Issue Paper

Multi-Stage Generator Unit Modeling Enhancements

June 24, 2011
MSG Enhancements

Prepared for Discussion on a Stakeholder Call – July 1, 2011

1 Introduction

In December 2010, the ISO implemented modeling functionality that optimizes the commitment and dispatch of generating units that, by their physical nature, have multiple operating configurations. The MSG functionality is designed to take advantage of the inherent flexibility of these resources while respecting their operating characteristics and the costs of their operation. Through experience gained with MSG over the past seven months, analysis of commitment, dispatch, and market outcomes for MSG resources, and with the help of stakeholder feedback, the ISO has identified potential refinements to the MSG functionality.

Starting with this issue paper, the ISO is initiating a stakeholder process to review the identified potential refinements to the modeling of multi-stage generation units, and to solicit feedback and suggestions from interested stakeholders. The outcome of this process should determine the key policy features for modeling and dispatching multi-stage generating unit models, as well as any implications or related concerns such as Bid Cost Recovery for embedded generating units.

2 Process and Timetable

The purpose of the present issue paper / straw proposal is to provide stakeholders with a description of the suite of near-term improvements to MSG modeling identified by the ISO. This paper offers ISO recommendations for how to proceed on these issues, and “next steps” in the process to implement the targeted improvements in November 2011.

<table>
<thead>
<tr>
<th>Date</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 24, 2011</td>
<td>Post issue paper / straw proposal</td>
</tr>
<tr>
<td>July 1, 2011</td>
<td>Stakeholder conference call</td>
</tr>
<tr>
<td>July 14, 2011</td>
<td>Stakeholder comments due *</td>
</tr>
<tr>
<td>August 5, 2011</td>
<td>Post revised straw proposal</td>
</tr>
<tr>
<td>August 12, 2011</td>
<td>Stakeholder conference call</td>
</tr>
<tr>
<td>August 19, 2011</td>
<td>Stakeholder comments due *</td>
</tr>
<tr>
<td>September 9, 2011</td>
<td>Post draft final proposal</td>
</tr>
<tr>
<td>September 16, 2011</td>
<td>Stakeholder conference call</td>
</tr>
<tr>
<td>September 23, 2011</td>
<td>Stakeholder comments due *</td>
</tr>
<tr>
<td>October 27–28, 2011</td>
<td>CAISO Board of Governors meeting</td>
</tr>
<tr>
<td>November, 2011</td>
<td>Implementation</td>
</tr>
</tbody>
</table>

* Please e-mail comments to msg-enhance@caiso.com

3 Description of the Issues, Proposed Resolutions, & Next Steps
Following implementation of the MSG modeling functionality in December 2010, the ISO and stakeholders have identified several enhancements that can improve modeling to allow better real-time operation and MSG participation in light of the characteristics typical of MSG resources. In doing so, this list also addresses several stakeholder concerns. The issues and proposed resolutions are described below along with the ISO’s assessment of the next steps in this stakeholder effort that will be required to implement these changes.

3.1 Limitations on MSG configurations and paths in real-time

**Issue**
The current limitation in the number of MSG configurations in real-time is 3 plus the day-ahead and/or RUC committed configuration. Production experience indicates that, the real impact to MSG performance is the number of alternative transition paths among configurations, not the number of configurations themselves.

**Proposed resolution**
The ISO proposes to open up the number of real-time bid-in configurations while limiting the number of possible transitions among configurations. Being able to bid in more configurations will give market participants more flexibility in bidding in their MSG units. Additionally, having more bid-in configurations will aid the real-time market in optimizing the dispatch of MSG resources in situations of under- and over-generation.

The ISO further proposes to limit the number of paths between any two configurations to two. Thus, for the transition from configuration 1 to configuration 4, the resource can only specify – for example – a transition directly from configuration 1 to configuration 4, and a transition from configuration 1 to configuration 3, and then to configuration 4. In practice, MSG resources have not registered so many transition paths that this would negatively impact them. However, as noted above, if the number of paths between configurations were to expand beyond two, there would be a significant negative impact on the ability for the real-time optimization to run in the allotted amount of time.

**Next steps**
ISO Board approval and Tariff changes are not required for increasing the number of configurations that can be bid into the real-time market. However, the limitation on the number of transition paths will require ISO Board approval as well as a change to the ISO Tariff upon resolution of this stakeholder process.

3.2 Bidding requirements on lower configurations

**Issue**
Current bidding requirements allow an MSG resource to bid in any start-able configuration. This leaves the capacity below the minimum operating level of that configuration unavailable to the market optimization. This is not consistent with the treatment of non-MSG resources for which the optimization can consider the operating levels from the plant-level Pmin up to the maximum bid-in capacity. As a consequence, the market solution has less flexibility. Furthermore, situations can arise in which an MSG resource’s Resource Adequacy capacity is not fully bid in as required.

**Proposed Resolution**
The ISO proposes that MSG resources be required to offer the entire capacity range below their day-ahead scheduled energy and/or awarded capacity into the real-time market. Note that the enhancement to enable resources to bid up to ten configurations in real-time will make this possible without limiting participants’ ability to supply other real-time bids. This will improve the market solution by giving it additional flexibility, and it will also ensure that all Resource Adequacy capacity is bid in as required.

Next steps
ISO Board approval and changes to the ISO Tariff are required following the resolution of this stakeholder process.

3.3 Transition cost validation rules

Issue
The ISO proposes a change to the validation rules currently applied to the MSG transition cost registration. The objective is to be able to allow market participants to register the unit’s true fuel cost associated with each transition. The current rules, though originally intended to provide market participants with flexibility, have proved too limiting in this regard.

Proposed Resolution
The ISO proposes to replace the existing transition cost validation rules with a proxy calculation for transitions between configurations. Thus the transition costs will be purely formulaic and based entirely on physical operating parameters. Specifically, for each feasible transition between configurations, an MSG resource’s proxy transition cost will be calculated in the same manner as the proxy start-up value which is determined by multiplying the resource’s heat rate (for a “hot start”) by the daily gas price index.¹ The proxy costs submitted to the ISO will thus be the costs of moving from one MSG configuration to another. The calculation of proxy start-up values includes the resource’s unit-specific auxiliary power used for start-up multiplied by that resource’s unit-specific electricity price. The ISO proposes to allow the inclusion of auxiliary power in the calculation of proxy transition costs. The rationale for this proposal is that auxiliary power can be accounted for in the event that a transition involves a physical unit start-up in practice.

Next steps
ISO Board approval and Tariff changes will be required following the resolution of this stakeholder process.

3.4 Limitation to one ramp-rate for each MSG configuration

Issue
The current MSG functionality allows only one ramp-rate to be defined and bid-in per configuration. This creates limitations for some resources. Some combined cycle units can ramp from, for example, one configuration that can operate in two modes: 2x1, and 2x1 plus duct firing. These two modes have largely different ramp-rates

¹ For detail on the calculation of the daily gas price index, see Appendix C of the Market Instruments Business Practice Manual at the following link:
https://bpm.caiso.com/bpm/bpm/version/00000000000133
Proposed resolution
The ISO proposes to allow two ramp-rates per configuration. Feedback from market participants indicates that this is a significant improvement and that it will increase MSG participation.

Next steps
ISO Board approval and Tariff changes will be required following the resolution of this stakeholder process.

3.5 Flexibility needed with respect to the self-scheduled real-time configuration to support the energy schedule or A/S award from the day-ahead market

Issue
Currently, if an MSG resource has a day-ahead energy schedule or ancillary service award in one configuration, then the resource can only self-schedule in real-time in that configuration. In actuality, there can be more than one configuration able to support that day-ahead schedule and ancillary service award.

Proposed resolution
The ISO proposes to relieve this limitation by enabling market participants to self-schedule in real-time into a configuration different from that scheduled in the day-ahead so long as the real-time configuration can support the same awarded ancillary service and/or Residual Unit Commitment capacity.

Next steps
ISO Board approval and Tariff changes will be required following the resolution of this stakeholder process.

3.6 Bid Cost Recovery calculation

Issue
Under the current rules, if an MSG resource is committed by the ISO to a higher configuration, its minimum load costs will be included in the Bid Cost Recovery calculation provided that the meter is within the 3 percent Tolerance Band of the Pmin. If the resource falls short of the 3 percent Tolerance Band, no minimum load costs are considered in the Bid Cost Recovery calculation for that interval. However, the resource in this case may still be operating above the minimum load of a lower configuration and would be operating above the plant-level minimum load. There is therefore the concern that this rule be revised to capture in the BCR calculation the cost incurred by the resource’s operation in this circumstance.

Proposed resolution
The ISO has identified three options for revising the calculation of an MSG resource’s minimum load costs for inclusion in the calculation of Bid Cost Recovery. In the event that a resource is committed by the ISO to a higher configuration and the resource does not reach the lower bound of the Tolerance Band of that target configuration, the ISO has identified the following three alternative measures of determining an MSG resource’s minimum load energy for the BCR calculation:

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2 The Tolerance Band is calculated as 3 percent of the plant-level Pmax.
1. The plant-level minimum load costs;
2. The minimum load costs for the highest configuration that the meter is within or above the 3 percent Tolerance Band of its Pmin; or
3. The proration of the target configuration’s minimum load costs based on the percentage of the meter to the target configuration’s minimum load level if the meter is above the Pmin of the MSG resource. For example, consider an MSG resource that is dispatched up into a higher configuration with a Pmin of 200 MW. If the tolerance band for the resource were 15 MW, but the resource only reaches 150 MW, it would receive 75 percent of the target configuration’s minimum load costs.

The ISO proposes the second option because it fairly compensates generating resources for energy delivered. This is consistent with FERC’s September, 2006 order since the minimum load cost of a higher configuration above the resource’s Pmin normally reflects the energy fuel cost when the unit delivers that higher level of energy. Additionally, Option 2 is consistent with the treatment of non-MSG resources which don’t get their plant-level minimum load costs included in the BCR calculation for an interval in which they are outside the tolerance band around their Pmin. Since MSG configurations are considered as “logical generators” the ISO proposes that it is reasonable to exclude a configuration’s minimum load costs if the Pmin less the tolerance band is not achieved. Again, to be consistent with the 2006 FERC Order, the ISO proposes that the minimum load costs associate with the highest configuration that the meter is in (less the tolerance band) be included in the BCR calculation since that minimum load energy is actually delivered.

Next steps
After the completion of this stakeholder initiative, approval by the ISO Board is not required but the ISO Tariff will need to be modified to reflect a change to the compensation for Minimum Load Costs for MSG units.

4 Conclusion

The focus of this issue paper / straw proposal and the ensuing stakeholder discussion is on the identified enhancements to the MSG modeling functionality. The ISO invites stakeholder comments and discussion on the issues raised within this paper. The ISO will conduct an initial conference call to review this document on July 1, 2011 from 8:30 a.m. to 10:00 a.m. Additional time is allotted for comments out of recognition that many participants providing comments will be unavailable for all or part of the 4th of July holiday week. Comments should be sent to msg-enhance@caiso.com by close of business on July 14, 2011.

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