



Memorandum

To: ISO Board of Governors

From: Mark Rothleder, Vice President, Market Policy and Performance

Date: September 23, 2020

Re: **Decision on flexible ramping product refinements proposal**

This memorandum requires Board action.

EXECUTIVE SUMMARY

The ISO's Energy Markets Price Performance Report, published September 23, 2019, identified issues that limit the effectiveness of the flexible ramping product. The flexible ramping product is intended to address uncertainty caused by load and variable energy resources that materializes between market runs. The current design does not allow the market to consider locational constraints when procuring the flexible ramping product. This results in the market awarding the flexible ramping product to resources that may not be fully deliverable when and where uncertainty materializes.

Management proposes to implement nodal procurement of the flexible ramping product. The nodal procurement is accomplished through incorporating in the real-time market potential congestion scenarios that consider whether the resources awarded flexible ramping product can be deployed when needed for energy in the real-time market. The scenarios would ensure that upward flexible ramping product awards are not given to resources located behind a transmission constraint, and downward flexible ramping product awards are not given to resources providing counter flow to resolve a transmission constraint. This is accomplished by ensuring that (1) energy plus upward flexible ramping product awards and (2) energy less downward flexible ramping product awards are deliverable.

The proposed enhancements provide several benefits that will result in more efficient real-time commitment of resources. The enhancements will reduce the need for out-of-market actions to meet intra-hour ramping uncertainty. They will also improve the pricing of flexibility by no longer awarding product to undeliverable resources with no opportunity cost. Finally, enhancements that ensure the deliverability of products that address uncertainty is key to the success of both the day-ahead market enhancements and extended day-ahead market initiatives.

Management proposes the following motion:

Moved, that the ISO Board of Governors approves flexible ramping product refinements proposal described in the memorandum dated September 23, 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 proposal described in the memorandum, 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

The flexible ramping product was introduced in Fall 2016 to improve the pricing and management of ramping capability in the real-time market. The flexible ramping product addresses uncertainty caused by load and variable energy resources that materializes between real-time market runs. Prior to the flexible ramping product implementation, the multi-interval market optimization would solve forecast net load¹ utilizing the precise amount of ramping capability across the market horizon. However, when system conditions changed in subsequent market runs, the market would often lack sufficient ramping capability to meet the updated net load forecast. The flexible ramping product secures additional ramping capability that can be dispatched in subsequent market runs to cover uncertainty in forecast net load. Resources providing this ramping capability are compensated at the marginal opportunity cost for both changes in their energy schedules between the binding and advisory intervals and uncertainty awards.

The ISO's Energy Markets Price Performance Report, published September 23, 2019, identified issues that limit the effectiveness of the flexible ramping product. Procurement of the flexible ramping product is based on minimizing energy opportunity costs, which arise from the trade-offs between the need for energy and the need for ramping capability. The current market does not consider locational constraints when procuring the flexible ramping product. This results in the market awarding the flexible ramping product to resources that may not be fully deliverable.

The complication relates to congestion from internal constraints within a balancing authority area and from scheduling limits on transfers between balancing authority areas. The market enforces transmission constraints within each balancing authority area to economically manage congestion while resources are optimally dispatched for energy to meet the net load forecast. As part of the congestion management process, resources move up if they help to mitigate the congestion, or down if they exacerbate

¹ Net load is gross load less wind and solar resource output.

congestion. Currently, congestion management does not explicitly account for the flexible ramping product procurement.

As a result, the market can procure upward flexible ramping capacity from resources that are dispatched down for congestion management, which in the next market run when uncertainty materializes cannot be deployed due to congestion. This interplay between congestion and flexible ramping product procurement can be further exacerbated because the market may find it optimal to allocate upward flexible ramping product capacity precisely to resources dispatched down for congestion management. A similar dynamic exists for downward flexible ramping capacity and resources dispatched higher for energy to provide counter flow to mitigate congestion. In its current implementation, the market has no mechanism to avoid this outcome.

Deliverability of flexible ramping products

Management proposes to implement nodal procurement of the flexible ramping product. The nodal procurement approach addresses operational concerns that flexible ramping capacity may not be dispatchable and more accurately prices an individual resource's flexible ramping capacity. The flexible ramping product awards will result in a locational value of flexible ramping product similar to energy.

Nodal flexible ramping product procurement is accomplished through the introduction of deployment scenarios to ensure that (1) energy plus upward flexible ramping product awards and (2) energy less downward flexible ramping product awards are transmission feasible. This ensures that upward flexible ramping product awards are not given to resources located behind a transmission constraint, and downward flexible ramping product awards are not given to resources providing counter flow to resolve a transmission constraint.

The goal of the nodal procurement approach is to not eliminate stranded ramping capability when system conditions change. The goal is to not knowingly strand capacity because the optimization awards resources with zero energy opportunity cost due to congestion.

In response to stakeholder comments, Management is proposing two refinements to the deployment scenarios to improve deliverability and availability, as follows: (1) recognize that uncertainty can materialize at load and variable energy resource locations versus just load, and (2) distribute the demand curve surplus variable as a decision variable at load aggregation points versus balancing authority areas to minimize excess relaxation.

Management analyzed uncertainty for load, wind and solar individually by operating hour for 2019. The data shows that in the middle of the day uncertainty in the forecast of variable energy resources is the predominant driver of uncertainty. Therefore, the deployment scenario will more accurately reflect the dispatch of the flexible ramping product by distributing a larger portion of the deployment scenario to variable energy resource nodes.

The flexible ramping product requirement is relaxed by a demand price curve that reflects the expected cost of foregoing the procurement of the flexible ramping product. Therefore, it is not procured when it is more expensive than the benefit it provides. In order to implement the demand curve, the market uses a demand curve surplus variable to add “supply,” and procure less flexible ramping product. Ideally, the demand curve would be considered on a nodal basis, but this is not practical from an implementation standpoint. As a result, the demand curve surplus variables will be considered for each load aggregation point. This can limit the shortfall to an individual load aggregation point while allowing the requirement in other load aggregation points to be fully met.

Proxy demand response

The flexible ramping product can only be awarded to resources that can respond to the 5-minute real-time dispatch. In the ISO’s Energy Markets Price Performance Report it was observed that proxy demand response resources that cannot respond to the 5-minute real-time dispatch have been awarded the flexible ramping product because of their low energy opportunity costs.

In the energy storage and distributed energy resources phase 3A initiative, additional bidding options were made available to proxy demand response resources. These included a 60-minute and 15-minute dispatchable bid option. Unlike the 5-minute dispatch which has a 2.5 minute notification to curtail load, these options provide 22.5 minutes and 52.5 minutes notification prior to the time load needs to be curtailed. These provisions became effective November 13, 2019. To ensure that the flexible ramping product is not awarded to proxy demand response resources that cannot respond to a 5-minute real-time dispatch, Management proposes to set the default setting for proxy demand response resources to be 60-minute dispatchable. Under this approach, proxy demand resources will have to take action to affirm their ability to respond to 5-minute dispatch instructions and thus be eligible for flexible ramping product awards.

POSITIONS OF THE PARTIES

Stakeholders agree with the principles of nodal procurement but are concerned about its complexity and potential impact to the ISO’s market system performance. Management is confident that the proposed nodal design can be implemented in both the real-time market for the flexible ramping product and in the day-ahead market for the imbalance reserves and reliability capacity currently being developed in the day-ahead market enhancements initiative. Management believes it is important to focus resources on nodal deliverability of the flexible ramping product versus developing interim solutions. This will provide additional operational experience prior to implementing imbalance reserves and reliability capacity in the day-ahead market.

Prior to the development of the draft final proposal, PG&E questioned if distributing the uncertainty of the flexible ramping product to load only is appropriate given that uncertainty is driven by both load and variable energy resource variation. Also, PG&E

requested that the approach for distributing the demand curve surplus variable be reconsidered. Management modified the proposed design to address these concerns.

The Department of Market Monitoring reiterated their request to increase the uncertainty requirement to cover larger uncertainty that can occur over an hour or longer than the current approach which includes the 15-minute uncertainty in each of the advisory intervals in the real-time market. Since the current flexible ramping product is not fully deliverable, Management is unsure of the incremental benefit of adding an additional time horizon of uncertainty into the optimization at this time since the 15-minute requirement is already included in each advisory interval. However, Management is considering the potential need to model longer uncertainty horizons as part of the day-ahead market enhancements initiative.

CONCLUSION

Management recommends the Board of Governors approve the proposed changes discussed above. The refinements will result in more efficient real-time unit commitment reducing the need for out-of-market actions to meet intra-hour ramping uncertainty, improve the pricing of flexibility by no longer awarding product to undeliverable resources with no opportunity cost, and deliverability of products that address uncertainty is key to the success of the day-ahead market enhancements and extended day-ahead market.