California Independent
System Operator Corporation

February 3, 2012

The Honorable Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Re: California Independent System Operator Corporation
Docket No. ER12-____- 000

Amendments to California ISO FERC Electric Tariff to Enable Enhancements to the Multi-Stage Generating Resource Modeling Functionality

Dear Secretary Bose:

Pursuant to Section 205 of the Federal Power Act, 16 U.S.C. § 824d, and Part 35 of the Federal Energy Regulatory Commission's (FERC or the Commission) regulations, 18 C.F.R. Part 35, and in compliance with Order No. 714 regarding electronic filing of tariff submittals,[1] the California Independent System Operator Corporation (ISO) hereby submits for filing the attached amendments to its Fifth Replacement FERC Electric Tariff. The ISO is filing these amendments to enable the ISO to make improvements to its multi-stage generating resource modeling functionality.

In order to provide sufficient time to prepare for the implementation of the proposed enhancements, the ISO respectfully requests a Commission order by April 4, 2012.

I. BACKGROUND

In December 2010, the ISO implemented the multi-stage generating resource functionality. The functionality optimizes the commitment and dispatch of generating resources that, by their physical nature, have multiple operating configurations. Examples of such resources are combined-cycle units which are comprised of multiple generation resources, large thermal generators that require the operation of auxiliary equipment (*e.g.*, feed water pumps or additional boilers), and certain types of hydro-

[1] *Electronic Tariff Filings*, Order No. 714, FERC Stats. & Regs. ¶ 31,276 (2008).

electric generation plants. The multi-stage generating resource functionality is designed to take advantage of the inherent flexibility of these resources while respecting their operating characteristics and the costs of their operation. Multi-stage generating resources essentially can bid each configuration into the market as if it were a separate generating resource. The ISO, through its market optimization software, then determines which configuration is most economic given those bids while respecting the configurations' operating constraints.

II. DISCUSSION OF FILING

Through experience gained since deployment of the multi-stage generating resource functionality, the ISO, in collaboration with its stakeholders, has identified several refinements to the market rules that address various stakeholder concerns and issues identified by the ISO. By addressing these concerns, the ISO anticipates that it will provide greater flexibility to multi-stage generating resources and allow such resources to participate in the ISO markets more economically, allow for more efficient real-time dispatch, and aid in the reliable operation of the ISO grid. The ISO accordingly seeks Commission approval of tariff amendments necessary to implement the following five refinements:

1. Increase the number of configurations that a multi-stage resource can bid into the real-time market from three to six and limit the number of transition paths between any two configurations to two for those units that have registered more than six configurations.

2. Require multi-stage generating resources to bid the entire range of capacity from the overall minimum operating capacity of the resource (or its self-schedule) up to the maximum bid-in energy and permit the ISO to insert cost-based generated bids where a unit does not so bid in its capacity.

3. Increase the number of ramp-rates that can be specified per configuration from one to two.

4. Permit multi-stage generating resources to self-schedule in the real-time market in a different configuration than was scheduled in the day-ahead market, so long as the different configuration can support any ancillary service or RUC awards.

5. Credit a multi-stage generating resource with the lower of the minimum load costs of its metered configuration and its committed configuration in cases where the metered configuration is different from the committed configuration.

A. Increasing the Number of Configurations in the Real-Time Market and Limiting the Transition Paths for Units with More than Six Configurations

Under the current market design, each multi-stage generating resource can register up to ten configurations.[2] Each unit must submit a transition matrix, which identifies, among other things, the number of alternative paths the generator can take to get from any one configuration to another.[3] The current design does not place any limits on the number of such alternative transition paths between the various configurations. For example, consider a hypothetical multi-stage resource with five configurations (C1 through C5) that can transition from C1 to C5 by either: (1) transitioning directly from C1 → C5; (2) transitioning from C1 → C2 → C5; or (3) transitioning from C1 → C3 → C4 → C5. Under current tariff rules, this hypothetical unit could register all three separately feasible upward transition paths to move from C1 to C5, without limitations.[4] However, because of performance concerns, the ISO limited the number of configurations a resource could register as permissible configurations and how many configurations can be bid into the ISO market. These limitations were not imposed because of any desire to limit flexibility for participants. Rather, the ISO was seeking to balance the need to provide participants with sufficient flexibility with the need to ensure reliable performance of the ISO software. In its most recent stakeholder process, the ISO was able to fashion a set of proposed changes that continues to balance these interests.

In the day-ahead market, multi-stage generating resources are permitted to submit bids from up to ten configurations (*i.e.*, all of its configurations). In the real-time market, multi-stage generating resources are permitted to submit bids from three configurations, plus the day-ahead and/or RUC committed configuration. This limitation on the number of bid-in configurations for the real-time market is the product of a trade-off between providing flexibility to multi-stage units while also not compromising market software performance. In the initial design, the concern was that allowing units to bid too many configurations into the real-time market could add too many permutations to allow the market algorithm to optimize in the time available for the real-time market.[5] As compared to the day-ahead market, the software for the real-time market is expected to optimize over a greater number of variables within a much smaller time frame. Therefore, the ISO was concerned that allowing too many configurations in the real-time

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[2] ISO tariff, § 27.8.1.

[3] ISO tariff, § 27.8.2; *Cal. Indep. Sys. Operator Corp.*, Transmittal Letter at 12, FERC Docket Nos. ER10-1360-000, ER10-2159-000 & ER10-2560-000 (May 27, 2010) (May 2010 Transmittal Letter) ("Scheduling Coordinators will also be able to define the transition matrix which describes the feasible transitions between the configurations with their transition time and cost.").

[4] The unit can separately register downward transition paths. For example, if the unit had four separate paths to transition downward from C5 to C1, then it could register four downward transition paths to move from C5 to C1.

[5] May 2010 Transmittal Letter, at 20-21.

would compromise the software's ability to optimize over the fifteen-minute and five-minute dispatch intervals and reach a feasible solution.

Production experience since implementation of the functionality has shown that the performance of the multi-stage algorithms is impacted more significantly by the number of transition paths than it is impacted by the number of configurations that each unit can bid in. As an example, consider a multi-stage resource A, that has four configurations each of which has a single transition path, and a multi-stage resource B, that has three configurations each of which has three transition paths. The system would be far more strained in considering resource B as compared to the resource A. This is because each of B's three configurations can be reached in one of three manners. As a result, the software must consider far more permutations in the time available for the optimization than it would need to consider for resource A.

To address the performance concerns the ISO sought to address with the real-time limitations in the first place, the ISO concluded that it could provide more flexibility on the number of configurations submitted if instead it limited the number of transition paths that are registered in the transition matrix. The ISO was able to determine that any limitations placed on the number of configurations the participants could register and use in the ISO markets must be developed in light of the limitations placed on the number of transition paths the resources can register. Therefore, following the recent stakeholder process taking into consideration almost a year's worth of actual market experience, the ISO is now proposing to allow multi-stage generating resources to bid up to six configurations (plus the day-ahead and/or RUC committed configuration) in the real-time market.[6]

The ISO's proposal would increase the maximum possible number of configurations such resources can bid into the real-time market from five to eight. Because of the relationship between the number of paths and biddable configurations described above, in loosening this restriction, the ISO must limit the number of transition paths permissible in the ISO markets for units that have seven or more registered MSG configurations. Such units will be limited to no more than two transition paths between any two configurations.[7] These limitations on upward and downward paths will be imposed independently of each other. In the case of a multi-stage generating resource with eight configurations, the two transition paths from C1 → C5 need not be the same paths as from C5 → C1. Units with six or fewer registered configurations will continue to have no restriction on the number of transition paths that can be registered.

Being able to bid in more configurations will give market participants more flexibility in bidding their multi-stage generating resources. Additionally, having more bid-in configurations will aid the real-time market in optimizing the dispatch of multi-

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[6] The change to the number of configurations bid into the real-time market is reflected in the proposed amendments to tariff §§ 30.5.1(g) & 30.5.1(h) as reflected in Attachments A and B.

[7] The restriction on transition paths for units with more than six configurations is reflected in the proposed amendments to tariff § 27.8.2 as reflected in Attachments A and B.

stage generating resources in situations of under- and over-generation. At the same time, the ISO has concluded that these changes should not compromise performance of the modeling software.

These proposed changes were unanimously supported by stakeholders in the ISO stakeholder process conducted prior to this proposed tariff amendment.

B. Requiring Bids from a Multi-Stage Generating Resource's Minimum Capacity up to the Highest Bid-In Capacity

Under the current market rules, multi-stage generating resources that have a resource adequacy obligation must offer into both the day-ahead and real-time markets a configuration that supports the upper bound of their resource adequacy obligation. There is currently no requirement that the scheduling coordinator submit bids along the resource adequacy path for the resource that takes the resource to the upper bound of its resource adequacy obligation. After more than one year of actual experience with the new functionality, the ISO was able to determine that in cases where the minimum operating level of the bid-in configuration (configuration PMin) is above the minimum operating level of the plant (plant PMin), the difference between the two PMins is resource adequacy capacity that becomes effectively unavailable to the ISO market. This hinders the ISO's operational flexibility in utilizing resource adequacy capacity committed for the ISO's use. This is also inconsistent with the treatment of resource adequacy units that are not multi-stage generating resources, as those resources are obligated to offer in the entire range of their resource adequacy obligation.

A similar concern exists with non-resource adequacy units. A non-resource adequacy, non-multi-stage resource has no must-offer obligation. If it submits an economic bid, however, that bid must cover the entire range of output between the maximum bid-in quantity and the plant PMin (or its self-schedule). In contrast, a multi-stage resource with no resource adequacy obligation can submit a bid from a single configuration whose configuration PMin is well above the plant PMin. In this instance that multi-stage resource has the ability to submit an economic bid yet still not offer in the entire range of output between the maximum bid-in quantity and the plant PMin. Again, there is inconsistent treatment between multi-stage and non-multi-stage resources.

So far this inability for the ISO to access the entire range of multi-stage resources' output between the plant PMin (or self-schedule level) and the maximum bid-in quantity has yet to create observable operational complications. In practice, nearly all multi-stage resources have submitted bids that cover the entire range of capacity between the plant PMin (or self-schedule level) and the maximum bid-in quantity. To help avoid the possibility of future problems, however, the ISO believes it is prudent to create a new rule to address this concern. The ISO thus proposes that multi-stage units be required to offer into both the day-ahead and real-time markets the entire capacity range between the maximum bid-in energy MW and the higher of either the: (a) self-

scheduled energy MW; or (b) plant PMin.[8] The enhancement (addressed above) to enable resources to bid up to six configurations (plus the day-ahead and/or RUC committed configuration) in the real-time market will make compliance with this new requirement possible without unduly 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. In the event that a unit does not offer in the required bids, then the ISO proposes having the authority to insert cost-based generated bids to ensure that the full range of capacity is available for the ISO dispatch.[9]

These proposed changes we are unanimously supported by stakeholders in the ISO stakeholder process conducted prior to this proposed tariff amendment.

C. Expanding Number of Allowable Ramp Rates per Configuration

The current multi-stage generating 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. Forcing such units to register a single ramp rate for the configuration can require unit owners to make difficult trade-offs in registering their unit's values. To address this concern, the ISO proposes to allow multi-stage resources to register either one or two ramp rates per configuration.[10] Experience with the modeling functionality has shown that this enhancement will not encumber software performance.

These proposed changes were unanimously supported by stakeholders in the ISO stakeholder process conducted prior to this proposed tariff amendment.

D. Allowing More Flexibility in Self-Scheduling Configurations in the Real-Time Market

Under current tariff rules, if a multi-stage generating 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.[11] The purpose of this rule was to ensure that multi-stage generating resources "that are available and capable of performing are not withheld from the real-time market."[12] Production experience since

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[8] The obligation to offer the capacity below the maximum bid-in capacity is reflected in the proposed amendments to tariff § 30.5.1(j) as reflected in Attachments A and B.

[9] The authority for the ISO to create such generated bids is reflected in the proposed amendments to tariff § 30.7.3.5.

[10] The ability for multi-stage units to submit either one or two ramp rates per configuration is reflected in the proposed amendments to tariff § 27.8.2.

[11] ISO tariff, § 30.5.1(g).

[12] May 2010 Transmittal Letter, at 21.

the implementation of the functionality indicates that this rule is overly restrictive from an operational perspective because there can be more than one configuration adequately capable of supporting the day-ahead schedule and ancillary service awards.

The ISO thus proposes to ease the self-scheduling restriction by enabling multi-stage generating resources 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 day-ahead ancillary services award.[13] A configuration will be deemed to support the ancillary service if the configuration is certified to provide the awarded ancillary service and the self-schedule is far enough below the maximum operating level of the configuration and far enough above the configuration PMin to allow the unit to respond to the ancillary service award if needed.

These proposed changes were unanimously supported by stakeholders in the ISO stakeholder process conducted prior to this proposed tariff amendment.

E. Crediting a Multi-Stage Generating Resource with the Lesser of the Minimum Load Costs of its Metered and Committed Configurations

Under the current bid cost recovery rules applicable to multi-stage generating resources, if a unit is dispatched upward by the ISO into a new configuration, its minimum load costs will be included in the bid cost recovery calculation provided that the meter is within the 3% tolerance band around the configuration PMin of the committed configuration.[14] If the resource falls short of the committed configuration's tolerance band, no minimum load costs are considered in the bid cost recovery calculation for that settlement interval. In this instance, the resource may still be operating above the configuration PMin of a lower configuration and most likely is operating above the plant PMin. As such, the unit is legitimately incurring some minimum load costs even though it is not credited for those costs in the bid cost recovery calculation. This practice is to the disadvantage of multi-stage generating resources and is misaligned with minimum load cost accounting for other generating resources.

To make the minimum load cost treatment of multi-stage generating resources more consistent with the general bid cost recovery principles for non-multi-stage generating resources, the ISO proposes adopting the following rule: When a multi-stage unit's metered configuration is different from the committed configuration, then the minimum load costs will be determined based on the lower of the minimum load costs of the metered configuration and the minimum load costs of the committed configuration.[15]

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[13] The ability for multi-stage units to self-schedule in the real-time in a different configuration than was committed in the day-ahead is reflected in the proposed amendments to tariff § 30.5.1(g).

[14] ISO tariff, §§ 11.8.2.1.2, 11.8.3.1.2, & 11.8.4.1.2 (IFM, RUC, & Real-Time, respectively).

[15] The changes to the minimum load cost treatment for multi-stage units is reflected in the proposed amendments to tariff §§ 11.8.2.1.2, 11.8.3.1.2, & 11.8.4.1.2.

To forestall over-recovery of bid cost recovery, the proposed rule would address three other potential complications.

The first complication is where a multi-stage generating resource is dispatched downward and the unit transitions downwards too far so that the metered configuration is lower than the committed configuration. If the rule were simply designed to address the upward dispatch scenario, then it leaves open the possibility that the unit would receive the higher minimum load costs of the higher configuration, even though it only incurred the lower costs of the lower configuration. By awarding the lower of the minimum load costs of the committed or metered configuration, the unit will only receive credit for the costs it incurs.

The second complication is where between two configurations, the higher configuration (as determined by its PMin) has lower minimum load costs.[16] The rule would be problematic if it focused solely on whether the metered configuration is higher or lower than the committed configuration. In the case where between two configurations, the lower configuration has higher minimum load costs, then if the unit is dispatched downward to the higher of the two configurations, the unit has an incentive to exceed the downward transition all the way to the lower of the two configurations. By doing so, it would receive credit for greater minimum load costs as a result of ignoring a dispatch instruction. By focusing this new bid cost recovery rule on higher or lower dollar amounts rather than focusing on higher or lower configuration PMins, the ISO has attempted to remove a potential incentive for multi-stage generating resources to deviate from dispatch instructions intentionally.

The third complication is where the metered configuration is higher than the committed configuration (because the unit either exceeds its upward transition or does not comply fully with a downward transition). If the rule focused solely on awarding the minimum load costs of the metered configuration, then a multi-stage generating resource could have an incentive to ignore dispatch instructions and move to higher configurations to receive higher minimum load costs. As the rule is constructed, the committed configuration's minimum load costs are a ceiling. A unit could never be credited for minimum load costs above the minimum load costs of the committed configuration.

A participant expressed concern that these changes to minimum load cost treatment will lead to increased bid cost recovery payments. This same participant indicated continuing concern over potential gaming or abuse of bid cost recovery and encourages the ISO to monitor the minimum load costs submitted after these new rules go into effect to prevent gaming.

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[16] In the ordinary course, the ISO would not expect this scenario to occur. However, under existing bid cost recovery rules, a unit would not be forbidden from submitting registered costs that fit this pattern.

The ISO acknowledges that this proposal likely will lead to some increase in bid cost recovery payments. The proposal, however, is justified based on equity concerns over treating multi-stage generating resources and non-multi-stage generating resources in a more consistent fashion. The current accounting of minimum load costs for multi-stage generating resources does not consider legitimate costs associated with the ISO's dispatch of the resources, while non-multi-stage generating resources are eligible to recover analogous costs. In other words, under the current paradigm, a resource may fail to reach the minimum load of a higher configuration, but reach the minimum load of a lower configuration and in so doing incur minimum load costs that are not compensated because it failed to reach within the permissible bandwidth of the committed bandwidth. This existing rule therefore unreasonably requires the ISO to not compensate the resource for any minimum load costs even though the resource actually did provide minimum load energy. This proposal rectifies that shortcoming of the current settlement rules.

The ISO shares the continuing concern over potential gaming of bid cost recovery and will continue to monitor for potential abuses. Additionally, the ISO is currently engaged in a stakeholder process aimed at limiting market behaviors that may inappropriately expand bid cost recovery payments.[17] The ISO also notes that it considered potential gaming opportunities in designing these new rules for minimum load costs. An example is the second complication discussed above, in which a higher configuration can have lower minimum load costs. The rule the ISO seeks to implement was designed to eliminate incentives for inappropriate market behavior by providing appropriate compensation without allowing for unwarranted over-recovery of bid costs.

III. DESCRIPTION OF STAKEHOLDER PROCESS

The stakeholder process commenced with the publication of a combined Issue Paper and Straw Proposal in June 2011, followed by a Revised Straw Proposal and Draft Final Proposal published in August 2011 and September 2011, respectively.[18] The ISO's Board of Governors approved the policy proposal on October 27, 2011. The ISO published draft tariff language for stakeholder review on December 22, 2011. Each of these documents published for stakeholder review was followed by a teleconference with stakeholders to discuss their feedback.

The ISO's initial proposal underwent two significant modifications as a result of stakeholder feedback. The first change deals with the number of biddable configurations in the real-time market. The second change deals with the transition cost

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[17] More information on the ISO's stakeholder process is available at: http://www.caiso.com/informed/Pages/StakeholderProcesses/PostEmergencyBidCostRecoveryFilingReview.aspx.

[18] More information on the ISO's stakeholder process is available at: http://www.caiso.com/informed/Pages/StakeholderProcesses/Multi-StageGenerationEnhancements.aspx.

validation rules. Aside from these two modifications, as noted above, the ISO received universal support to these proposed enhancements.

The ISO initially proposed allowing a unit to bid up to ten configurations in the real-time market but only allowing a maximum of two transition paths between any two configurations. One stakeholder commented that limiting the number of transition paths hindered the flexibility of unit operations.[19] As explained above, there is trade-off between allowing more configurations and allowing more transition paths. Based on stakeholder feedback, the ISO determined that the final rule it is proposing offers MSG units greater flexibility than the initial rule while also appropriately managing the current system limitations that require placing limits on the combination of bid-in configurations and transition paths.

The initial Issue Paper and Straw Proposal proposed to change the validation rules for registering transition costs. Based on perceived stakeholder dissatisfaction with the current validation rules, the ISO proposed to move to a proxy calculation based on a unit's heat rate for transition costs. Under the current rules, transition costs are based on registered values subject to certain mitigation rules. No stakeholder supported this change and several stakeholders expressed opposition to removing the registered cost option for transition costs.[20] Based on this response, the ISO will continue to evaluate the current transition cost validation rules with the Department of Market Monitoring but concluded that no changes are necessary to the transition cost rules at this time.

IV. EFFECTIVE DATES

The ISO respectfully requests that the Commission accept the tariff amendments contained in the instant filing to be effective on April 10, 2012. The ISO respectfully requests that the Commission issue an order on the instant filing by April 4, 2010. An order at the end of the 60-day period is necessary because the software changes necessary to implement the proposed amendments are part of a larger software implementation known as the ISO's Spring Release.[21] The Spring Release will address multiple software and market enhancements related to issues beyond the multi-stage generating resource modeling functionality. The ISO plans to implement the Spring Release software enhancements on April 10. In the event that the Commission were not to accept the instant tariff amendments, an order by the expiration of the 60-day period would give the ISO some amount of time to evaluate the ways in which the Spring Release software code may need to be changed prior to April 10.

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[19] Pacific Gas & Electric. While offering this comment, Pacific Gas & Electric does not oppose the ISO's final proposal.

[20] Southern California Edison; Pacific Gas & Electric; Calpine; California Department of Water Resources State Water Project. The ISO's Department of Market Monitoring expressed support for the initial proposal to move to a proxy cost approach but does not oppose the current approach.

[21] More information on the ISO's Spring Release is available at: http://www.caiso.com/informed/Pages/ReleasePlanning/Default.aspx.

V. COMMUNICATIONS

Communications regarding this filing should be addressed to the following individuals. The individuals identified with an asterisk are the persons whose names should be placed on the official service list established by the Secretary with respect to this submittal:

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VI. SERVICE

The ISO has served copies of this transmittal letter, and all attachments, on the California Public Utilities Commission and the California Energy Commission, and all parties with effective Scheduling Coordinator Service Agreements under the ISO Tariff. In addition, the ISO is posting this transmittal letter and all attachments on the ISO website.

VII. ATTACHMENTS

The following documents, in addition to this transmittal letter, support the instant filing:

Attachment A Revised ISO Tariff Sheets – Clean

Attachment B Revised ISO Tariff Sheets – Blackline

Attachment C California Board of Governors Memo on Multi-Stage Generating resource Modeling Enhancements

VIII. CONCLUSION

For the foregoing reasons, the ISO respectfully requests that the Commission approve this tariff revision as filed. Please contact the undersigned if you have any questions concerning this matter.

Respectfully submitted,

By: */s/ David Zlotlow*

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Attorneys for the California Independent System Operator Corporation

Attachment A – CleanTariff

California Independent System Operator Corporation

Fifth Replacement FERC Electric Tariff

MSG Enhancements Amendment

February 3, 2012

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11.8.2.1.2 IFM Minimum Load Cost

The Minimum Load Cost for the applicable Settlement Interval shall be the Minimum Load Cost submitted to the CAISO in the IFM divided by the number of Settlement Intervals in a Trading Hour. For each Settlement Interval, only the IFM Minimum Load Cost in a CAISO IFM Commitment Period is eligible for Bid Cost Recovery. The IFM Minimum Load Cost for any Settlement Interval is zero if: (1) the Settlement Interval is in an IFM Self Commitment Period for the Bid Cost Recovery Eligible Resource; (2) the Bid Cost Recovery Eligible Resource is manually pre-dispatched under an RMR Contract prior to the Day-Ahead Market or the resource is flagged as an RMR Dispatch in the Day-Ahead Schedule for the applicable Settlement Interval; or (3) the Bid Cost Recovery Eligible Resource is determined not actually On during the applicable Settlement Interval. For the purposes of determining IFM Minimum Load Cost, a Bid Cost Recovery Eligible Resource, except for a Multi-Stage Generating Resource, is assumed to be On if its metered Energy in a Settlement Interval is equal to or greater than the difference between its Minimum Load Energy and the Tolerance Band. Otherwise, such non-Multi-Stage Generating Resources are determined to be Off. For Multi-Stage Generating Resources, the commitment period is determined based on application of section 11.8.1.3. If application of section 11.8.1.3 dictates that the IFM is the commitment period, then the calculation of the IFM Minimum Load Costs will depend on whether the metered MSG Configuration is equal to or different from the IFM committed MSG Configuration. If the metered MSG Configuration is equal to the IFM committed MSG Configuration, then the IFM Minimum Load Costs will be based on the Minimum Load Costs of the IFM committed MSG Configuration. If the metered MSG Configuration is different from the IFM committed MSG Configuration, then the IFM Minimum Load Costs will be based on the lower of the Minimum Load Costs of the metered MSG Configuration and the Minimum Load Costs of the IFM committed MSG Configuration. The metered MSG Configuration is determined based on the highest MSG Configuration submitted to the IFM for which the Metered Data is within or above the three (3) percent (or 5 MW) Tolerance Band of the PMin of that highest MSG Configuration submitted to the IFM. Between two (2) (or more) MSG Configurations, the highest MSG Configuration is the MSG Configuration with the PMin value that is the greatest MW value.

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11.8.3.1.2 RUC Minimum Load Cost

The Minimum Load Cost for the applicable Settlement Interval shall be the Minimum Load Cost of the Bid Cost Recovery Eligible Resource divided by the number of Settlement Intervals in a Trading Hour. For each Settlement Interval, only the RUC Minimum Load Cost in a CAISO RUC Commitment Period is eligible for Bid Cost Recovery. The RUC Minimum Load Cost for any Settlement Interval is zero if: (1) the Bid Cost Recovery Eligible Resource is manually pre-dispatched under an RMR Contract or the resource is flagged as an RMR Dispatch in the Day-Ahead Schedule in that Settlement Interval; (2) the Bid Cost Recovery Eligible Resource is not actually On in the applicable Settlement Interval; or (3) the applicable Settlement Interval is included in an IFM Commitment Period. For the purposes of determining RUC Minimum Load Cost, a Bid Cost Recovery Eligible Resource, except for a Multi-Stage Generating Resource, is assumed to be On if its metered Energy in a Settlement Interval is equal to or greater than the difference between its Minimum Load Energy and the Tolerance Band. Otherwise, such non-Multi-Stage Generating Resources are determined to be Off. For Multi-Stage Generating Resources, the commitment period is determined based on application of section 11.8.1.3. If application of section 11.8.1.3 dictates that RUC is the commitment period, then the calculation of the RUC Minimum Load Costs will depend on whether the metered MSG Configuration is equal to or different from the RUC committed MSG Configuration. If the metered MSG Configuration is equal to the RUC committed MSG Configuration, then the RUC Minimum Load Costs will be based on the Minimum Load Costs of the RUC committed MSG Configuration. If the metered MSG Configuration is different from the RUC committed MSG Configuration, then the RUC Minimum Load Costs will be based on the lower of the Minimum Load Costs of the metered MSG Configuration and the Minimum Load Costs of the RUC committed MSG Configuration. The metered MSG Configuration is determined based on the highest MSG Configuration submitted to the RUC for which the Metered Data is within or above the three (3) percent (or 5 MW) Tolerance Band of the PMin of that highest MSG Configuration submitted to the RUC. Between two (2) (or more) MSG Configurations, the highest MSG Configuration is the MSG Configuration with the PMin value that is the greatest MW value.

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11.8.4.1.2 RTM Minimum Load Cost

The RTM Minimum Load Cost is the Minimum Load Cost of the Bid Cost Recovery Eligible Resource submitted to the CAISO for the Real-Time Market divided by the number of Settlement Intervals in a Trading Hour. For each Settlement Interval, only the RTM Minimum Load Cost in a CAISO RTM Commitment Period is eligible for Bid Cost Recovery. The RTM Minimum Load Cost for any Settlement Interval is zero if: (1) the Settlement Interval is included in a RTM Self-Commitment Period for the Bid Cost Recovery Eligible Resource; (2) the Bid Cost Recovery Eligible Resource has been manually dispatched under an RMR Contract or the resource has been flagged as an RMR Dispatch in the Day-Ahead Schedule or the Real-Time Market in that Settlement Interval; (3) the Bid Cost Recovery Eligible Resource is not actually On in that Settlement Interval; (4) for all resources that are not Multi-Stage Generating Resources, that Settlement Interval is included in an IFM or RUC Commitment Period; or (5) the Bid Cost Recovery Eligible Resource is committed pursuant to Section 34.9.2 for the purpose of performing Ancillary Services testing, pre-commercial operation testing for Generating Units, or PMax testing. For the purposes of RTM Minimum Load Cost, a Bid Cost Recovery Eligible Resource, other than a Multi-Stage Generating Resource, is determined to not actually be On if the metered Energy in that Settlement Interval is less than the Tolerance Band referenced by the Minimum Load Energy. For Multi-Stage Generating Resources, the commitment period is determined based on application of section 11.8.1.3. If application of section 11.8.1.3 dictates that the RTM is the commitment period, then the calculation of the RTM Minimum Load Costs will depend on whether the metered MSG Configuration is equal to or different from the RTM committed MSG Configuration. If the metered MSG Configuration is equal to the RTM committed MSG Configuration, then the RTM Minimum Load Costs will be based on the Minimum Load Costs of the RTM committed MSG Configuration. If the metered MSG Configuration is different from the RTM committed MSG Configuration, then the RTM Minimum Load Costs will be based on the lower of the Minimum Load Costs of the metered MSG Configuration and the Minimum Load Costs of the RTM Committed configuration. The metered MSG Configuration is determined based on the highest MSG Configuration submitted to the Real-Time Market for which the Metered Data is within or above the three (3) percent (or 5 MW) Tolerance Band of the PMin of that highest MSG Configuration submitted to the Real-Time Market. Between two (2) (or more) MSG Configurations, the highest MSG Configuration is the MSG Configuration with the PMin value that is the greatest MW value. For

Settlement Intervals that contain two (2) Dispatch Intervals with two (2) different MSG Configurations, the CAISO will determine the Transition Costs, and Minimum Load Costs based on the sum of the two (2) applicable Dispatch Intervals.

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27.8.2 Informational Requirements

As part of the registration process described in Section 27.8.1, the Scheduling Coordinators for Generating Units or Dynamic Resource-Specific System Resources that seek to qualify as Multi-Stage Generating Resources must submit to the CAISO a Transition Matrix, which contains the Transition Costs and operating constraints associated with MSG Transitions. The Scheduling Coordinator may register up to six (6) MSG Configurations without any limitation on the number of transitions between the registered MSG Configurations in the Transition Matrix. If the Scheduling Coordinator registers seven (7) or more MSG Configurations, then the Scheduling Coordinator may only include two (2) eligible transitions between MSG Configurations for upward and downward transitions, respectively, starting from the initial MSG Configuration in the Transition Matrix. For each MSG Configuration, the responsible Scheduling Coordinator shall submit an Operational Ramp Rate and, as applicable, an Operating Reserve Ramp Rate and Regulating Reserves ramp rate, each of which shall have at least one (1) segment and no more than two (2) segments. The Scheduling Coordinator must establish the default MSG Configuration and its associated Default Resource Adequacy Path that apply to Multi-Stage Generating Resources that are subject to Resource Adequacy must-offer obligations. The Scheduling Coordinator may submit changes to this information consistent with Sections 27.8.1 and 27.8.3, as they may apply.

* * *

30.5.1 General Bidding Rules

(a) All Energy and Ancillary Services Bids of each Scheduling Coordinator submitted to the DAM for the following Trading Day shall be submitted at or prior to 10:00 a.m. on the day preceding the Trading Day, but no sooner than seven (7) days prior to the Trading Day. All Energy and Ancillary Services Bids of each Scheduling Coordinator submitted to the HASP for the following Trading Day

shall be submitted starting from the time of publication, at 1:00 p.m. on the day preceding the Trading Day, of DAM results for the Trading Day, and ending seventy-five (75) minutes prior to each applicable Trading Hour in the RTM. The CAISO will not accept any Energy or Ancillary Services Bids for the following Trading Day between 10:00 a.m. on the day preceding the Trading Day and the publication, at 1:00 p.m. on the day preceding the Trading Day, of DAM results for the Trading Day;

(b) Bid prices submitted by a Scheduling Coordinator for Energy accepted and cleared in the IFM and scheduled in the Day-Ahead Schedule may be increased or decreased in the HASP. Bid prices for Energy submitted but not scheduled in the Day-Ahead Schedule may be increased or decreased in the HASP. Incremental Bid prices for Energy associated with Day-Ahead AS or RUC Awards in Bids submitted to the HASP may be revised. Scheduling Coordinators may revise ETC Self-Schedules for Supply only in the HASP to the extent such a change is consistent with TRTC Instructions provided to the CAISO by the Participating TO in accordance with Section 16. Scheduling Coordinators may revise TOR Self-Schedules for Supply only in the HASP to the extent such a change is consistent with TRTC Instructions provided to the CAISO by the Non-Participating TO in accordance with Section 17. Energy associated with awarded Ancillary Services capacity cannot be offered in the HASP or Real-Time Market separate and apart from the awarded Ancillary Services capacity;

(c) Scheduling Coordinators may submit Energy, AS and RUC Bids in the DAM that are different for each Trading Hour of the Trading Day;

(d) Bids for Energy or capacity that are submitted to one CAISO Market, but are not accepted in that market are no longer a binding commitment and Scheduling Coordinators may submit Bids in a subsequent CAISO Market at a different price;

(e) The CAISO shall be entitled to take all reasonable measures to verify that Scheduling Coordinators meet the technical and financial criteria set forth in

Section 4.5.1 and the accuracy of information submitted to the CAISO pursuant to this Section 30; and

(f) In order to retain the priorities specified in Section 31.4 and 34.10 for scheduled amounts in the Day-Ahead Schedule associated with ETC and TOR Self-Schedules or Self-Schedules associated with Regulatory Must-Take Generation, a Scheduling Coordinator must submit to the HASP and Real-Time Market ETC or TOR Self-Schedules, or Self-Schedules associated with Regulatory Must-Take Generation, at or below the Day-Ahead Schedule quantities associated with the scheduled ETC, TOR or Regulatory Must-Take Generation Self-Schedules. If the Scheduling Coordinator fails to submit such HASP or Real-Time Market ETC, TOR or Regulatory Must-Take Generation Self-Schedules, the defined scheduling priorities of the ETC, TOR, or Regulatory Must-Take Generation Day-Ahead Schedule quantities may be subject to adjustment in the HASP and the Real-Time Market as further provided in Section 31.4 and 34.10 in order to meet operating conditions.

(g) For Multi-Stage Generating Resources that receive a Day-Ahead Schedule, are awarded a RUC Schedule, or receive an Ancillary Services Award the Scheduling Coordinator must submit an Energy Bid in the Real-Time Market for the same Trading Hour(s). If the Scheduling Coordinator submits an Economic Bid for such Trading Hour(s), the Economic Bid must be for either: the same MSG Configuration scheduled or awarded in the Integrated Forward Market; or the MSG Configuration committed in RUC. If the Scheduling Coordinator submits a Self-Schedule in the Real-Time Market for such Trading Hour(s), then the Energy Self-Schedule may be submitted in any registered MSG Configuration, including the MSG Configuration awarded in the Day-Ahead Market, that can support the awarded Ancillary Services (as further required by Section 8). Scheduling Coordinators for Multi-Stage Generating Resources may submit into the Real-Time Market bids from up to six (6) MSG Configurations in

addition to the MSG Configuration scheduled or awarded in the Integrated Forward Market and Residual Unit Commitment, provided that the MSG Transitions between the MSG Configurations bid into the Real-Time Market are feasible and the transition from the previous Trading Hour are also feasible.

(h) For the Trading Hours that Multi-Stage Generating Resources do not have a CAISO Schedule or award from a prior CAISO Market run, the Scheduling Coordinator can submit up to six (6) MSG Configurations into the RTM.

(i) A Scheduling Coordinator cannot submit a Bid to the CAISO Markets for a MSG Configuration into which the Multi-Stage Generating Resource cannot transition due to lack of Bids for the specific Multi-Stage Generating Resource in other MSG Configurations that are required for the requisite MSG Transition.

(j) In order for Multi-Stage Generating Resource to meet any Resource Adequacy must-offer obligations, the responsible Scheduling Coordinator must submit either an Economic Bid or Self-Schedule for at least one MSG Configuration into the Day-Ahead Market and Real-Time Market that is capable of fulfilling that Resource Adequacy obligation, as feasible. The Economic Bid shall cover the entire capacity range between the maximum bid-in Energy MW and the higher of Self-Scheduled Energy MW and the Multi-Stage Generating Resource plant-level PMin.

(k) For any given Trading Hour, a Scheduling Coordinator may submit Self-Schedules and/or Submissions to Self-Provide Ancillary Services in only one MSG Configuration for each Generating Unit or Dynamic Resource-Specific System Resource.

(l) In any given Trading Hour in which a Scheduling Coordinator has submitted a Self-Schedule for a Multi-Stage Generating Resource, the Scheduling Coordinator may also submit Bids for other MSG Configurations provided that they concurrently submit Bids that enable the applicable CAISO Market to transition the Multi-Stage Generating Resource to other MSG Configurations.

(m) If in any given Trading Hour the Multi-Stage Generating Resource was awarded Regulation or Operating Reserves in the IFM, any Self-Schedules or Submissions to Self-Provide Ancillary Services the Scheduling Coordinator submits for that Multi-Stage Generating Resource in the RTM must be for the same MSG Configuration for which Regulation or Operating Reserve is Awarded in IFM for that Multi-Stage Generating Resource in that given Trading Hour.

(n) If a Multi-Stage Generating Resource has received a binding RUC Start-Up Instruction as provided in Section 31, any Self-Schedule or Submission to Self-Provide Ancillary Services in the RTM must be in the same MSG Configuration committed in RUC.

(o) If in any given Trading Hour the Multi-Stage Generating Resource is scheduled for Energy in the IFM, any Self-Schedules the Scheduling Coordinator submits for that Multi-Stage Generating Resource in the RTM must be for the same MSG Configuration for which Energy is scheduled in IFM for that Multi-Stage Generating Resource in that given Trading Hour.

(p) For a Multi-Stage Generating Resource, the Bid(s) submitted for the resource's configuration(s) shall collectively cover the entire capacity range between the maximum bid-in Energy MW and the higher of the Self-Scheduled Energy MW and the Multi-Stage Generating Resource plant-level PMin. This rule shall apply separately to the Day-Ahead Market and the Real-Time Market.

* * *

30.7.3.5 Bid Validation Rules for Multi-Stage Generating Resources

If a Scheduling Coordinator does not submit a Bid in the Day-Ahead Market or Real-Time Market for a Multi-Stage Generating Resource with a Resource Adequacy must-offer obligation at a MSG Configuration that can meet the applicable Resource Adequacy must-offer obligation, the CAISO will create a Generated Bid for the default Resource Adequacy MSG Configuration. If the Multi-Stage Generating Resource is not capable of Start-Up in the default Resource Adequacy MSG Configuration,

the CAISO will create a Generated Bid for every MSG Configuration in the registered Default Resource Adequacy Path. In the event that the Scheduling Coordinator does not submit a Bid in compliance with section 30.5.1(p), the CAISO will create a Generated Bid for all of the capacity not bid into the CAISO Market between the maximum bid-in Energy MW and the higher of Self-Scheduled Energy MW and the Multi-Stage Generating Resource plant-level PMin. If the Scheduling Coordinator submits a Bid for the Multi-Stage Generating Resource, the CAISO will create this Generated Bid for the registered MSG Configurations before the Market Close, and if it does not submit such a Bid the CAISO will create this Generated Bid after the Market Close. Any Generated Bid created by the CAISO for the default Resource Adequacy MSG Configuration will be in addition to the MSG Configurations bid into the Real-Time Market by the responsible Scheduling Coordinator. If the Scheduling Coordinator submits a Bid in the Day-Ahead Market or Real-Time Market for a MSG Configuration that is not the default Resource Adequacy MSG Configuration and that does not cover the full amount of the resource's Resource Adequacy requirements, the CAISO will create a Generated Bid for the full Resource Adequacy Capacity. Before the market closes, if a Scheduling Coordinator submits a Bid in the Day-Ahead Market or Real-Time Market for the default Resource Adequacy MSG Configuration of a Multi-Stage Generating Resource that only meets part of the resource's Resource Adequacy must-offer obligation, the CAISO will extend the last segment of the Energy Bid curve in the submitted Bid for the Multi-Stage Generating Resource up to the Multi-Stage Generating Resource's Resource Adequacy must-offer obligation. After the market closes, to the extent that no Bid is submitted into the Real-Time Market for a Multi-Stage Generating Resource scheduled in the Integrated Forward Market as required in Section 30.5 the CAISO will create a Self-Schedule for MSG Configuration equal to the Day-Ahead Schedule for that resource for the MSG Configuration scheduled in the IFM. To the extent a Multi-Stage Generating Resource is awarded Operating Reserves in the Day-Ahead Market and no Economic Energy Bids is submitted for that resource in the Real-Time Market, the CAISO will insert Proxy Energy Bid in the MSG Configuration that was awarded in the Day-Ahead Market to cover the awarded Operating Reserves. To the extent that a Multi-Stage Generating Resources RUC Schedule is greater than its Day-Ahead Schedule, if the Scheduling Coordinator does not submit an Energy Bid in the RTM to cover the difference, then the CAISO will either create a Bid in the MSG Configuration awarded in RUC, or extend the Bid submitted by

the Scheduling Coordinator before the Market Close. After the Market Close, the CAISO will create a Generated Bid if there is no Bid submitted for the resource for this difference. The CAISO will validate that the combination of the Day-Ahead Ancillary Services Awards and Submissions to Self-Provide Ancillary Services are feasible with respect to the physical operating characteristics of the applicable MSG Configuration. The CAISO will reject Ancillary Services Bids or Submissions to Self-Provide Ancillary Services for MSG Configurations that are not certified Ancillary Services. For any given Multi-Stage Generating Resource, for any given CAISO Market and Trading Hour if one MSG Configuration's Bid fails the bid validation process, all other Bids for all other MSG Configurations are also invalidated.

* * *

Appendix A

Master Definition Supplement

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- Generated Bid

A post-market Clean Bid generated by the CAISO in accordance with the provisions of Section 40 or other applicable provisions of the CAISO Tariff when a Bid is not submitted by the Scheduling Coordinator and is required for a resource adequacy requirement, an Ancillary Services Award, a RUC Award, a Day-Ahead Schedule, or as required by Section 30.7.3.5.

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Attachment B – Marked Tariff

California Independent System Operator Corporation

Fifth Replacement FERC Electric Tariff

MSG Enhancements Amendment

February 3, 2012

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11.8.2.1.2 IFM Minimum Load Cost

The Minimum Load Cost for the applicable Settlement Interval shall be the Minimum Load Cost submitted to the CAISO in the IFM divided by the number of Settlement Intervals in a Trading Hour. For each Settlement Interval, only the IFM Minimum Load Cost in a CAISO IFM Commitment Period is eligible for Bid Cost Recovery. The IFM Minimum Load Cost for any Settlement Interval is zero if: (1) the Settlement Interval is in an IFM Self Commitment Period for the Bid Cost Recovery Eligible Resource; (2) the Bid Cost Recovery Eligible Resource is manually pre-dispatched under an RMR Contract prior to the Day-Ahead Market or the resource is flagged as an RMR Dispatch in the Day-Ahead Schedule for the applicable Settlement Interval; or (3) the Bid Cost Recovery Eligible Resource is determined not actually On during the applicable Settlement Interval. For the purposes of determining IFM Minimum Load Cost, a Bid Cost Recovery Eligible Resource, except for a Multi-Stage Generating Resource, is assumed to be On if its metered Energy in a Settlement Interval is equal to or greater than the difference between its Minimum Load Energy and the Tolerance Band. Otherwise, such non-Multi-Stage Generating Resources are determined to be Off. For Multi-Stage Generating Resources, the commitment period is determined based on application of section 11.8.1.3. If application of section 11.8.1.3 dictates that the IFM is the commitment period, then the calculation of the IFM Minimum Load Costs will depend on whether the metered MSG Configuration is equal to or different from the IFM committed MSG Configuration. If the metered MSG Configuration is equal to the IFM committed MSG Configuration, then the IFM Minimum Load Costs will be based on the Minimum Load Costs of the IFM committed MSG Configuration. If the metered MSG Configuration is different from the IFM committed MSG Configuration, then the IFM Minimum Load Costs will be based on the lower of the Minimum Load Costs of the metered MSG Configuration and the Minimum Load Costs of the IFM committed MSG Configuration. The metered MSG Configuration is determined based on the highest MSG Configuration submitted to the IFM for which the Metered Data is within or above the three (3) percent (or 5 MW) Tolerance Band of the PMin of that highest MSG Configuration submitted to the IFM. Between two (2) (or more) MSG Configurations, the highest MSG Configuration is the MSG Configuration with the PMin value that is the greatest MW

value.~~Otherwise, it is determined to be Off. The CAISO will determine the IFM Minimum Load Costs for Multi-Stage Generating Resources, based on the CAISO Commitment Period MSG Configuration.~~

* * *

11.8.3.1.2 ~~-~~RUC Minimum Load Cost

~~-~~The Minimum Load Cost for the applicable Settlement Interval shall be the Minimum Load Cost of the Bid Cost Recovery Eligible Resource divided by the number of Settlement Intervals in a Trading Hour. For each Settlement Interval, only the RUC Minimum Load Cost in a CAISO RUC Commitment Period is eligible for Bid Cost Recovery. The RUC Minimum Load Cost for any Settlement Interval is zero if: (1) the Bid Cost Recovery Eligible Resource is manually pre-dispatched under an RMR Contract or the resource is flagged as an RMR Dispatch in the Day-Ahead Schedule in that Settlement Interval; (2) the Bid Cost Recovery Eligible Resource is not actually On in the applicable Settlement Interval; or (3) the applicable Settlement Interval is included in an IFM Commitment Period. For the purposes of determining RUC Minimum Load Cost, a Bid Cost Recovery Eligible Resource, except for a Multi-Stage Generating Resource, is assumed to be On if its metered Energy in a Settlement Interval is equal to or greater than the difference between its Minimum Load Energy and the Tolerance Band. Otherwise, such non-Multi-Stage Generating Resources are determined to be Off. For Multi-Stage Generating Resources, the commitment period is determined based on application of section 11.8.1.3. If application of section 11.8.1.3 dictates that RUC is the commitment period, then the calculation of the RUC Minimum Load Costs will depend on whether the metered MSG Configuration is equal to or different from the RUC committed MSG Configuration. If the metered MSG Configuration is equal to the RUC committed MSG Configuration, then the RUC Minimum Load Costs will be based on the Minimum Load Costs of the RUC committed MSG Configuration. If the metered MSG Configuration is different from the RUC committed MSG Configuration, then the RUC Minimum Load Costs will be based on the lower of the Minimum Load Costs of the metered MSG Configuration and the Minimum Load Costs of the RUC committed MSG Configuration. The metered MSG Configuration is determined based on the highest MSG Configuration submitted to the RUC for which the Metered Data is within or above the three (3) percent (or 5 MW) Tolerance Band of the PMin of that highest MSG Configuration submitted to the RUC. Between two (2)

(or more) MSG Configurations, the highest MSG Configuration is the MSG Configuration with the PMin value that is the greatest MW value~~Otherwise, it is determined to be Off~~.

* * *

11.8.4.1.2 ~~-~~RTM Minimum Load Cost

The RTM Minimum Load Cost is the Minimum Load Cost of the Bid Cost Recovery Eligible Resource submitted to the CAISO for the Real-Time Market divided by the number of Settlement Intervals in a Trading Hour. For each Settlement Interval, only the RTM Minimum Load Cost in a CAISO RTM Commitment Period is eligible for Bid Cost Recovery. The RTM Minimum Load Cost for any Settlement Interval is zero if: (1) the Settlement Interval is included in a RTM Self-Commitment Period for the Bid Cost Recovery Eligible Resource; (2) the Bid Cost Recovery Eligible Resource has been manually dispatched under an RMR Contract or the resource has been flagged as an RMR Dispatch in the Day-Ahead Schedule or the Real-Time Market in that Settlement Interval; (3) the Bid Cost Recovery Eligible Resource is not actually On in that Settlement Interval; (4) for all resources that are not Multi-Stage Generating Resources, that Settlement Interval is included in an IFM or RUC Commitment Period; or (5) the Bid Cost Recovery Eligible Resource is committed pursuant to Section 34.9.2 for the purpose of performing Ancillary Services testing, pre-commercial operation testing for Generating Units, or PMax testing. For the purposes of RTM Minimum Load Cost, a Bid Cost Recovery Eligible Resource, other than a Multi-Stage Generating Resource, is determined to not actually be On if the metered Energy in that Settlement Interval is less than the Tolerance Band referenced by the Minimum Load Energy. For Multi-Stage Generating Resources, the commitment period is determined based on application of section 11.8.1.3. If application of section 11.8.1.3 dictates that the RTM is the commitment period, then the calculation of the RTM Minimum Load Costs will depend on whether the metered MSG Configuration is equal to or different from the RTM committed MSG Configuration. If the metered MSG Configuration is equal to the RTM committed MSG Configuration, then the RTM Minimum Load Costs will be based on the Minimum Load Costs of the RTM committed MSG Configuration. If the metered MSG Configuration is different from the RTM committed MSG Configuration, then the RTM Minimum Load Costs will be based on the lower of the Minimum Load Costs of the metered MSG Configuration and the Minimum Load Costs of the RTM Committed configuration. The metered MSG Configuration is determined based on the

highest MSG Configuration submitted to the Real-Time Market for which the Metered Data is within or above the three (3) percent (or 5 MW) Tolerance Band of the PMin of that highest MSG Configuration submitted to the Real-Time Market. Between two (2) (or more) MSG Configurations, the highest MSG Configuration is the MSG Configuration with the PMin value that is the greatest MW value. For Settlement Intervals that contain two (2) Dispatch Intervals with two (2)~~In addition, the CAISO will determine the Multi-Stage Generating Resource RTM Minimum Load Costs based on the MSG Configuration in which the CAISO commits the Multi-Stage Generating Resource in RTM. For Settlement Intervals that contain two Dispatch Intervals with two~~ different MSG Configurations, the CAISO will determine the Transition Costs, and Minimum Load Costs based on the sum of the two (2) applicable Dispatch Intervals.

* * *

27.8.2 Informational Requirements

As part of the registration process described in Section 27.8.1, the Scheduling Coordinators for Generating Units or Dynamic Resource-Specific System Resources that seek to qualify as Multi-Stage Generating Resources must submit to the CAISO a Transition Matrix, which contains the Transition Costs and operating constraints associated with MSG Transitions. The Scheduling Coordinator may register up to six (6) MSG Configurations without any limitation on the number of transitions between the registered MSG Configurations in the Transition Matrix. If the Scheduling Coordinator registers seven (7) or more MSG Configurations, then the Scheduling Coordinator may only include two (2) eligible transitions between MSG Configurations for upward and downward transitions, respectively, starting from the initial MSG Configuration in the Transition Matrix. For each MSG Configuration, the~~The~~ responsible Scheduling Coordinator shall submit an ~~for each MSG Configuration a single segment~~ Operational Ramp Rate~~,~~ and, as applicable, an Operating Reserve Ramp Rate~~Reserves ramp rate~~ and Regulating Reserves ramp rate, each of which shall have at least one (1) segment and no more than two (2) segments.~~.~~ The Scheduling Coordinator must establish the default MSG Configuration and its associated Default Resource Adequacy Path that apply to Multi-Stage Generating Resources that are subject to Resource Adequacy must-offer obligations. The Scheduling Coordinator may submit changes to this information consistent with Sections 27.8.1 and 27.8.3, as they may apply.

* * *

30.5.1 General Bidding Rules

(a) All Energy and Ancillary Services Bids of each Scheduling Coordinator submitted to the DAM for the following Trading Day shall be submitted at or prior to 10:00 a.m. on the day preceding the Trading Day, but no sooner than seven (7) days prior to the Trading Day. All Energy and Ancillary Services Bids of each Scheduling Coordinator submitted to the HASP for the following Trading Day shall be submitted starting from the time of publication, at 1:00 p.m. on the day preceding the Trading Day, of DAM results for the Trading Day, and ending seventy-five (75) minutes prior to each applicable Trading Hour in the RTM. The CAISO will not accept any Energy or Ancillary Services Bids for the following Trading Day between 10:00 a.m. on the day preceding the Trading Day and the publication, at 1:00 p.m. on the day preceding the Trading Day, of DAM results for the Trading Day;

(b) Bid prices submitted by a Scheduling Coordinator for Energy accepted and cleared in the IFM and scheduled in the Day-Ahead Schedule may be increased or decreased in the HASP. Bid prices for Energy submitted but not scheduled in the Day-Ahead Schedule may be increased or decreased in the HASP. Incremental Bid prices for Energy associated with Day-Ahead AS or RUC Awards in Bids submitted to the HASP may be revised. Scheduling Coordinators may revise ETC Self-Schedules for Supply only in the HASP to the extent such a change is consistent with TRTC Instructions provided to the CAISO by the Participating TO in accordance with Section 16. Scheduling Coordinators may revise TOR Self-Schedules for Supply only in the HASP to the extent such a change is consistent with TRTC Instructions provided to the CAISO by the Non-Participating TO in accordance with Section 17. Energy associated with awarded Ancillary Services capacity cannot be offered in the HASP or Real-Time Market separate and apart from the awarded Ancillary Services capacity;

(c) Scheduling Coordinators may submit Energy, AS and RUC Bids in the DAM that are different for each Trading Hour of the Trading Day;

(d) Bids for Energy or capacity that are submitted to one CAISO Market, but are not accepted in that market are no longer a binding commitment and Scheduling Coordinators may submit Bids in a subsequent CAISO Market at a different price;

(e) The CAISO shall be entitled to take all reasonable measures to verify that Scheduling Coordinators meet the technical and financial criteria set forth in Section 4.5.1 and the accuracy of information submitted to the CAISO pursuant to this Section 30; and

(f) In order to retain the priorities specified in Section 31.4 and 34.10 for scheduled amounts in the Day-Ahead Schedule associated with ETC and TOR Self-Schedules or Self-Schedules associated with Regulatory Must-Take Generation, a Scheduling Coordinator must submit to the HASP and Real-Time Market ETC or TOR Self-Schedules, or Self-Schedules associated with Regulatory Must-Take Generation, at or below the Day-Ahead Schedule quantities associated with the scheduled ETC, TOR or Regulatory Must-Take Generation Self-Schedules. If the Scheduling Coordinator fails to submit such HASP or Real-Time Market ETC, TOR or Regulatory Must-Take Generation Self-Schedules, the defined scheduling priorities of the ETC, TOR, or Regulatory Must-Take Generation Day-Ahead Schedule quantities may be subject to adjustment in the HASP and the Real-Time Market as further provided in Section 31.4 and 34.10 in order to meet operating conditions.

(g) For Multi-Stage Generating Resources that receive a Day-Ahead Schedule, are awarded a RUC Schedule, or receive an Ancillary Services Award the Scheduling Coordinator must submit an Energy Bid~~, which may consist of a Self-Schedule,~~ in the Real-Time Market for the same Trading Hour(s). If the Scheduling Coordinator submits an Economic Bid for such Trading Hour(s), the Economic Bid must be~~)~~ for either: the same MSG Configuration scheduled or

awarded in the Integrated Forward Market; or the MSG Configuration committed in RUC. If the Scheduling Coordinator submits a Self-Schedule in the Real-Time Market for such Trading Hour(s), then the Energy Self-Schedule may be submitted in any registered MSG Configuration, including the MSG Configuration awarded in the Day-Ahead Market, that can support the awarded Ancillary Services (as further required by Section 8). Scheduling Coordinators for ~~In addition, the Scheduling Coordinator for such~~ Multi-Stage Generating Resources may ~~also~~ submit ~~Bids~~ into the Real-Time Market bids from up to six (6)~~for three other~~ MSG Configurations in addition to the MSG Configuration scheduled or awarded in the Integrated Forward Market and Residual Unit Commitment, provided that the MSG Transitions between the MSG Configurations bid into the Real-Time Market are feasible and the transition from the previous Trading Hour are also feasible.

(h) For the Trading Hours that Multi-Stage Generating Resources do not have a CAISO Schedule or award from a prior CAISO Market run, the Scheduling Coordinator can submit up to six (6)~~three~~ MSG Configurations into the RTM.

(i) A Scheduling Coordinator cannot submit a Bid to the CAISO Markets for a MSG Configuration into which the Multi-Stage Generating Resource cannot transition due to lack of Bids for the specific Multi-Stage Generating Resource in other MSG Configurations that are required for the requisite MSG Transition.

(j) In order for Multi-Stage Generating Resource to meet any Resource Adequacy must-offer obligations, the responsible Scheduling Coordinator must submit either an Economic Bid or Self-Schedule for at least one MSG Configuration into the Day-Ahead Market and Real-Time Market that is capable of fulfilling that Resource Adequacy obligation, as feasible. The Economic Bid shall cover the entire capacity range between the maximum bid-in Energy MW and the higher of Self-Scheduled Energy MW and the Multi-Stage Generating Resource plant-level PMin.

(k) For any given Trading Hour, a Scheduling Coordinator may submit Self-Schedules and/or Submissions to Self-Provide Ancillary Services in only one MSG Configuration for each Generating Unit or Dynamic Resource-Specific System Resource.

(l) In any given Trading Hour in which a Scheduling Coordinator has submitted a Self-Schedule for a Multi-Stage Generating Resource, the Scheduling Coordinator may also submit Bids for other MSG Configurations provided that they concurrently submit Bids that enable the applicable CAISO Market to transition the Multi-Stage Generating Resource to other MSG Configurations.

(m) If in any given Trading Hour the Multi-Stage Generating Resource was awarded Regulation or Operating Reserves in the IFM, any Self-Schedules or Submissions to Self-Provide Ancillary Services the Scheduling Coordinator submits for that Multi-Stage Generating Resource in the RTM must be for the same MSG Configuration for which Regulation or Operating Reserve is Awarded in IFM for that Multi-Stage Generating Resource in that given Trading Hour.

(n) If a Multi-Stage Generating Resource has received a binding RUC Start-Up Instruction as provided in Section 31, any Self-Schedule or Submission to Self-Provide Ancillary Services in the RTM must be in the same MSG Configuration committed in RUC.

(o) If in any given Trading Hour the Multi-Stage Generating Resource is scheduled for Energy in the IFM, any Self-Schedules the Scheduling Coordinator submits for that Multi-Stage Generating Resource in the RTM must be for the same MSG Configuration for which Energy is scheduled in IFM for that Multi-Stage Generating Resource in that given Trading Hour.

(p) For a Multi-Stage Generating Resource, the Bid(s) submitted for the resource's configuration(s) shall collectively cover the entire capacity range between the maximum bid-in Energy MW and the higher of the Self-Scheduled Energy MW

and the Multi-Stage Generating Resource plant-level PMin. This rule shall apply separately to the Day-Ahead Market and the Real-Time Market.

* * *

30.7.3.5 Bid Validation Rules for Multi-Stage Generating Resources

If a Scheduling Coordinator does not submit a Bid in the Day-Ahead Market or Real-Time Market for a Multi-Stage Generating Resource with a Resource Adequacy must-offer obligation at a MSG Configuration that can meet the applicable Resource Adequacy must-offer obligation, the CAISO~~ISO~~ will create a Generated Bid for the default Resource Adequacy MSG Configuration. If the Multi-Stage Generating Resource is not capable of Start-Up in the default Resource Adequacy MSG Configuration, the CAISO will create a Generated Bid for every MSG Configuration in the registered Default Resource Adequacy Path. In the event that the Scheduling Coordinator does not submit a Bid in compliance with section 30.5.1(p), the CAISO will create a Generated Bid for all of the capacity not bid into the CAISO Market between the maximum bid-in Energy MW and the higher of Self-Scheduled Energy MW and the Multi-Stage Generating Resource plant-level PMin. If the Scheduling Coordinator submits a Bid for the Multi-Stage Generating Resource, the CAISO will create this Generated Bid for the registered MSG Configurations before the Market Close, and if it does not submit such a Bid the CAISO will create this Generated Bid after the Market Close. Any Generated Bid created by the CAISO for the default Resource Adequacy MSG Configuration will be in addition to the MSG Configurations bid into the Real-Time Market by the responsible Scheduling Coordinator. If the Scheduling Coordinator submits a Bid in the Day-Ahead Market or Real-Time Market for a MSG Configuration that is not the default Resource Adequacy MSG Configuration and that does not cover the full amount of the resource's Resource Adequacy requirements, the CAISO will create a Generated Bid for the full Resource Adequacy Capacity. Before the market closes, if a Scheduling Coordinator submits a Bid in the Day-Ahead Market or Real-Time Market for the default Resource Adequacy MSG Configuration of a~~an~~ Multi-Stage Generating Resource that only meets part of the resource's Resource Adequacy must-offer obligation, the CAISO will extend the last segment of the Energy Bid curve in the submitted Bid for the Multi-Stage Generating Resource up to the Multi-Stage Generating Resource's Resource Adequacy must-offer obligation. After the market closes, to the extent that no Bid is submitted into the Real-Time Market for a Multi-Stage

Generating Resource scheduled in the Integrated Forward Market as required in Section 30.5 the CAISO will create a Self-Schedule for MSG Configuration equal to the Day-Ahead Schedule for that resource for the MSG Configuration scheduled in the IFM. To the extent a Multi-Stage Generating Resource is awarded Operating Reserves in the Day-Ahead Market and no Economic Energy Bids is submitted for that resource in the Real-Time Market, the CAISO will insert Proxy Energy Bid in the MSG Configuration that was awarded in the Day-Ahead Market to cover the awarded Operating Reserves. To the extent that a~~an~~ Multi-Stage Generating Resources RUC Schedule is greater than its Day-Ahead Schedule, if the Scheduling Coordinator does not submit an Energy Bid in the RTM to cover the difference, then the CAISO will either create a Bid in the MSG Configuration awarded in RUC, or extend the Bid submitted by the Scheduling Coordinator before the Market Close. After the Market Close, the CAISO will create a Generated Bid if there is no Bid submitted for the resource for this difference. The CAISO will validate that the combination of the Day-Ahead Ancillary Services Awards and Submissions to Self-Provide Ancillary Services are feasible with respect to the physical operating characteristics of the applicable MSG Configuration. The CAISO will reject Ancillary Services Bids or Submissions to Self-Provide Ancillary Services for MSG Configurations that are not certified Ancillary Services. For any given Multi-Stage Generating Resource, for any given CAISO Market and Trading Hour if one MSG Configuration's Bid fails the bid validation process, all other Bids for all other MSG Configurations are also invalidated.

* * *

Appendix A

Master Definition Supplement

* * *

- Generated Bid

-A post-market Clean Bid generated by the CAISO in accordance with the provisions of Section 40 or other applicable provisions of the CAISO Tariff when a Bid is not submitted by the Scheduling Coordinator and is required for a resource adequacy requirement, an Ancillary Services Award, a RUC Award, ~~or~~ a Day-Ahead Schedule, or as required by Section 30.7.3.5

* * *

Attachment C – Board Memo

California Independent System Operator Corporation

Fifth Replacement FERC Electric Tariff

MSG Enhancements Amendment

February 3, 2012

California Independent
System Operator Corporation

Memorandum

To: ISO Board of Governors

From: Keith Casey, Vice President – Market & Infrastructure Development

Date: October 20, 2011

Re: **Decision on Multi-Stage Generating Unit Modeling Enhancements**

This memorandum requires Board action.

EXECUTIVE SUMMARY

Management proposes to implement several enhancements to the multi-stage generating unit modeling. Management has developed a proposal that increases accurate and flexible modeling of these units. Pending approval from the Board of Governors and FERC, Management is targeting spring 2012 for implementation.

This memorandum proposes enhancements to modeling multi-stage generating unit modeling that would:

- Improve multi-stage generating unit modeling to allow more efficient real-time dispatch;
- Increase economic participation of flexible generating resources; and
- Aid in the ISO's ability to reliably operate the grid.

Moved, that the ISO Board of Governors approves the policy to implement multi-stage generating unit modeling enhancements as described in the memorandum dated October 20, 2011; and

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

DISCUSSION AND ANALYSIS

Within the fleet of resources available to the California Independent System Operator Corporation, several resources are characterized by multiple operating configurations. These resources are termed multi-stage generating units. Typically, multi-stage generating units are in fact comprised of two or more generating units that can be operated separately or in concert. A good example is combined-cycle units which have interconnected gas and steam turbines generating electricity. The gas turbines generate electricity and, in so doing, create heat which is in turn used to boil water. The resulting steam then turns another turbine which generates additional electricity. Combined cycle generating units are built with different combinations of generating units. For example, a three by two (3x2) design has three gas turbines combined with two steam generators. As a result, these units can operate in several different configurations that consist of the various combinations of gas turbines and steam generators. There is great synergy and flexibility created by this arrangement, but also complexity. The ability to operate in multiple configurations makes multi-stage generating units more flexible than those with a single configuration from the standpoint of operating the physical plant. However, it also requires comprehensive modeling of the various configurations in order to take advantage of that flexibility, and to avoid the infeasible dispatch of the resources.

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 multi-stage generating unit modeling functionality is designed to take advantage of the inherent flexibility of these resources while respecting their operating characteristics and the costs of their operation. To employ the multi-stage generating unit modeling functionality, a market participant registers with the ISO the various operating configurations – and their associated operating parameters – and then bids those configurations into the ISO market individually. The ISO, through its market optimization software, determines which configuration is most economic given those bids while respecting the configurations' operating constraints. In short, the multi-stage generating unit modeling enables the market software to support the efficient and feasible economic dispatch of generating units with multiple operating configurations.

Through experience gained since deployment of the multi-stage generating unit modeling functionality, the analysis of commitment, dispatch, and market outcomes for multi-stage generating resources, and with the help of stakeholder feedback, Management has identified potential refinements to the modeling functionality. The enhancements are designed to improve modeling that allows for more efficient real-time dispatch. This suite of enhancements addresses several stakeholder concerns and, in so doing, is anticipated to increase economic participation of the flexible generating resources in the ISO market.

After careful consideration of input from stakeholders and ISO software developers, Management recommends that the enhancements to the multi-stage generating unit modeling functionality listed below be incorporated into the ISO systems and, as applicable, into the tariff. Our recommendation considers stakeholder feedback and system software constraints while providing flexibility in economically bidding multi-stage generating units into the ISO market. The enhancements to multi-

stage generating unit modeling described below will help improve the modeling functionality's efficiency. In so doing, it will aid in the ISO's ability to reliably operate the grid.

Management recommends the following five enhancements to the multi-stage generating unit modeling functionality:

1. *An increase from three to six configurations that a multi-stage generating unit may bid into the real-time market.*

   Currently each multi-stage generating unit can have three configurations bid into the real-time market. We propose to allow all multi-stage generating units to have up to six configurations bid into the real-time market. Being able to bid in more configurations will give market participants more flexibility and will aid the real-time market in optimizing the dispatch of multi-stage generating units in situations of under- and over-generation.

   One of the strengths of the multi-stage generating unit modeling is that it takes into account the costs and operational constraints associated with transitioning between operating configurations. However, the more possible transitions among configurations that the optimization must consider, the longer it takes that software system to reach a solution. In order to offer market participants the ability to offer bids for six configurations into the real-time market while not compromising software performance, Management recommends a limitation of two transition paths for multi-stage generating resources with more than six registered configurations.

   Both the recommendation to increase the number of configurations that can be bid into the real-time market, and the limitation on the number of transition paths, are based on experience with the multi-stage generating unit model. Based on that experience and considering stakeholder feedback, Management has determined that increasing real-time configurations and limiting transition paths achieves a balance that enhances flexibility for market participants without compromising performance of the modeling software. While Management would ideally not have any limitations on configurations or paths, some limits are needed to ensure that the software can perform as required in the real-time. Management anticipates that the need for such limitations will wane over time as the software is continually tuned to achieve greater performance.

2. *Multi-stage generating units will be required to bid the capacity from the overall minimum operating capacity of the resource up to the resource adequacy capacity or highest bid-in capacity. For such capacity not bid into the market, the ISO will insert cost-based generated bids.*

   Since the deployment of multi-stage generating unit modeling functionality, resources have been able to bid in any unit configuration to which the resource can start directly. This can result in the plant owner bidding a configuration option that leaves the capacity below the minimum operating level of that configuration unavailable to the market optimization. As a consequence, the market solution may not have the option to dispatch resources at their

lower capacity levels when the resource is bid into the market at its highest resource adequacy capacity requirement. This can result in the inability to make full use of a multi-stage generating resource's resource adequacy capacity and is not consistent with the treatment of non-multi-stage generating resources for which the optimization can consider operating levels from the plant-level minimum operating level up to the maximum bid-in capacity.

The recommendation provided herein will give the ISO the authority to insert cost-based generated bids for multi-stage generating unit configurations from a resource's overall minimum operating capacity up to its resource adequacy capacity or highest bid-in capacity.

Importantly, to date, not having this requirement in place has not posed a problem, as multi-stage generating resources have been providing the needed bids. However, Management recommends that this requirement be formalized to ensure that resource adequacy and bid-in capacity are available to follow the economic dispatch of the multi-stage generating unit.

3. *The number of ramp-rates that can be specified per multi-stage generating unit configuration will be increased from one to two.*

   The current multi-stage generating functionality allows only one ramp-rate to be defined and bid-in per configuration. This creates limitations for some resources. Experience with the modeling functionality has shown that this enhancement will not encumber the performance of the software.

4. *Market participants will be able to self-schedule a multi-stage generating unit in the real-time market into a configuration different from that scheduled in the day-ahead market.*

   Under current practices, if a multi-stage generating 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 capable of supporting that day-ahead schedule and ancillary service award. This enhancement would allow a multi-stage generating unit to self-schedule into the real-time market in a configuration different from that scheduled in the day-ahead market so long as the real-time configuration can support the same awarded ancillary service or residual unit commitment capacity.

5. *When a multi-stage generating unit does not reach the configuration (given the tolerance band) to which it is dispatched upward, the minimum load costs of the lower configuration will be included in the bid-cost recovery calculation. If the resource is dispatched downward into a lower configuration, it is recommended that the minimum load costs for the target configuration be used in the bid-cost recovery calculations.*

   Today, if a multi-stage generating unit is dispatched upward by the ISO into a configuration, its minimum load costs will be included in the bid cost recovery calculation provided that the meter is within the tolerance band around the configuration's minimum output level.

However, if the resource falls short of the tolerance band, no minimum load costs are considered in the bid cost recovery calculation for that settlement interval. The resource in this case may still be operating above the minimum load of a lower configuration, and if so, is legitimately incurring some minimum load costs.

The current practice is to the disadvantage of the market participant bidding in the multi-stage generating unit, and is misaligned with minimum load cost accounting for other generating resources. Management recommends that the multi-stage generating unit have the next lower configuration's minimum load cost considered in the bid-cost recovery calculation in the case that it does not meet the target configuration in an upward dispatch.[1]

Furthermore, Management recommends that when a multi-stage generating unit that is dispatched downward into a lower configuration by the ISO but does not leave the operating range of the higher configuration, the resource will not be eligible for the minimum load costs of the higher configuration. Instead, the minimum load costs for the target configuration would be included in the bid-cost recovery calculation.[2]

POSITION OF PARTIES

The suite of multi-stage generating unit modeling enhancements recommended herein received nearly unanimous support from stakeholders as can be seen in the attached stakeholder matrix. Also as discussed in the Department of Market Monitoring Board memo, DMM is supportive of the proposed enhancements noting that they can benefit both the ISO system and multi-stage units by dispatching these resources more accurately and efficient.

At the start of the stakeholder process on this policy initiative, the ISO proposed one additional change to the modeling of multi-stage generating units. Stakeholder feedback on that element – namely, a change from the existing methodology for determining allowable transition costs – did not receive stakeholder support. As a result, the change to the transition cost rules was removed from the group of enhancements ultimately proposed.

MANAGEMENT RECOMMENDATION

This memorandum describes multi-stage generating unit modeling enhancements designed to improve increasingly efficient real-time economic dispatch. Management anticipates that implementation of these enhancements will increase the economic participation of flexible generating resources and thereby improve the ISO's ability to reliably operate the grid. For these reasons, Management recommends that the Board approve the enhancements to the multi-stage generating unit modeling described above.

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[1] The lowest minimum load cost of the two configurations will be used. In practice it is expected that the lower configuration would have a lower minimum load cost, however, if this is not the case then the lower minimum load cost of the higher configuration will be used in the bid cost recovery calculation.

[2] Similar to footnote 1, the lowest minimum load cost of the two configurations would be used in the bid cost recovery calculation.

Attachment A

Stakeholder Process: Multi-Stage Generating Unit Modeling Enhancements

Summary of Submitted Comments

Stakeholders submitted four rounds of written comments to the ISO on the following dates:

- Round One: July 14, 2011
- Round Two: August 19, 2011
- Round Three: September 26, 2011

This matrix summarizes the most recently submitted stakeholder comments.

Stakeholder comments are posted at: http://www.caiso.com/informed/Pages/StakeholderProcesses/Multi-StageGenerationEnhancements.aspx

Other stakeholder efforts include:

- Stakeholder Conference Call: July 1, 2011
- Stakeholder Conference Call: August 12, 2011
- Stakeholder Conference Call: September 16, 2011

Management Proposal	Calpine	PG&E	SCE	SDG&E	CDWR	Management Response
Increase in the number of configurations that can be bid into the real-time market; limitation on the number of transition paths between MSG configurations for those with 7-10 registered configurations	Supports all elements of the proposal	Supports all elements of the proposal Requests additional technical documentation of MSG software improvements. The ISO has provided the requested documentation.	Either supports or does not oppose each element of the proposal	Either supports or does not oppose each element of the proposal	Supports	
Requirement to bid in capacity between plant-level minimum load and the higher of the resource's resource adequacy capacity or its highest bid-in capacity						
Increase from 1 to 2 ramp-rates can be registered per MSG configuration						
Ability to self-schedule in real-time in a different configuration than day-ahead self-scheduled configuration						
In calculation of bid-cost recovery, use the minimum load costs for the highest configuration for which the resource achieves its minimum load when dispatched upward. When dispatched downward, minimum load costs considered for bid cost recovery are those of the target configuration					CDWR is concerned this could increase bid cost recovery payments. Encourages the ISO to monitor submitted minimum load costs.	While overall bid-cost recovery payments will likely increase, this change aligns accounting for multi-stage generating resources' minimum load costs with that of other resources. The ISO proposes to continue the enforcement of existing rules with respect to allowable minimum load costs.
No change from the current transition cost validation rules					Supports	The change to transition cost validation rules was removed from the proposal based on stakeholder feedback.

Board of Governors	October 27-28, 2011	Decision on Multi-Stage Generation Unit Modeling Enhancements

Motion

Moved, that the ISO Board of Governors approves the policy to implement multi-stage generation unit modeling enhancements as described in the memorandum dated October 20, 2011; and

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

Moved: Galiteva Second: Maullin

Board Action: **Passed**	Vote Count: **4-0-0**
Bhagwat	Y
Foster	Y
Galiteva	Y
Maullin	Y

Motion Number: 2011-10-G1