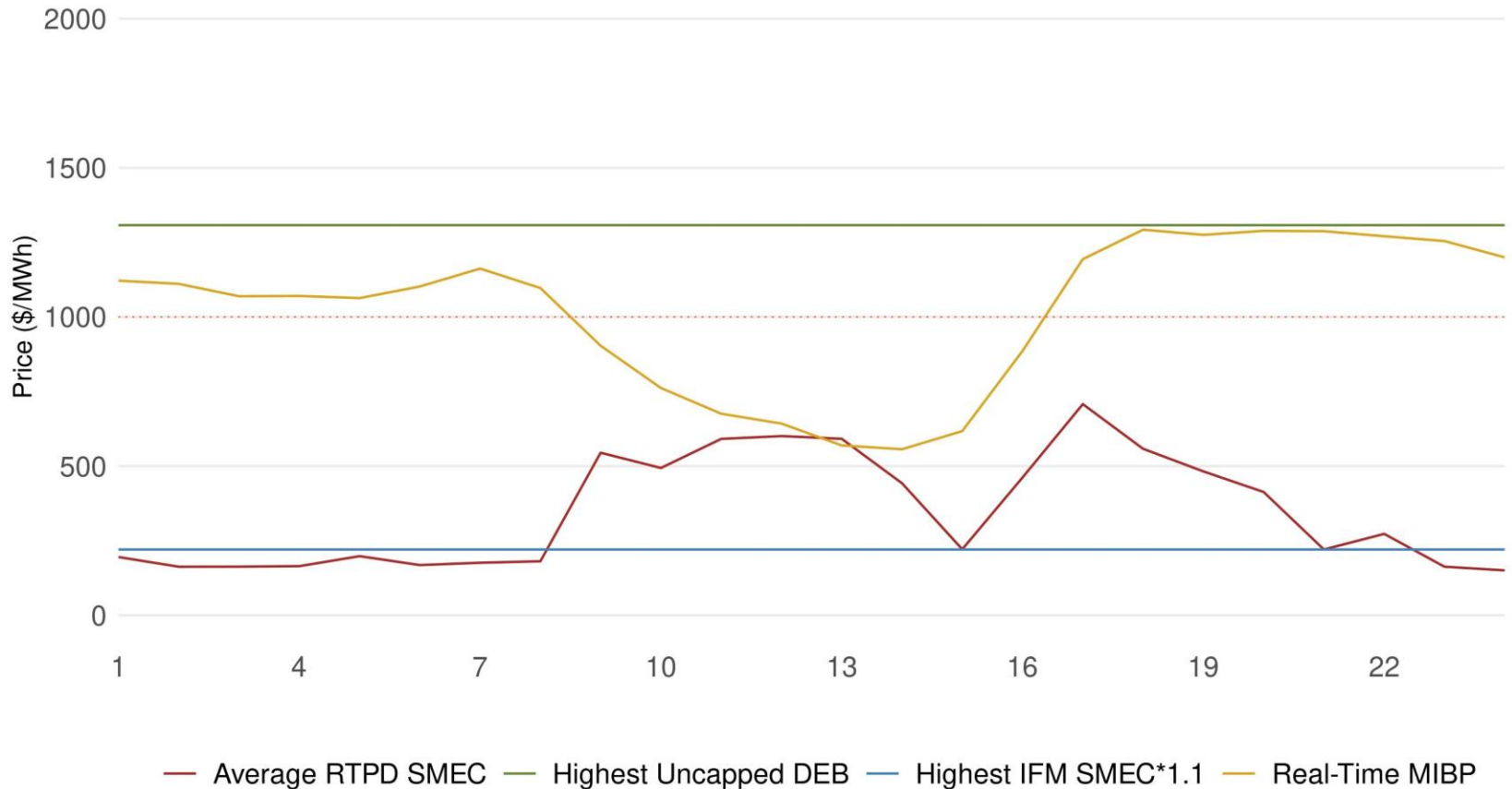
September 6 2022 RTPD prices follow the real-time MIBP trend, with peak hour prices above both the highest uncapped DEB and highest IFM SMEC*1.1



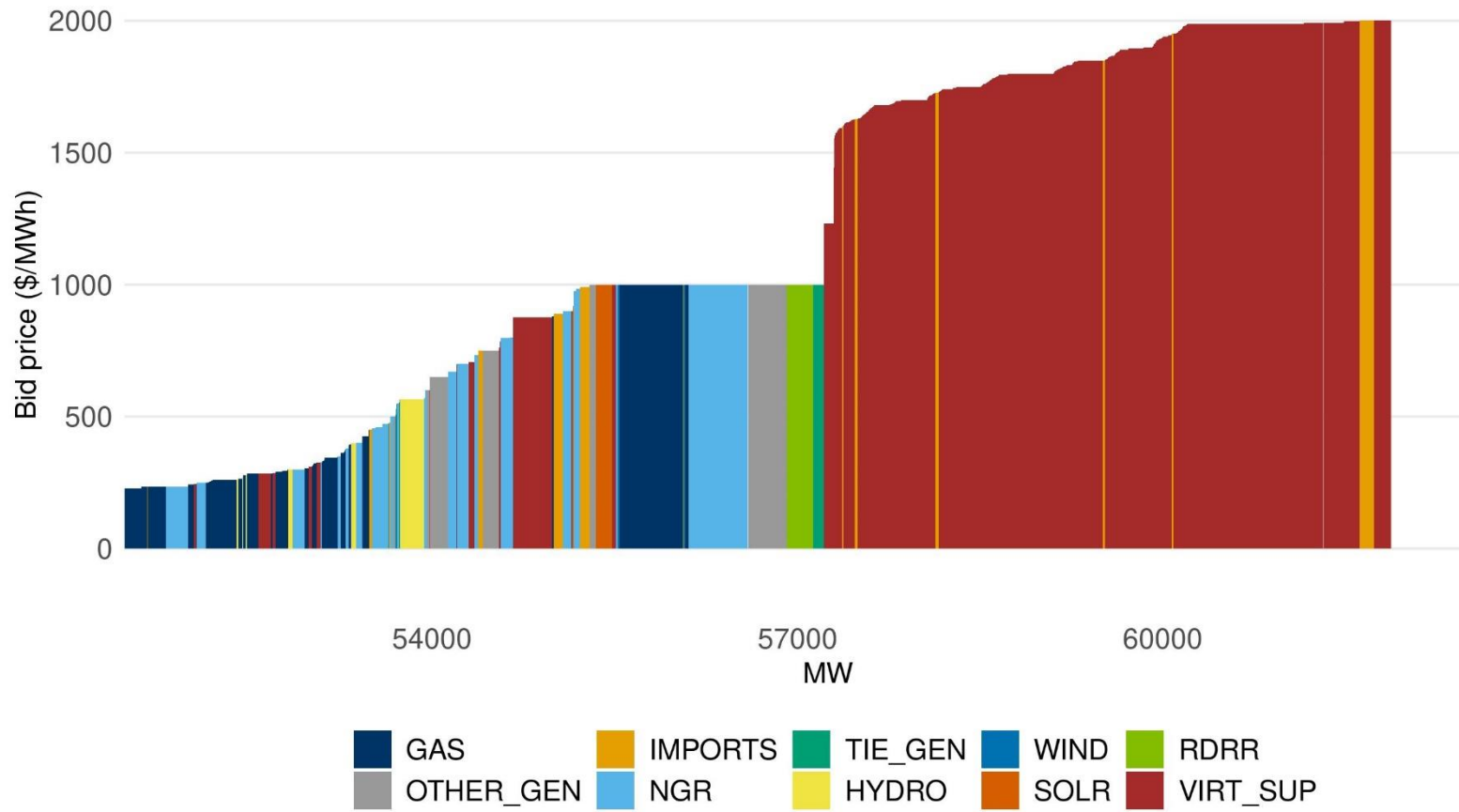
August 16 2023 RTPD prices also follow the real-time MIBP trend, and only rise above highest DEB and IFM SMEC*1.1 in one hour



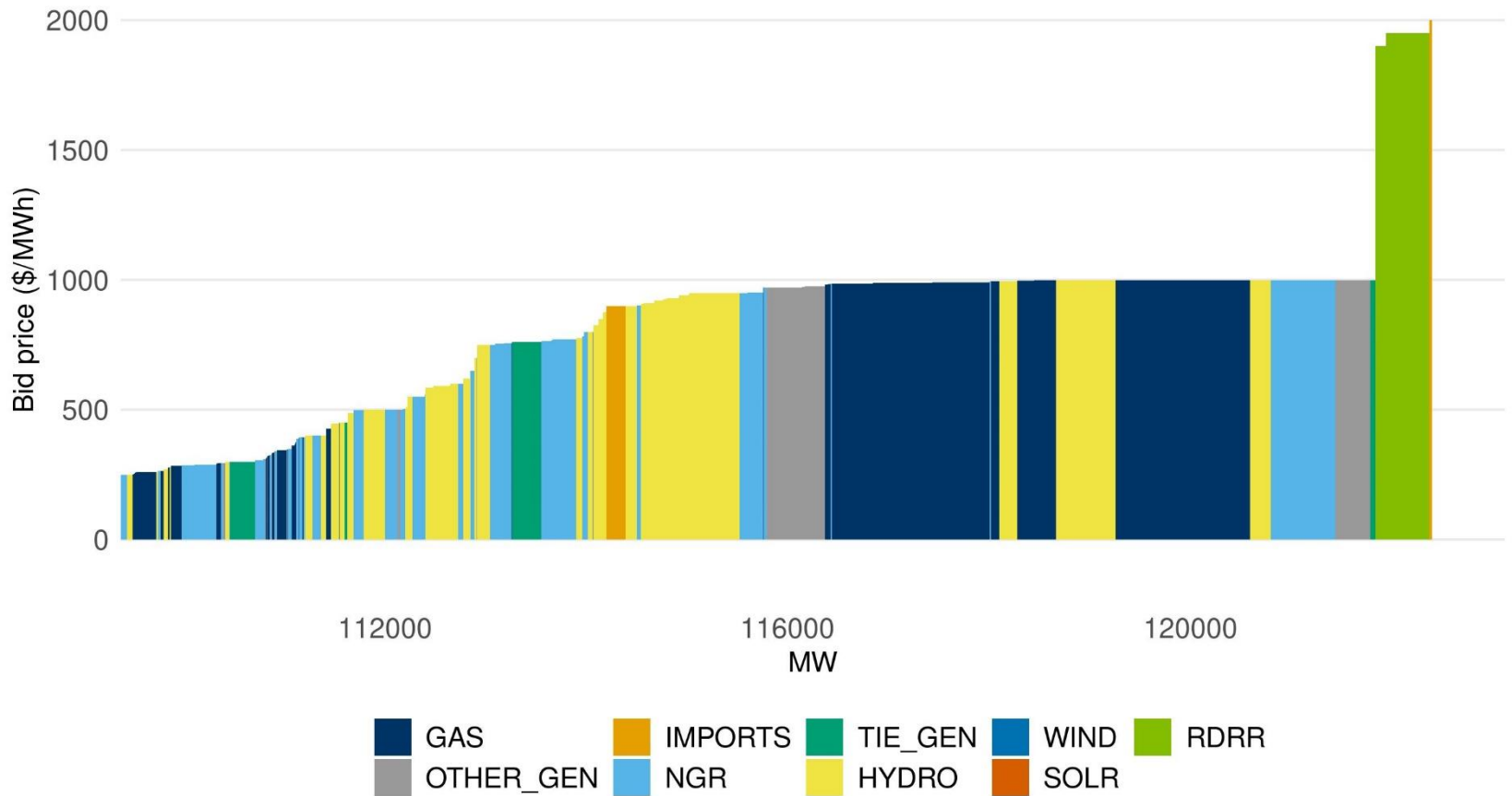
January 14 2024 RTPD prices are lower than most other charted parameters, while MIBP and uncapped DEB are set by high bilateral prices



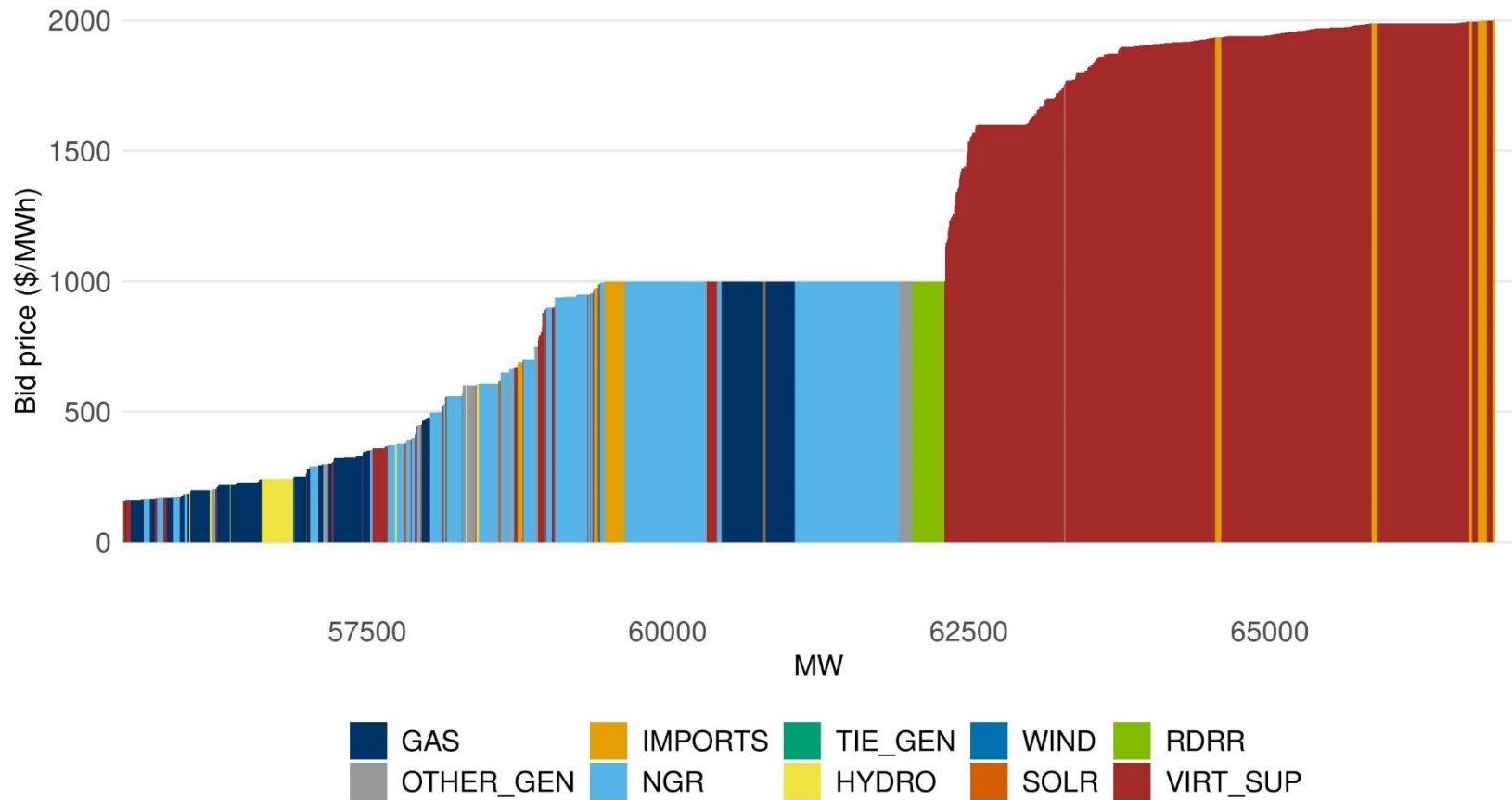
DAM bid price duration curve of 9/6/2022 HE19 shows some portion of NGR (storage) bidding up to the \$1000 cap



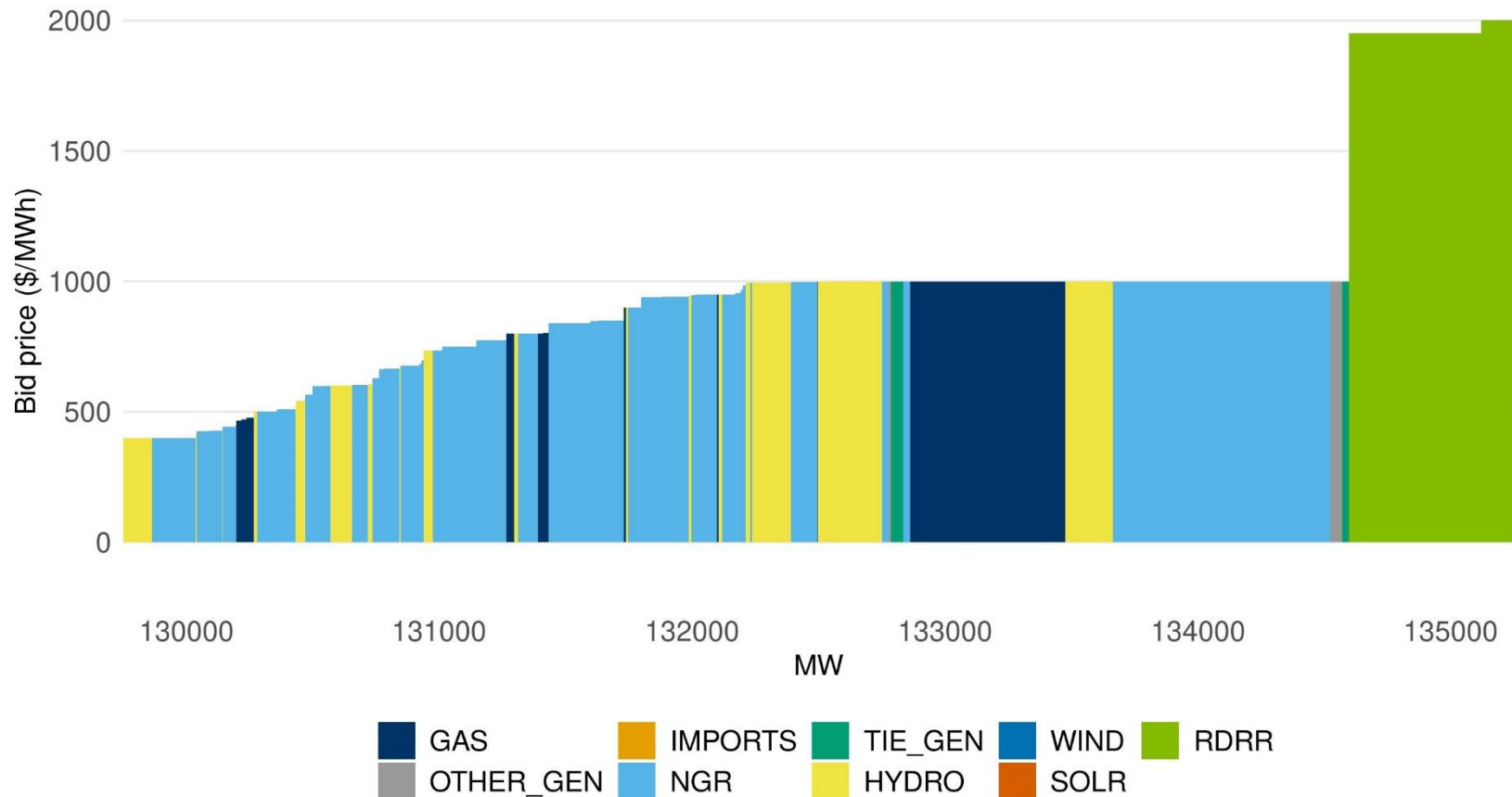
In RTM, bid price duration curve of 9/6/2022 HE19 shows larger quantity of hydro bidding to \$1000 cap as compared to DAM



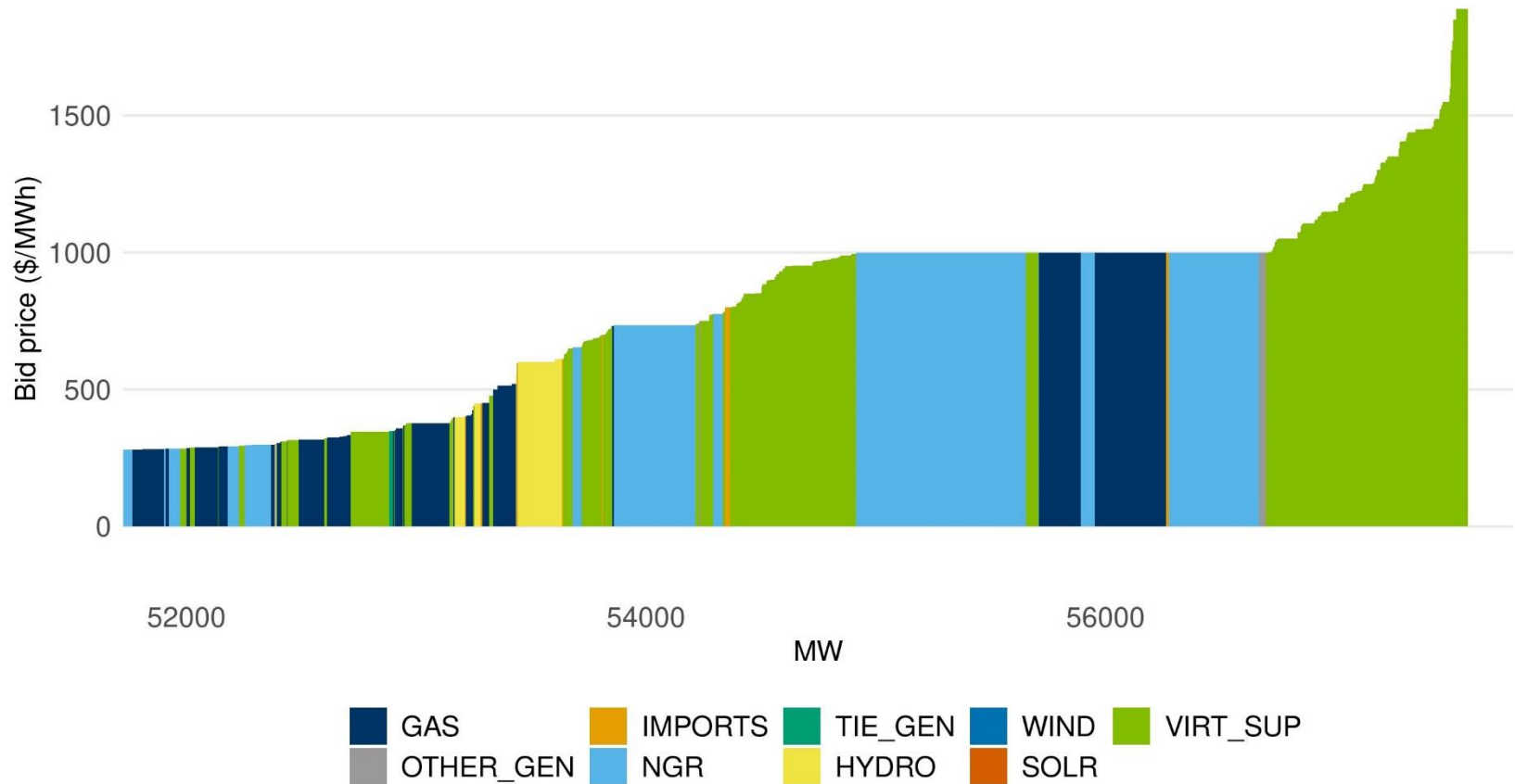
DAM bid price duration curve for 8/16/2023 HE19 shows higher quantity of NGR (storage) with bids at the \$1000 cap



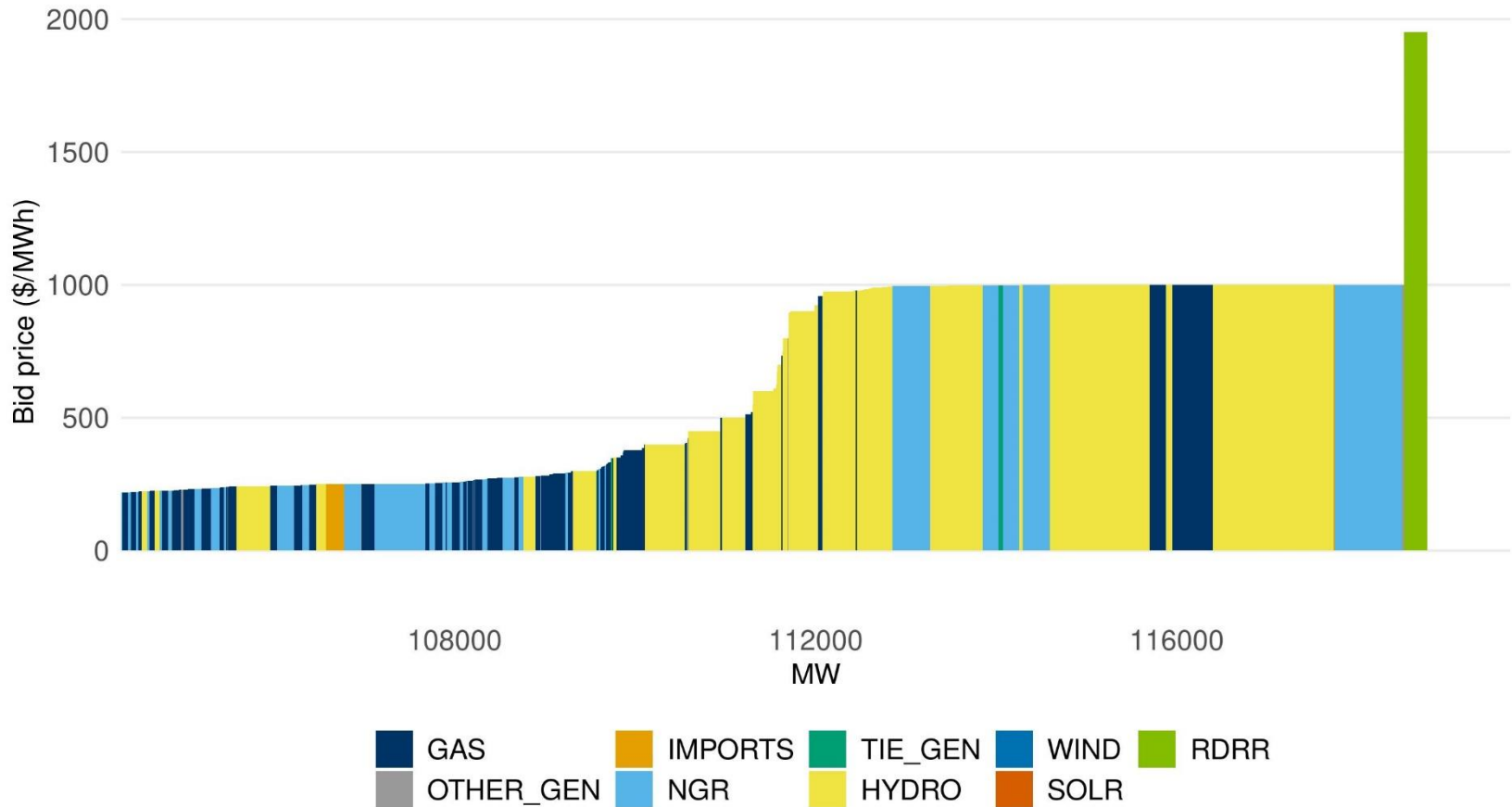
RTM bid price duration curve for 8/16/2023 HE19 shows larger quantities of storage and hydro bidding at or near the \$1000 cap



DAM January 14 2024 bid duration curve shows primarily NGR (storage), some gas and virtual supply bidding at \$1000 cap



RTM January 14 2024 bid duration curve yields larger quantity of hydro bidding at cap compared to DAM

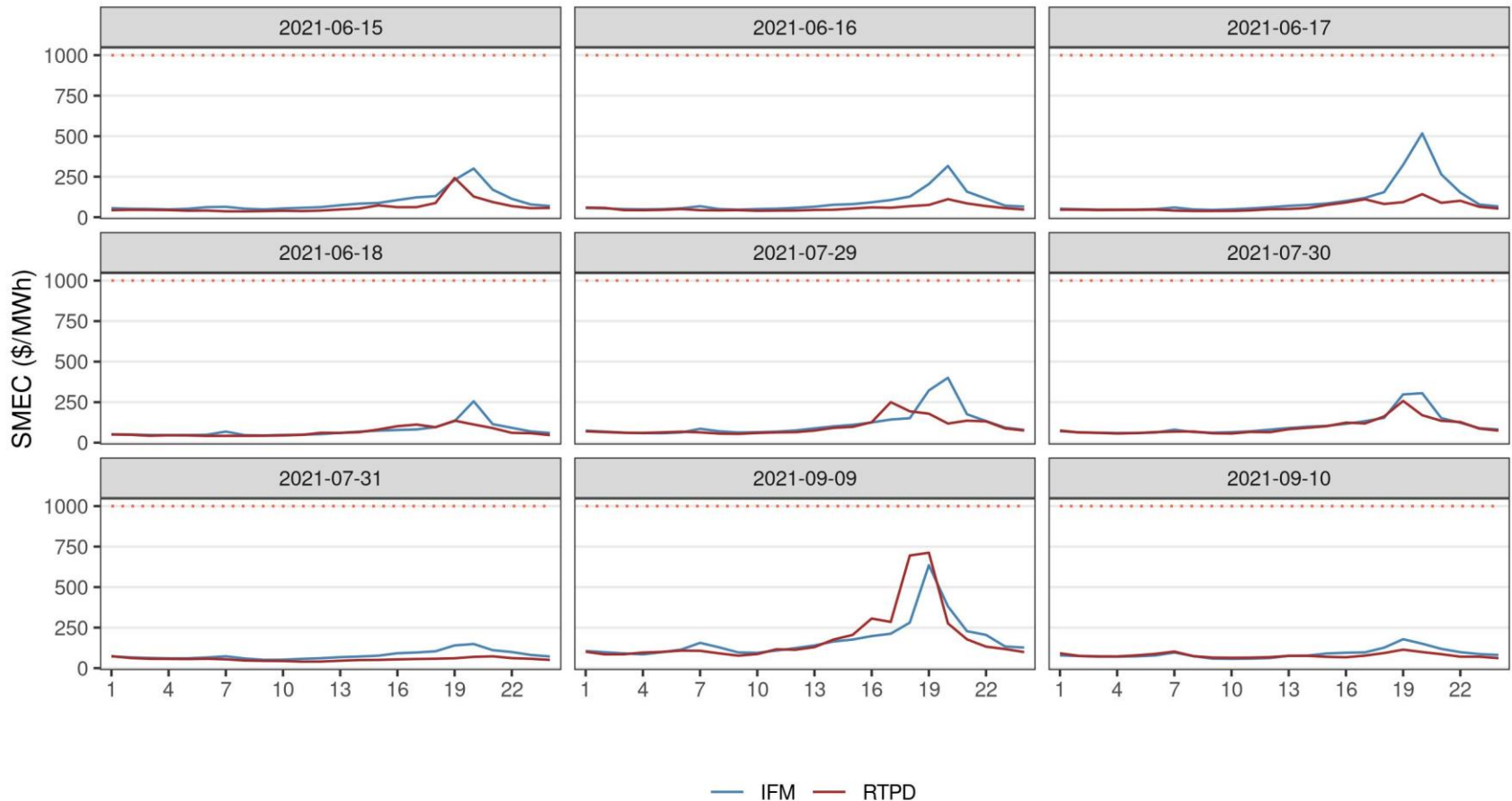


Scope of in-depth metrics covered

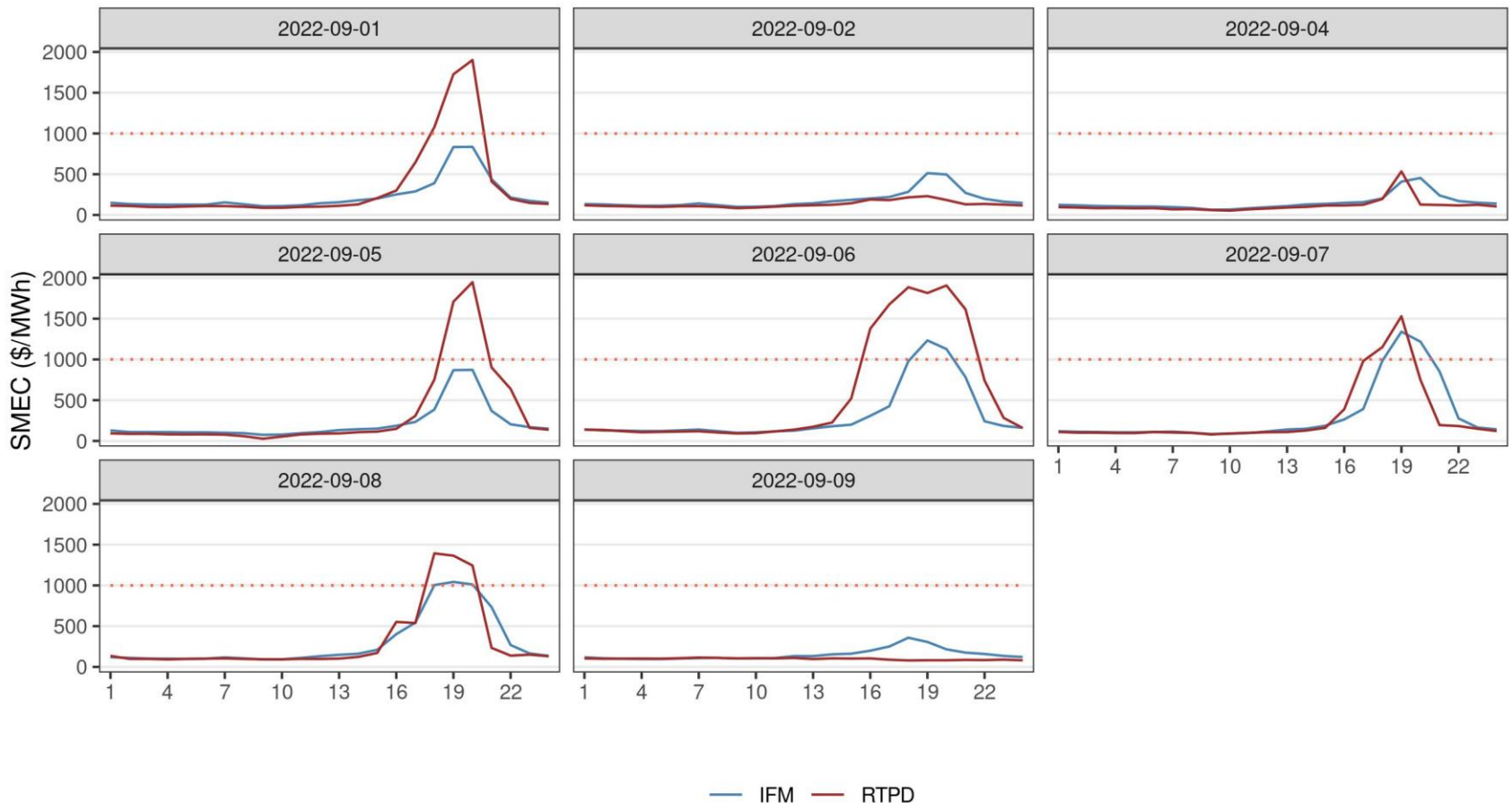
All metrics captured for days when the bid ceiling was raised to \$2,000/MWh (“831 day”)

- IFM SMEC vs. (average) RTPD SMEC
 - Gives a sense of how appropriate IFM SMEC may be as a proxy for a RT bid cap
- Real-time MIBP vs. (average) RTPD SMEC
 - Gives a sense of how appropriate RT MIBP may be as a proxy for a RT bid cap
- Counterfactual of uncapped real-time hydro and storage DEBs in box plot format

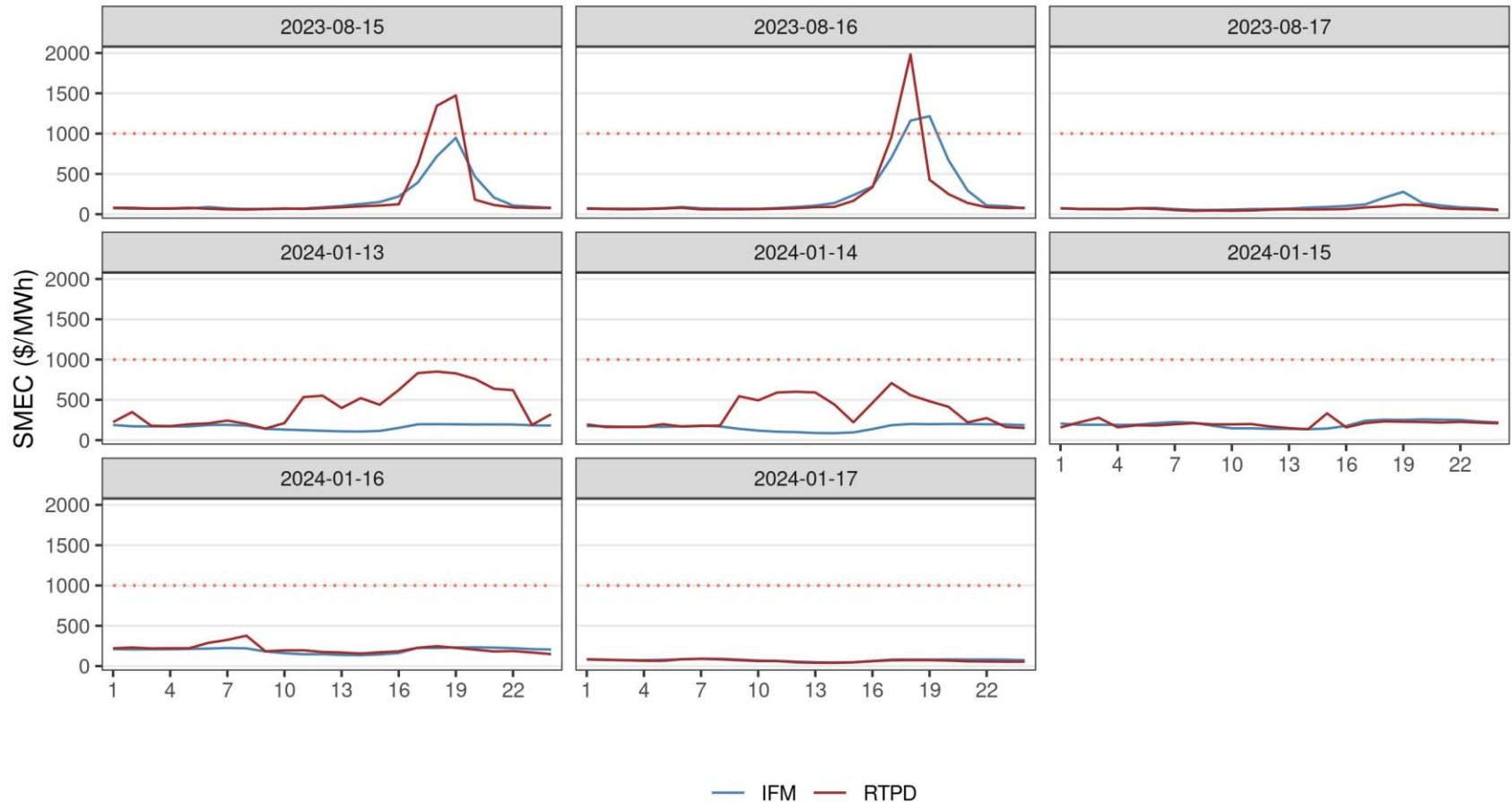
RTPD price excursions remained below \$1000 in 2021; IFM sometimes tracked high RTPD prices



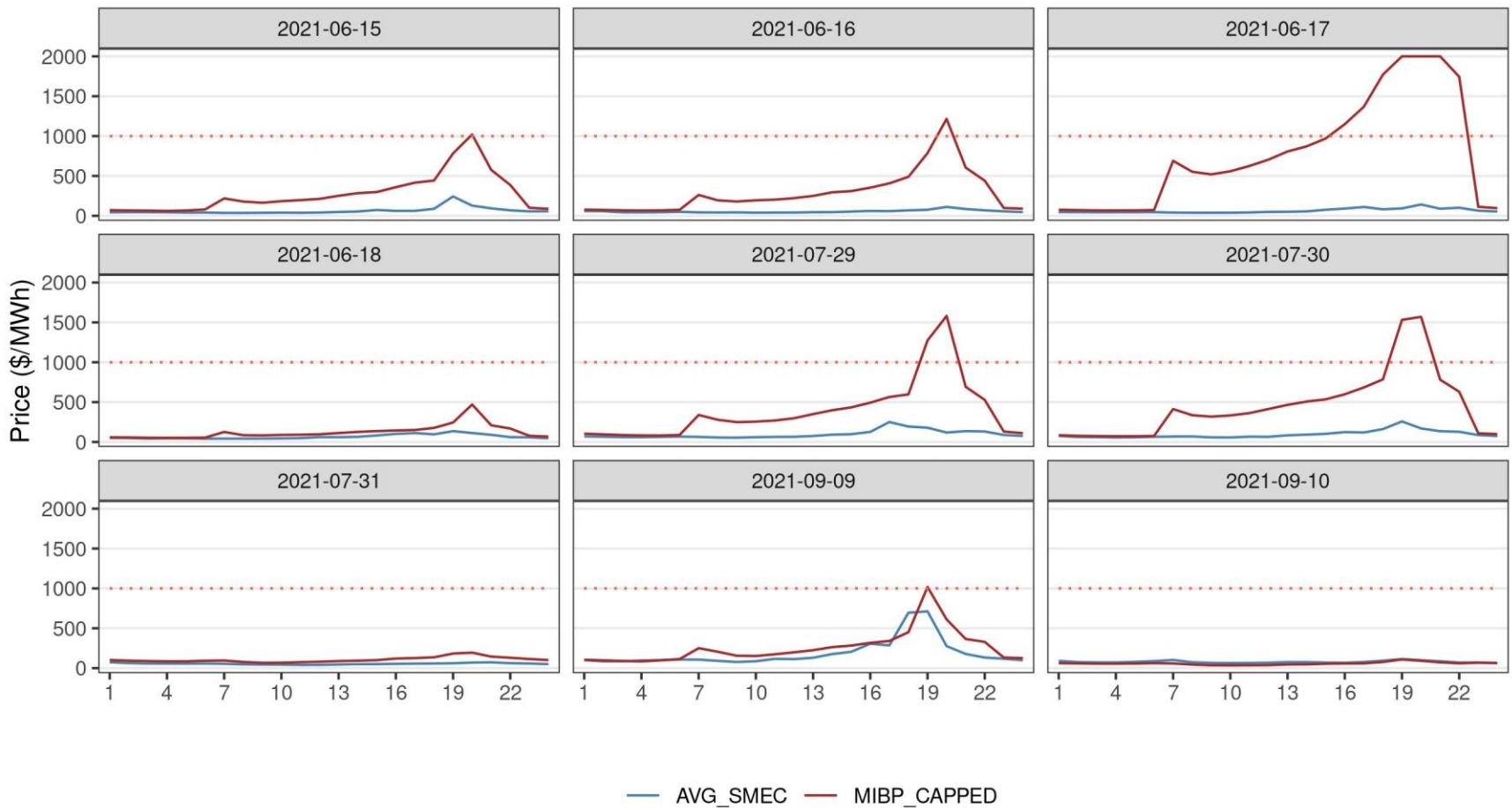
Both IFM and RTPD prices exceeded \$1000 during some periods of the Sept. 2022 heatwave, but for fewer hours in IFM than RTPD



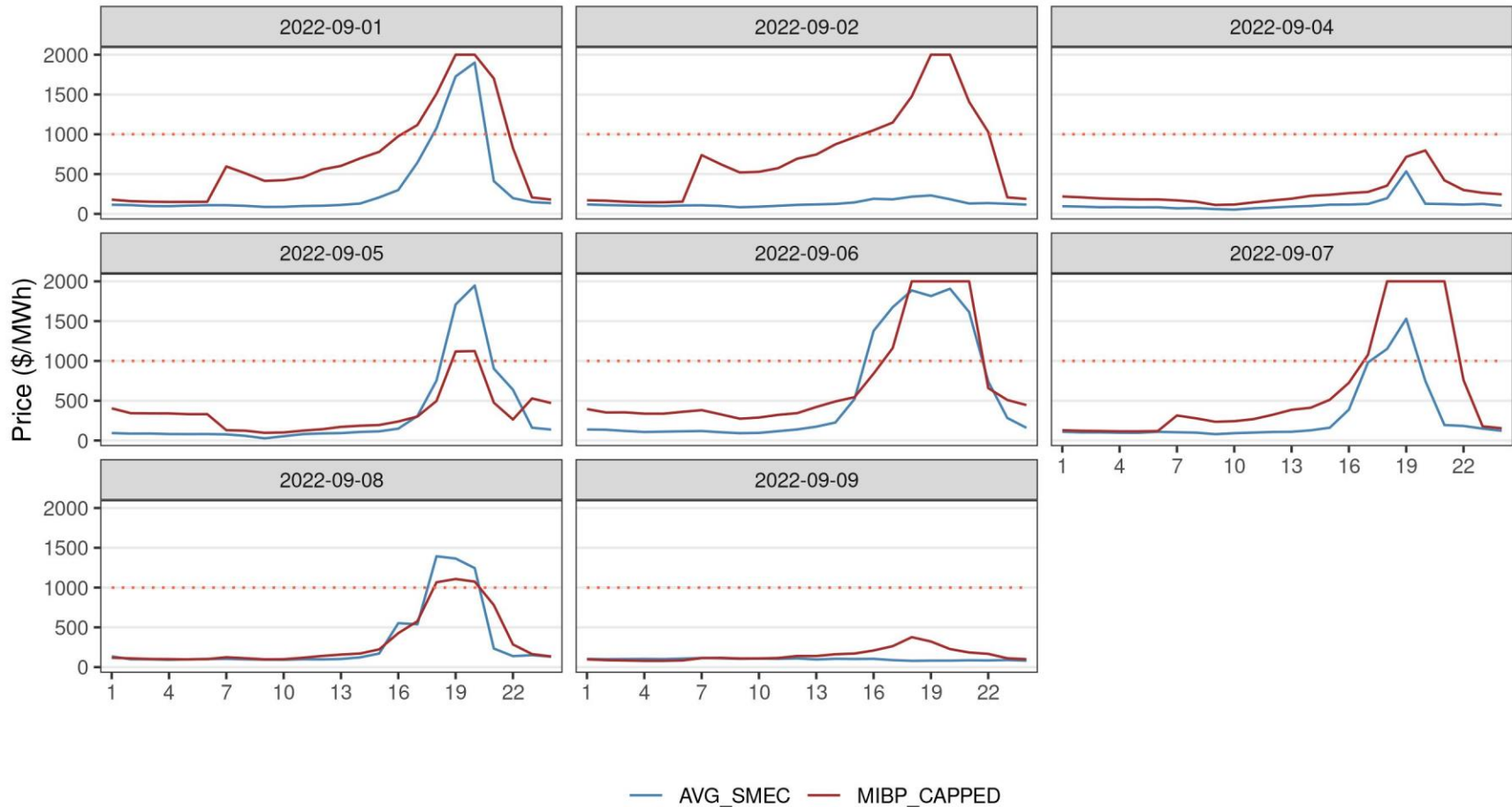
With the exception of August 16 2023, IFM SMEC was below \$1000 on all “831 days” in 2023 and 2024



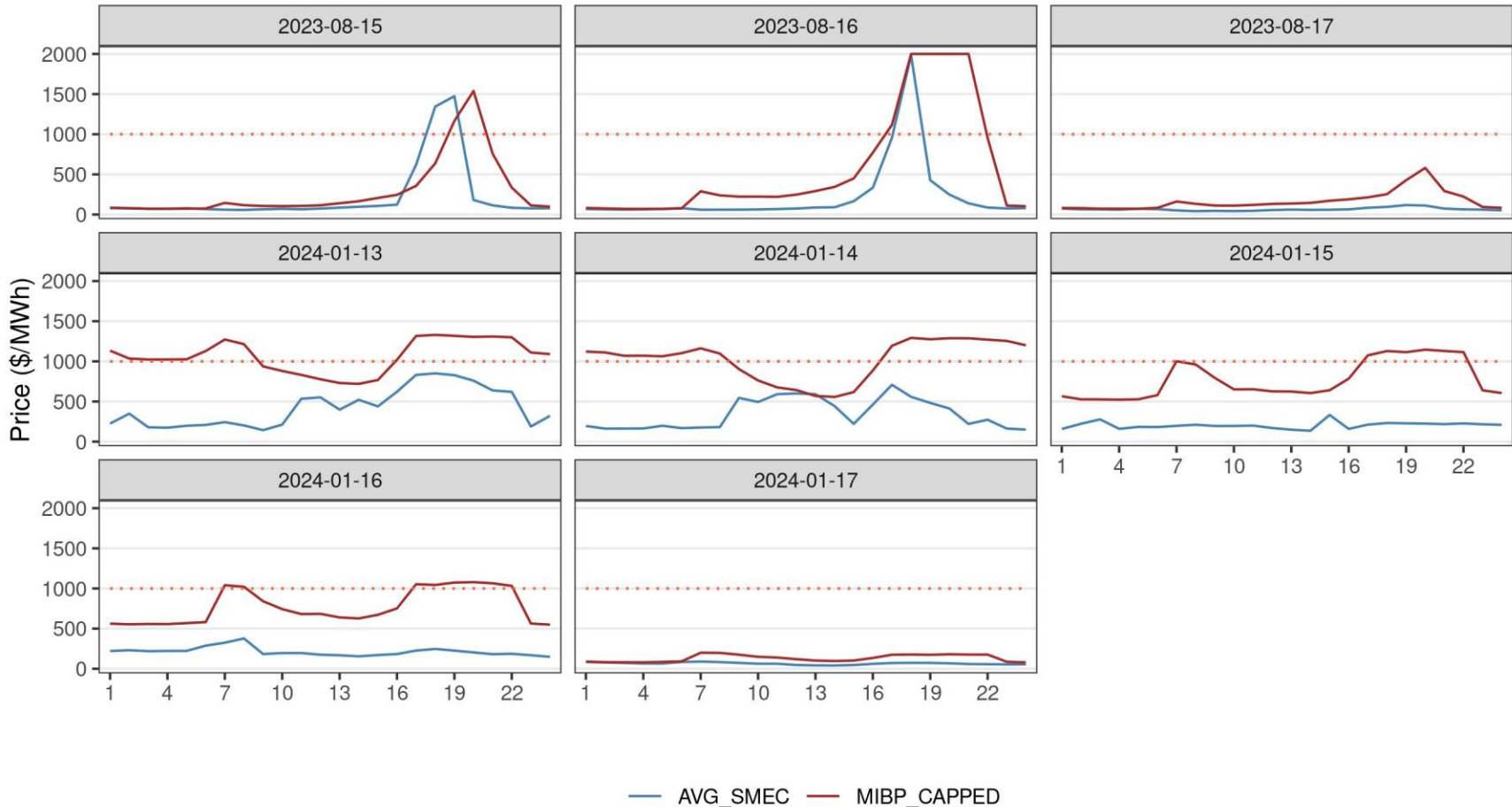
RT MIBP far exceeds average RTPD SMEC during many hours of the “831 days” in 2021



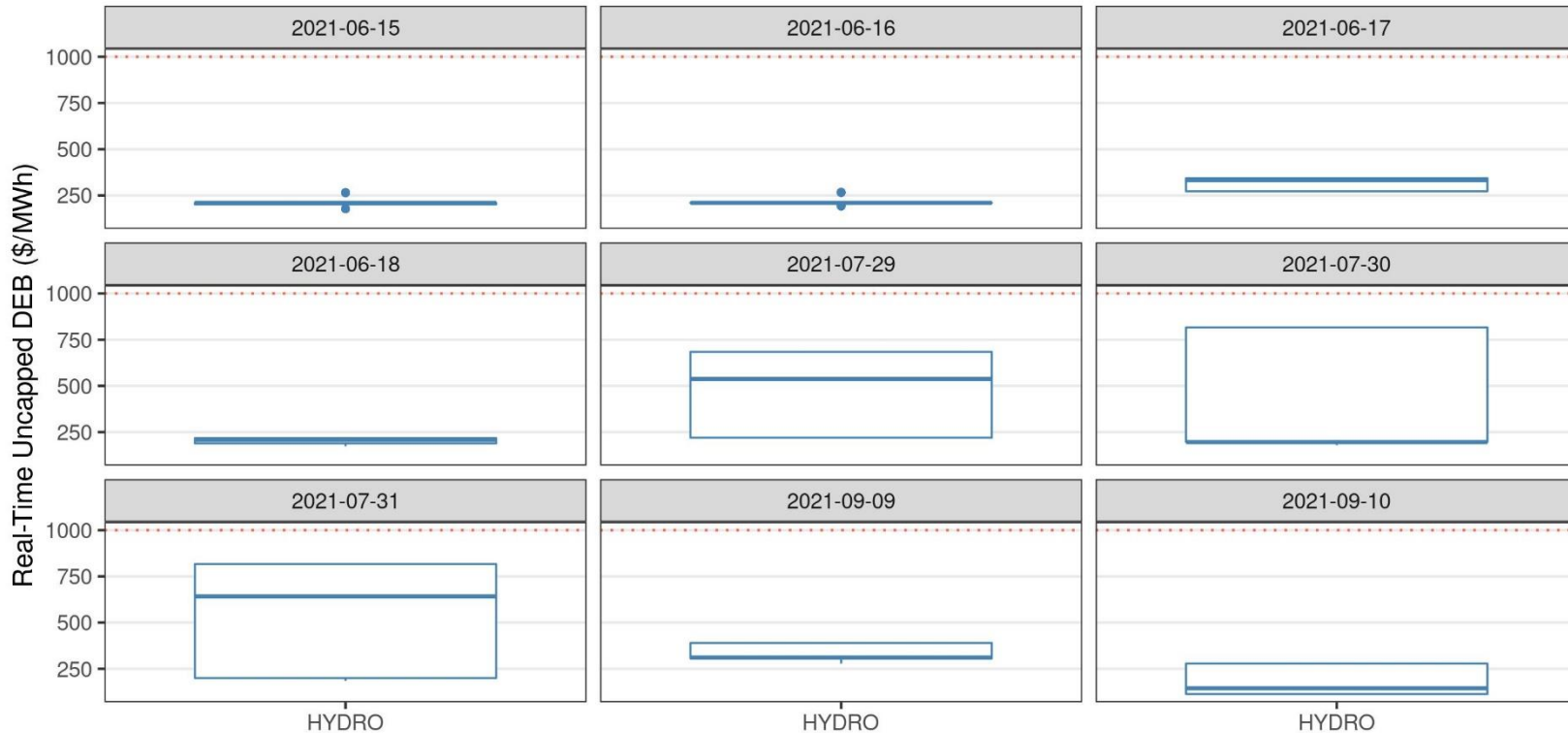
RT MIBP tracks RTPD SMEC more closely during specific September 2022 heatwave days



RT MIBP tracks RTPD SMEC closer during August 2023 heatwave days than during January 2024 cold snap days

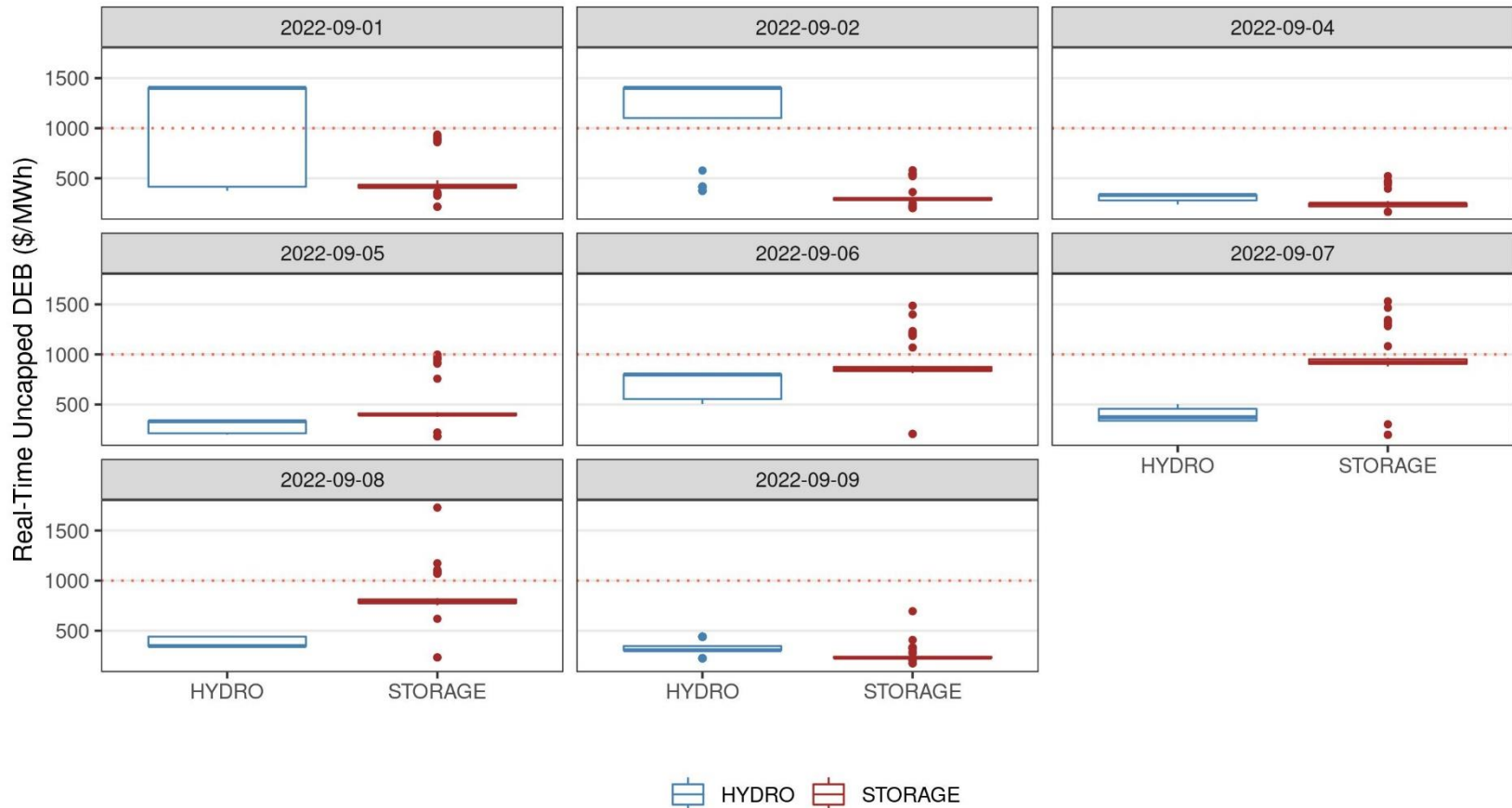


Counterfactual uncapped hydro DEBs would not have exceeded \$1000 during 2021 “831 days” (storage DEB not yet implemented)

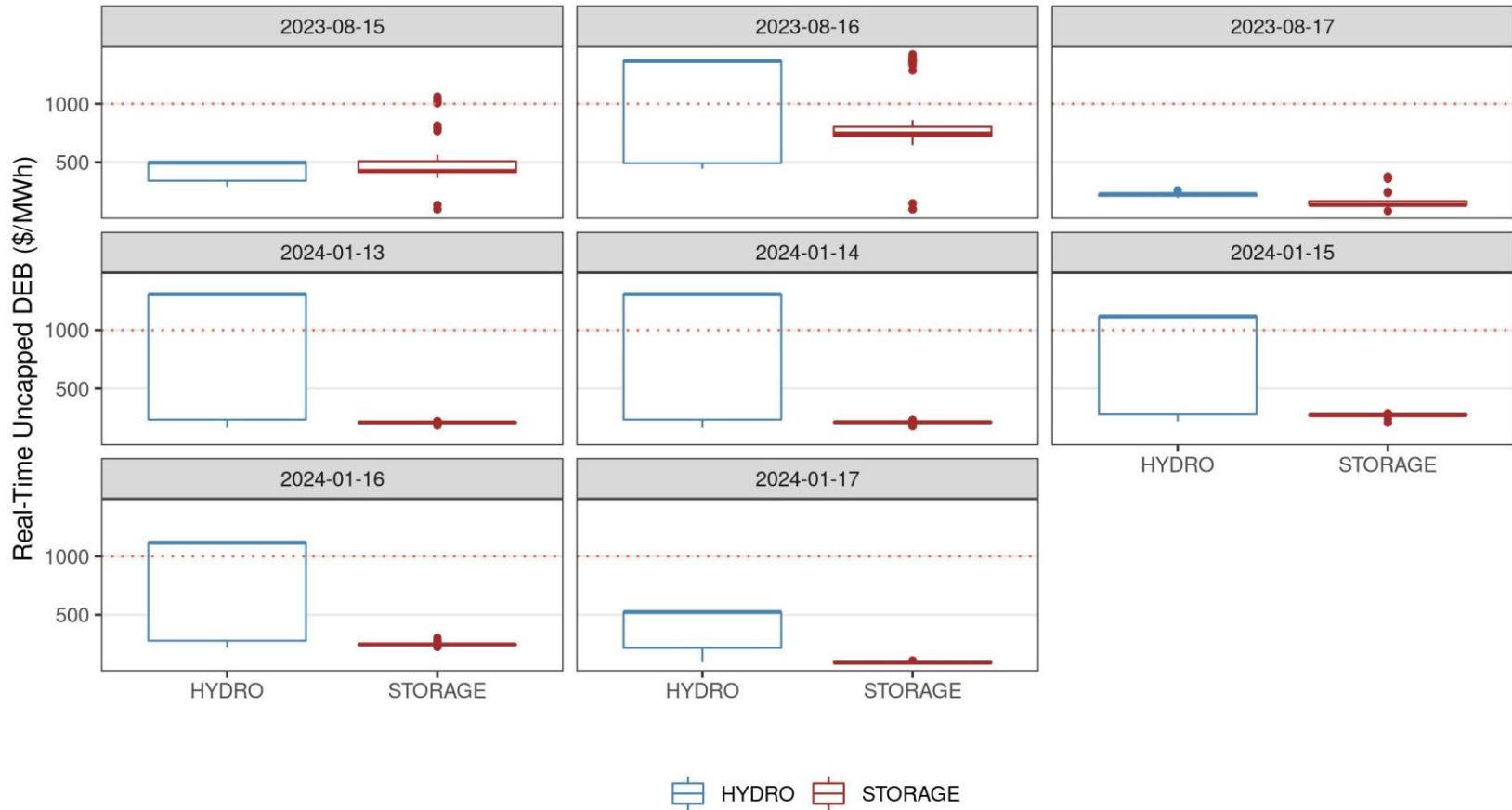


HYDRO

Some counterfactual hydro DEBs exceed \$1000 but not during peak Sept. 2022 heat wave days. Some storage DEBs would have exceeded \$1000 for a few resources



More instances of counterfactual hydro DEBs exceeding \$1000 during 2023/2024 days. Minimal storage DEBs above \$1000



For reference

- Visit Price Formation Enhancements Working Group initiative webpage for more information:
<https://stakeholdercenter.caiso.com/StakeholderInitiatives/Price-formation-enhancements>
- If you have any questions, please contact Brenda Corona at bcorona@caiso.com or isostakeholderaffairs@caiso.com



Energy Matters blog provides timely insights into ISO grid and market operations as well as other industry-related news

<http://www.caiso.com/about/Pages/Blog/default.aspx>.



April 15, 2024
Inside the ISO, Markets

Working groups playing key role in policy development

At the California Independent System Operator, we value the views of stakeholders and take a variety of steps to make sure they are integrated into our market design and transmission planning efforts. Over the past couple of years, we have looked for opportunities to enhance our engagement practices to give them more meaningful input at all ...

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New Resource Implementation Meeting

We will host a hybrid New Resource Implementation (NRI) stakeholder meeting on May 1, 2024.

If you plan to attend the in person, please [register](#) by end of day 26, 2024. [Virtual registration form](#)

The final agenda and a presentation will be available prior to the meeting on the [public forums webpage](#).



SAVE THE DATE

2024 STAKEHOLDER SYMPOSIUM

OCT. 30, 2024
SACRAMENTO, CA

The California ISO Stakeholder Symposium will be held on Oct. 30, 2024 at the Safe Credit Union Convention Center in Sacramento, California.

A welcome reception for all attendees will be held the evening of Oct. 29.

Additional information, including event registration and sponsorship opportunities, will be provided in a future notice and on the ISO's website.

Please contact Symposium Registration at symposiumreg@caiso.com with any questions.





A new **caiso.com** is coming in late May

Training sessions will be held on
May 23 from 9:00 a.m. – 10:00 a.m.
May 29 from 10:00 a.m. – 11:00 a.m.

Watch the Daily Briefing for details and
follow us on social media.