

Comments on Minimum State of Charge Extension Straw Proposal

Department of Market Monitoring

February 24, 2023

Summary

The Department of Market Monitoring (DMM) appreciates the opportunity to comment on the *Minimum State of Charge Extension - Straw Proposal*.¹ DMM does not oppose the extension of the minimum state of charge (MSOC) constraint until the implementation of the Energy Storage Enhancements exceptional dispatch provisions, or through September 2024 at the latest.

Existing exceptional dispatch provisions can facilitate similar or more operationally conservative outcomes during tight supply conditions. However, exceptional dispatches to batteries using existing tools can be infeasible at times and requires significant real-time intervention by CAISO operations staff. The MSOC ensures a minimum feasible market discharge award during critical hours. The MSOC may also provide a more transparent market solution in some circumstances.

While DMM does not oppose extension of the MSOC, we note that the MSOC was intended to be a temporary solution and can introduce inefficiencies into real-time market dispatch for battery storage resources. Therefore, DMM encourages the ISO to implement the storage exceptional dispatch provisions developed in the Energy Storage Enhancements as soon as practicable, and to extend the MSOC no longer than necessary. DMM also notes that the need for the MSOC could be further reduced by allowing storage resources to better reflect intraday opportunity costs in energy bids and default energy bids on days when the \$2,000/MWh energy offer hard cap is in effect.

Comments

DMM does not oppose the extension of the minimum state of charge (MSOC) constraint until the implementation of the Energy Storage Enhancements exceptional dispatch provisions.

DMM does not oppose the extension of the minimum state of charge (MSOC) constraint. The MSOC ensures the deliverability of day-ahead energy discharge awards for batteries providing resource adequacy capacity, during critical hours on days with a RUC infeasibility. Existing exceptional dispatch tools may also be used to manage storage resources on tight supply days. However, existing exceptional dispatch functionality is limited to megawatt dispatch instructions that do not explicitly consider state-of-charge in the exceptional dispatch instruction. This can at times lead to exceptional dispatch instructions that may be infeasible

¹ *Minimum State of Charge Extension –Straw Proposal*, California ISO, February 2, 2022:
<http://www.caiso.com/InitiativeDocuments/StrawProposal-Minimum-state-of-charge-extension.pdf>

for storage resources due to state-of-charge limitations. Further, exceptional dispatch of storage resources using current tools requires significant intervention in real-time by CAISO operations staff.

The MSOC ensures that at a minimum, energy discharge schedules awarded in the day-ahead market to batteries providing resource adequacy capacity are feasible over the highest need hours of the day. Because the MSOC does not rely on out-of-market instructions, the MSOC may also produce a more transparent market solution when used in the absence of exceptional dispatch instructions.

Finally, as noted in the ISO's Summer Market Performance Report for September 2022, the MSOC played an important role in preserving state-of-charge for some resources during some extreme high load hours of the 2022 heat wave.² This was particularly true on September 6, 2022 when batteries discharged during periods of high prices earlier in the day.³ On this day, the MSOC was binding for more resources than any other day of the heat wave period.⁴ The MSOC ensured that resources that had discharged earlier in the day were recharged and capable of producing their day-ahead discharge schedules in time for the highest load hours.

The MSOC was intended to be a temporary solution and can introduce inefficiencies into real-time market dispatch for battery storage resources.

In the context of current market rules, the MSOC serves as an additional tool to support system reliability on the tightest supply days. However, this tool was developed and approved as an interim measure pending the development of additional tools to manage battery storage resources.

The MSOC can introduce inefficiencies into the market dispatch of battery storage resource by limiting the ability of battery storage resources to fully participate in the real-time market for all hours of the day. Further, while the MSOC will ensure a certain state-of-charge level at a designated time, the constraint will not prevent batteries from discharging in real-time in the hours leading up to the hours of the MSOC. This can lead to a battery with a MSOC in the late afternoon and evening hours discharging in earlier hours, and then recharging immediately before the MSOC is in effect. This hour may still be a high load period where large amounts of additional battery charging load could contribute to operational challenges. Further, recharging in the hour before the MSOC is in effect may be uneconomic and can contribute to out-of-market uplift payments through bid cost recovery.

The Energy Storage Enhancements initiative developed new exceptional dispatch rules for storage resources that allow exceptional dispatch to a particular state-of-charge rather than to a fixed megawatt level. This initiative also established new opportunity cost based compensation measures for this type of exceptional dispatch. This initiative was approved in

² *Summer Market Performance Report September 2022*, California ISO, November 2, 2022, p.150.
<http://www.aiso.com/Documents/SummerMarketPerformanceReportforSeptember2022.pdf>

³ *Ibid*, p.152 and 154

⁴ In subsequent days of the 2022 heat wave period, the ISO relied more on exceptional dispatch of storage resources, so that the MSOC was binding much less frequently than on September 6.

2022. As noted in the Straw Proposal, the MSOC will no longer be needed after implementation of these market design changes.

DMM recommends that the ISO implement the approved Energy Storage Enhancements exceptional dispatch market design changes as quickly as practicable. This will minimize potential market inefficiencies, increase the effectiveness of exceptional dispatches to storage resources, and reduce the real-time operational burden of issuing exceptional dispatch to storage resources. Implementation of these changes is needed to ensure the MSOC is extended for only shortest possible amount of time.

DMM recommends consideration of additional market design changes to better facilitate the inclusion of intraday opportunity cost in battery energy bids. This may further reduce the need for the MSOC and out-of-market actions on tight supply days.

On extremely high load days, batteries are most needed for discharge during the highest net load hours of the day. These hours are also likely to have the highest prices of the day. While the MSOC ensures that day-ahead energy discharge schedules remain feasible in the highest net load hours, market participants may also use energy bids to ensure discharge availability in the highest valued hours. Energy bids in the hours leading up to the highest priced hours may be expected to reflect the opportunity cost of discharging before reaching those hours.⁵ This is especially true in real-time, where future intraday market opportunities may be beyond the time horizon considered by the real-time market optimization.

On some extremely high load days, prices can exceed the \$1,000/MWh energy soft offer cap in the highest priced hours, as well as in the hours leading up to the highest priced hours. However, battery resources are currently limited in their ability to reflect intraday opportunity costs through energy bids greater than \$1,000/MWh. As DMM understands, the ISO does not consider intraday opportunity cost as a fuel or fuel-equivalent cost that can support the reference level change request necessary to allow market bids over the \$1,000/MWh soft offer cap or to allow a revised default energy bid that may better reflect intraday opportunity cost during periods of extreme prices.

On days with high prices throughout the day, this can lead to batteries bidding up to \$1,000/MWh in real-time, but still receiving discharge schedules in the hours prior to those in which prices are highest and the battery discharge capacity is most needed. Similar outcomes can occur when batteries are mitigated to a level that does not adequately represent opportunity cost and leads to discharge earlier in the operating day. The ISO has cited market power mitigation as one factor that led to batteries discharging earlier in the operating day on

⁵ Intraday opportunity costs reflected in storage energy bids should consider future charging and discharging opportunities. When additional charging opportunities exist before reaching the highest priced hours, the opportunity cost will be less than the full value of prices expected in those hours. When no additional charging opportunities exist before reaching a profit maximizing discharge opportunity, the opportunity cost will reflect the full value of the forgone discharging opportunity.

September 6, increasing dependence on both the MSOC and exceptional dispatch in later hours.⁶

The MSOC ensures that these batteries are still charged in time to meet critical hour reliability needs, but charging may occur in periods with high load and in a manner that is uneconomic with respect to prices and submitted charging bids. If batteries were able to fully reflect intraday opportunity costs in market and default energy bids under these circumstances, energy discharge bids may work to better support the availability of battery discharge capacity in peak net load hours, while reducing dependency on the MSOC and exceptional dispatch.

Allowing the use of intraday opportunity costs to support storage reference level requests and energy bids over \$1,000/MWh would require careful policy development. However, in certain hours where a reasonable estimate of intraday opportunity costs exceeds \$1,000/MWh, this enhancement would support more efficient dispatch of energy storage resources. This would also support real-time reliability by significantly decreasing the probability of early discharge, and would do so without the use of the MSOC or exceptional dispatch. DMM recommends that the ISO consider this enhancement in a future initiative to allow batteries to better reflect intraday opportunity costs in market energy bids and default energy bids on days with extreme prices and system conditions.

⁶ *Summer Market Performance Report September 2022*, California ISO, November 2, 2022, p.149-150.
<http://www.caiso.com/Documents/SummerMarketPerformanceReportforSeptember2022.pdf>