

Memorandum

To: ISO Board of Governors
From: Laura Manz, Vice President – Market & Infrastructure Development
Date: May 8, 2009
Re: **Decision on Multi-Stage Generating Unit Modeling**

This memorandum requires Board action.

EXECUTIVE SUMMARY

Management proposes to implement multi-stage generating unit modeling within the market software to facilitate the efficient dispatch of generation resources with forbidden operating regions. Management has developed a proposal that balances flexible modeling of these units with software constraints. Multi-stage generating unit modeling is targeted for implementation in the fourth quarter of 2009. The proposal:

- Enables market participants to bid up to ten configurations of their multi-stage units into the integrated forward market; and
- Provides multi-stage generating units with the flexibility to bid up to three configurations into the real-time market. At least one configuration bid into the real-time market must support the day-ahead schedule, ancillary services award, residual commitment award/schedule, and resource adequacy offer obligation. All configurations bid into real time must be certified for the ancillary services product and capacity awarded in the day-ahead market, and must reserve that capacity for operating reserves in real time.

Moved, that the ISO Board of Governors approves the policy to implement Multi-Stage Generating Unit Modeling as outlined in the memorandum dated May 8, 2009; and

That the ISO Board of Governors authorizes Management to make all the necessary and appropriate tariff filings with the Federal Energy Regulatory Commission to implement this policy.

BACKGROUND

Within the fleet of resources available to the California Independent System Operator Corporation (the ISO), several resources are multi-stage generating units characterized by multiple operating configurations. While this makes them more flexible, it also requires explicit modeling of the configurations in order to take advantage of that flexibility, and to avoid infeasible dispatch of the resources.

The current market software does not yet support the efficient, feasible dispatch of multi-stage generation units. Initially, the ISO had intended to use the forbidden operating region functionality to act as a proxy for modeling of multi-stage units. The use of forbidden operating regions to capture the operating constraints of multi-stage generating units proved both inadequate and unstable in market simulations. As a result, the forbidden operating region functionality was suspended, leaving ISO operators and market participants to manage these units in more manual ways. To ensure that units are not dispatched to infeasible output levels, market participants will manually limit dispatches of multi-stage units using outage reporting tools and, as a last resort, ISO operators will use exceptional dispatch to guard against infeasible dispatches.

As directed in a Federal Energy Regulatory Commission (FERC) order,¹ implementation of explicit modeling of multi-stage units was planned for within three years of the launch of the new ISO markets. Due to the suspension of the forbidden operating region functionality, and because manually managing the dispatch of these units is burdensome and inexact, as accepted by FERC most recently, the timeline for implementation of multi-stage generating unit modeling is targeted for the fourth quarter of 2009.²

DESIGN CRITERIA

In developing an approach to the modeling of multi-stage generating units, Management sought to balance the importance of capturing the flexibility of these units with the need to respect software performance constraints. In particular, Management sought design options that:

- More accurately incorporate the operating parameters of multi-stage generating units so that the units will be economically and feasibly dispatched, and the market can benefit from their full participation; and
- Consider the feasibility and cost of implementation for both the ISO and stakeholders.

¹ Paragraph 573 of FERC's September 21, 2006 *Order on MRTU* "direct(s) the ISO to continue working with software vendors to develop an application that will accurately detail the constraints of combined cycle units, and to file tariff language" for implementation of such improvements no later than three years after MRTU start up.

² Paragraph 30 of FERC's January 30, 2009, *Order on Deferred Functionality* accepts the ISO's commitment to develop the multi-stage modeling functionality within six to nine months following MRTU go live.

OPTIONS CONSIDERED

Considering the above design criteria, the following four options were evaluated:

- To model multi-stage units by dividing them up into identical, mutually exclusive sub-resources, also known as pseudo-units. Stakeholders and the ISO agreed that this approach would not enable the accurate modeling of the embedded configurations of multi-stage units;
- To model all configurations of multi-stage units in both the day-ahead and real-time markets. Although this approach would capture all the operating and economic constraints of the multi-stage units, it would lead to a major computational burden in the real-time market timeline. In fact, it is unlikely that optimizing over all multi-stage unit configurations would be feasible in real time;
- To model all configurations of multi-stage units on a configuration basis in the integrated forward market, and use the outcome of the forward market to set a single configuration for the real time optimization. To keep a resource that is not taken in the integrated forward market available to the market in real time, a market participant could submit a bid for one configuration of the resource into the real-time market optimization. Stakeholder feedback indicated that this option was not satisfactory because fixing the integrated forward market configuration for real time does not enable the market to take advantage of the flexibility of multi-stage units; and
- To model multi-stage units on a configuration basis in both the day-ahead and real-time markets while limiting the number of configurations that can be bid into the markets. In the day-ahead market bids can be submitted for up to ten configurations, and up to three configuration-level bids can be submitted into the real-time market. This fourth option adds considerable complexity over options described in the first and third bullets above. This option better meets participants' needs than those options, however, and mitigates software performance issues raised by the ISO software vendor.

STAKEHOLDER FEEDBACK

Throughout the stakeholder process leading up to this proposal, all comments have favored multi-stage generating unit modeling. In addition, all stakeholders who expressed a preference between configuration-based modeling and the pseudo-unit models were in favor of the former. In response to the first straw proposal, which proposed the third option described above, stakeholders commented that fixing the configuration chosen in the integrated forward market did not allow enough flexibility to effectively bid multi-stage units in the ISO markets.

In response to this feedback, Management prepared a revised straw proposal based on the fourth option described above. Generally, stakeholders expressed support for this revised straw proposal. There were some requests for clarification and some expression of concern about particular elements of the proposal. These comments are summarized in the attached matrix.

MANAGEMENT RECOMMENDATION

After careful consideration of input from both stakeholders and ISO software developers, Management recommends the approach outlined in the fourth item above. Our recommendation for the design of multi-stage generating unit modeling is based on the goal of offering market participants maximal opportunity to bid the flexibility of these units into the ISO markets, while adhering to software performance constraints. This will enable both the participants and the ISO to avoid infeasible dispatches, thus relieving the burden of manually managing the units using outages, de-rates, and exceptional dispatch. The proposed design for multi-stage generating unit modeling will not only keep those units in the market, but will provide participants the ability to offer up the inherent flexibility of these units and for the ISO to employ that flexibility.

The proposal enables market participants to submit bids for up to ten configurations of their multi-stage units into the integrated forward market, which would select one configuration based on the market optimization. The market participant can submit up to three configuration-level bids for the resource into the real-time market. Only one configuration would be selected for real-time dispatch.

In addition, with respect to the design for multi-stage generating unit modeling, Management recommends the following:

1. Bids for ancillary services should be submitted at the configuration level for multi-stage generating units. This will require that individual configurations be tested and certified to provide ancillary services. Furthermore, all valid real-time bids should be certified to provide the capacity and product of any day-ahead award for ancillary services;
2. Local market power mitigation should be performed at the configuration level, and default energy bids should be developed at the configuration level as well;
3. Multi-stage units with resource adequacy offer obligations should be required to offer the contracted capacity into both the day-ahead and real-time markets;
4. For resource adequacy multi-stage units, residual unit commitment should consider all configurations that have capacity equal to or greater than the configuration scheduled in the day-ahead market; and
5. Bid cost recovery should be calculated at the resource level, and should be based on the costs associated with the configuration actually dispatched by the optimization as well as the costs of transitioning between configurations.