Comments on Price Formation Enhancements
Issue Paper

Department of Market Monitoring

August 11, 2022

The Department of Market Monitoring (DMM) appreciates the opportunity to comment on the *Price Formation Enhancements – Issue Paper*.[1]

Comments

I. Scarcity pricing

Ancillary services

DMM agrees with the CAISO that re-optimizing ancillary services in real-time with other products would be beneficial. This could increase efficiency and allow real-time energy prices to better reflect real-time ancillary service conditions. The CAISO currently has ancillary service real-time re-optimization and locational procurement on their policy road map as a longer term item. The CAISO should study whether and how to include ancillary service re-optimization into the real-time markets in either the current price formation initiative or in a longer term initiative, whichever is more feasible for implementation purposes.

The CAISO asks if ancillary service penalty prices should be raised above their current levels of about $250/MW. Raising ancillary service reserve penalty prices would be appropriate. Reserves are valuable for system reliability. Load can be dropped, or armed to be quickly dropped, to maintain reserves. Therefore, raising ancillary service penalty prices to not be lower than power balance penalty prices appears sensible.

Further, the ancillary service penalty prices currently cap how far flexible ramping demand curve prices can rise. This keeps flexible ramping prices from approaching the power balance prices as available capacity approaches zero. Raising ancillary service penalty prices would allow flexible ramping prices to increase past $250/MW and better serve the scarcity pricing function of the flexible ramping product.

A demand curve based scarcity pricing mechanism similar to the flexible ramping product, such as the imbalance reserve product, could achieve the same scarcity pricing goals in the day-ahead market.

[1] *Price Formation Enhancements – Issue Paper*, California ISO, July 5, 2022: http://www.caiso.com/InitiativeDocuments/Issue-Paper-Price-Formation-Enhancements.pdf

Extending the flexible ramping product time-horizon

DMM continues to recommend that the CAISO extend the flexible ramping product time horizon or create products or constraints to serve the same purpose as extending the horizon. As described below, extending the flexible ramping product time horizon is necessary to allow the marginal costs of re-dispatch in future intervals incurred by multi-interval optimization to be included in the binding market interval prices used for settlement. Extending the flexible ramping product time horizon would also allow the market optimization to better reflect the scarcity conditions.

In addition to increasing procurement of flexible reserves, the flex ramp product is meant to serve a scarcity pricing function. As available capacity falls, prices for flexible reserves increase along the flexible ramping product demand curve. Because there is a tradeoff between procuring capacity or energy, this capacity scarcity is included in the energy price.[2] As available flexible reserves fall, the prices for both flexible reserves and energy start to rise to reflect that capacity is becoming scarcer even before there is insufficient energy supply to meet load in the market.

However, the flexible ramping product only looks out one 15-minute interval past the binding market interval. This means that if flexible capacity is relatively available in the next market interval, but not in subsequent intervals, the flexible ramping price will not reflect this scarcity in the binding market interval. And similarly, the binding interval energy price will not reflect this scarcity either.

Further, there is a general pricing problem when the flexible ramping product time horizon is not extended beyond the next interval in a multi-interval optimization. In many cases, the optimization may need to make an advisory interval dispatch feasible, i.e. ensure that there is enough rampable capacity to get from the binding interval dispatch to the advisory interval dispatch. Making this advisory interval feasible may require re-dispatch and re-dispatch costs in the binding market interval.

The marginal cost of making the advisory interval dispatch feasible would be part of the advisory interval prices. But these advisory prices are not used in settlements, with only the binding interval prices being used in settlement. In the subsequent market optimization run, when what was once the advisory interval becomes the binding interval, there is no cost to make this interval feasible to ramp to. This interval is ramp feasible only because the previous market runs have dispatched resources based on advisory results. Costs no longer need to be incurred by the optimization to make the interval feasible. These costs are now sunk and no longer appear in the market price.

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2 The absence of locational procurement of flexible ramping product largely broke the tradeoff between the energy and flexible reserves. With the implementation of locational flexible ramping product, the connection between energy and flexible reserve prices should be intact.

The flexible ramping product accounts for the costs to make the interval feasible when it is still an advisory interval. And the flexible ramping price moves the marginal costs into the binding interval settlement prices for both flexible capacity and energy. But the flexible ramping product currently only accounts for the advisory interval immediately after the current binding interval. There could be costs to making advisory intervals further out feasible as well. The marginal costs of making intervals past the first advisory interval feasible will not be moved into the binding interval settlement prices. Extending the flexible ramping product time horizon would allow these marginal costs to be included in the prices used for settlement.

Extending the flexible ramping product time horizon would allow the market optimization to better reflect the scarcity conditions and would fix a pricing issue in the current market design. Therefore, DMM continues to recommend that the CAISO extend the flexible ramping product time horizon or create products or constraints to serve the same purpose as extending the horizon.

II. Market power mitigation

DMM supports working on a market power mitigation design to test groups of balancing areas for market power

The ISO proposes updating the market power mitigation (MPM) design to group multiple balancing authority areas (BAAs) together when performing dynamic competitive path assessment. DMM believes that carefully designed MPM enhancements around this BAA grouping principle could significantly improve the accuracy of the detection and mitigation of market power in EDAM and the WEIM.

Assessing groups of balancing areas would result in at least two substantial enhancements to the MPM design. First, the existing WEIM practice of only assessing individual BAAs for market power, rather than groups of BAAs together, could potentially result in exposing all resources in BAAs to bid mitigation under conditions when no market power exists. A WEIM balancing authority area can currently be in a region with other BAAs, all of which are separated by the CAISO BAA via congested WEIM transfers. Testing a BAA by itself may lead to a non-competitive result. But testing a group of BAAs with WEIM transfers between them could lead to competitive results and avoid unnecessary bid mitigation. An appropriate design for testing groups of balancing areas for market power could substantially reduce this source of potential over-mitigation.

Second, assessing groups of balancing areas would allow the CAISO balancing area to be assessed with other groups of balancing areas, and on its own, for the existence of market power. Currently, the exercise of market power is only mitigated in the CAISO BAA when a binding flow-based constraint within the CAISO BAA is deemed to be uncompetitive. However, conditions may arise in which market power may exist in the CAISO BAA on its own, or in combination with other surrounding balancing areas, due to these areas being separated by congestion from the rest of the west. An appropriate design for testing groups of balancing areas that include the CAISO BAA for market power could substantially reduce this source of potential under-mitigation.

DMM believes the benefits from these two sources of improvement to market power mitigation accuracy warrant the ISO prioritizing working out the details of the design elements.

Design should not assume all other BAAs and BAA groups are competitive if a BAA with a relatively high BAA-specific power balance constraint shadow price is deemed competitive

The ISO proposes to group BAAs in descending order of their power balance constraint shadow price. Starting with the highest price group, the ISO proposes to test the groups for competitiveness until a competitive group is found. If a BAA or group of BAAs is found to be competitive, all BAAs with lower power balance constraint shadow prices will be deemed competitive. This method will allow significant gaps in the detection and mitigation of the exercise of market power.

If a high-priced balancing area is deemed competitive, the current proposal would assume that market power is not being exercised in lower priced balancing areas. So, the power balance constraints in all lower priced BAAs would be deemed competitive and would not expose resources to potential bid mitigation. One BAA with the highest power balance constraint shadow price being competitive on its own clearly does not indicate that other areas of EDAM/WEIM, including groups in which that one high-priced BAA is a part, are competitive. For example, the highest-priced BAA could be a BAA with a very small amount of load but a handful of generation companies that supply other areas of the west. This area on its own could be competitive, but when grouped with a large non-competitive neighbor, the combined group would be non-competitive.

The proposal to assume that all other BAAs are competitive if the highest priced BAA is deemed competitive creates at least two potentially significant issues that the ISO should consider. First, if one area has exceptionally high costs, due to isolated gas pipeline constraints in its area for example, supply in the rest of EDAM/WEIM could exercise market power up to the level of the high costs in that area.[3] High costs in specific areas would be easy to predict by resources in non-competitive areas, and so it may not be appropriate to allow resources in non-competitive regions to exercise market power up to the level of predictable, high costs in neighboring areas.

The second potentially significant issue with this proposal concerns dominant entities in BAAs that may be deemed competitive having incentives to inflate their own prices in order to undermine mitigation in the rest of EDAM/WEIM. The ISO's grouping proposal could potentially make it very easy for such entities to undermine mitigation in the rest of

[3] This is because if resources in neighboring non-competitive BAAs kept their bids below the level of costs in the gas-constrained BAA, power would continue to flow into the gas-constrained area, separating it from the rest of the EDAM/WEIM, and subjecting that gas-constrained BAA to a market power assessment that would prevent BAA-level mitigation in the rest of EDAM/WEIM.

EDAM/WEIM. Next we describe some scenarios in which a dominant entity in a balancing area may have incentives to take advantage of the ISO's grouping proposal in order to undermine mitigation in the rest of EDAM/WEIM.

The ISO's proposal to "only consider supply in excess of scheduled load for scheduling coordinators and affiliates as supply counter flow" is a significant change to the dynamic competitive path assessment.[4] Depending on the details of this aspect of the proposal, balancing areas may be deemed competitive in one interval when a dominant entity in that BAA still actually has incentives to inflate prices in other BAAs on average in the future —and potentially even in the current interval.

Consider a BAA whose load all belongs to one vertically integrated utility, and the vertically integrated utility has significant excess supply that it regularly markets to other BAAs in the west. If the ISO is proposing to count in the residual supply index's (RSI) numerator all supply from the vertically integrated utility up to the amount of its load, this BAA could be deemed competitive every interval.[5] If the design counts the utility's non-EDAM/non-WEIM exports "as load", this would cause the RSI to deem the BAA competitive in scenarios where the utility's own supply supports all of its load and all of the non-transfer exports out of the BAA.

This would directly create incentives for the utility to inflate prices in the rest of EDAM/WEIM each interval it has exports that are not EDAM/WEIM transfers out. This is because the utility would be able to sell those exports back to EDAM/WEIM BAAs at inflated prices. As a result, under the ISO's current proposal the utility would have the incentive to inflate their own resources' bid prices, making their BAA the highest priced BAA. This would eliminate all BAA-level market power mitigation in the rest of EDAM/WEIM when this one BAA was deemed competitive. Eliminating market power mitigation in the rest of EDAM/WEIM would systematically increase prices at which the utility could sell its non-transfer exports.

In order to address part of this concern, DMM recommends below the ISO clarify that it will not count non-transfer exports as load when determining how much of an entity's supply will be included in the RSI's numerators. However, even if the ISO's design adopts this recommendation, the vertically integrated utility would still have incentives to systematically artificially inflate its BAA's prices, thereby eliminating BAA-level mitigation and inflating average prices in the rest of EDAM/WEIM. This is because during hours or days the utility did not sell non-transfer exports, the utility could exploit the above MPM design flaw to increase prices in the rest of EDAM/WEIM and the west. This would increase the expectation for higher future prices, which the marketer for the vertically integrated utility could profit from via inflated bilateral export sales.

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[4] *July 5 Issue paper*, footnote 27, p. 22.

[5] A handful of small, third-party generators in, or pseudo-tied into, the BAA could guarantee the BAA would be deemed competitive every interval.

As a result, DMM recommends the ISO and stakeholders consider alternative methods for testing groups of BAAs for market power. Other methods may be able to assess groups of balancing areas for competitiveness without the kind of gaps in allowing the exercise of market power described above. DMM outlines one alternative to consider in the final subsection of these MPM comments below.

Clarify that the CAISO balancing authority area will be included in the group assessment and mitigation of market power

As described above, an appropriate design that includes the CAISO BAA in any method that groups BAAs for market power assessment and mitigation would reduce a potentially significant source of inaccurate under-mitigation. We do not see anything in the issue paper that would prevent the CAISO BAA from inclusion in the grouping methodology, nor do we do see anything implying that the CAISO BAA would not be included in the proposed grouping methodology. However, DMM asks that the ISO clarify that any proposal to test and mitigate groups of BAAs will include the CAISO BAA.

Clarify the details of the residual supply index and how a BAA's designation in various competitive and non-competitive groups will impact the competitive and non-competitive congestion LMP components of resources in the BAA

A footnote in the issue paper states "the ISO will only consider supply in excess of scheduled load for scheduling coordinators and affiliates as supply counter flow".[6] As explained above, this is a potentially very significant change to existing market power mitigation design. Entities that may have less supply than load one interval may still have significant incentives to inflate prices in that interval in order to increase the expectation of future, average prices when the entity has excess supply. DMM recommends that the ISO at least carefully write out the details of this aspect of the proposal. For example, it is not clear how non-transfer exports will be treated when determining "supply in excess of scheduled load". As explained above, the implementation of this detail could significantly undermine market power mitigation. So, DMM recommends not counting non-transfer exports as load when determining how much of an entity's supply will be included in the RSI's numerators.

Details related to competitive and non-competitive LMPs also need to be developed and clarified in detail. Whether or not a resource is subject to bid mitigation is determined by the resource's non-competitive congestion LMP component in the MPM run. The resource's non-competitive LMP component is a combination of the contribution from non-competitive flow-based constraints and the resource's BAA's power balance constraint, if its power balance constraint is deemed non-competitive. A resource's competitive LMP component in the MPM run sets an important floor below which a resource's bid cannot be mitigated.

[6] *July 5 Issue paper*, footnote 27, p. 22.

For example, the proposal states "only resource bids of pivotal suppliers in the uncompetitive balancing authority area groups receive mitigated bids at the default energy bids."[7] DMM asks the ISO clarify how this would align with the current MPM structure that subjects resources to bid mitigation based on the impact of every non-competitive constraint on a resource's price. The design could potentially determine the pivotal suppliers for each uncompetitive BAA group, and then only include the non-competitive congestion contribution of the power balance constraints into the non-competitive LMP of the pivotal suppliers for that uncompetitive BAA group. DMM notes that it would be insufficient to only identify the top three suppliers of counter flow to subject to potential mitigation in any uncompetitive BAA group. DMM asks the ISO to confirm that the design will identify the top two pivotal suppliers and then every other supplier whose withholding of counter flow supply would cause the uncompetitive BAA group's RSI to be less than one.

The MPM design is incomplete without explaining in detail how a BAA's designation in various competitive and non-competitive groups will impact the competitive and non-competitive congestion LMP components of resources in the BAA. Working through the details of this important aspect of the grouping mitigation enhancements is critical to specifying and assessing the design.

Outline of alternative method for assessing and mitigating potential market power in groups of BAAs to consider

As explained above, the current proposal to deem the rest of EDAM/WEIM competitive when one high priced BAA gets deemed competitive would create substantial gaps in mitigating the exercise of market power. DMM recommends the ISO and stakeholders consider various, potentially very different, methods of iteratively testing BAAs and groups of BAAs for market power and applying power balance constraint shadow prices to each resource's non-competitive and competitive LMP congestion components.

The perfect method would likely involve iteratively testing all possible combinations of BAAs for market power. However, with nineteen BAAs in WEIM, more in the future and additional potential EDAM participants, this would involve hundreds of thousands of permutations and would therefore be computationally infeasible. Therefore, we understand the need for reasonable simplifications that would drastically reduce the number of groups tested while not erring too much either way in terms of over- or under-mitigation.

Below DMM outlines one potential alternative to the grouping method proposed in the issue paper. We have not thought through all of its pros and cons, so we are not proposing it as the best solution. We are introducing it as one example for the ISO and stakeholders to consider and vet along with other potential options.

[7] Ibid, p. 21.

Instead of hierarchically sorting all BAAs into groups from highest to lowest priced power balance constraints, this method would hierarchically sort all BAAs into groups from lowest priced to highest priced power balance constraints. Note that any reference to what a resource's competitive or non-competitive LMP would be only concerns the contribution from the system and BA-specific power balance constraints. Flow-based constraints would continue to add to or subtract from each resource's competitive and non-competitive LMPs outside of the process described below.

A. Start by testing all BAAs together for market power (potentially excluding the lowest price group, if there was a desire to try to maintain a "local" market power mitigation design, but the ISO should consider starting with a group of all BAAs).
   i. If the group is competitive, the contribution of the power balance constraint shadow prices (system power balance and each BAA's BA-specific power balance shadow prices) to the lowest-priced group of BAAs in the test group would be the competitive LMP of all resources in all BAAs tested this round. There would be no contribution at this point to the non-competitive LMP congestion component of any resources.

   ii. If the group is non-competitive, the contribution of the power balance shadow prices to the lowest-priced group of BAAs in the test group would be the non-competitive LMP of all resource in all BAAs tested this round. There would be no contribution at this point to the competitive LMP congestion component of any resources.
B. Remove the BAAs that were in the lowest priced group in the last round of testing. The contributions to the competitive and/or non-competitive LMP of each resource in each of these BAAs being removed from the process has now been set. Subsequent iterations of the market power test, as the tests move up to groups with increasing power balance prices, will not impact the contribution of power balance constraint shadow prices to competitive and non-competitive LMPs of resources in the BAAs removed for the subsequent iterations.
   i. Test all remaining BAAs together for market power.
      a. If the group is competitive, the contribution of the power balance constraint shadow prices (system power balance and each BAA's BA-specific power balance shadow prices) to the lowest-priced group of BAAs tested this round would *become* the new competitive LMP of all resources in all BAAs tested this round. The non-competitive LMP for all resources in all BAAs tested this round would *become* $0.

      b. If the group is non-competitive, competitive LMPs remain the same for all resources in all BAAs tested this round. The non-competitive LMPs for all resources in all BAAs tested this round become the difference between 1. The contribution of the power balance constraint shadow prices (system power balance and each BAA's BA-specific power balance shadow prices) to the lowest-priced group of BAAs tested this round; and 2. The competitive LMP of the resources

C. If the highest-priced group was just tested, the process is over. If not, go to Step B.

DMM recognizes that the above approach could result in potential over- or under- mitigation in some situations, but it has some merits relative to the ISO's proposal in the issue paper.[8] We look forward to discussions about alternatives to the ISO's mitigation proposal and hope the above approach can contribute to those discussions.

III. Multi-interval optimization

DMM opposes elimination of the multi-interval optimization and changes to the multi-interval optimization for battery storage resources.

At this stage, DMM opposes changes to the use of multi-interval optimization (MIO) for battery storage and other resources. Significant changes to the broader real-time market optimization intended to address the issues of a single technology type should not be taken lightly and have great potential to lead to unintended outcomes.

As the CAISO notes in the issue paper, the original intent of multi-interval optimization is to ensure that all resources on the grid are operating in a way that will enable the resource mix to serve load in the future advisory intervals. The multi-interval optimization process ensures that the market starts and/or positions resources appropriately to meet anticipated future needs of the grid.

In addition, the multi-interval optimization may be especially valuable in the context of battery storage resources. Because there is a significant intertemporal dependence between battery market awards and future interval capabilities, the ability to optimize over a multi-interval horizon helps ensure the availability of batteries which require charging or discharging in advance in order to be positioned to respond to market conditions. Battery storage resources can respond very quickly, but only if they have been properly positioned to do so by charging or discharging in previous intervals.

[8] For example, a small BAA that was part of a larger grouping deemed competitive one round may be the lowest priced BAA in the next round in which the remaining group is deemed non-competitive. The above approach would protect the resources in this small BAA by setting the mitigation bid floor at the competitive LMP from the earlier round. However, the determination of the group being competitive in the prior round and then non-competitive in the round in which the small BAA gets removed from testing may be driven mainly by larger BAAs removed in the prior round and/or larger BAAs remaining in subsequent rounds. So, there could be an argument for testing each BAA individually, or even with the group of BAAs it is removed from testing with, and setting their competitive LMPs at their system plus BA-specific power balance constraint shadow prices (and setting $0 non-competitive LMPs) if they are competitive.

DMM also agrees with the CAISO's statement in the issue paper that the removal of selected resources from the multi-interval optimization can negatively impact the accuracy of advisory intervals. In order to maximize the accuracy of the multi-interval optimization solution, the optimization needs to reflect as much information as possible in all advisory dispatches about expected resource availability when the interval is binding.

Finally, DMM notes that changes in between binding and advisory market outcomes are not the only potential driver of uneconomic real-time dispatch related to the multi-interval optimization. Changes in resource bids over the horizon of the multi-interval optimization may also lead to uneconomic outcomes in a given interval. Ensuring consistent market bids over the optimization horizon will minimize the chances that a particular resource's market dispatch is adversely affected by multi-interval optimization.

IV. Bid cost recovery

DMM recommends that bid cost recovery changes related to the multi-interval optimization issues for storage resources be considered as part of a more comprehensive evaluation of bid cost recovery rules for storage resources

The CAISO states that one proposed solution to the issue of uneconomic dispatch due to multi-interval optimization is to compensate resources through a revised approach to bid cost recovery (BCR). DMM agrees that there are many market issues related to BCR for battery storage resources, and supports the CAISO considering these issues.[9] However, DMM recommends that if the CAISO considers BCR changes to address the issues of multi-interval optimization for batteries, such changes only be made in the context of a complete and comprehensive review of BCR rules for storage resources.

The potential changes to BCR discussed in the issue paper are a significant departure from current BCR rules. Making large changes to BCR rules for a subset of resources on an ad-hoc basis is likely to result in unintended consequences, while also leaving many other important BCR issues related to storage resources unaddressed.

DMM also suggests that if the CAISO considers in any initiative to change the way in which bid costs are netted over the day to calculate BCR, that additional design elements may be needed to avoid unnecessary BCR payments. Specifically, the CAISO needs to carefully consider and address the potential for increased BCR resulting from binding state-of-charge constraints in the binding and advisory market intervals.

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[9] *Comments on Energy Storage Enhancements Second Revised Straw Proposal*, Department of Market Monitoring, August 4, 2022: http://www.caiso.com/Documents/DMM-Comments-Energy-Storage-Enhancements-Second-Revised-Straw-Proposal-Aug-4-2022.pdf

V. Fast-start pricing

DMM submitted detailed comments on the issue of fast start pricing in 2017. [10] DMM continues to believe that "two-part pricing" with LMPs set by marginal cost pricing represents the most efficient market design for optimized dispatch for generating resources, and that basing prices on the average cost of resources undermines market efficiency.

Bid cost recovery from commitment of fast start turbines is actually very low

One of the key intended goals of fast start pricing is to lower uplift payments by providing additional compensation to resources through higher energy prices. A recent paper by Powerex and the Public Power Counsel contends that in 2020 "the CAISO has provided approximately $125 million per year in so-called 'bid cost recovery' payments [in 2020], reflecting compensation in addition to the wholesale market price but that is paid almost entirely to natural gas peaking units." [11]

However, the total bid cost recovery payments associated with commitment of fast start combustion turbines are actually very low in the CAISO markets. This reflects the fact that in most cases, when these units are committed in the CAISO market, the resulting LMP market revenues cover the full cost of starting up and operating fast start units over the hours in which they operate after being committed.

As shown in Table 1, bid cost recovery payments made to fast start combustion turbines totaled $22 million out of $158 million in 2021. [12] Of this $22 million, DMM estimates that bid cost recovery from non-reliability commitment of fast start resources total about $7 to $9 million (i.e. excluding reliability must run, exceptional dispatches, minimum on-line capacity constraints, and real time energy buy-backs).

This $7 to $9 million in bid cost recovery represents only about 2 to 3 percent of the total market revenues of these fast start resources. Most commitments of fast start turbines occur in the day-ahead market, and are paid day-ahead energy prices, which tend to be significantly higher than real time prices during net peak hours. [13]

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[10] Comments of the Department of Market Monitoring, Docket No. RM17-3-000, February 28, 2017. http://www.caiso.com/Documents/DMMCommentsonFast-StartPricingNOPR2-28-2017.pdf

[11] *The Importance Of Fast-Start Pricing In Market Design: Including The Cost Of Starting And Operating Natural Gas Peaking Units In Wholesale Market Prices*, Prepared By Powerex And Public Power Council (PPC) June 2022, p. 12. https://www.ppcpdx.org/wp-content/uploads/The-Importance-of-Fast-Start-Pricing-In-Market-Design-June-2022.pdf

[12] For this analysis, DMM classified combustion turbines as fast start if the units' start-time and minimum operating time was within the definition of fast start resources used by any of the five RTOs that have adopted fast start pricing (ISO-NE, NYISO, MISO, PJM or SPP)

[13] Analysis of fast start pricing submitted by Powerex And Public Power Council appears to be based on "real-time, 5-minute" prices, which are much lower than day-ahead and 15-minute prices upon which most energy is settled

Table 1. Total Bid Cost Recovery Payments in CAISO area in 2021 (millions)

Combined cycle	$56.70
Once-through-cooling	$56.54
Gas turbines - Fast start	$22.28*
Gas turbines - non-fast start	$5.57
Reciprocating engines	$4.65
Hydro	$5.82
Batteries	$4.13
Other	$2.35
	$158.03

* DMM estimates that bid cost recovery from non-reliability commitment of fast start turbines total about $7 to $9 million (i.e. excluding various forms of reliability commitments and real time energy buy-backs)

Table 2 shows a breakdown of bid cost recovery payments made in the Western Energy Imbalance market (WEIM) by gas technology type in 2021. Only about $831k in bid cost recovery was paid to fast start combustion turbines, out of $18.5 million in total bid cost recovery to gas resources. In WEIM areas, there is no day-ahead market, but a significant portion of fast start combustion turbine unit commitments are incorporated in base schedules. In addition, many combustion turbines have reported a minimum up time of two to three hours, which exceeds the 60 minute minimum up time cutoff used in other markets with fast start pricing. These gas turbines received about $3 million in 2021.

Table 2. Total Bid Cost Recovery Payments in WEIM areas in 2021

Combined cycle	$14,579,607
Gas turbines - non-fast start	$3,052,965
Gas turbines - fast start	$831,537
Reciprocating engines	$45,308
Steam turbines	$25,963
	$18,535,380

(Energy GPS, Technical Appendix, p.29). https://www.ppcpdx.org/wp-content/uploads/The-Importance-of-Fast-Start-Pricing-In-Market-Design-June-2022.pdf

DMM is working on a detailed analysis of the usage and profitability of fast start resources to help inform this stakeholder process. DMM also stands ready to help the CAISO release any other data which could facilitate discussion and additional analysis.

DMM supports other enhancements that directly increase flexibility and improve price formation during the net peak hours

DMM agrees that during net peak hours when fast start turbines are typically dispatched, CAISO market prices – particularly in the real time market – do not accurately reflect the marginal cost of providing energy, flexibility and reliability in these hours. While fast start pricing may tend to increase prices in these hours, DMM believes this is not a reason to implement fast start pricing—a form of average cost pricing. DMM supports other elements of various ongoing initiatives which improve price formation during net peak hours by building upon (rather than abandoning) the principles of marginal cost pricing which form the foundation of the CAISO's LMP market design. These other initiatives include the following:

- **Flexible ramping product.** DMM has strongly supported implementation of locational procurement of flexible ramping capacity. DMM also continues to recommend extending the time horizon of the product beyond the current 15-minute period to a multi-hour time horizon that reflects the lead time needed to commit and position resources to provide needed ramping capacity. These enhancements would tend to increase energy prices during the net peak hours and provide additional compensation to resources that actually provide needed flexibility and ramping capacity.

- **Scarcity pricing.** As discussed in these comments, DMM supports the type of scarcity pricing being proposed by the CAISO in this price formation initiative. This will ensure that prices rise (well above the costs of gas turbines) during hours when supply is needed the most.

- **Day-ahead market imbalance reserve product.** DMM supports implementation of a flexibility and uncertainty product in the day-ahead market.[14]

Unlike fast start pricing, these market enhancements build upon the marginal cost pricing framework by introducing new constraints and products directly into the market scheduling optimization. Unlike fast start pricing, these enhancements cause additional flexibility to be incorporated into the results of the scheduling run of the market software. The price and cost impacts of these enhancements are derived directly from the shadow prices produced by the market optimization. And the additional flexibility created in the scheduling run by these enhancements should greatly reduce the need for manual interventions by grid operators —

[14] The ISO is attempting to develop the imbalance reserve product as a flexibility and uncertainty product in the day-ahead market enhancements (DAME) and enhanced day-ahead market (EDAM) initiatives. However, DMM does not support the specific design proposed in the most recent DAME straw proposal.

interventions which create flexibility and protect against uncertainty but which can reduce real time prices during the net peak hours.