



Memorandum

To: ISO Board of Governors and Western Energy Imbalance Market Governing Body
From: Anna McKenna, Vice President of Market Policy and Performance
Date: December 7, 2022
Re: **Decision on energy storage enhancements**

This memorandum requires ISO Board of Governors and WEIM Governing Body action.

EXECUTIVE SUMMARY

Storage developers are rapidly deploying new utility-scale resources onto the California grid. These storage resources will help the state meet its clean energy and climate goals. Storage resources are a critical technology because they can be available to meet energy needs during periods when renewable resources are unavailable. Currently, the ISO has access to over 4,700 MW of storage capacity in the markets. As a result of a robust stakeholder process in furtherance of efforts to continue to evolve the market models for storage resources, Management proposes three reliability enhancements to how storage resources are managed in the ISO market processes. Two other proposed changes apply to how storage resources co-located with other resources are modeled. The final proposed enhancement is a minor refinement to the day-ahead storage default energy bid applicable to storage resources.

The proposed reliability enhancements consist of three changes:

1. Accounting for a storage resource's state of charge for storage providing regulation service. This will ensure it is feasible for the storage resource to provide the service when procuring the service in the market.
2. New bidding requirements for storage providing ancillary services. This will ensure that a storage resource is available to provide awarded ancillary services.
3. Improved tools for exceptional dispatch for storage resources and enhancements to associated settlement provisions. This will ensure storage resources receive

adequate compensation for remaining charges so they have energy to meet load later in the day during peak hours.

The proposed co-located model enhancements consist of two changes:

1. An option to only charge storage from on-site renewables. This will avoid “grid charging” that could have federal tax implications for solar resources.
2. Allowing pseudo-tied resources to use co-located features. This extends a feature that is available today to internal ISO resources also to pseudo-tied resources, which are resources physically located outside the ISO balancing authority area.

Finally, Management proposes an enhancement to storage resources’ “default energy bid,” which is primarily used as part of the ISO market’s local power mitigation process. This change will add an opportunity cost adder to storage resources’ day-ahead default energy bid. This change will allow the day-ahead market to more accurately reflect these resources’ cost, enabling it to dispatch them more efficiently.

Moved, that the ISO Board of Governors and WEIM Governing Body approve the energy storage enhancements described in the memorandum dated December 7, 2022; and

Moved, that the ISO Board of Governors and the WEIM Governing Body authorize Management to make all necessary and appropriate filings with the Federal Energy Regulatory Commission to implement these changes, including any filings that implement the overarching initiative policy but contain discrete revisions to incorporate Commission guidance in any initial ruling on the proposed tariff amendment.

DISCUSSION AND ANALYSIS

In support of the evolving market, this proposal includes several enhancements to continue to integrate storage resources. These enhancements are to support reliable grid operations, improving the co-located hybrid resource model and expand the resources it applies to, and enhance the day-ahead default energy bid for storage resources.

Enhancements to support reliable grid operation

Today, the real-time market requires that any resource with an ancillary service award be capable of delivering energy to the full amount of the award for at least 30 minutes. For storage resources, this means they must have sufficient state of charge, *i.e.*, energy stored, to meet an ancillary service schedule. If a storage resource has insufficient state of charge, the real-time market can attempt to charge the resource before it will

become deficient. However, if the storage resource cannot successfully reach the state of charge needed in the time frame allotted, the market may force a buy-back of an ancillary service award and rescind the day-ahead ancillary service payment. Storage resources' inability to meet an ancillary service schedule can drive the market to procure incremental ancillary services in the 15-minute market to address the shortfall. This can result in a significant gap in time between market procurement and actual capacity availability. Additionally, this can present operational challenges because this process involves manual oversight by ISO operators. To help address these operational issues, Management proposes two changes to rules for storage resources providing ancillary services.

First, Management proposes to enhance the ISO market optimization to recognize the impact of regulation awards on storage resources' states of charge in the day-ahead and real-time markets. This will anticipate the energy that can be lost or gained when a storage resource provides ancillary services. The change will better align predicted state of charge with actual state of charge when storage resources are providing regulation service.

Second, Management proposes to require scheduling coordinators for storage resources to submit economic energy bids to charge when awarded upward ancillary services, or economic bids to discharge when providing regulation down. This, coupled with the first change, will ensure that a storage resource is available to provide awarded ancillary services. The second change ensures that the market software can always impact the state of charge of a resource energy schedule awards, thus ensuring that the resource is able to provide the awarded service to the market. In absence of the second change, a storage resource could potentially have insufficient state of charge to provide ancillary services and the market would have no ability to schedule that resource to achieve a state of charge where the resource could provide these services.

Third, Management proposes to enhance exceptional dispatch tools available to the operations' team. Compensation for traditional exceptional dispatch is based on the "bid or better" paradigm where resources receive compensation for energy delivered in response to exceptional dispatch instructions at the higher of their bid, the prevailing market price, or their default energy bid. This ensures that resources receive compensation at least as great as the marginal cost to provide energy. Today, if the operators want a storage resource to hold state of charge, they can issue an exceptional dispatch at or near 0 MW, but this results in almost no compensation to the resource for the exceptional dispatch. When storage resources must hold a state of charge pursuant to exceptional dispatch, the storage resource could potentially miss opportunities to participate in the real-time market. To compensate for this potential loss, Management proposes to settle such a storage resource based on the revenue it could have earned if it did not have to hold its state of charge. This will ensure storage resources receive adequate compensation for holding a state of charge to ensure energy available for reliability later in the day.

Improvements to the co-located model

Current investment tax credit rules impact the financial incentives for storage resources. The investment tax credit rules also can impact contracting for storage resources.

Some contracts expressly prohibit 'grid charging' for storage resources because grid charging might be from non-renewable resources. The resulting revenue consequences can reduce the revenue stream for a storage or co-located projects. Stakeholders requested a new mechanism for co-located resources that ensures revenue recovery if a storage resource seeking the investment tax credit were to incur costs due to grid charging. In response, Management proposes change to ensure any co-located storage resource can avoid grid charging by preventing dispatches above scheduled output from on-site renewable resources through the following proposed changes.

First, Management proposes to allow co-located storage resources to limit their charging from the grid so as not to exceed the co-located renewable resource's production. In simple terms, this generally will mean that a storage resource will elect not to charge more than its co-located solar generation in the same interval, allowing the storage resource to claim it did not charge "from the grid." This enhancement will allow co-located resources to take advantage of the investment tax credit law, which is frequently required by their financing and power purchase agreement. This functionality will be available to all co-located storage resources and electable on an hourly basis. This feature will not sacrifice reliability because all co-located resources will continue to be required to respond to operator and exceptional dispatch instructions within physical bounds of operation, regardless of their election.

In addition, also requested by some developers of co-located resources external to the ISO Balancing Area, Management proposes to extend co-located functionality to pseudo-tie resources. This includes offering the aggregate capability constraint, which limit dispatch instructions so that they do not exceed interconnection capabilities. This is a key feature available to co-located resources within the ISO footprint today, but is currently unavailable to pseudo-tie resources.

Refinements to the default energy bid

Management proposes for the addition of an opportunity cost adder in the day-ahead storage default energy bid. This adder will align the day-ahead default energy bid formulation with the formulation used in the real-time market. This will help prevent storage resources being scheduled to discharge too early in the day-ahead market.

POSITIONS OF THE PARTIES

Over 20 stakeholders submitted written comments during different phases of the policy development process. Stakeholder feedback was critical in defining the scope of the policy, shaping the policy, iterating to the final version of the policy. Stakeholders remain engaged in the policy development process for all aspects related to storage because it directly impacts forecasts for new storage resource profitability, how contracting occurs for new storage resources, how storage resources bid and perform, and how the ISO models new storage resources. The policy was developed as operational experience with storage resources was gained, and much of this policy is a direct result of challenges that the operators face while managing storage resources and challenges that storage developers face as new projects are interconnecting to the CAISO system.

Most of the stakeholder feedback on the aspects of this proposal are supportive and call for the ISO to implement these changes as quickly as possible to help accommodate storage operating in the market today.

Some stakeholders expressed concern about the aspects of the policy that require bids for storage resources providing ancillary services. These requirements can potentially reduce how much ancillary services storage resources may be awarded, which could impact resource profitability. The ISO recognizes this limitation; however, ISO has experienced operational issues during some periods in which storage resources are scheduled to provide ancillary services may be unable to do so due to either too high or too low of state of charge. This situation can threaten grid reliability if operating reserves from such resources are unable to be deployed during a contingency outage event. This typically occurs when storage resources are at very high or very low levels of state of charge and can be less responsive. Additionally, this can occur during periods when the market has no ability to charge these storage resources in real-time because there are no energy bids. Energy storage resources elect to bid to provide ancillary services. Requiring energy bids for ancillary service awards will help reduce risks that storage is unavailable to provide ancillary services, and scheduling coordinators can factor this requirement into their decision-making in bidding to provide ancillary services in the first place. As these new tools are developed, the ISO will collect data on their efficacy. This includes tuning and updating parameters, discussing methodologies for developing parameters, and potentially relaxing requirements. This policy seeks to strike a balance between resource availability to provide procured ancillary services and the ability for storage resources to participate as extensively as possible in the energy and ancillary service markets today.

The stakeholder policy continues to be a collaborative process and feedback was invaluable for developing these proposals. As we add more storage to the grid, rules around storage participation will continue to evolve and more collaboration will be necessary to develop the next generation of storage market rules and models. The

other aspects of the proposals to co-located resources and refinements to default energy bids are responsive to stakeholder input and have stakeholder support.

CONCLUSION

Management seeks approval for the above-described enhancements for reliability, changes to the co-located resource model, and refinement to the day-ahead storage default energy bid applicable to storage resources as part of the continuing effort to evolve the market models for storage resources.