Price formation enhancements: rules for bidding above the soft offer cap straw proposal discussion

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Problem Statement

Energy storage and hydro resource bids and DEBs are limited to the $1000 soft offer cap, which may not provide these resources with sufficient flexibility to reflect opportunity costs in conditions when the energy bid cap is raised to $2000

Problem Statement impacts

- Absent defined opportunity costs above $1000, these resources' cannot successfully verify and reflect those costs in the market.

- Limited energy resources may be dispatched inefficiently early, putting downward pressure on prices leading up to a shortage.

- This could lead to increased reliance on manual actions and/or use of operational constraints.

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

- Today, resource-specific resource bids in ISO markets are capped by the higher of
  - $1000 or
  - That resource's verified cost-based incremental energy offer represented by the DEB, which is also capped at $1000

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

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 capture the distinct opportunity costs of certain resource types
  - The storage DEB option defines opportunity costs using nodal specific LMPs from the day ahead market
  - The hydro DEB option defines opportunity costs as bilateral buying power in the short, medium, and long-term

- SCs can also negotiate a DEB through the Department of Market Monitoring if the DEB options offered don't provide sufficient flexibility to reflect resource specific costs

The Hydro DEB Option

Hydro DEB = MAX[gas floor, short term component, long term component]	
The **gas floor** represents the opportunity cost for the hydroelectric generator to sell electricity generated from a gas resource instead of the hydro resource	110% * [gas generator heat rate * fuel region gas price]
The **short-term component** represents the opportunity cost of sales at the local wholesale electric pricing hub with a 140% multiplier	140% * MAX[DA power price index, Balance-of-month power price index, month ahead power price index]
The **long-term component** represents the opportunity cost of sales at the default and additional electric pricing hubs over future months of the storage horizon.	110% * MAX[DA power price index, Balance-of-month power price index, month ahead power price index]

The Storage DEB Option

MAX{MAX(Energy charging duration/round-trip efficiency, 0) + variable storage operations cost], price-based opportunity cost} * 110%	
Energy cost, using DA LMP prices at the relevant PNode	Estimate of the average cost of energy needed to charge the storage resource
Round-trip efficiency	Ratio of energy put into and retrieved from the resource
Energy charging duration	Hours are used in the opportunity cost component
Variable storage operational costs	Cycling and degradation
Price-based opportunity costs	Market opportunity costs when determining whether to discharge storage energy at various hours during the day
DEB multiplier **[110%]**	Intended to cover variability between the CAISO's calculation of the storage DEB and the resource's actual marginal costs

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

- ISO 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.

The automated RLCR process is intended to accommodate most hourly deviations between actual and expected costs

- Both the manual and automated RLCR processes give SCs the ability to request an adjusted DEB
- The DEB is a single value calculated pre-market, but some variation throughout the day is expected
- The automated RLCR process offers automated review and validation of requests
  - SCs still have to retain supporting documentation and are subject to audit but
  - Changes can be made at any time through SIBR and would be immediately validated or rejected

- Stakeholders support enhancements to the RLCR process to facilitate DEB adjustments for non-gas resources, but these proposals are not feasible for summer 2024.

Stakeholders propose modifications to the bid cap logic to allow resources to bid above their DEBs

- Today, bids above $1000 are capped by the higher of the $1000 soft offer cap and the resource's DEB, which is capped at $1000.

- Stakeholders recommend modifying this logic in real-time so that bids above $1000 are capped by the higher of $1000, the DEB, and:
  - $2,000/MWh when the bid cap is raised to $2,000/MWh,
  - 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)
  - The higher of the highest value of MIBP calculated for real-time and highest cost-verified offer received/calculated over the entire day

Stakeholders propose modifications to the bid cap logic to allow resources to bid above their DEBs

- Stakeholders recommend removing the cap on the DEB so that bids above $1000 are capped by the higher of the $1000 soft offer cap, [some additional logic] and the uncapped DEB.
  - This would apply to all resources, in both DA and RT

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

Policy considerations

- These proposals do not modify DEB calculations. If subject to market power mitigation,
  - DEBs would reflect costs as defined by today's policies
  - the risk of premature depletion of storage/hydro capacity would not be resolved

- Removing the 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
1. Remove the $1000 cap on all DEBs • 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	2. Highest value of the real-time max import bid price (MIBP) • Apply to resources with opportunity-cost-based DEBs	Pro: Recommended by and supported by most stakeholders Cons: Some stakeholders are concerned about the liquidity of bilateral indexes and accuracy and shaping factors of the MIBP calculation itself.
	3. The highest day-ahead marginal energy cost (MEC) • Apply to resources with opportunity-cost-based DEBs	Pro: Opportunity cost estimate is based on a more liquid market result, and an hourly granularity improves precision. Con: Additional technology complexity and implementation risk.

831 BID CAP ANALYSIS

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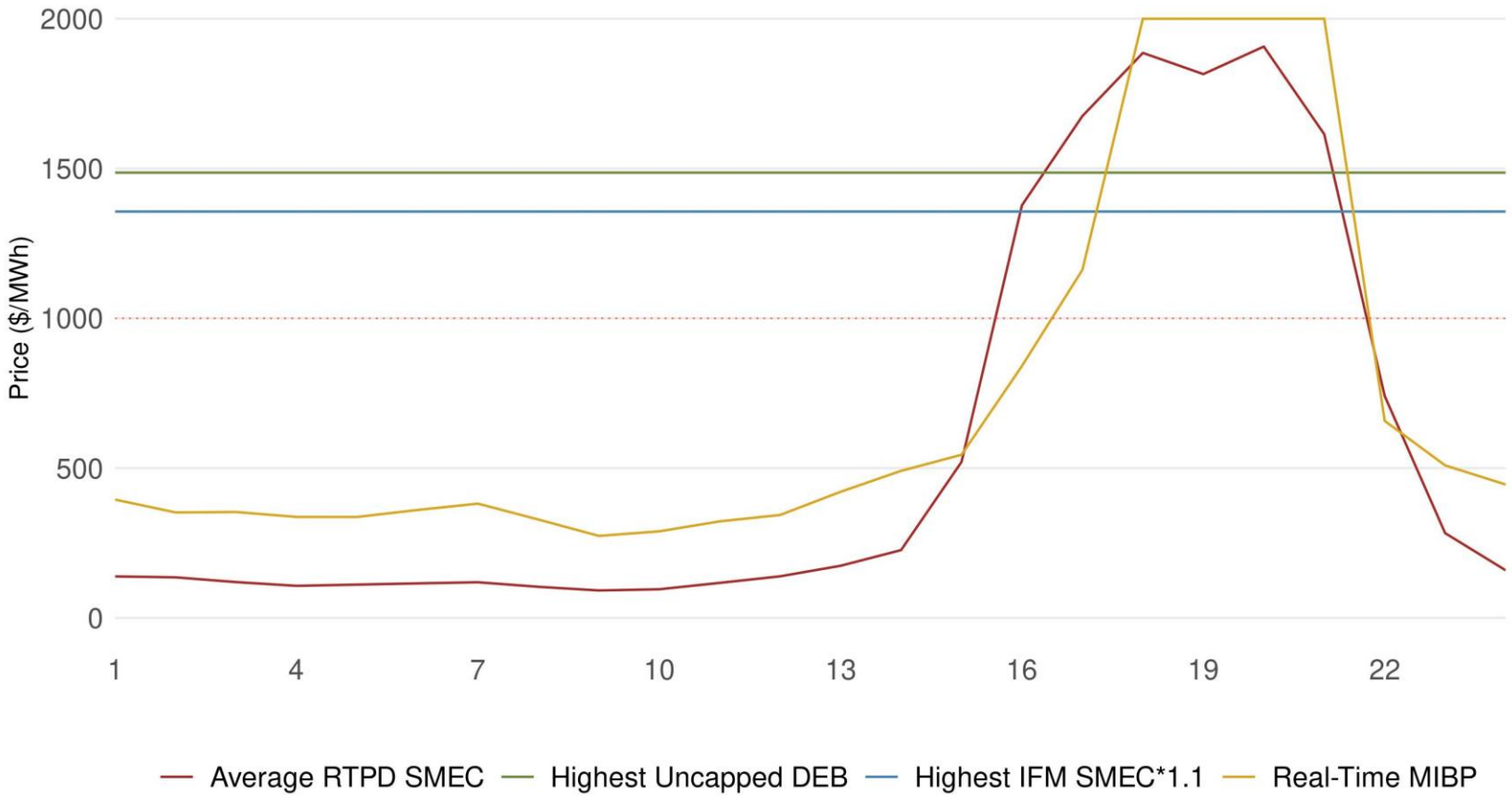
Scope of high-level metrics covered

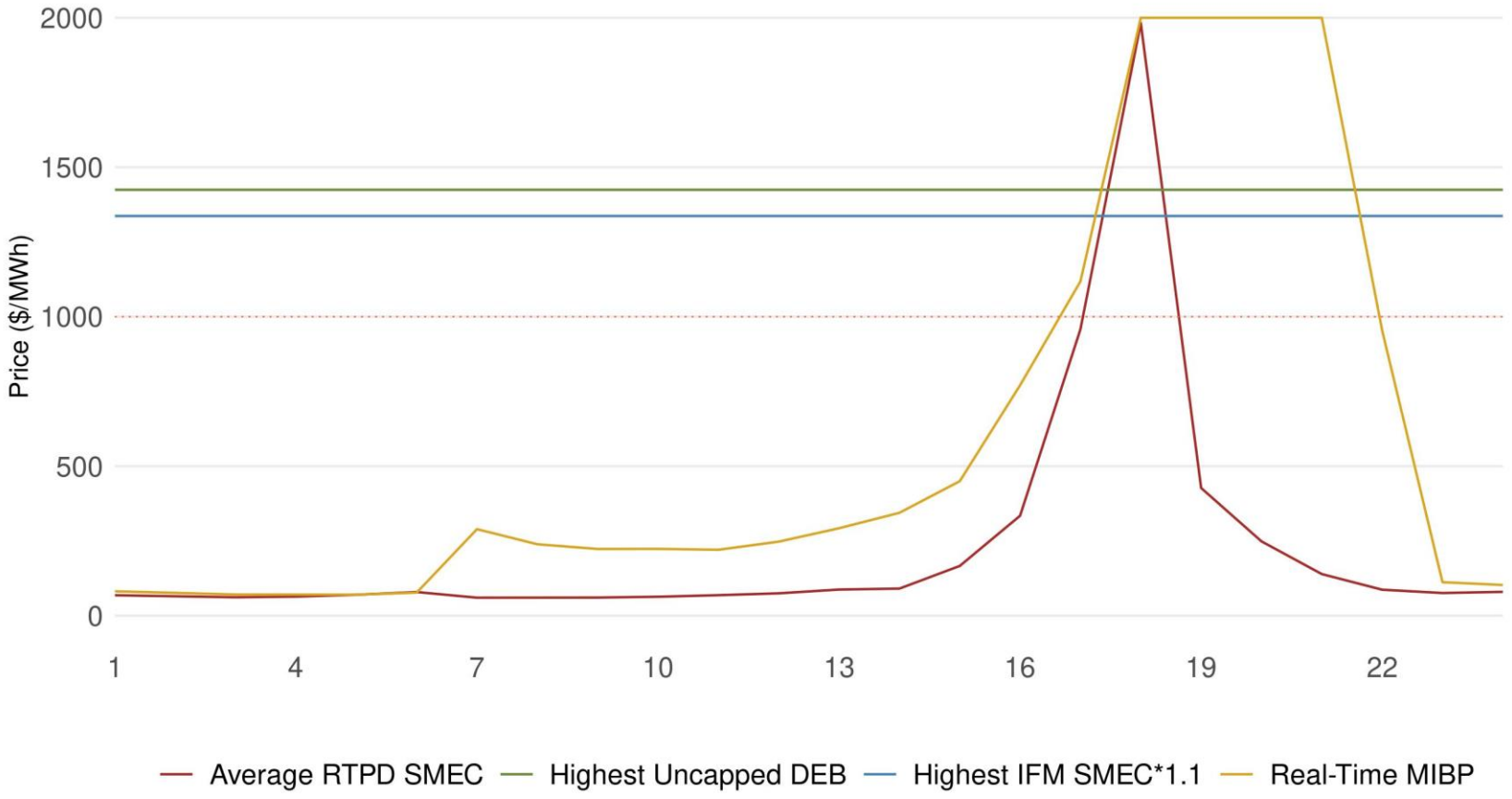
Metrics are captured for a smaller subset of days when the bid ceiling was raised to $2,000/MWh ("831 days")

- 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

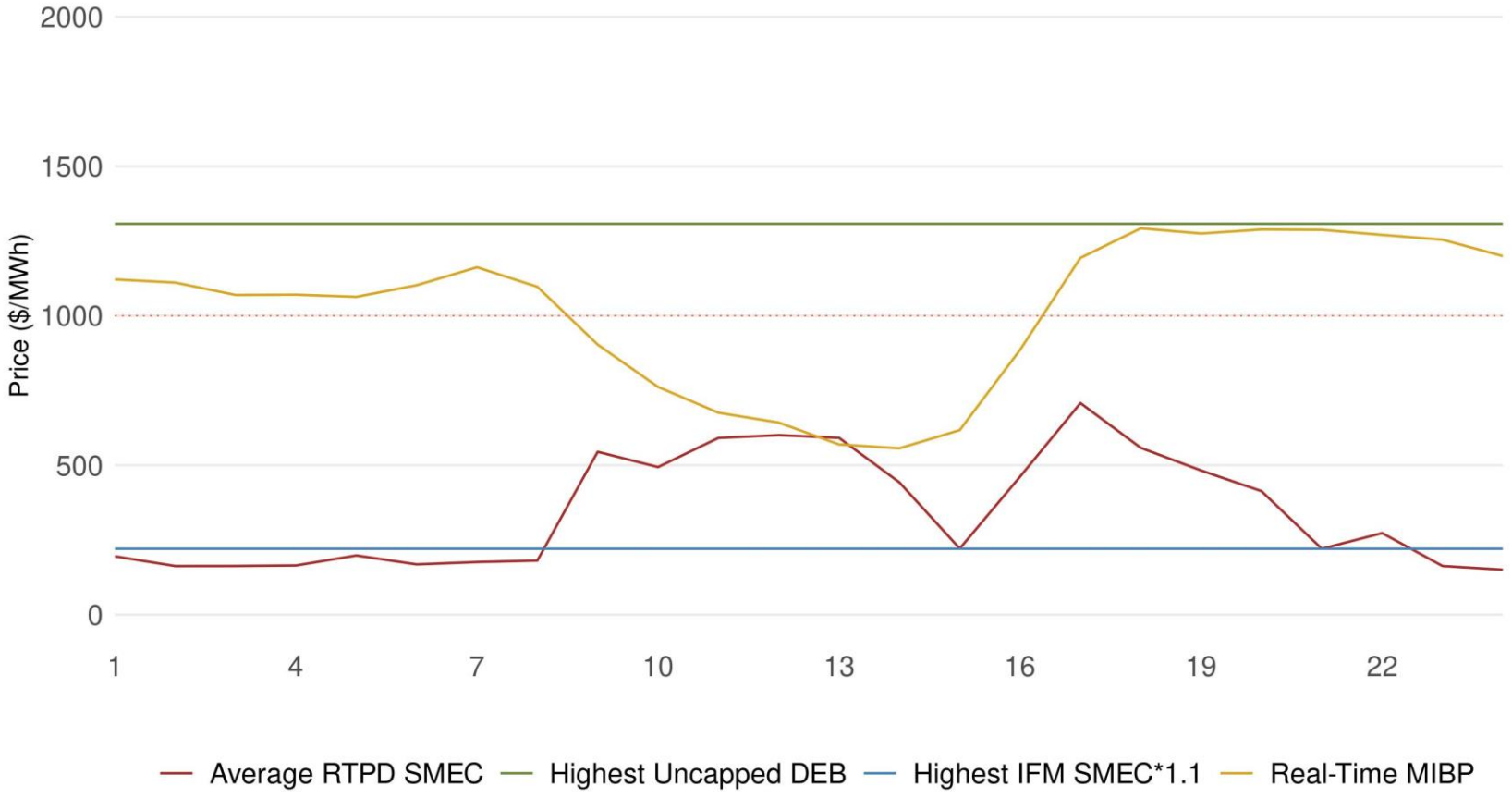
September 6 2022 RTPD prices follow the real-time MIBP trend, with peak hour prices above both the highest uncapped DEB and highest IFM SMEC*1.1



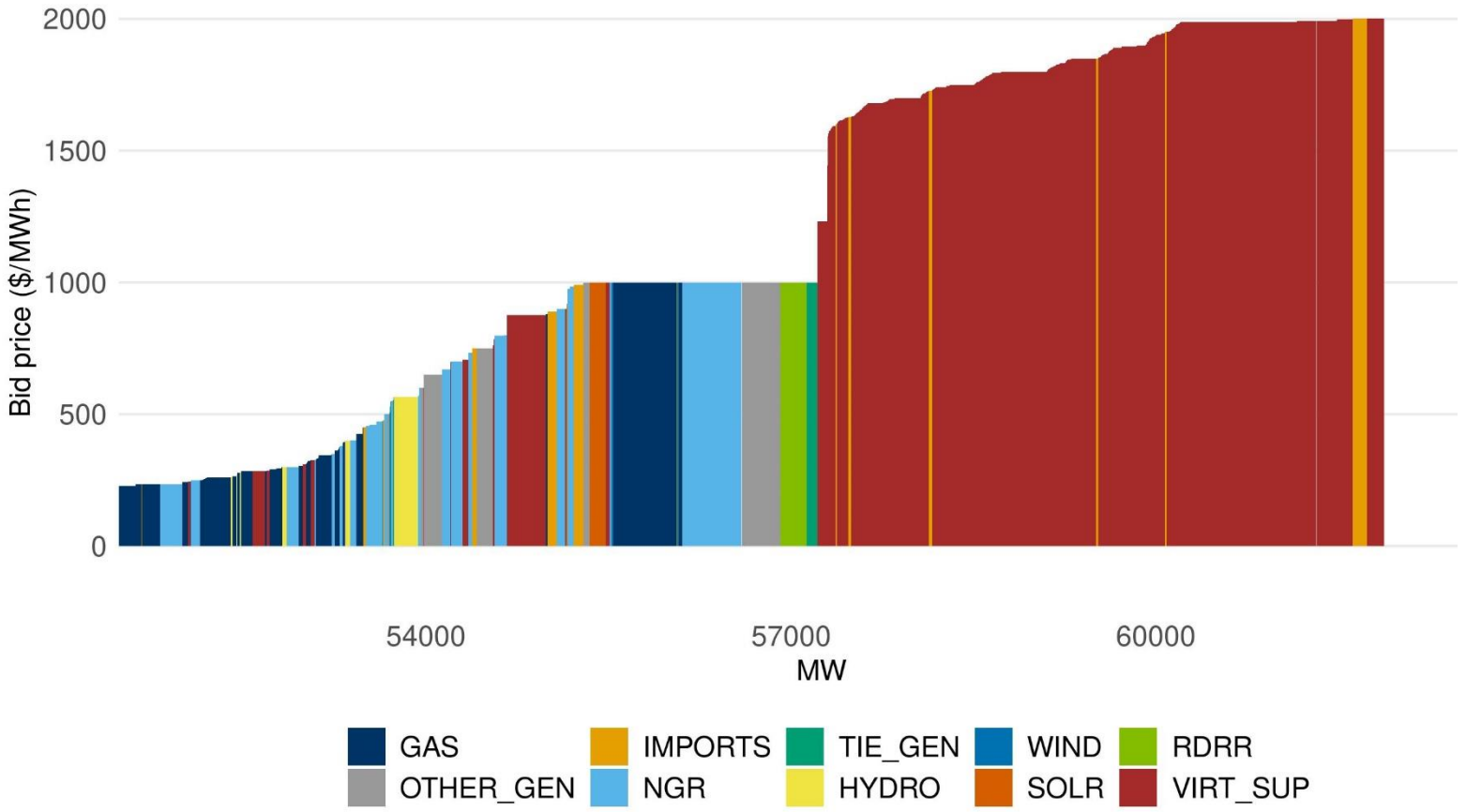
August 16 2023 RTPD prices also follow the real-time MIBP trend, and only rise above highest DEB and IFM SMEC*1.1 in one hour



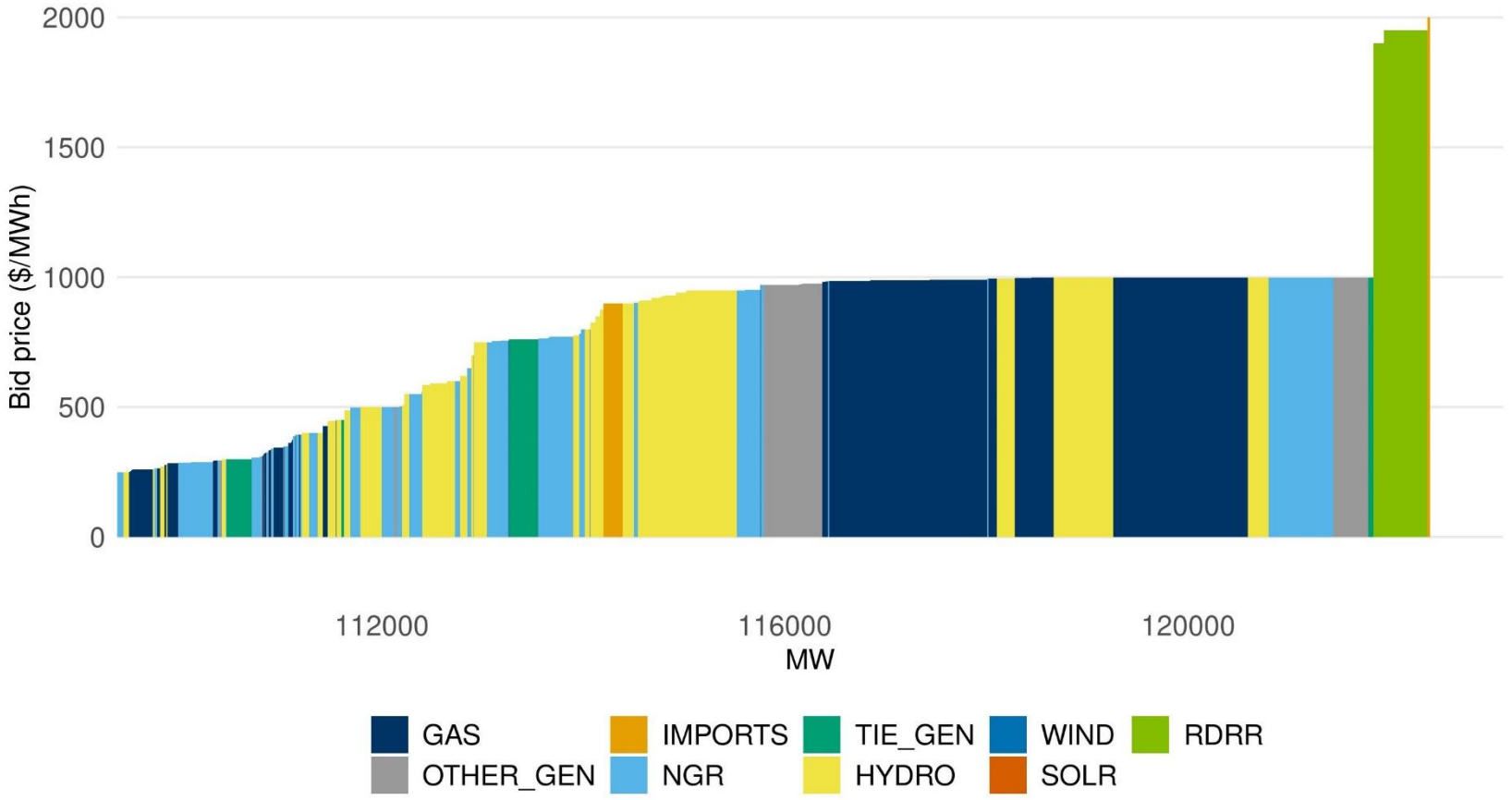
January 14 2024 RTPD prices are lower than most other charted parameters, while MIBP and uncapped DEB are set by high bilateral prices



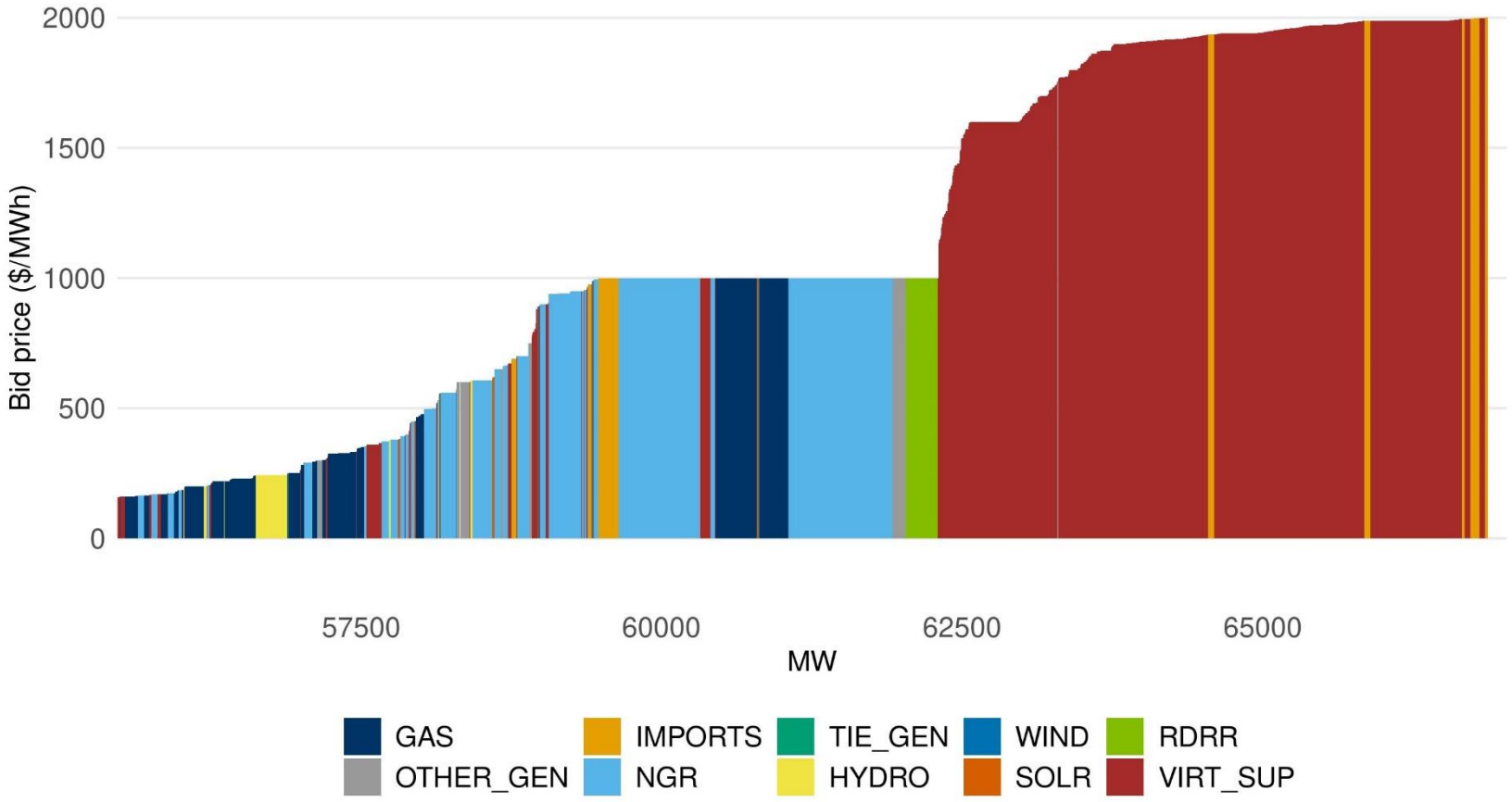
DAM bid price duration curve of 9/6/2022 HE19 shows some portion of NGR (storage) bidding up to the $1000 cap



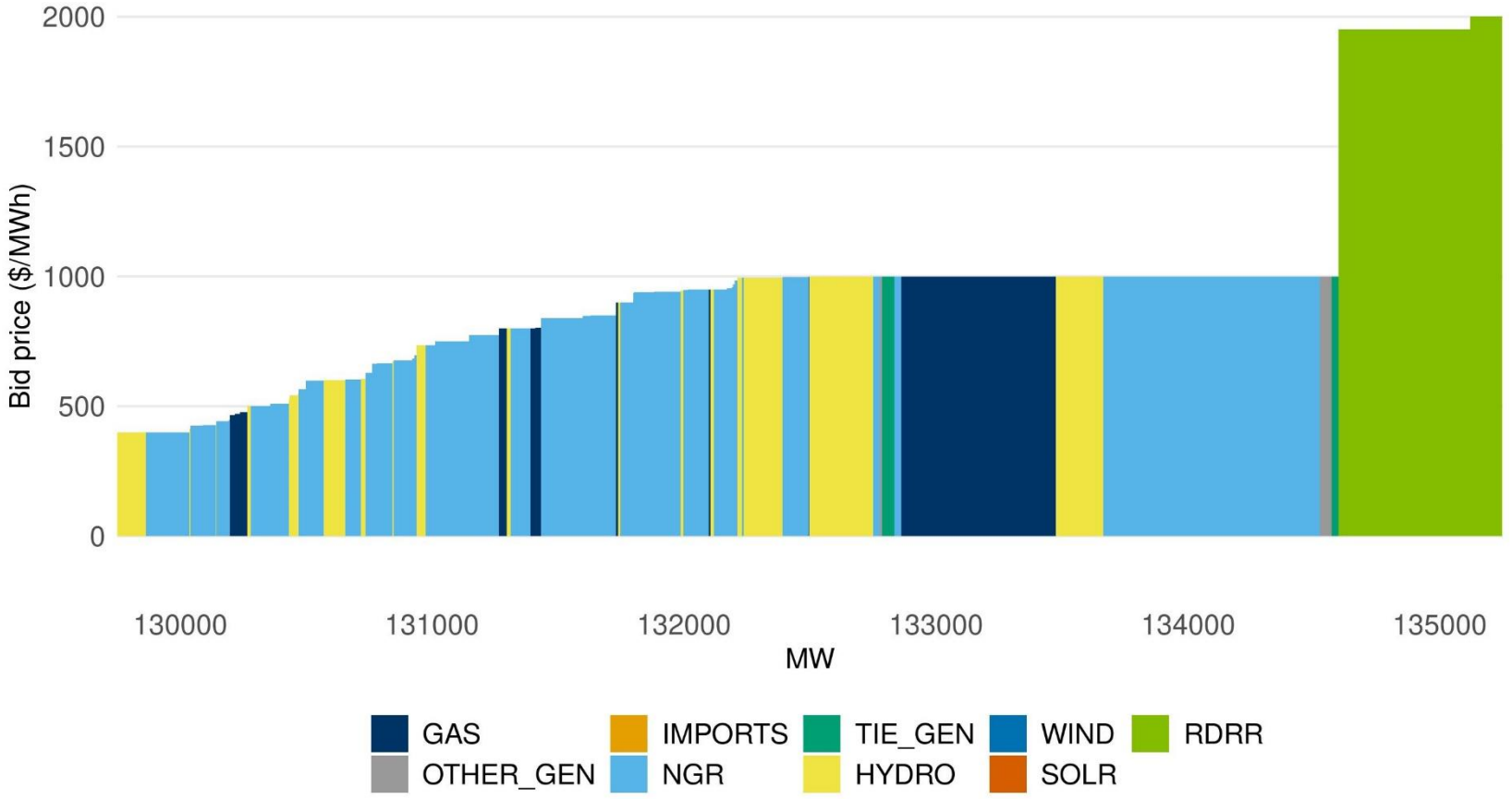
In RTM, bid price duration curve of 9/6/2022 HE19 shows larger quantity of hydro bidding to $1000 cap as compared to DAM



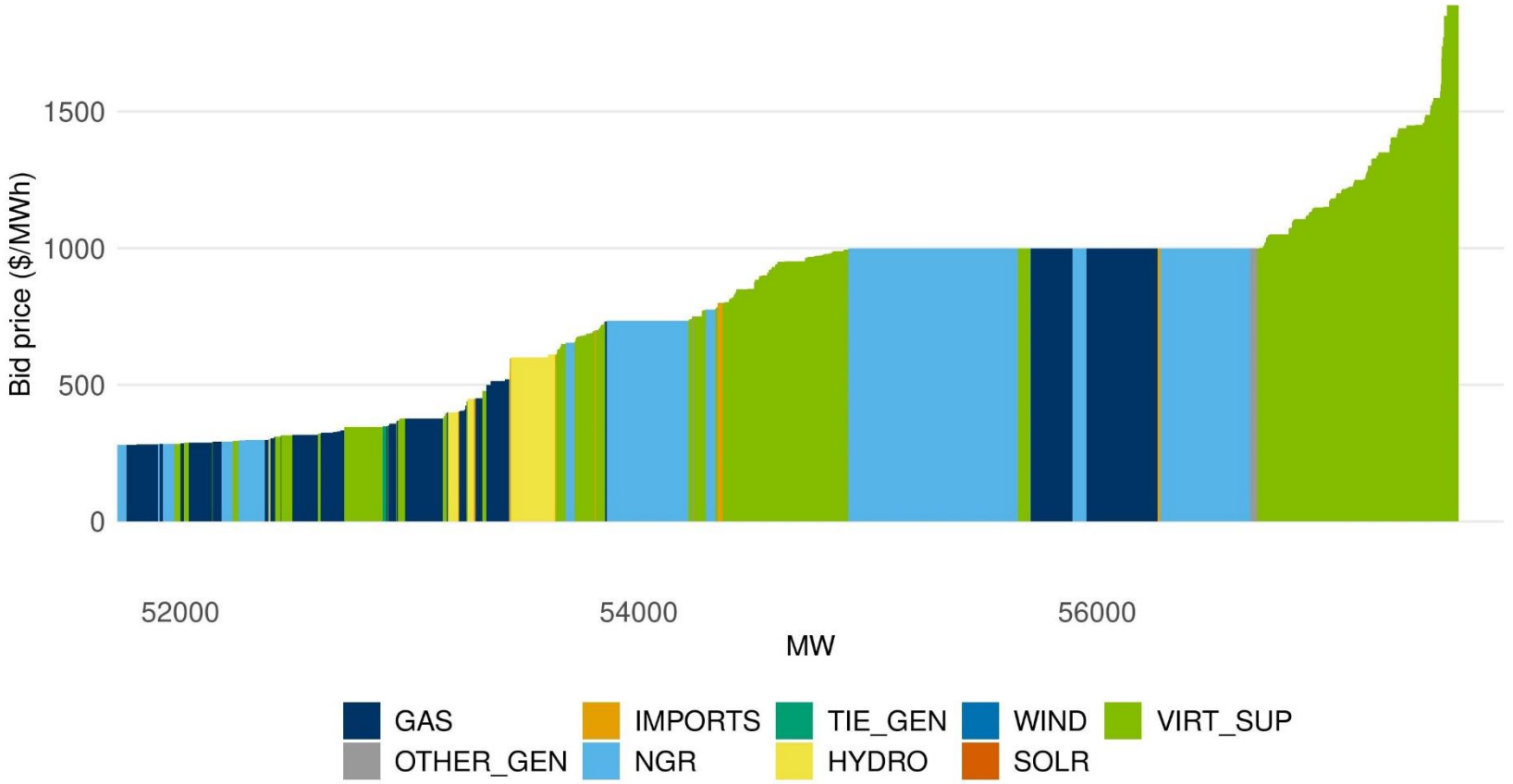
DAM bid price duration curve for 8/16/2023 HE19 shows higher quantity of NGR (storage) with bids at the $1000 cap



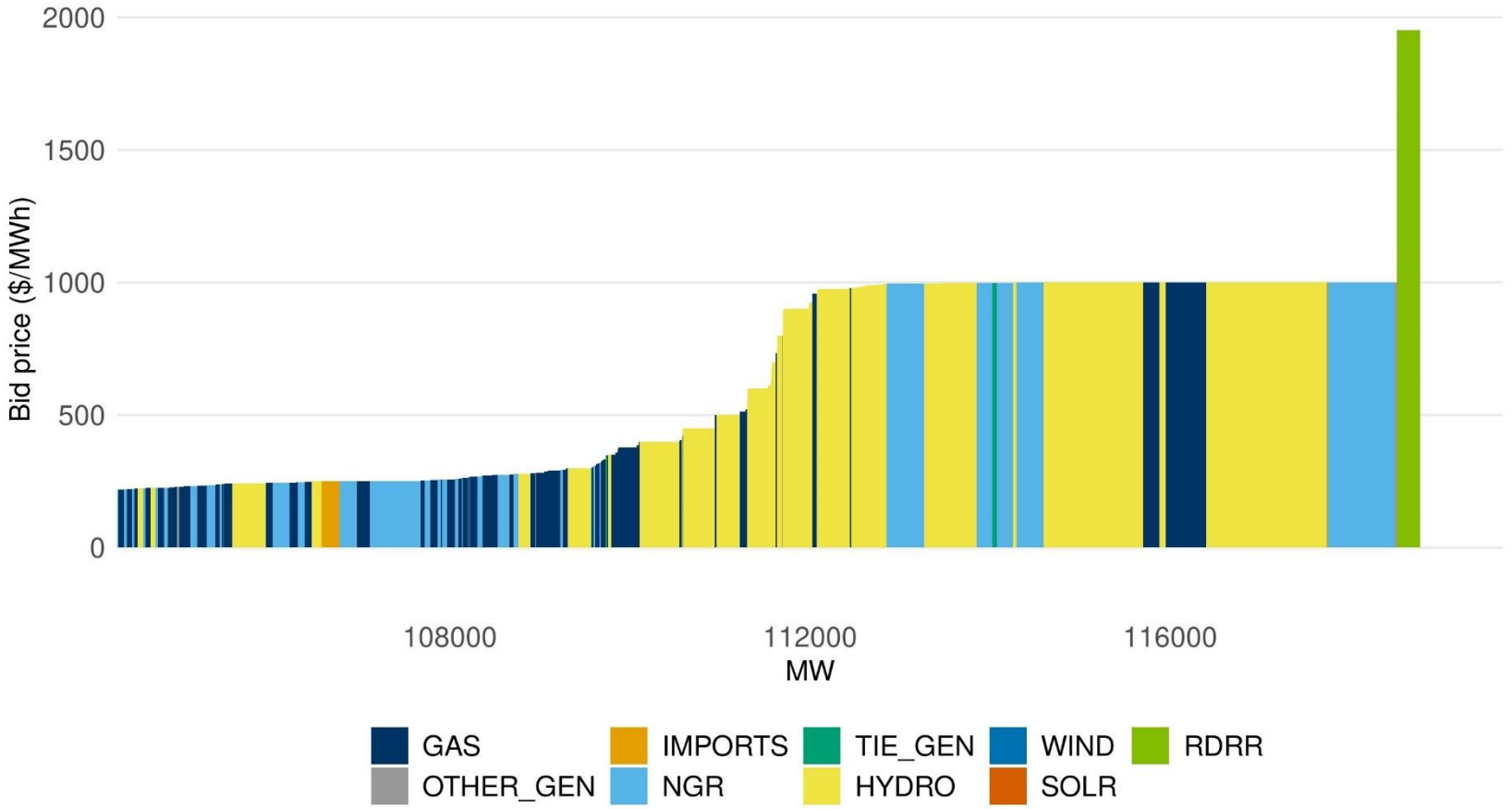
RTM bid price duration curve for 8/16/2023 HE19 shows larger quantities of storage and hydro bidding at or near the $1000 cap



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

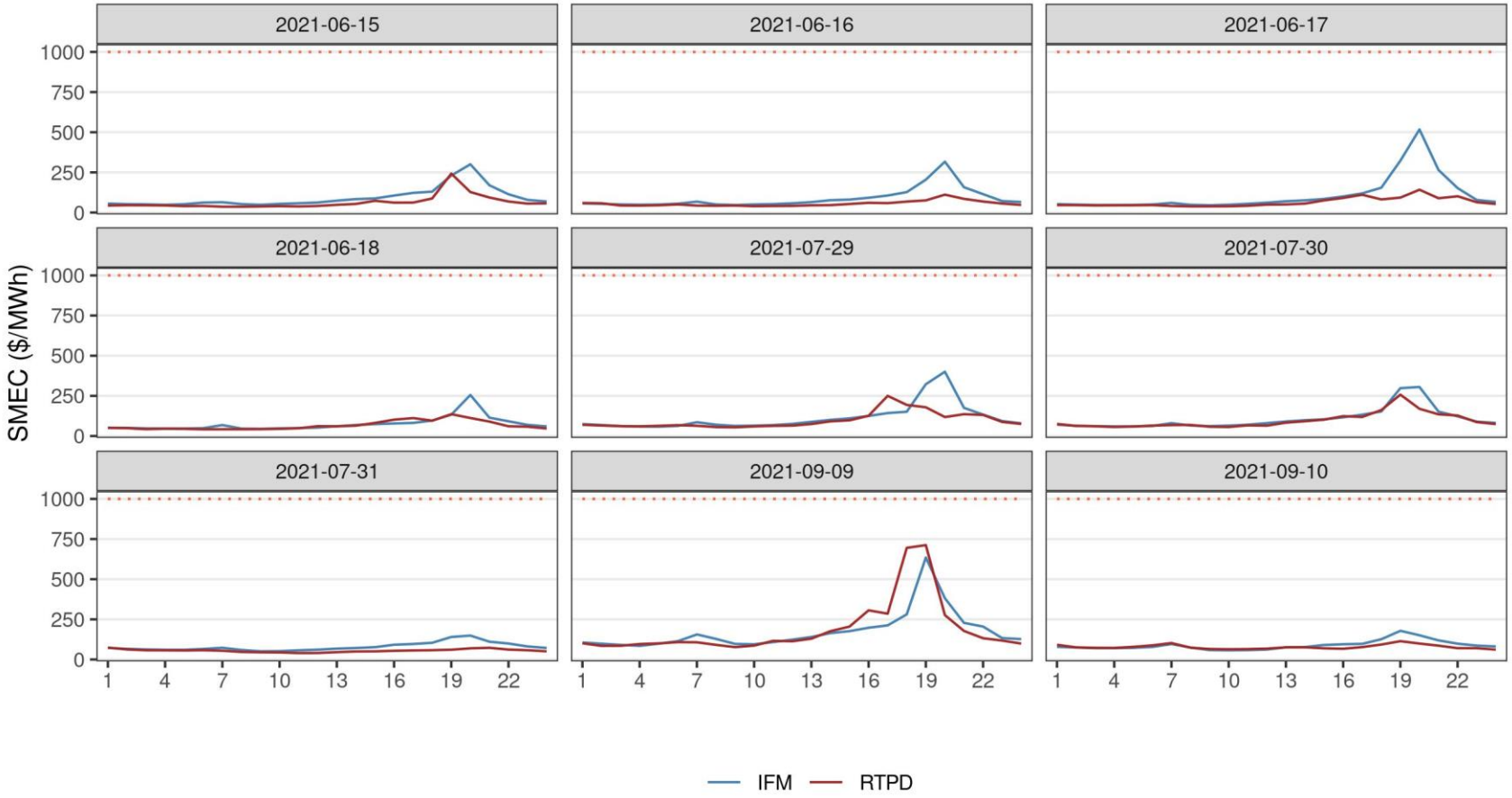


Scope of in-depth metrics covered

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

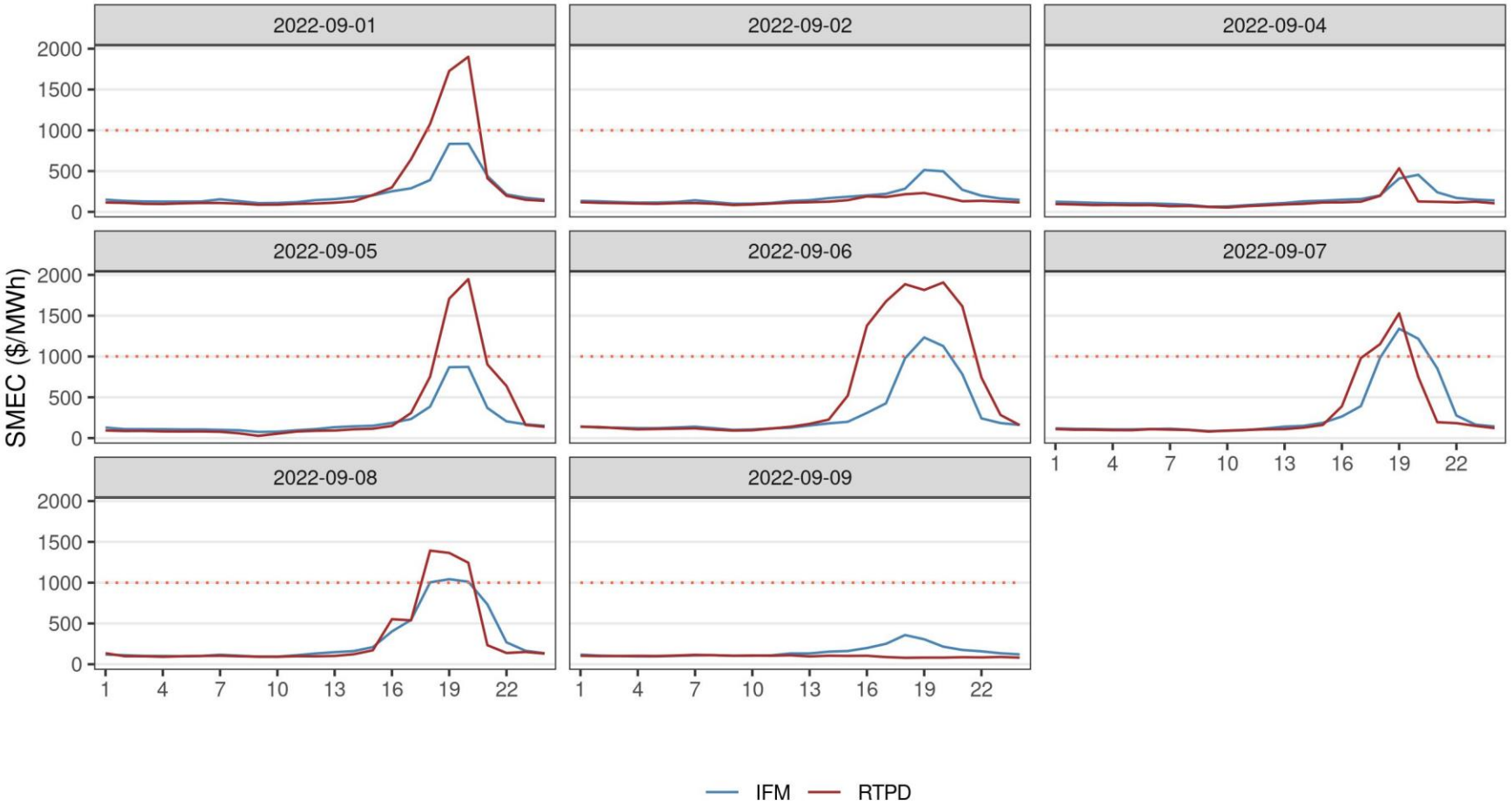
- IFM SMEC vs. (average) RTPD SMEC
  - Gives a sense of how appropriate IFM SMEC may be as a proxy for a RT bid cap
- Real-time MIBP vs. (average) RTPD SMEC
  - Gives a sense of how appropriate RT MIBP may be as a proxy for a RT bid cap
- Counterfactual of uncapped real-time hydro and storage DEBs in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

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

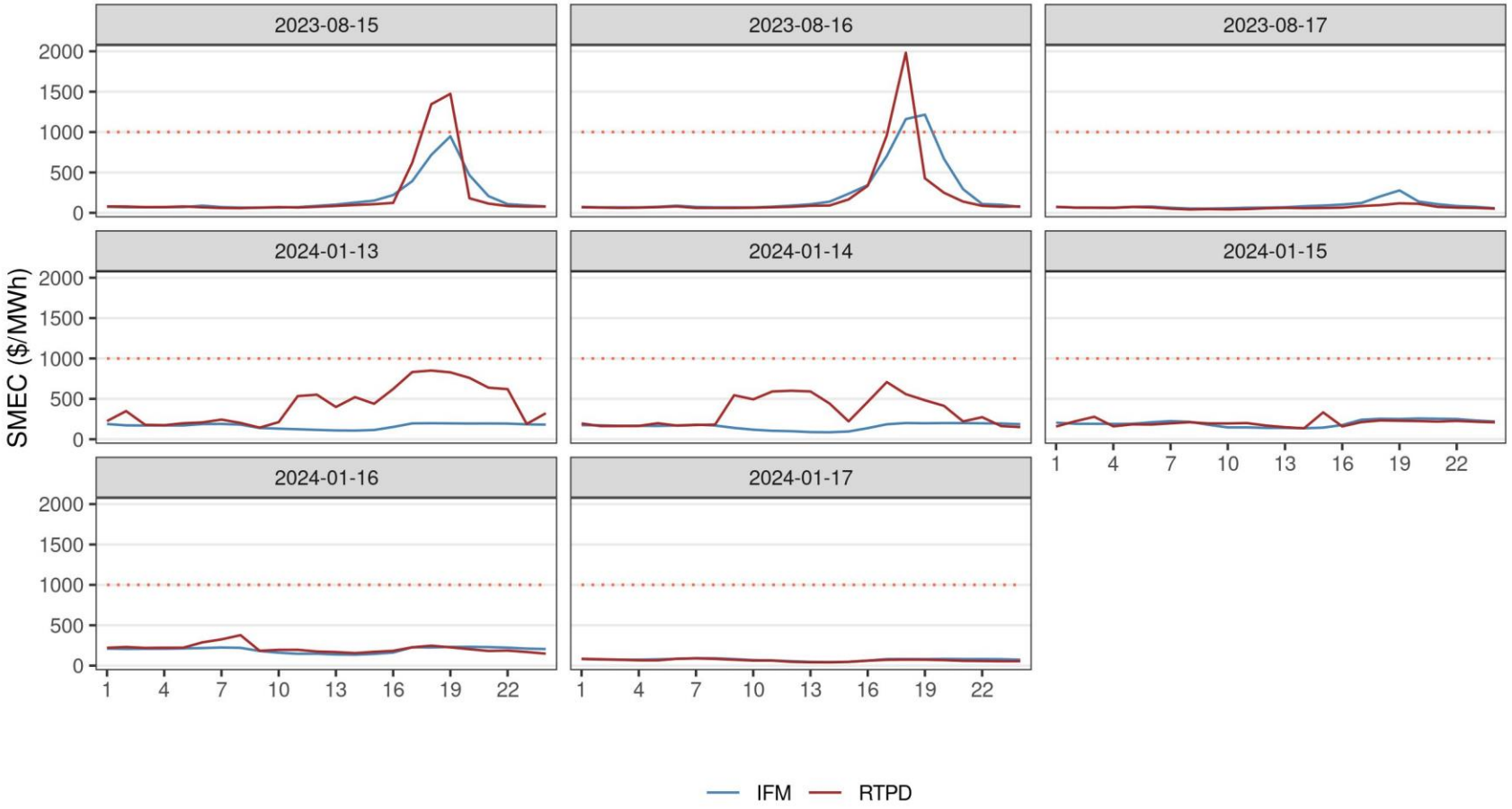


Both IFM and RTPD prices exceeded $1000 during some periods of the Sept.

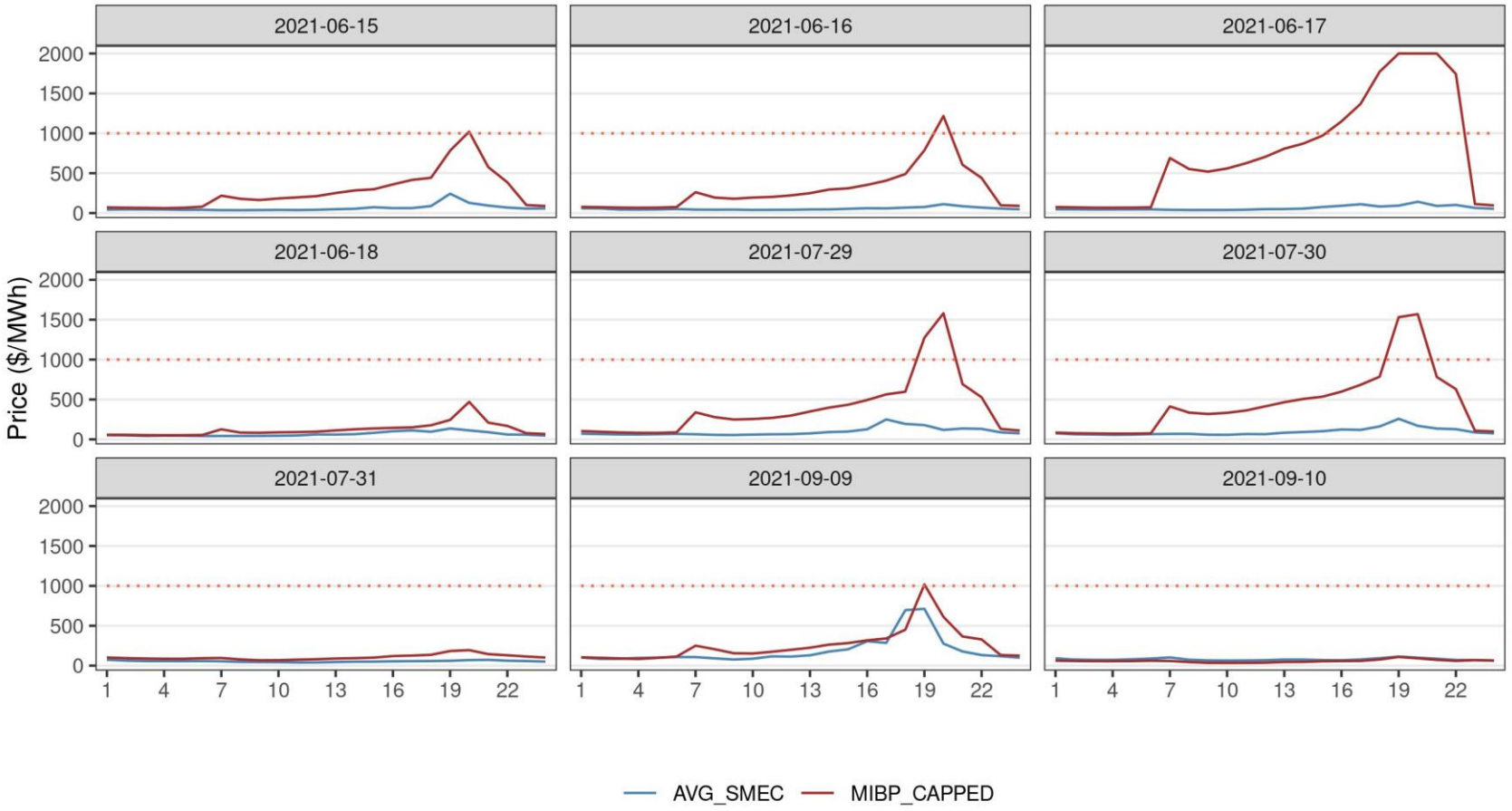
2022 heatwave, but for fewer hours in IFM than RTPD



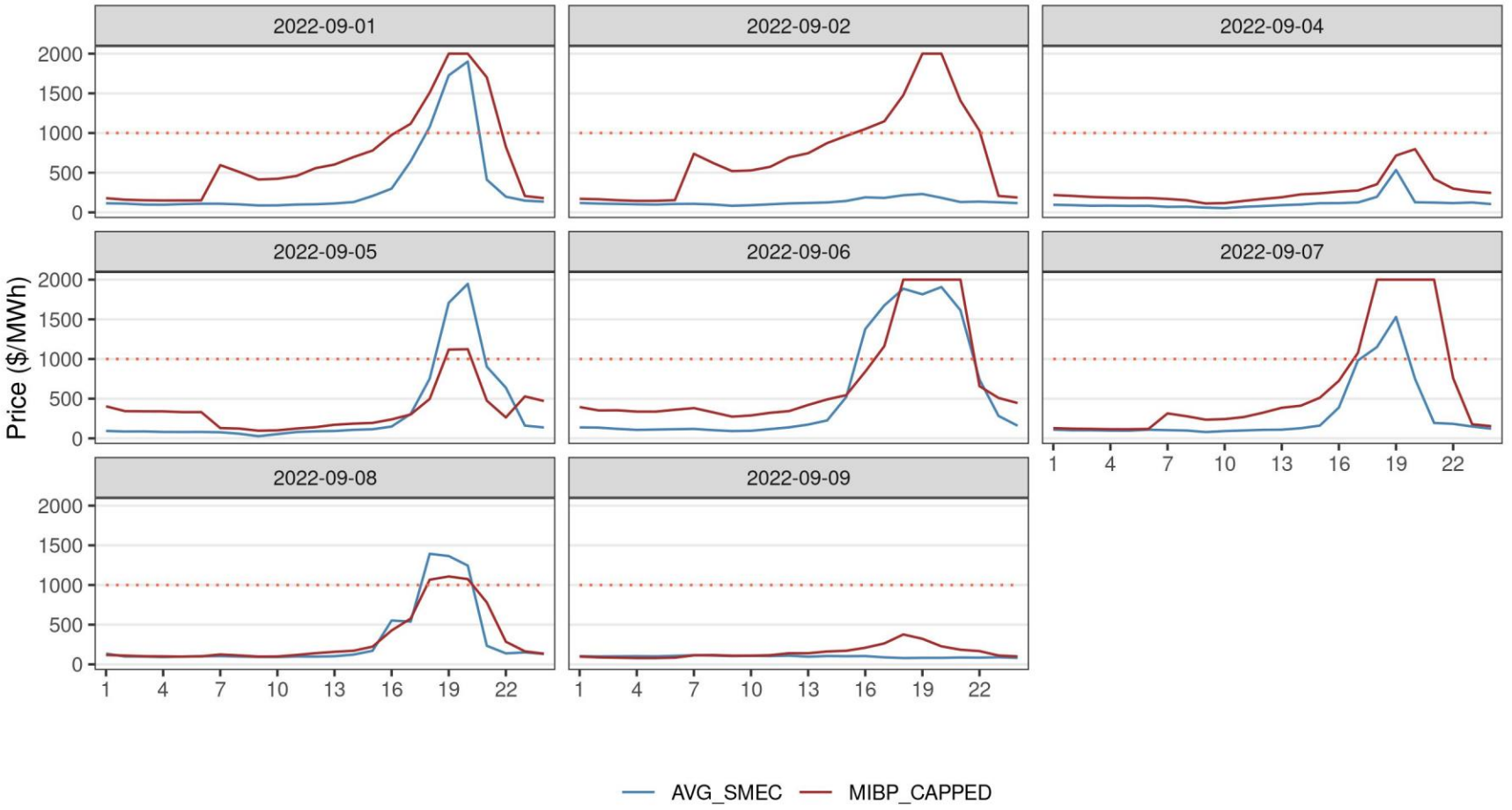
With the exception of August 16 2023, IFM SMEC was below $1000 on all “831 days” in 2023 and 2024



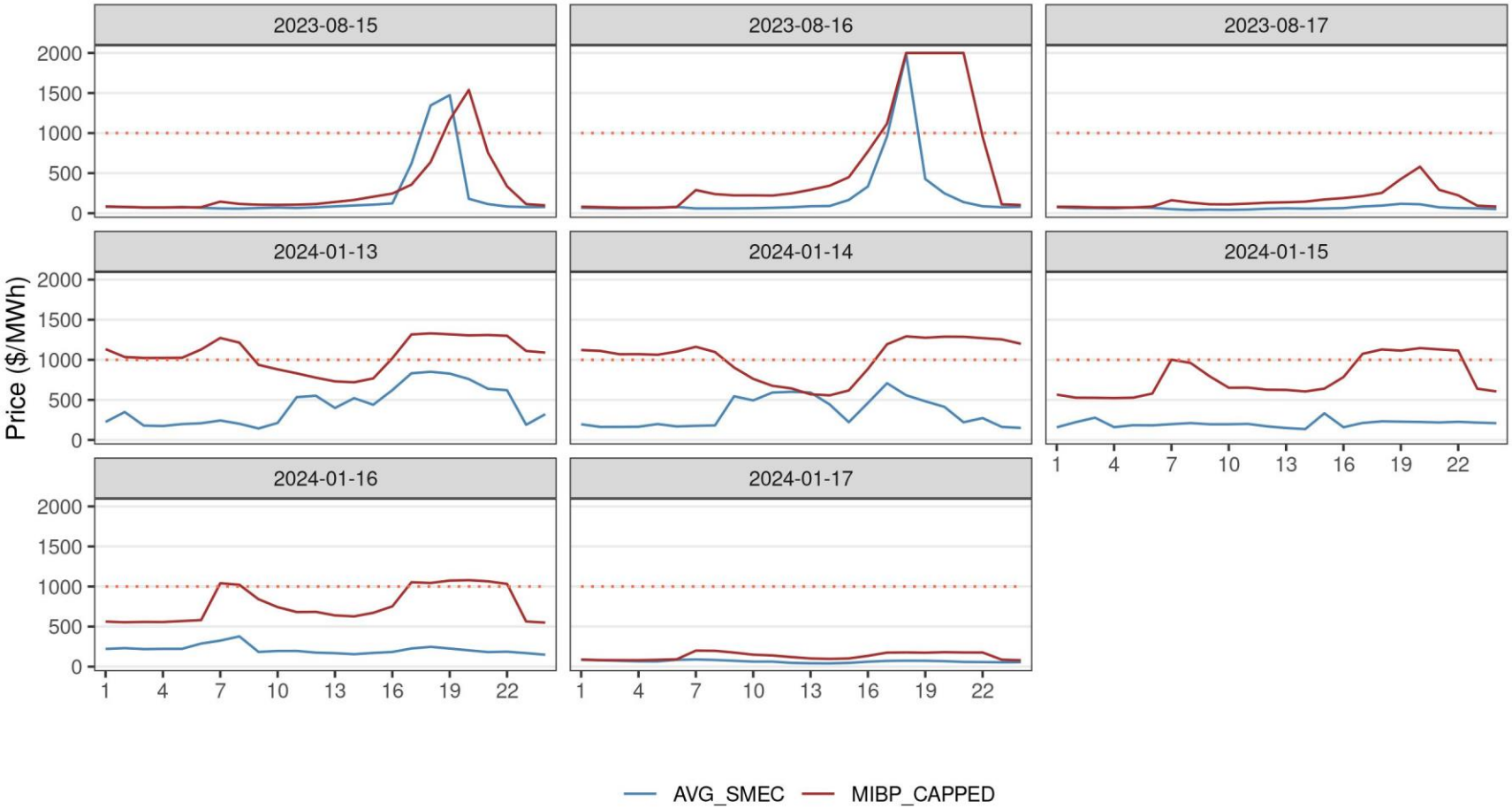
RT MIBP far exceeds average RTPD SMEC during many hours of the “831 days” in 2021



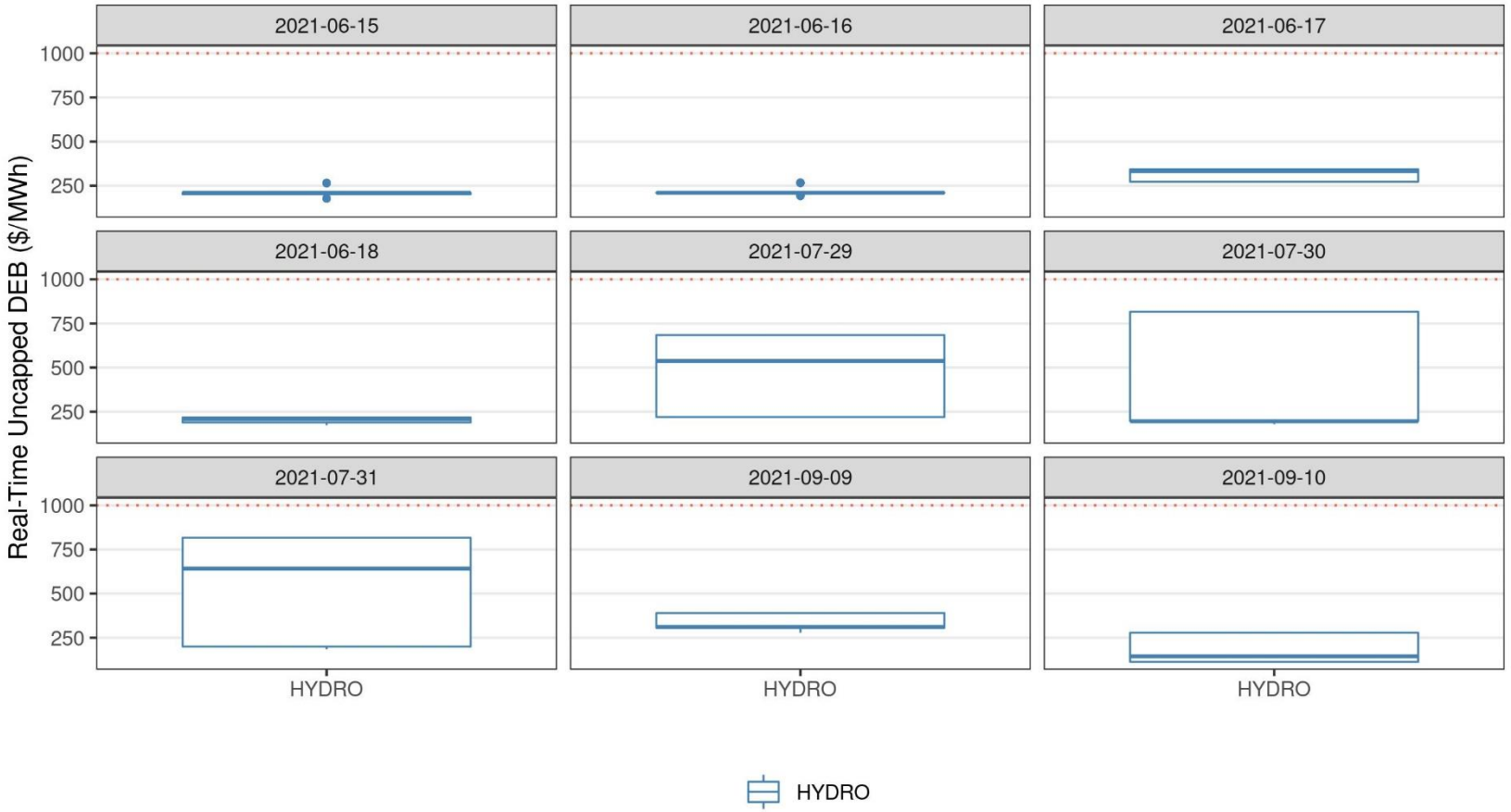
RT MIBP tracks RTPD SMEC more closely during specific September 2022 heatwave days



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

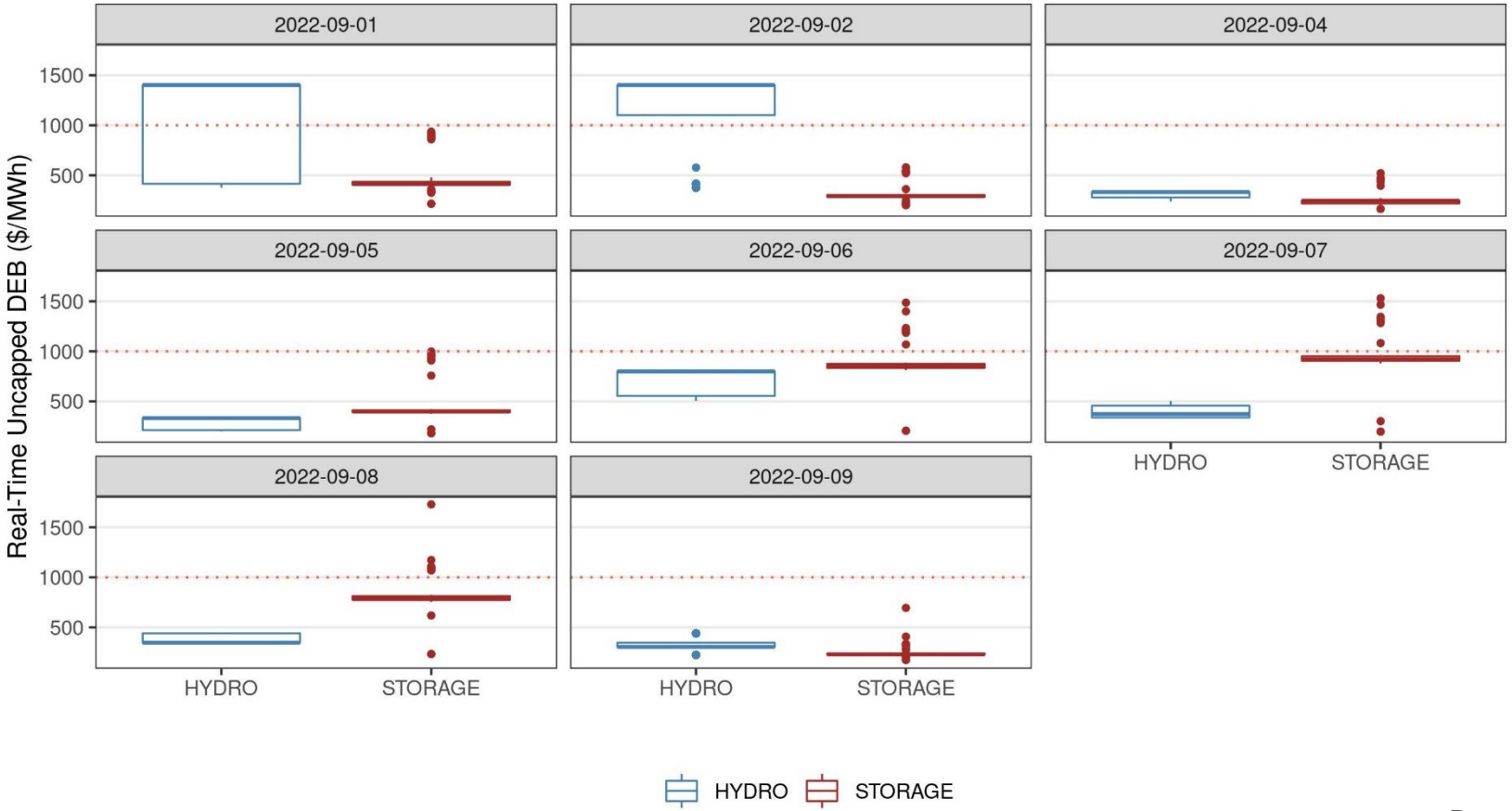


Counterfactual uncapped hydro DEBs would not have exceeded $1000 during 2021 “831 days” (storage DEB not yet implemented)



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