



Memorandum

To: ISO Board of Governors

From: Anna McKenna, Interim Head of Market Policy and Performance

Date: December 9, 2020

Re: **Decision on energy storage and distributed energy resources – default energy bid for storage resources**

This memorandum requires Board action.

EXECUTIVE SUMMARY

The ISO's energy storage and distributed energy resources (ESDER) initiative focuses on lowering barriers and enhancing the participation of storage and distributed energy resources in the ISO market. As the presence and diversity of these resources increases, the ISO must be able to integrate and support their operational and commercial success as key reliability resources for California. The ESDER initiative is an omnibus initiative started in 2015 that has covered several related but distinct topics in furtherance of these goals. The initiative reflects the ISO's on-going commitment to learning, evolving, and improving its market systems, operational tools, and rules to best operate a more decentralized and distributed grid and integrating non-traditional resource types like demand response, battery storage, and hybrid resources.

The ISO Board of Governors approved a series of market enhancements related to energy storage and distributed energy resources included in the ESDER 4 initiative at its October meeting. Management did not include a proposal for storage default energy bids at the October meeting so that it could consider changes to the policy in response to feedback received from the ISO's Market Surveillance Committee.

Today, the ISO does not apply market power mitigation to storage resources because, until recently, there have been very few of such resources on the grid, and calculating cost-based bids for these resources is complex. As part of the fourth phase of the initiative, Management proposes market rule changes to enable the application of market power mitigation to storage resources. Management's proposal is the product of significant effort spent with current and future storage resource owners and operators to understand how storage resource costs impact their operation and how best to apply an appropriate default energy bid formulation to such resources. This resulted in a default energy bid formulation that is distinct from default energy bids for conventional resources. Management's proposed default energy bid for storage resources includes

the energy costs to charge the resource, the marginal costs to operate the resource, and daily opportunity costs. In addition, Management adopted two recommendations from the Market Surveillance Committee, which are as follows. First, Management proposes to exclude the opportunity cost component in the day-ahead storage default energy bid because the day-ahead market already considers opportunity costs in optimizing such resources' use over the day. Second, Management proposes to exclude small storage resources of less than 5 MW from local market power mitigation measures because they cannot influence market prices.

Management requests that the Board of Governors approve the proposal to apply local market power mitigation measures to storage resources including the formulation of the default energy bid. The proposal falls under the EIM Governing Body's advisory role. Management presented the proposal to the Governing Body at their December 2 meeting. The Governing Body voted to support the Board's approval of the proposal.

Management proposes the following motions:

Moved, that the ISO Board of Governors approves the tariff revisions necessary to implement the proposal to apply local market power mitigation measures to storage resources and the formulation of a default energy bid for storage resources as described in the memorandum dated December 9, 2020; and

Moved, that the ISO Board of Governors authorizes Management to make all necessary and appropriate filings with the Federal Energy Regulatory Commission to implement the proposed deliverability methodology revisions, 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

Today, there are approximately 550 MWs of grid-connected storage resources installed on the ISO system. This number does not include behind the meter storage resources installed in households or businesses that participate under state or local tariffs. Management anticipates that about 1,500 MW of storage resources will be installed and operational on the ISO grid by the end of 2021. Management further anticipates the storage buildout will continue at a high rate over the next few years as CPUC-jurisdictional load serving entities meet a near-term 3,300 MW procurement order. Given the transforming grid and growing reliance on battery storage, Management believes it is important to get in front of this wave of new storage development and implement market participation measures in anticipation of the growing number of energy storage resources that will interconnect to the grid in the very near term.

Default Energy Bid for Storage Resources

The ISO has local market power mitigation measures in place to prevent resources from exercising market power during uncompetitive market conditions. When uncompetitive market conditions are detected, resources subject to local market power mitigation have their supply bids replaced with cost-based bids determined by the ISO. These cost-based bids are called default energy bids. Today storage resources are exempt from local market power mitigation. However, as the size of the storage fleet increases, there will be increasing opportunities for such resources to exercise market power and it is therefore important to apply local market power mitigation to such resources.

The marginal cost of operating storage resources is different than most traditional generating resources participating in the market today. For example, default energy bids for gas resources generally consist of cost of fuel and their heat rates as their marginal cost. Storage resources are fundamentally different, as they do not originate electricity. They store electricity when charging during one time of the day, then may discharge that energy later in the day. The value proposition for these resources, and the benefit that these resources offer to the grid, is to charge during low priced hours when there is excess generation on the system and discharge when there is less generation available and prices are higher. Therefore, the cost to purchase the energy must be considered in addition to the variable cost of charging and discharging that energy. These latter costs are primarily accrued in the form of cell degradation, which eventually leads to the incurred maintenance cost of cell modification or cell replacement.

In addition to these costs, nearly all of the storage resources on the grid and in the interconnection queue have a small number of hours that they may continuously provide energy to the grid. Most are designed to provide energy for a 4-hour period of time. The ISO accounts for the ability of these resources to provide a limited amount of energy in an opportunity cost term that is also a component of the default energy bid for storage resources. This value is considered in the real-time in parallel with the costs outlined above. The opportunity costs included in this default energy bid formulation will prevent the resource from being discharged prior to the expected hours when the resource could earn maximum revenue, and the grid is in most need for their resource. This concept is similar to opportunity cost adders that the ISO allows for existing use-limited resources on our systems today.

The ISO offers a negotiated default energy bid to all resources that are subject to local market power mitigation. This provision would also be available to storage resources that find the proposed default energy bid does not accurately account for their costs. If a scheduling coordinator for a storage resource believes that the default energy bid proposed by the ISO does not cover their marginal costs, they may consult with the ISO's Department of Market Monitoring to negotiate a default energy bid that is sufficient to cover their marginal costs.

The Market Surveillance Committee provided guidance on how a default energy bid should work and offered specific feedback on Management's proposed formulation. Management also adopted two of their recommendations, which are as follows. First,

Management proposes to not include an opportunity cost adder for storage default energy bids calculated for the day-ahead market. Second, Management also proposes to exempt small storage resources that are net-buyers from local market power mitigation. The Market Surveillance Committee noted that the day-ahead optimization performs over a 24-hour period and the opportunity costs were not needed in this construct. Further, they noted that an incorrect default energy bid could have significant adverse impacts on very small storage resources, and that these resources were unlikely to have a significant ability to impact market prices. The Committee recommended that small resources that were net buyers in the market be exempt from local market power mitigation. Management included both of the Market Surveillance Committee's recommendations because they are prudent and consider the unique features of these resources.

POSITIONS OF THE PARTIES

The stakeholder process provided significant education and information about energy storage technologies and how their costs are calculated over the course of the ESDER 4 initiative, which is reflected in Management's proposed storage default energy bids. Stakeholders shared their experiences in participating in markets and technology constraints and costs, along with insight into how resource availability decisions are made when participating in the market. This collaborative information exchange began with a stakeholder web conference held in February 2019 and continued through most of 2020. In total, eight stakeholder web conferences and six on-site stakeholder working groups were held with 10 sets of stakeholder comments received and considered in the refinement of the ESDER 4 final proposal and the final draft of the storage default energy bid. Comments and feedback throughout this period included suggestions for various ways to improve the default energy bid for storage resources. Further, the Market Surveillance Committee provided feedback on the ESDER 4 final proposal in September and prior to the final two stakeholder web conferences.

Management appreciates the time, attention, and experience shared by market participants in this stakeholder process and the valuable feedback they provided along the way that shaped the final version of the proposal. The following summarizes stakeholder comments received on the proposal.

Stakeholders were generally supportive of applying local market power mitigation to storage resources and the proposed default energy bid. Several stakeholders listed specific caveats for features that they believe could improve the default energy bid.

Default energy bids are an important market feature that ensure market participants receive sufficient market compensation to cover their marginal costs. If this bid is below a resource's true marginal costs, it can create an unsustainable situation for market participants where compensation could be less than actual marginal costs. Several stakeholders voiced concerns about the accuracy of the default energy bids. Because of the critical role that these bids play, Management understands these concerns and is sensitive to how default energy bids are calculated. Some of the concerns voiced by

stakeholders included accuracy of the costs to buy energy and the opportunity cost components of the default energy bid.

The construction of the default energy bid for storage resources is novel and includes a process not used for default energy bids available to other resources. This construct includes a calculation of the estimated costs to buy energy. The proposal provides an estimate of this value at the lowest prices of the day. Management contends that rational behavior from a storage resource would dictate that these periods are the periods when energy is procured. To compute this value in the day-ahead market, the market software will use an earlier run of the day-ahead market to obtain the energy charging costs. Real-time default energy bids will also be calculated using energy prices from the day-ahead market. Historically, the convergence between these two markets has been good, and therefore Management believes these are reasonable estimates for the cost that storage resources will incur to procure energy.

Stakeholders also suggested that the opportunity cost component of the default energy bid may not be sufficient to capture the highest priced intervals when a storage resource would prefer to run. The opportunity cost component of the default energy bid is applied only in the real-time market. The default energy bid will use the highest priced hours from the day-ahead market as the opportunity cost. Management also believes that these values will provide a sufficient buffer to prevent storage resources from being discharged prematurely because of the strong convergence between prices in the day-ahead market and the real-time market.

In earlier versions of this proposal the ISO included a more complex default energy bid that could change dynamically throughout the day. This could be advantageous for storage resources because an inverse relationship typically exists between state of charge and what price the resource operator is willing to sell energy. Further, a dynamic calculation could include actual prices paid for energy costs rather than estimates. Because of the complexity of implementing such a calculation and the ISO's limited operational experience with storage resources, Management has elected a simpler default bid formulation for storage resources. Some stakeholders continue to comment that the derivation should include some of these additional complexities. Management remains committed to reviewing this default energy bid in the future, as more operational experience is gained with storage resources. At that time, this calculation may be enhanced with additional features, potentially including dynamic attributes.

CONCLUSION

This proposal will further advance the efficient and effective use of energy storage and distributed energy resources in the wholesale markets. Management requests the Board approve the proposed items included in the proposal to apply market power mitigation to storage resources and for the default energy bid for storage resources.