



September 8, 2010

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

**Re: California Independent System Operator Corporation  
Docket No. ER10-2159-000 and ER10-1360-000**

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 (Commission) regulations, 18 C.F.R. Part 35, and consistent with Order No. 714 regarding electronic filing of tariff submittals, the California Independent System Operator Corporation (ISO) hereby resubmits a compliance filing the ISO previously submitted on August 6, 2010 in the above-referenced dockets. This repeated submission is necessary to correct a technical error experienced during the prior submission due to a software anomaly and does not contain any substantive changes from the prior submission.

## **I. Discussion**

On August 6, 2010, the ISO submitted a compliance filing in response to the Commission's order on July 30, 2010 regarding the ISO's proposal to implement the Multi-Stage Generating Resource functionality.<sup>1</sup> The Commission's order mandated that the ISO resubmit through the Commission's electronic tariff filing system the proposed tariff language that was accepted by the Commission in Docket No. ER10-1360. In the time between the ISO's submission of the initial tariff sheets in Docket ER10-1360 and the Commission's July 30 order accepting the tariff sheets, the Commission implemented its electronic tariff filing system. The resubmittal was necessary to ensure that the new tariff language would be included in the electronic version of the ISO's Fifth Replacement FERC Electric Tariff.

Due to a software anomaly, the tariff records associated with the compliance filing submitted on August 6 inadvertently were not processed. Consequently, the electronic tariff filing system currently does not contain all of the relevant tariff language. The ISO apologizes for any inconvenience caused by this issue and hereby resubmits

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<sup>1</sup> *Cal. Indep. Sys. Operator Corp.*, 132 FERC ¶ 61,087 (2010) (July 30 Order).

the compliance filing, which includes the tariff records that were previously not transferred correctly into the electronic tariff filing system in the August 6 filing.

## **II. Effective Dates**

The ISO respectfully requests that the tariff language associated with this filing be given the effective dates reflected in the Commission's July 30 order. In the July 30 order, the Commission accepted the ISO's proposed tariff modifications, with staggered effective dates of August 2, 2010 and October 1, 2010. Because the instant filing is intended to address only the electronic tariff processing issue, the ISO respectfully requests that the Commission grant any waivers or exceptions necessary for the tariff language associated with this filing to be given the same effective dates reflected in the July 30 order and as indicated in the data records submitted with this filing.

The August 6 filing, as well as the instant filing, was purely administrative in nature and did not call for the Commission to make any substantive determinations. Additionally, only one party intervened in Docket No. ER10-2159 and that party did not offer any comment on the ISO's filing. For these reasons, a shortened comment period and a waiver of the notice requirements would not have an adverse impact on any party.

## **III. Communications**

Communications regarding this filing should be addressed to the following individuals, whose names should be placed on the official service list established by the Secretary with regard to this submittal:

Anna A. McKenna  
Senior Counsel  
David S. Zlotlow  
Counsel  
California Independent System Operator Corporation  
151 Blue Ravine Road  
Folsom, CA 95630  
Tel: (916) 608-7007  
Fax: (916) 608-7296  
Email: [amckenna@caiso.com](mailto:amckenna@caiso.com)  
E-mail: [dzlotlow@caiso.com](mailto:dzlotlow@caiso.com)

## **IV. Service**

The ISO has served copies of this transmittal letter, and all attachments, on the California Public Utilities Commission, the California Energy Commission, and all parties to Docket Nos. ER10-2159 and ER10-1360. In addition, the ISO is posting this transmittal letter and all attachments on the ISO website.

**V. Materials Provided in the Instant Amended Compliance Filing**

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

- |              |   |
|--------------|---|
| Attachment A | Clean sheets incorporating the red-lined changes contained in Attachment B          |
| Attachment B | Red-lined changes to the Tariff to implement the revisions contained in this filing |

**VI. Conclusion**

The ISO respectfully requests that the Commission accept the instant filing as complying with the directives of the July 30 Order and Order No. 714.

Respectfully submitted,

By: /s/ David Zlotlow  
Nancy J. Saracino  
Vice President, General Counsel and Chief  
Administrative Officer  
Anthony J. Ivancovich  
Assistant General Counsel – Regulatory  
Anna A. McKenna  
Senior Counsel  
David S. Zlotlow  
Counsel  
California Independent  
System Operator Corporation  
151 Blue Ravine Road  
Folsom, CA 95630  
Tel: (916) 608-7007  
Fax: (916) 608-7296  
[dzlotlow@caiso.com](mailto:dzlotlow@caiso.com)

Attorneys for the California Independent  
System Operator Corporation

Dated: September 8, 2010

**Attachment A – Clean Tariff**  
**Multi-Stage Generating Resource Compliance Filing**  
**California Independent System Operator Corporation**  
**Fifth Replacement FERC Electric Tariff**

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#### **8.4.1 Operating Characteristics Required To Provide AS**

Each Generating Unit, System Unit, Participating Load or System Resource for which a Scheduling Coordinator wishes to submit a Bid to provide Ancillary Services must comply with the requirements for the specific Ancillary Service as set forth in Appendix K and the Business Practice Manual. The certification requirements in Section 8, Appendix K of the CAISO Tariff, and the Business Practice Manuals shall apply to Multi-Stage Generating Resources based on the MSG Configurations. Scheduling Coordinators shall submit Ancillary Services Bids or Submissions to Self-Provide Ancillary Services to the CAISO Markets only for MSG Configurations that are certified consistent with these requirements. In addition, to the extent the CAISO requires specific operating characteristics for Ancillary Services certification of Multi-Stage Generating Resources the responsible Scheduling Coordinator shall submit to the CAISO such specific operating characteristics at the MSG Configuration level. The requirements in Appendix K and the Business Practice Manuals include Ancillary Service control, capability and availability standards. The requirements also involve the following operating characteristics:

- (a) Ramp Rate increase and decrease (MW/minute);
- (b) power factor (leading and lagging) as required by Section 8.2.3.3;
- (c) maximum output (real and reactive), except that System Resources shall be required to comply only with the requirement for maximum real power;
- (d) minimum output (real and reactive), except that System Resources shall be required to comply only with the requirement for minimum real power;
- (e) AGC capability, control scheme, and range; and
- (f) minimum length of time the resource can be available to provide the relevant Ancillary Service.

In Appendix K and the Business Practice Manuals the CAISO will differentiate the operating characteristics according to the Ancillary Service being provided.

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## **8.9 Verification, Compliance Testing, And Auditing**

Availability of contracted and Self-Provided Ancillary Services and RUC Capacity shall be verified by the CAISO by unannounced testing of Generating Units, Loads and System Resources, by auditing of response to CAISO Dispatch Instructions, and by analysis of the appropriate Meter Data, or Interchange Schedules. The CAISO may test the capability of any Generating Unit, System Unit, System Resource, external import of a System Resource, Participating Load, or reactive device providing Ancillary Services or RUC Capacity. Participating Generators, owners or operators of Participating Loads, operators of System Units or System Resources, owners or operators of reactive devices and Scheduling Coordinators shall notify the CAISO immediately whenever they become aware that an Ancillary Service or RUC Capacity is not available in any way. All Participating Generators, owners or operators of Loads, operators of System Units or System Resources and owners or operators of reactive devices shall check, monitor and/or test their system and related equipment routinely to assure availability of the committed Ancillary Services and RUC Capacity. These requirements apply to Ancillary Services whether the Ancillary Services are contracted or self-provided. For a duration specified by the CAISO, the CAISO may suspend the technical eligibility certificate of a Scheduling Coordinator for a Generating Unit, System Unit, Load or System Resource, which repeatedly fails to perform. The CAISO shall develop measures to discourage repeated non-performance on the part of both bidders and self-providers. Further, all of these requirements apply to each MSG Configuration.

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### **8.9.2 Compliance Testing For Regulation**

The CAISO may test the capability of any Generating Unit or System Resource providing Regulation by using the CAISO EMS to move that Generating Unit's or System Resource's output over the full range of its Regulation capacity within a ten-minute period. For a Multi-Stage Generating Resource the full range of Regulation capacity is evaluated at the applicable MSG Configuration.

### **8.9.3 Compliance Testing For Non-Spinning Reserve**

#### **8.9.3.1 Compliance Testing of a Generating Unit, System Unit or System Resource**

The CAISO may test the Non-Spinning Reserve capability of a Generating Unit, System Unit or an external import of a System Resource by issuing unannounced Dispatch Instructions requiring the

Generating Unit or System Unit to come on line and ramp up or, in the case of a System Resource, to affirmatively respond to Real-Time interchange schedule adjustment; all in accordance with the Scheduling Coordinator's Bid. Such tests may not necessarily occur on the hour. The CAISO shall measure the response of the Generating Unit, System Unit or external import of a System Resource to determine compliance with its stated capabilities. For a Multi-Stage Generating Resource the full range of Non-Spinning capacity is evaluated at the applicable MSG Configuration.

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#### **8.9.6 Compliance Testing For RUC Capacity**

The CAISO may test the capability of a Generating Unit, System Unit or an external import of a System Resource to provide RUC Capacity by issuing unannounced Dispatch Instructions requiring the Generating Unit or System Unit to come on line and ramp up or, in the case of a System Resource, to affirmatively respond to a Real-Time Interchange Schedule adjustment; all in accordance with the Scheduling Coordinator's Bid. Such tests may not necessarily occur on the hour. The CAISO shall measure the response of the Generating Unit, System Unit or external import of a System Resource to determine compliance with its stated capabilities. For a Multi-Stage Generating Resource the range of RUC Capacity evaluated is the range for the applicable MSG Configuration.

#### **8.9.9 Performance Audit For Regulation**

The CAISO will audit the performance of a Generating Unit providing Regulation by monitoring its response to CAISO EMS control or, in the case of an external import of a System Resource providing Regulation, by monitoring the dynamic Interchange response to CAISO EMS control around its Set Point within its rated MW/minute capability over the range of Regulation capacity scheduled for the current Settlement Period. For a Multi-Stage Generating Resource the range of Regulation capacity evaluated is the range for the applicable MSG Configuration.

#### **8.9.10 Performance Audit For Spinning Reserve**

The CAISO will audit the performance of a Generating Unit or external import of a System Resource providing Spinning Reserve by auditing its response to Dispatch Instructions and by analysis of Meter Data associated with the Generating Unit. Such audits may not necessarily occur on the hour. A Generating Unit providing Spinning Reserve shall be evaluated on its ability to respond to a Dispatch

Instruction, move at the MW/minute capability stated in its Bid, reach the amount of Spinning Reserve capacity scheduled for the current Settlement Period within ten (10) minutes of issue of the Dispatch Instruction by the CAISO, and respond to system frequency deviations outside the allowed frequency deadband. An external import of a System Resource providing Spinning Reserve shall be evaluated on its ability to respond to a Dispatch Instruction, move at the MW/minute capability stated in its Bid, reach the amount of Spinning Reserve capacity scheduled for the current Settlement Period within ten (10) minutes of issue of the Dispatch Instruction by the CAISO. For a Multi-Stage Generating Resource the range of Spinning Reserve capacity evaluated is the range for the applicable MSG Configuration.

#### **8.9.11 Performance Audit For Non-Spinning Reserve**

The CAISO will audit the performance of a Generating Unit, Load, or System Resource providing Non-Spinning Reserve by auditing its response to Dispatch Instructions, and by analysis of Meter Data associated with the resource. Such audits may not necessarily occur on the hour. A Generating Unit providing Non-Spinning Reserve shall be evaluated on its ability to respond to a Dispatch Instruction, move in accordance with the time delay and MW/minute capability stated in its Bid, and reach the amount of Non-Spinning Reserve capacity under the control of the CAISO scheduled for the current Settlement Period within ten (10) minutes of issue of the Dispatch Instruction by the CAISO. An external import of a System Resource providing Non-Spinning Reserve shall be evaluated on its ability to respond to a Dispatch Instruction, move in accordance with the time delay and MW/minute capability stated in its Bid, and reach the amount of Non-Spinning Reserve capacity scheduled for the current Settlement Period within ten (10) minutes of issue of the Dispatch Instruction by the CAISO. A Load providing Non-Spinning Reserve from Curtailable Demand shall be evaluated on its ability to respond to a Dispatch Instruction, move in accordance with the time delay and MW/minute capability stated in its Bid, and reach the amount of Non-Spinning Reserve capacity scheduled for the current Settlement Period within ten (10) minutes of issue of the Dispatch Instruction by the CAISO. For a Multi-Stage Generating Resource the range of Non-Spinning capacity evaluated is the range for the applicable MSG Configuration.

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#### **8.9.14 Performance Audit For RUC Capacity**

The CAISO will audit the performance of a Generating Unit, Participating Load, or System Resource providing RUC Capacity by auditing its response to Dispatch Instructions, and by analysis of Meter Data associated with the resource. Such audits may not necessarily occur on the hour. A Generating Unit providing RUC Capacity shall be evaluated on its ability to respond to a Dispatch Instruction, start within the designated time delay, move at the MW/minute capability stated in its Bid, reach the amount of RUC Capacity scheduled for the Settlement Period concerned and sustain operation at this level for a sufficient time to assure availability over the specified period. An external import of a System Resource providing RUC Capacity shall be evaluated on its ability to respond to a Dispatch Instruction, start within the designated time delay, move at the MW/minute capability stated in its Bid, reach the amount of RUC Capacity scheduled for the Settlement Period concerned and sustain operation at this level for a sufficient time to assure availability over the specified period. For a Multi-Stage Generating Resource range of RUC Capacity evaluated is the range for the applicable MSG Configuration.

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#### **8.10.2 Spinning Reserve**

The CAISO shall test the Spinning Reserve capability of a Generating Unit, System Unit or System Resource by issuing unannounced Dispatch Instructions requiring the Generating Unit, System Unit or System Resource to ramp up to its ten (10) minute capability. The CAISO shall measure the response of the Generating Unit, System Unit or System Resource to determine compliance with requirements. Such tests may not necessarily occur on the hour. The Scheduling Coordinator for the Generating Unit, System Unit or System Resource shall be paid pursuant to Section 11.5.6. For a Multi-Stage Generating Resource the range of Spinning capacity evaluated is the range for the applicable MSG Configuration.

#### **8.10.3 Non-Spinning Reserve**

The CAISO may test the Non-Spinning Reserve capability of a Generating Unit, Load, System Unit or System Resource by issuing unannounced Dispatch Instructions requiring the Generating Unit, Load, System Unit or System Resource to come on line and ramp up or to reduce Demand to its ten (10) minute capability. The CAISO shall measure the response of the Generating Unit, System Unit, System Resource or Load to determine compliance with requirements. The Scheduling Coordinator for the

Generating Unit, System Unit, Load or System Resource shall be paid pursuant to Section 11.5.6. For a Multi-Stage Generating Resource the range of Non-Spinning capacity evaluated is the range at the applicable MSG Configuration.

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#### **8.10.8.1 Rescission of Payments for Undispatchable Ancillary Service Capacity**

The CAISO shall calculate the Real-Time ability of each Generating Unit, Participating Load, System Unit or System Resource to deliver Energy from Ancillary Services capacity or Self-Provided Ancillary Services capacity for each Settlement Interval based on its maximum operating capability, actual telemetered output, and Operational Ramp Rate as described in Section 30.10. To make this determination for Multi-Stage Generating Resources the CAISO shall use the MSG-Configuration-specific Maximum Operating Limit and Operational Ramp Rate. System Resources that are awarded Ancillary Services capacity in the Day-Ahead Market are required to electronically tag (E-Tag as prescribed by the WECC) the Ancillary Services capacity. If the amounts of Ancillary Services capacity in an electronic tag differ from the amounts of Ancillary Services capacity for the System Resource, the Undispatchable Capacity will equal the amount of the difference, and will be settled in accordance with the provisions of Section 11.10.9.1.

#### **8.10.8.2 Rescission of Payments for Unavailable Ancillary Service Capacity**

If the CAISO determines that a Scheduling Coordinator has supplied Uninstructed Imbalance Energy to the CAISO during a Settlement Interval from the capacity of a Generating Unit, Participating Load, System Unit or System Resource that is obligated to supply Spinning Reserve or Non-Spinning Reserve to the CAISO, payments to the Scheduling Coordinator for the Ancillary Service capacity used to supply Uninstructed Imbalance Energy shall be eliminated to the extent of the deficiency, in accordance with the provisions of Section 11.10.9.2. For Multi-Stage Generating Resources that have supplied Uninstructed Imbalance Energy from capacity obligated to supply Spinning or Non-Spinning Reserves, the CAISO shall calculate the capacity for which payments will be rescinded at the Generating Unit or Dynamic Resource-Specific System Resource level, as applicable, and will use the MSG Configuration-specific Maximum Operating Limit.

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### **9.7 Multi-Stage Generating Resources Outages**

Participating Generators of Multi-Stage Generating Resources shall report Outages in accordance with the Outage reporting requirements in Section 9 for the Generating Unit and for each MSG Configuration, as applicable. In addition, to the extent that the responsible Scheduling Coordinator modifies the registered Multi-Stage Generating Resource's characteristics as provided in Section 27.8.3, the Participating Generator for the Multi-Stage Generating Resource shall modify any information or reports previously submitted pursuant to this Section 9 to account for any registered status and characteristic changes as soon as possible after receiving notice from the CAISO acceptance of the registered status or characteristics changes and no later than two (2) business days prior to the date on which the Section 27.8.3 changes are expected to be in effect.

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### **11.8.1 CAISO Determination Of Self-Commitment Periods**

For the purposes of identifying the periods during which a Bid Cost Recovery Eligible Resource is deemed self-committed and thus ineligible for Start-Up Costs, Transition Costs, Minimum Load Costs, IFM Pump Shut-Down Costs and IFM Pumping Costs, the CAISO derives the Self-Commitment Periods as described below. The CAISO will determine the Self-Commitment Periods for Multi-Stage Generating Resources based on the applicable MSG Configuration. MSS resources designated for Load following are considered to be self-committed if they have been scheduled with non-zero Load following capacity, or are otherwise used to follow Load in the Real-Time. The IFM and RUC Self-Commitment Periods will be available as part of the Day-Ahead Market results provided to the applicable Scheduling Coordinator. The interim RTM Self-Commitment Periods as reflected in the HASP will be available as part of the HASP results for the relevant Trading Hour as provided to the applicable Scheduling Coordinator. The final RTM Self-Commitment Period is determined ex-post for Settlements purposes. ELS Resources committed through the ELC Process described in Section 31.7 are considered to have been committed in the IFM Commitment Period for the applicable Trading Day for the purposes of determining BCR settlement in this section 11.8.

#### **11.8.1.1 IFM Self-Commitment Period**

An IFM Self-Commitment Period for a Bid Cost Recovery Eligible Resource shall consist of one or more sets of consecutive Trading Hours during which the relevant Bid Cost Recovery Eligible Resource has either a Self-Schedule or, except for Self-Provided Ancillary Services for Non-Spinning Reserve by a Fast Start Unit, has a non-zero amount of Self-Provided Ancillary Services. An IFM Self-Commitment Period for a Bid Cost Recovery Eligible Resource may not be less than the relevant Minimum Run Time (MRT), rounded up to the next hour. Consequently, if a Bid Cost Recovery Eligible Resource first self-commits in hour  $h$  of the Trading Day, the self-commitment will be extended to hour  $h + \text{MRT}$ . Two IFM Self-Commitment Periods for a Bid Cost Recovery Eligible Resource may not be apart by less than the relevant Minimum Down Time (MDT) (rounded up to the next hour). Consequently, if a Bid Cost Recovery Eligible Resource has submitted a Self-Schedule or Submission to Self-Provide an Ancillary Service in hours  $h$  and  $h + n$ , and  $n$  is less than the MDT, the IFM Self-Commitment Period will be extended to the hours in between  $h$  and  $h + n$  inclusive. The number of IFM Self-Commitment Periods for a Bid Cost Recovery Eligible Resource within a Trading Day cannot exceed the relevant Maximum Daily Start-Ups (MDS), or  $\text{MDS} + 1$  if the first IFM Self-Commitment Period is the continuation of an IFM or RUC Commitment Period from the previous Trading Day. Consequently, if a Bid Cost Recovery Eligible Resource has submitted a Self-Schedule or Submission to Self-Provide an Ancillary Service, such that after applying the preceding two rules, the number of disjoint Self Commitment Periods for the Operating Day exceeds the Maximum Daily Start-Ups (MDS), or  $\text{MDS} + 1$  if the first IFM Self-Commitment Period is the continuation of an IFM or RUC Commitment Period from the previous Trading Day, the disjoint Self Commitment Periods with smallest time gap in between will be joined together to bring down the number of disjoint Self Commitment Periods to MDS or  $\text{MDS} + 1$  as relevant. To determine whether an extension of the IFM Self-Commitment Period applies for Multi-Stage Generating Resources, the CAISO will ensure that the respective Minimum Run Time and Minimum Down Time for both the Generating Unit or Dynamic Resource-Specific System Resource and MSG Configuration levels are simultaneously respected.

#### **11.8.1.2 Real-Time Self-Commitment Period**

A Real-Time Market Self-Commitment Period for a Bid Cost Recovery Eligible Resource shall consist of all consecutive Dispatch Intervals not in an IFM Commitment Period or a RUC Commitment Period where the Bid Cost Recovery Eligible Resource has a Self-Schedule or, except for Self-Provided Ancillary

Services for Non-Spinning Reserve by a Fast Start Unit, has a non-zero amount of Self-Provided Ancillary Services. A Real-Time Market Self-Commitment Period for a Bid Cost Recovery Eligible Resource may not be less than the relevant MUT (rounded up to the next 15-minute Commitment Interval) when considered jointly with any adjacent IFM Self-Commitment Period. For example, if a Bid Cost Recovery Eligible Resource self-commits at time  $h$ , the self-commitment will be extended to Commitment Interval  $h + \text{MUT}$ , unless an IFM or RUC Commitment Period exists starting after hour  $h$ , in which case the self-commitment will be extended to Commitment Interval  $h + \min(\text{MUT}, t)$ , where  $t$  represents the time interval between the Real-Time Market Self-Commitment Period and the IFM or RUC Commitment Period. A Real-Time Market Self-Commitment Period for a Bid Cost Recovery Eligible Resource may not be apart from an IFM or RUC Commitment Period by less than the relevant MDT (rounded up to the next 15-minute Commitment Interval). For example, if a Bid Cost Recovery Eligible Resource self-commits at time  $T1$  and has a RUC Schedule at time  $T2 < T1$ , the Real-Time Market Self-Commitment Period will be extended to the interim Commitment Intervals if  $T1 - T2 < \text{MDT}$ . The number of Real-Time Market Self-Commitment Periods for a Bid Cost Recovery Eligible Resource within a Trading Day, when considered jointly with any adjacent IFM Self-Commitment Period, may not exceed the relevant MDS (or  $\text{MDS} + 1$  if the first Real-Time Market Self-Commitment Period is the continuation of a Real-Time Market Commitment Period from the previous Trading Day). For example, if a Bid Cost Recovery Eligible Resource self-commits at time  $T1$  and has a RUC Schedule at time  $T2 > T1$ , the Real-Time Market Self-Commitment Period will be extended to the interim Commitment Intervals if an additional Real-Time Market Start-Up at  $T1$  would violate the MDS constraint. To determine whether an extension of the RTM Self-Commitment Period applies for Multi-Stage Generating Resources, the CAISO will ensure that the respective Minimum Run Time and Minimum Down Time for both the Generating Unit or Dynamic Resource-Specific System Resource and MSG Configuration levels are simultaneously respected.

### **11.8.1.3 Multi-Stage Generating Resource Start-Up, Minimum Load, or Transition Costs**

For the settlement of the Multi-Stage Generating Resource Start-Up Cost, Minimum Load Cost, and Transition Cost in the IFM, RUC, and RTM, the CAISO will determine the applicable Commitment Period and select the applicable Start-Up Cost, Minimum Load Cost, and Transition Cost based on the following rules.

(1) In any given Settlement Interval, the CAISO will first apply the following rules to determine the applicable Start-Up Cost, Minimum Load Cost, and Transition Cost for the Multi-Stage Generating Resources. For a Commitment Period in which the:

- (a) IFM Commitment Period and/or RUC Commitment Period MSG Configuration(s) are different than the RTM CAISO Commitment Period MSG Configuration, the Multi-Stage Generating Resource's Start-Up Cost, Minimum Load Cost, and Transition Cost will be settled based on the RTM CAISO Commitment Period MSG Configuration Start-Up Cost, Minimum Load Cost, and Transition Cost, as described in Section 11.8.4.1.
- (b) IFM CAISO Commitment Period and/or RUC CAISO Commitment Period MSG Configuration(s) and there is a RTM Self-Commitment Period in any MSG Configuration, the Multi-Stage Generating Resource's Start-Up Cost, Minimum Load Cost, and Transition Cost will be settled based on the IFM CAISO Commitment Period and/or RUC CAISO Commitment Period MSG Configuration(s) Start-Up Cost, Minimum Load Cost, and Transition Cost, as described in Sections 11.8.2.1 and 11.8.3.1, and further determined pursuant to part (2) of this Section below.
- (c) IFM CAISO Commitment Period and/or RUC CAISO Commitment Period MSG Configuration is the same as the RTM CAISO Commitment Period MSG Configuration, the Multi-Stage Generating Resource's Start-Up Cost, Minimum Load Cost, and Transition Cost will be settled based on the IFM CAISO Commitment Period and/or RUC CAISO Commitment Period MSG Configuration(s) Start-Up Cost, Minimum Load Cost, and Transition Cost described in Sections 11.8.2.1 and 11.8.3.1, and further determined pursuant to part (2) of this Section below.
- (d) IFM and RUC Self-Commitment Period MSG Configuration(s) are the same as the RTM CAISO Commitment Period MSG Configuration, then

the Multi-Stage Generating Resource's Start-Up Cost, Minimum Load Cost, and Transition Cost will be settled based on the RTM CAISO Commitment Period MSG Configuration Start-Up Cost, Minimum Load Cost, and Transition Cost as described in Section 11.8.4.1.

(2) In any given Settlement Interval, after the rules specified in part (1) above of this Section have been executed, the ISO will apply the following rules to determine whether the IFM or RUC Start-Up Cost, Minimum Load Cost, and Transition Cost apply for Multi-Stage Generating Resources. For a Commitment Period in which the:

(a) IFM Commitment Period MSG Configuration is different than the RUC CAISO Commitment Period MSG Configuration the Multi-Stage Generating Resource's Start-Up Cost, Minimum Load Cost, and Transition Cost will be settled based on the RUC CAISO Commitment Period MSG Configuration Start-Up Cost, Minimum Load Cost, and Transition Cost as described in Section 11.8.3.1.

(b) IFM CAISO Commitment Period MSG Configuration is the same as the RUC Commitment Period MSG Configuration, the Multi-Stage Generating Resource's Start-Up Cost, Minimum Load Cost, and Transition Cost will be based on the IFM CAISO Commitment Period MSG Configuration Start-Up Cost, Minimum Load Cost, and Transition Cost as described in Section 11.8.2.1.

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#### **11.8.2.1 IFM Bid Cost Calculation**

For each Settlement Interval, the CAISO shall calculate IFM Bid Cost for each Bid Cost Recovery Eligible Resource as the algebraic sum of the IFM Start-Up Cost, IFM Transition Cost, IFM Minimum Load Cost, IFM Pump Shut-Down Cost, IFM Energy Bid Cost, IFM Pumping Cost, and IFM AS Bid Cost. For Multi-Stage Generating Resources, in addition to the specific IFM Bid Cost rules described in Section 11.8.2.1, the CAISO will apply the rules described in Section 11.8.1.3 to further determine the applicable MSG

Configuration-based CAISO Market Start-Up Cost, Transition Cost and Minimum Load Cost in any given Settlement Interval. For Multi-Stage Generating Resources, the incremental IFM Start-Up, Minimum Load, and Transition Costs to provide Energy Scheduled in the Day-Ahead Schedule or awarded RUC or Ancillary Service capacity for an MSG Configuration other than the self-scheduled MSG Configuration are determined by the IFM rules specified in Section 31.3.

#### **11.8.2.1.1 IFM Start-Up Cost**

The IFM Start-Up Cost for any IFM Commitment Period shall equal to the Start-Up Costs submitted by the Scheduling Coordinator to the CAISO for the IFM divided by the number of Settlement Intervals within the applicable IFM Commitment Period. For each Settlement Interval, only the IFM Start-Up Cost in a CAISO IFM Commitment Period is eligible for Bid Cost Recovery. The CAISO will determine the IFM Start-Up Costs for Multi-Stage Generating Resources based on the CAISO-committed MSG Configuration. The following rules shall apply sequentially to qualify the IFM Start-Up Cost in an IFM Commitment Period:

- (a) The IFM Start-Up Cost for an IFM Commitment Period shall be zero if there is an IFM Self-Commitment Period within or overlapping with that IFM Commitment Period.
- (b) The IFM Start-Up Cost for an IFM Commitment Period shall be zero if 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 in the Day-Ahead Market anywhere within the applicable IFM Commitment Period.
- (c) The IFM Start-Up Cost for an IFM Commitment Period shall be zero if there is no actual Start-Up at the start of the applicable IFM Commitment Period because the IFM Commitment Period is the continuation of an IFM, RUC, or RTM Commitment Period from the previous Trading Day.
- (d) The IFM Start-Up Cost for an IFM Commitment Period shall be zero if the Start-Up is delayed by the Real-Time Market past the IFM Commitment Period in



question or cancelled by the Real-Time Market before the start-up process has started.

- (e) If an IFM Start-Up is terminated in the Real-Time within the applicable IFM Commitment Period through an Exceptional Dispatch Shut-Down Instruction issued while the Bid Cost Recovery Eligible Resource was starting up, the IFM Start-Up Cost for that IFM Commitment Period shall be prorated by the ratio of the Start-Up Time before termination over the total IFM Start-Up Time.
- (f) The IFM Start-Up Cost is qualified if an actual Start-Up occurs within the applicable IFM Commitment Period. An actual Start-Up is detected between two consecutive Settlement Intervals when the relevant metered Energy in the applicable Settlement Intervals increases from below the Minimum Load Energy and reaches or exceeds the relevant Minimum Load Energy. The Minimum Load Energy is the product of the relevant Minimum Load and the duration of the Settlement Interval. The CAISO will determine the Minimum Load Energy for Multi-Stage Generating Resources based on the CAISO Commitment Period applicable MSG Configuration.
- (g) The IFM Start-Up Cost will be qualified if an actual Start-Up occurs earlier than the start of the IFM Commitment Period if the advance Start-Up is as a result of a Start-Up instruction issued in a RUC or Real-Time Market process subsequent to the IFM, or the advance Start-Up is uninstructed but is still within the same Trading Day and the Bid Cost Recovery Eligible Resource actually stays on until the targeted IFM Start-Up.

#### **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 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, 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.

\* \* \*

#### **11.8.2.1.5 IFM Energy Bid Cost**

For any Settlement Interval, the IFM Energy Bid Cost for Bid Cost Recovery Eligible Resources, except Participating Loads, shall be the integral of the relevant Energy Bid submitted to the IFM, if any, from the higher of the registered Bid Cost Recovery Eligible Resource's Minimum Load and the Day-Ahead Total Self-Schedule up to the relevant MWh scheduled in the Day-Ahead Schedule, divided by the number of Settlement Intervals in a Trading Hour. The IFM Energy Bid Cost for Bid Cost Recovery Eligible Resources, except Participating Loads, for any Settlement Interval is set to zero for any portion of the Day-Ahead Schedule that is not delivered from the otherwise Bid Cost Recovery Eligible Resource that has metered Generation below its Day-Ahead Schedule; any portion of the Day-Ahead Schedule that is actually delivered remains eligible for IFM Energy Bid Cost Recovery. The CAISO will determine the IFM Energy Bid Cost for a Multi-Stage Generating Resource at the Generating Unit or Dynamic Resource-Specific System Resource level.

#### **11.8.2.1.6 IFM AS Bid Cost**

For any Settlement Interval, the IFM AS Bid Cost shall be the product of the IFM AS Award from each accepted IFM AS Bid and the relevant AS Bid Price, divided by the number of Settlement Intervals in a Trading Hour. The CAISO will determine and calculate IFM AS Bid Cost for a Multi-Stage Generating Resource at the Generating Unit or Dynamic Resource-Specific System Resource level.

#### **11.8.2.1.7 IFM Transition Cost**

For each Settlement Interval, the IFM Transition Costs shall be based on the MSG Configuration to which the Multi-Stage Generating Resource is transitioning and is allocated to the CAISO Commitment Period of that MSG Configuration.

\* \* \*

#### **11.8.2.2 IFM Market Revenue**

For any Settlement Interval in a CAISO IFM Commitment Period the IFM Market Revenue for a Bid Cost Recovery Eligible Resource is the algebraic sum of: (1) the product of the delivered MWh, in the relevant Day-Ahead Schedule in that Trading Hour where for Pumped-Storage Hydro Units and Participating Load operating in the pumping mode or serving Load, the MWh is negative, and the relevant IFM LMP, divided by the number of Settlement Intervals in a Trading Hour; and (2) the product of the IFM AS Award from each accepted IFM AS Bid and the relevant Resource-Specific ASMP, divided by the number of Settlement Intervals in a Trading Hour. In the case of a Multi-Stage Generating Resource, the CAISO will calculate the market revenue at the Generating Unit or Dynamic Resource-Specific System Resource level. For any Settlement Interval in a IFM Self-Commitment Period the IFM Market Revenue for a Bid Cost Recovery Eligible Resource is the algebraic sum of: (1) the product of the delivered MWh above the greater of Minimum Load and Self-Scheduled Energy, in the relevant Day-Ahead Schedule in that Trading Hour and the relevant IFM LMP, divided by the number of Settlement Intervals in a Trading Hour; and (2) the product of the IFM AS Award from each accepted IFM AS Bid and the relevant Resource-Specific ASMP, divided by the number of Settlement Intervals in a Trading Hour.

\* \* \*

#### **11.8.3.1 RUC Bid Cost Calculation**

For each Settlement Interval, the CAISO shall determine the RUC Bid Cost for a Bid Cost Recovery Eligible Resource as the algebraic sum of the RUC Start-Up Cost, RUC Transition Cost, RUC Minimum Load Cost and RUC Availability Bid Cost. For Multi-Stage Generating Resources, in addition to the specific RUC Bid Cost rules described in Section 11.8.3.1, the rules described in Section 11.8.1.3 will be applied to further determine the applicable MSG Configuration-based CAISO Market Start-Up Cost, Transition Cost, and Minimum Load Cost in any given Settlement Interval. For Multi-Stage Generating

Resources, the incremental RUC Start-Up, Minimum Load, and Transition Costs to provide RUC awarded capacity for an MSG Configuration other than the self-scheduled MSG Configuration are determined by the RUC optimization rules in specified in Section 31.5.

#### **11.8.3.1.1 RUC Start-Up Cost**

The RUC Start-Up Cost for any Settlement Interval in a RUC Commitment Period shall consist of Start-Up Cost of the Bid Cost Recovery Eligible Resource submitted to the CAISO for the applicable RUC Commitment Period divided by the number of Settlement Intervals in the applicable RUC Commitment Period. For each Settlement Interval, only the RUC Start-Up Cost in a CAISO RUC Commitment Period is eligible for Bid Cost Recovery. The CAISO will determine the RUC Start-Up Cost for a Multi-Stage Generating Resource based on the MSG Configuration committed by the CAISO in RUC.

The following rules shall be applied in sequence and shall qualify the RUC Start-Up Cost in a RUC Commitment Period:

- (a) The RUC Start-Up Cost for a RUC Commitment Period is zero if there is an IFM Commitment Period within that RUC Commitment Period.
- (b) The RUC Start-Up Cost for a RUC Commitment Period is zero if the Bid Cost Recovery Eligible Resource is manually pre-dispatched under an RMR Contract prior to the Day-Ahead Market or is flagged as an RMR Dispatch in the Day-Ahead Schedule anywhere within that RUC Commitment Period.
- (c) The RUC Start-Up Cost for a RUC Commitment Period is zero if there is no RUC Start-Up at the start of that RUC Commitment Period because the RUC Commitment Period is the continuation of an IFM, RUC, or RTM Commitment Period from the previous Trading Day.
- (d) The RUC Start-Up Cost for a RUC Commitment Period is zero if the Start-Up is delayed beyond the RUC Commitment Period in question or cancelled by the Real-Time Market prior to the Bid Cost Recovery Eligible Resource starting its start-up process.

- (e) If a RUC Start-Up is terminated in the Real-Time within the applicable RUC Commitment Period through an Exceptional Dispatch Shut-Down Instruction issued while the Bid Cost Recovery Eligible Resource is starting up the, RUC Start-Up Cost is prorated by the ratio of the Start-Up Time before termination over the RUC Start-Up Time.
- (f) The RUC Start-Up Cost for a RUC Commitment Period is qualified if an actual Start-Up occurs within that RUC Commitment Period. An actual Start-Up is detected between two consecutive Settlement Intervals when the relevant metered Energy in the applicable Settlement Intervals increases from below the Minimum Load Energy and reaches or exceeds the relevant Minimum Load Energy. The Minimum Load Energy is the product of the relevant Minimum Load and the duration of the Settlement Interval. The CAISO will determine the Minimum Load Energy for Multi-Stage Generating Resources based on the CAISO-committed MSG Configuration.
- (g) The RUC Start-Up Cost shall be qualified if an actual Start-Up occurs earlier than the start of the RUC Start-Up, if the relevant Start-Up is still within the same Trading Day and the Bid Cost Recovery Eligible Resource actually stays on until the RUC Start-Up, otherwise the Start-Up Cost is zero for the RUC Commitment Period.

#### **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 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, it is determined to be Off. The CAISO will determine the RUC Minimum Load Cost for a Multi-Stage Generating Resource based on the MSG Configuration committed by the CAISO in RUC.

#### **11.8.3.1.3 RUC Availability Bid Cost**

The RUC Availability Bid Cost is calculated as the product of the RUC Award with the relevant RUC Availability Bid price, divided by the number of Settlement Intervals in a Trading Hour. The RUC Availability Bid Cost for a Bid Cost Recovery Eligible Resource for a Settlement Interval is zero if the Bid Cost Recovery Eligible Resource is operating below its RUC Schedule, and also has a negative Uninstructed Imbalance Energy (UIE) magnitude in that Settlement Interval in excess of: (1) five (5) MWh divided by the number of Settlement Intervals in the Trading Hour; or (2) three percent (3%) of its maximum capacity divided by the number of Settlement Intervals in a Trading Hour. The CAISO will determine the RUC Availability Bid Cost based on the Multi-Stage Generating Resource Generating Unit level.

#### **11.8.3.1.4 RUC Transition Cost**

For each Settlement Interval, the RUC Transition Costs shall be based on the MSG Configuration to which the Multi-Stage Generating Resource is transitioning and is allocated to the CAISO commitment period of that MSG Configuration.

#### **11.8.3.2 RUC Market Revenues**

For any Settlement Interval, the RUC Market Revenue for a Bid Cost Recovery Eligible Resource is the RUC Availability Payment as specified in Section 11.2.2.1 divided by the number of Settlement Intervals in a Trading Hour. If the RUC Availability Bid Cost of a BCR Eligible Resource is reduced to zero (0) in a Settlement Interval because of Uninstructed Deviation as stated in Section 11.8.3.1.3, then the RUC Market Revenue for that resource for that Settlement Interval shall also be set to zero (0) since the resource is subject to rescission of RUC Availability Payments as specified in Section 31.5.7. The CAISO

will determine the RUC Market Revenues for Multi-Stage Generating Resources based on the Generating Unit or Dynamic Resource-Specific System Resource level.

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#### **11.8.4.1 RTM Bid Cost Calculation**

For each Settlement Interval, the CAISO shall calculate RTM Bid Cost for each Bid Cost Recovery Eligible Resource, as the algebraic sum of the RTM Start-Up Cost, RTM Minimum Load Cost, RTM Transition Cost, RTM Pump Shut-Down Cost, RTM Energy Bid Cost, RTM Pumping Cost and RTM AS Bid Cost. For Multi-Stage Generating Resources, in addition to the specific RTM Bid Cost rules described in Section 11.8.4.1, the rules described in Section 11.8.1.3 will be applied to further determine the applicable MSG Configuration-based CAISO Market Start-Up Cost, Transition Cost, and Minimum Load Cost in given Settlement Interval. For Multi-Stage Generating Resources, the incremental RTM Start-Up Cost, Minimum Load Cost, and Transition Cost to provide RTM committed Energy or awarded Ancillary Services capacity for an MSG Configuration other than the self-scheduled MSG Configuration are determined by the RTM optimization rules in specified in Section 34.

##### **11.8.4.1.1 RTM Start-Up Cost**

For each Settlement Interval of the applicable Real-Time Market Commitment Period, the Real-Time Market Start-Up Cost shall consist of the Start-Up 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 the applicable Real-Time Market Commitment Period. For each Settlement Interval, only the Real-Time Market Start-Up Cost in a CAISO Real-Time Market Commitment Period is eligible for Bid Cost Recovery. The CAISO will determine the RTM Start-Up Cost for a Multi-Stage Generating Resource based on the MSG Configuration committed by the CAISO in RTM. The following rules shall be applied in sequence and shall qualify the Real-Time Market Start-Up Cost in a Real-Time Market Commitment Period:

- (a) The Real-Time Market Start-Up Cost is zero if there is a Real-Time Market Self-Commitment Period within the Real-Time Market Commitment Period.
- (b) The Real-Time Market Start-Up Cost is zero if the Bid Cost Recovery Eligible Resource has been manually pre-dispatched under an RMR Contract or the

resource is flagged as an RMR Dispatch in the Day-Ahead Schedule or Real-Time Market anywhere within that Real-Time Market Commitment Period.

- (c) The Real-Time Market Start-Up Cost is zero if the Bid Cost Recovery Eligible Resource is started within the Real-Time Market Commitment Period pursuant to an Exceptional Dispatch issued in accordance with Section 34.9.2 to (1) perform Ancillary Services testing; (2) perform pre-commercial operation testing for Generating Units; or (3) perform PMax testing.
- (d) The Real-Time Market Start-Up Cost is zero if there is no Real-Time Market Start-Up at the start of that Real-Time Market Commitment Period because the Real-Time Market Commitment Period is the continuation of an IFM or RUC Commitment Period from the previous Trading Day.
- (e) If a Real-Time Market Start-Up is terminated in the Real-Time within the applicable Real-Time Market Commitment Period through an Exceptional Dispatch Shut-Down Instruction issued while the Bid Cost Recovery Eligible Resource is starting up the Real-Time Market Start-Up Cost is prorated by the ratio of the Start-Up Time before termination over the Real-Time Market Start-Up Time.
- (f) The Real-Time Market Start-Up Cost shall be qualified if an actual Start-Up occurs within that Real-Time Market Commitment Period. An actual Start-Up is detected between two consecutive Settlement Intervals when the relevant metered Energy in the applicable Settlement Intervals increases from below the Minimum Load Energy and reaches or exceeds the relevant Minimum Load Energy. The Minimum Load Energy is the product of the relevant Minimum Load and the duration of the Settlement Interval. The CAISO will determine the Minimum Load Energy for Multi-Stage Generating Resources based on the CAISO-committed MSG Configuration.
- (g) The Real-Time Market Start-Up Cost for a Real-Time Market Commitment Period shall be qualified if an actual Start-Up occurs earlier than the start of the Real-



Time Market Start-Up, if the relevant Start-Up is still within the same Trading Day and the Bid Cost Recovery Eligible Resource actually stays on until the Real-Time Market Start-Up, otherwise the Start-Up Cost is zero for the RUC Commitment Period.

#### **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 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. 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 applicable Dispatch Intervals.

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#### **11.8.4.1.5 RTM Energy Bid Cost**

For any Settlement Interval, the RTM Energy Bid Cost for the Bid Cost Recovery Eligible Resource except Participating Loads shall be computed as the sum of the products of each Instructed Imbalance

Energy (IIE) portion, except Standard Ramping Energy, Residual Imbalance Energy, Exceptional Dispatch Energy, Derate Energy, MSS Load Following Energy, Ramping Energy Deviation and Regulating Energy, with the relevant Energy Bid prices, if any, for each Dispatch Interval in the Settlement Interval. The RTM Energy Bid Cost for a Bid Cost Recovery Eligible Resource except Participating Loads for a Settlement Interval is set to zero for any undelivered Real-Time Instructed Imbalance Energy by the Bid Cost Recovery Eligible Resource. Any Uninstructed Imbalance Energy in excess of Instructed Imbalance Energy is also not eligible for Bid Cost Recovery. For a Multi-Stage Generating Resource the CAISO will determine the RTM Energy Bid Cost based on the Generating Unit or Dynamic Resource-Specific System Resource level.

#### **11.8.4.1.6 RTM AS Bid Cost**

For each Settlement Interval, the Real-Time Market AS Bid Cost shall be the product of the average Real-Time Market AS Award from each accepted AS Bid submitted in the Settlement Interval for the Real-Time Market, reduced by any relevant tier-1 No Pay capacity in that Settlement Interval (but not below zero), with the relevant AS Bid price. The average Real-Time Market AS Award for a given AS in a Settlement Interval is the sum of the 15-minute Real-Time Market AS Awards in that Settlement Interval, each divided by the number of 15-minute Commitment Intervals in a Trading Hour and prorated to the duration of the Settlement Interval (10/15 if the Real-Time Market AS Award spans the entire Settlement Interval, or 5/15 if the Real-Time Market AS Award spans half the Settlement Interval). For a Multi-Stage Generating Resource the CAISO will determine the RTM AS Bid Cost based on the Generating Unit or Dynamic Resource-Specific System Resource level.

#### **11.8.4.1.7 RTM Transition Cost**

For each Settlement Interval, the RTM Transition Costs shall be based on the MSG Configuration to which the Multi-Stage Generating Resource is transitioning and is allocated to the CAISO commitment period of that MSG Configuration.

#### **11.8.4.2 RTM Market Revenue Calculations**

**11.8.4.2.1** For each Settlement Interval in a CAISO Real-Time Market Commitment Period, the RTM Market Revenue for a Bid Cost Recovery Eligible Resource is the algebraic sum of the elements listed

below in this Section. For Multi-Stage Generating Resources the RTM Market Revenue calculations will be made at the Generating Unit or Dynamic Resource-Specific System Resource level.

- (a) The sum of the products of the Instructed Imbalance Energy (including Energy from Minimum Load of Bid Cost Recovery Eligible Resources committed in RUC where for Pumped-Storage Hydro Units and Participating Load operating in the pumping mode or serving Load, the MWh is negative), except Standard Ramping Energy, Residual Imbalance Energy, Exceptional Dispatch Energy, Derate Energy, MSS Load following Energy, Ramping Energy Deviation and Regulation Energy, with the relevant Real-Time Market LMP, for each Dispatch Interval in the Settlement Interval;
- (b) The product of the Real-Time Market AS Award from each accepted Real-Time Market AS Bid in the Settlement Interval with the relevant ASMP, divided by the number of fifteen (15)-minute Commitment Intervals in a Trading Hour (4), and prorated to the duration of the Settlement Interval.
- (c) The relevant tier-1 No Pay charges for that Bid Cost Recovery Eligible Resource in that Settlement Interval.

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#### **11.8.5 Unrecovered Bid Cost Uplift Payment**

Scheduling Coordinators shall receive an Unrecovered Bid Cost Uplift Payment for a Bid Cost Recovery Eligible Resource, including resources for MSS Operators that have elected gross Settlement, if the net of all IFM Bid Cost Shortfalls and IFM Bid Cost Surpluses calculated pursuant to Section 11.8.2, RUC Bid Cost Shortfalls and RUC Bid Cost Surpluses calculated pursuant to Section 11.8.3, and the RTM Bid Cost Shortfalls and RTM Bid Cost Surpluses calculated pursuant to Section 11.8.4 for that Bid Cost Recovery Eligible Resource over a Trading Day is positive. For Multi-Stage Generating Resources, Unrecovered Bid Cost Uplift Payments will be calculated and made at the Generating Unit level or Dynamic Resource-Specific System Resource and not the MSG Configuration level. For MSS Operators that have elected net Settlement, the Unrecovered Bid Cost Uplift Payment is at the MSS level. The MSS IFM, RUC, and RTM Bid Cost Shortfall or IFM, RUC, and RTM Bid Cost Surplus for each market for each

Trading Hour is the sum of the IFM, RUC, and RTM Bid Cost Shortfalls and IFM, RUC, and RTM Bid Cost Surpluses for all resources in the MSS. Scheduling Coordinators for MSS Operators that have elected net Settlement will receive an Unrecovered Bid Cost Uplift Payment if the net of all IFM, RUC, and RTM Bid Cost Shortfalls and IFM, RUC, and RTM Bid Cost Surpluses for that MSS over a Trading Day is positive.

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## **27.8 Multi-Stage Generating Resources**

### **27.8.1 Registration and Qualification**

Scheduling Coordinators must comply with the registration and qualification process described in this Section 27.8.1, in order to effectuate any of the changes described in Section 27.8.3. No less than sixteen (16) days prior to the date that Scheduling Coordinator seeks to have the resource participate in the CAISO Markets under the new settings or MSG Configuration details, the Scheduling Coordinator must complete and submit to the CAISO the registration form and the resource data template provided by the CAISO for registration and qualification purposes. After the Scheduling Coordinator submits a request for registration of a Generating Unit or Dynamic Resource-Specific System Resource as a Multi-Stage Generating Resource or a change in the attributes in Section 27.8.3, the CAISO will coordinate with that Scheduling Coordinator to validate that the resource qualifies for the requested status and that all the requisite information has been successfully provided to the CAISO. The resource will be successfully registered and qualified as a Multi-Stage Generating Resource, or the requested changes in the attributes listed in Section 27.8.3 will be successfully registered and qualified as of the date on which the CAISO sends the responsible Scheduling Coordinator a notice that the resource has been successfully qualified as such. After the date on which the CAISO has provided such notice, any changes to the items listed in Section 27.8.3 will be subject to the timing and process requirements in this Section 27.8.1 and 27.8.3. The Scheduling Coordinator may modify all other Multi-Stage Generating Resource registered characteristics pursuant to the timing and processing requirements specified elsewhere in this CAISO Tariff, as they may apply. If the CAISO has reason to believe that the resource's operating and technical characteristics are not consistent with the registered and qualified attributes, the CAISO may request that the Scheduling Coordinator provide additional information necessary to support

their registered status and, if appropriate, may require that the resource be registered and qualified more consistent with the resource's operating and technical characteristics, including the revocation of its status as a Multi-Stage Generating Resource. Failure to provide such information may be grounds for revocation of Multi-Stage Generating Resource status. Such changes in status or MSG Configuration details would be subject to the registration and qualification requirements in this Section 27.8. Scheduling Coordinators may register the number MSG Configurations as are reasonably appropriate for the resource based on the technical and operating characteristics of the resource, which may not, however, exceed a total of ten MSG Configurations and cannot be fewer than two MSG Configurations. The information requirements specified in Section 27.8.2 will apply.

### **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 responsible Scheduling Coordinator shall submit for each MSG Configuration a single segment Operational Ramp Rate, and as applicable an Operating Reserves ramp rate and Regulating Reserves ramp rate. 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.

### **27.8.3 Changes in Status and Configurations of Resource**

Scheduling Coordinators may seek modifications to the Multi-Stage Generating Resource attributes listed below consistent with the process and timing requirements specified in Section 27.8.1 and the additional requirements discussed below in this Section 27.8.3:

- (1) Registration and qualification of a Generating Unit or Dynamic Resource-Specific System Resource as a Multi-Stage Generating Resource.
- (2) Changes to the MSG Configurations attributes, which include:

- a. addition of new MSG Configurations;
- b. removal of an existing MSG Configuration;
- c. a change in the physical units supporting the MSG Configuration;
- d. a change to the MSG Configuration Start Up and Shut Down flags;
- e. adding or removing an MSG Transition to the Transition Matrix;
- f. a material change in the Transition Times contained in the Master File, which consists of a change that more than doubles the Transition Times or reduces it to less than half; and
- g. a material change to the maximum Ramp Rate of the MSG Configuration(s) contained in the Master File, which consists of a change that more than doubles the maximum Ramp Rate or reduces it to less than half.

When transitioning to implement these changes across the midnight hour, for any Real-Time Market run in which the changes specified in this Section 27.8.3 are to take effect within the Time Horizon of any of the Real-Time Market runs, the CAISO will Schedule, Dispatch, or award resources consistent with either the prior or new status and definitions, as appropriate, and required by any Real-Time conditions regardless of the resource's state scheduled or awarded in the immediately preceding Day-Ahead Market. A Scheduling Coordinator may unregister a Generating Unit or Dynamic Resource-Specific System Resource from its Multi-Stage Generating Resource status subject to the timing requirements for Master File changes, and such changes are not subject to the timing requirements in Section 27.8.3. For the first forty-five (45) days after the effective date of this Section, Scheduling Coordinators may not change any of Multi-Stage Generating Resource attributes listed above in this Section. On the forty-sixth (46) day following the effective day of this Section, changes to the attributes listed above in this Section may take effect, including the registration of new Multi-Stage Generating Resources, provided Scheduling Coordinators have previously followed the registration process requirements listed in Section 27.8.1. Subsequently, further changes to the attributes listed above in this Section 27.8.3 may not take effect until after the one hundred-tenth (110) day following the effective date of this Section, subject to the

procedures described in Section 27.8.1. As of the one hundred-tenth (110) day following the effective date of this Section, changes to these attributes may only be made every sixty (60) days after the day on which any such changes have taken effect.

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### **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) for either the same MSG Configuration scheduled or awarded in the Integrated Forward Market or committed in RUC. In addition, the Scheduling Coordinator for such Multi-Stage Generating Resources may also submit Bids into the Real-Time Market for three other MSG Configurations 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 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.
- (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.

## **30.5.2 Supply Bids**

### **30.5.2.1 Common Elements for Supply Bids**

In addition to the resource-specific Bid requirements of this Section, all Supply Bids must contain the following components: Scheduling Coordinator ID Code; Resource ID and the MSG Configuration ID, as applicable; Resource Location; PNode or Aggregated Pricing Node as applicable; Energy Bid Curve; Self-Schedule component; Ancillary Services Bid; RUC Availability Bid; the Market to which the Bid applies; Trading Day to which the Bid applies; Priority Type (if any). Supply Bids offered in the CAISO Markets must be monotonically increasing. Energy Bids in the RTM must also contain a Bid for Ancillary Services to the extent the resource is certified and capable of providing Ancillary Service in the RTM up to the registered certified capacity for that Ancillary Service less any Day-Ahead Ancillary Services Awards. Scheduling Coordinators must submit the applicable Supply Bid components, including Self-Schedules, for the submitted MSG Configuration.

### **30.5.2.2 Supply Bids for Participating Generators**

In addition to the common elements listed in Section 30.5.2.1, Supply Bids for Participating Generators shall contain the following components: Start-Up Bid, Minimum Load Bid, Ramp Rate, Minimum and Maximum Operating Limits; Energy Limit, Regulatory Must-Take/Must-Run Generation; Contingency Flag; and Contract Reference Number (if any). Scheduling Coordinators submitting these Bid components for a Multi-Stage Generating Resource must do so for the submitted MSG Configuration. A Scheduling Coordinator for a Physical Scheduling Plant or a System Unit may include Generation Distribution Factors as part of its Supply Bid. If the Scheduling Coordinator has not submitted the Generation Distribution Factors applicable for the Bid, the CAISO will use default Generation Distribution Factors stored in the Master File. All Generation Distribution Factors used by the CAISO will be normalized based on Outage data that is available to the automated market systems. A Multi-Stage Generating Resource and its MSG Configurations are registered under a single Resource ID and Scheduling Coordinator for the Multi-Stage Generating Resource must submit all Bids for the resource's MSG Configurations under the same Resource ID. For a Multi-Stage Generating Resources Scheduling Coordinators may submit bid curves for up to ten individual MSG Configurations of their Multi-Stage Generating Resources into the Day-Ahead Market and up to three individual MSG Configurations into the Real-Time Market. Scheduling Coordinators for Multi-Stage Generating Resources must submit a single Operational Ramp Rate for each MSG Configuration for which it submits a supply Bid either in the Day-Ahead Market or Real-Time Market. For Multi-Stage Generating Resources the Scheduling Coordinator may submit the Transition Times, which cannot be greater than the maximum Transition Time registered in the Master File. To the extent the Scheduling Coordinator does not submit the Transition Time that is a registered feasible transition the CAISO will use the registered maximum Transition Time for that MSG Transition for the specific Multi-Stage Generating Resource.

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### **30.5.2.6 Ancillary Services Bids**

There are four distinct Ancillary Services: Regulation Up, Regulation Down, Spinning Reserve and Non-Spinning Reserve. Participating Generators are eligible to provide all Ancillary Services. Dynamic System Resources are eligible to provide Operating Reserves and Regulation. Non-Dynamic System

Resources are eligible to provide Operating Reserves only. Scheduling Coordinators may use Dynamic System Resources to Self-Provide Ancillary Services as specified in Section 8. Scheduling Coordinators may not use Non-Dynamic System Resources to Self-Provide Ancillary Services. All System Resources, including Dynamic System Resources and Non-Dynamic System Resources, will be charged the Shadow Price as prescribed in Section 11.10, for any awarded Ancillary Services. Participating Loads are eligible to provide Non-Spinning Reserve only. A Scheduling Coordinator may submit Ancillary Services Bids for Regulation Up, Regulation Down, Spinning Reserve, and Non-Spinning Reserve for the same capacity by providing a separate price in \$/MW per hour as desired for each Ancillary Service. The Bid for each Ancillary Services is a single Bid segment. Only resources certified by the CAISO as capable of providing Ancillary Services are eligible to provide Ancillary Services and submit Ancillary Services Bids. In addition to the common elements listed in Section 30.5.2.1, all Ancillary Services Bid components of a Supply Bid must contain the following: (1) the type of Ancillary Service for which a Bid is being submitted; (2) Ramp Rate (Operating Reserve Ramp Rate and Regulation Ramp Rate, if applicable); and (3) Distribution Curve for Physical Scheduling Plant or System Unit. A Scheduling Coordinator may only submit an Ancillary Services Bid or Submission to Self-Provide an Ancillary Service for Multi-Stage Generating Resources for the Ancillary Service for which the specific MSG Configurations are certified. For any such certified MSG Configurations the Scheduling Coordinator may submit only one Operating Reserve Ramp Rate and Regulation Ramp Rate. An Ancillary Services Bid submitted to the Day-Ahead Market when submitted to the Day-Ahead Market may be, but is not required to be, accompanied by an Energy Bid that covers the capacity offered for the Ancillary Service. Submissions to Self-Provide an Ancillary Services submitted to the Day-Ahead Market when submitted to the Day-Ahead Market may be, but are not required to be, accompanied by an Energy Bid that covers the capacity to be self-provided. If a Scheduling Coordinator's Submission to Self-Provide an Ancillary Service is qualified as specified in Section 8.6, the Scheduling Coordinator must submit an Energy Bid that covers the self-provided capacity prior to the close of the Real-Time Market for the day immediately following the Day-Ahead Market in which the Ancillary Service Bid was submitted. Except as provided below, the Self-Schedule for Energy need not include a Self-Schedule for Energy from the resource that will be self-providing the Ancillary Service. If a Scheduling Coordinator is self-providing an Ancillary Service from a Fast Start Unit,

no Self-Schedule for Energy for that resource is required. If a Scheduling Coordinator proposes to self-provide Spinning Reserve, the Scheduling Coordinator is obligated to submit a Self-Schedule for Energy for that particular resource, unless as discussed above the particular resource is a Fast Start Unit. When submitting Ancillary Service Bids in the HASP and Real-Time Market, Scheduling Coordinators for resources that either have been awarded or self-provide Spinning Reserve or Non-Spinning Reserve capacity in the Day-Ahead Market must submit an Energy Bid for at least the awarded or self-provided Spinning Reserve or Non-Spinning Reserve capacity, otherwise the CAISO will apply the Bid validation rules described in Section 30.7.6.1.

As provided in Section 30.5.2.6.4, a Submission to Self-Provide an Ancillary Service shall contain all of the requirements of a Bid for Ancillary Services with the exception of Ancillary Service Bid price information. In addition, Scheduling Coordinators must comply with the Ancillary Services requirements of Section 8. Scheduling Coordinators submitting Ancillary Services Bids for System Resources in the HASP or Real-Time Market must also submit an Energy Bid for the associated Ancillary Services Bid under the same Resource ID, otherwise the bid validation rules in Section 30.7.6.1 will apply to cover any portion of the Ancillary Services Bid not accompanied by an Energy Bid. As described in Section 33.7, if the resource is a Non-Dynamic System Resource, the CAISO will only use the Ancillary Services Bid in the HASP optimization and will not use the associated Energy Bid for the same Resource ID to schedule Energy from the Non-Dynamic System Resource in the HASP. Scheduling Coordinators must also comply with the bidding rules associated with the must offer requirements for Ancillary Services specified in Section 40.6.

\* \* \*

### **30.5.2.7 RUC Availability Bids**

Scheduling Coordinators may submit RUC Availability Bids for specific Generating Units in the DAM; however, Scheduling Coordinators for Resource Adequacy Capacity or ICPM Capacity must submit RUC Availability Bids for that capacity to the extent that the capacity has not been submitted in a Self-Schedule or already been committed to provide Energy or capacity in the IFM. For Multi-Stage Generating Resources the RUC Availability Bids shall be submitted at the MSG Configuration. Capacity that does not have Bids for Supply of Energy in the IFM will not be eligible to participate in the RUC process. The

RUC Availability Bid component is MW-quantity of non-Resource Adequacy Capacity in \$/MW per hour, and \$0/MW for Resource Adequacy Capacity or ICPM Capacity.

\* \* \*

### **30.7.3 DAM Validation**

#### **30.7.3.1 Validation Prior to Market Close and Master File Update**

The CAISO conducts Bid validation in three steps as described below. For a Multi-Stage Generating Resource the validation described herein is done for each submitted MSG Configuration.

Step 1: The CAISO will validate all Bids after submission of the Bid for content validation which determines that the Bid adheres to the structural rules required of all Bids as further described in the Business Practices Manuals. If the Bid fails any of the content level rules the CAISO shall assign it a rejected status and the Scheduling Coordinator must correct and resubmit the Bid.

Step 2: After the Bids are successfully validated for content, but prior to the Market Close of the DAM, the Bids will continue through the second level of validation rules to verify that the Bid adheres to the applicable CAISO Market rules and if applicable, limits based on Master File data. If the Bid fails any level two validation rules, the CAISO shall assign the Bid as invalid and the Scheduling Coordinator must either correct or resubmit the Bid.

Step 3: If the Bid successfully passes validation in Step 2, it will continue through the third level of validation where the Bid will be analyzed based on its contents to identify any missing Bid components that must be either present for the Bid to be valid consistent with the market rules contained in Article III of this CAISO Tariff and as reflected in the Business Practice Manuals. At this stage the Bid will either be automatically modified for correctness and assigned a status of conditionally modified or modified, or if it can be accepted as is, the Bid will be assigned a status of conditionally valid, or valid. A Bid will be automatically modified and assigned a status of modified or conditionally modified Bid, whenever the CAISO inserts or modifies a Bid component. The CAISO will insert or modify a Bid component whenever (1) a Self-Schedule quantity is less than the lowest quantity specified as an Economic Bid for either an Energy Bid or Demand Bid, in which case the CAISO extends the Self-Schedule to cover the gap; (2) for non-Resource Adequacy Resources, the CAISO will extend the Energy Bid Curve using Proxy Costs to

cover any capacity in a RUC Bid component, if necessary; and (3) for a Resource Adequacy Resource that is not a Use-Limited Resource, the CAISO will extend the Energy Bid Curve using Proxy Costs to cover any capacity in a RUC Bid component and, if necessary, up to the full registered Resource Adequacy Capacity. The CAISO will generate a Proxy Bid or extend an Energy Bid or Self-Schedule to cover any RUC Award or Day-Ahead Schedule in the absence of any Self-Schedule or Economic Bid components, or to fill in any gaps between any Self-Schedule Bid and any Economic Bid components to cover a RUC Award or Day-Ahead Schedule. To the extent that an Energy Bid to the HASP/RTM is not accompanied by an Ancillary Services Bid, the CAISO will insert a Spinning Reserve and Non-Spinning Reserve Ancillary Services Bid at \$ 0/MW for any certified Operating Reserve capacity. The CAISO will also generate a Self-Schedule Bid for any Generating Unit that has a Day-Ahead Schedule but has not submitted Bids in HASP/RTM, up to the quantity in the Day-Ahead Schedule. Throughout the Bid evaluation process, the Scheduling Coordinator shall have the ability to view the Bid and may choose to cancel the Bid, modify and re-submit the Bid, or leave the modified, conditionally modified or valid, conditionally valid Bid as is to be processed in the designated CAISO Market. The CAISO will not insert or extend any Bid for a Resource Adequacy Resource that is a Use-Limited Resource.

\* \* \*

#### **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 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. 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 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 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.



### **30.7.8 Format And Validation Of Start-Up And Shut-Down Times**

For a Generating Unit or a Resource-Specific System Resource, the submitted Start-Up Time expressed in minutes (min) as a function of down time expressed in minutes (min) must be a staircase function with up to three (3) segments defined by a set of 1 to 4 down time and Start-Up Time pairs. The Start-Up Time is the time required to start the resource if it is offline longer than the corresponding down time. The CAISO shall model Start-Up Times for Multi-Stage Generating Resource at the MSG Configuration level and Transition Times are validated based on the Transition Matrix submitted as provided in Section 27.8. The last segment will represent the time to start the unit from a cold start and will extend to infinity. The submitted Start-Up Time function shall be validated as follows:

- (a) The first down time must be zero (0) min.
- (b) The down time entries must match exactly (in number, sequence, and value) the corresponding down time breakpoints of the maximum Start-Up Time function, as registered in the Master File for the relevant resource.
- (c) The Start-Up Time for each segment must not exceed the Start-Up Time of the corresponding segment of the maximum Start-Up Time function, as registered in the Master File for the relevant resource.
- (d) The Start-Up Time function must be strictly monotonically increasing, i.e., the Start-Up Time must increase as down time increases.

For Participating Load, a single Shut-Down time in minutes is the time required for the resource to Shut-Down after receiving a Dispatch Instruction.

### **30.7.9 Format And Validation Of Start-Up Costs And Shut-Down Costs**

For a Generating Unit or a Resource-Specific System Resource, the submitted Start-Up Cost expressed in dollars (\$) as a function of down time expressed in minutes must be a staircase function with up to three (3) segments defined by a set of 1 to 4 down time and Start-Up Cost pairs. The Start-Up Cost is the cost incurred to start the resource if it is offline longer than the corresponding down time. The last segment will represent the cost to start the resource from cold Start-Up and will extend to infinity. The submitted Start-Up Cost function shall be validated as follows:

- (a) The first down time must be zero (0) min.

- (b) The down time entries must match exactly (in number, sequence, and value) the corresponding down time breakpoints of the Start-Up Cost function, as registered in the Master File for the relevant resource as either the Proxy Cost or Registered Cost.
- (c) The Start-Up Cost for each segment must not be negative and must be equal to the Start-Up Cost of the corresponding segment of the Start-Up Cost function, as registered in the Master File for the relevant resource. If a value is submitted in a Bid for the Start-Up Cost, it will be overwritten by the Master File value as either the Proxy Cost or Registered Cost based on the option elected pursuant to Section 30.4. If no value for Start-Up Cost is submitted in a Bid, the CAISO will insert the Master File value, as either the Proxy Cost or Registered Cost based on the option elected pursuant to Section 30.4.
- (d) The Start-Up Cost function must be strictly monotonically increasing, i.e., the Start-Up Cost must increase as down time increases.

For Participating Loads, a single Shut-Down Cost in dollars (\$) is the cost incurred to Shut-Down the resource after receiving a Dispatch Instruction. The submitted Shut-Down Cost must not be negative.

For Multi-Stage Generating Resources, the Scheduling Coordinator must provide Start-Up Costs for each MSG Configuration into which the resource can be started.

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### **31.2.2.2 Non-RMR Units**

If the dispatch level produced through the ACR is greater than the dispatch level produced through CCR, then the resource is subject to Local Market Power Mitigation, in which case the entire portion of the unit's Energy Bid Curve that is above the CCR dispatch level will be mitigated to the lower of the Default Energy Bid as specified in Section 39, or the DAM Bid, but no lower than the unit's highest Bid price that cleared the CCR. To the extent a Multi-Stage Generating Resource's MWh dispatch level produced in the All Constraints Run is greater than the MWhs dispatch level produced in the Competitive Constraints Run, for purposes of mitigation, all the MSG Configurations will be mitigated similarly and the CAISO will

evaluate all submitted Energy Bids for all MSG Configurations based on the relevant Default Energy Bids for the applicable MSG Configuration. The CAISO will calculate the Default Energy Bids for Multi-Stage Generating Resources by submitted MSG Configuration. When the ACR dispatch level is higher than the CCR level, the market Bid at and below the CCR dispatch level will be retained in the IFM. If the dispatch level produced through the ACR is not greater than the dispatch level produced through the CCR, the unit's original, unmitigated DAM Bid will be retained in its entirety.

### **31.3 Integrated Forward Market**

After the MPM-RRD and prior to RUC, the CAISO shall perform the IFM. The IFM (1) performs Unit Commitment and Congestion Management (2) clears mitigated or unmitigated Bids cleared in the MPM-RRD as well as Bids that were not cleared in the MPM-RRD process against bid-in Demand, taking into account transmission limits and honoring technical and inter-temporal operating Constraints, such as Minimum Run Times (3) and procures Ancillary Services to meet one hundred percent (100%) of the CAISO Forecast of CAISO Demand requirements. The IFM utilizes a set of integrated programs that: (1) determine Day-Ahead Schedules and AS Awards, and related LMPs and ASMPs; and (2) optimally commits resources that are bid in to the DAM. The IFM utilizes a SCUC algorithm that optimizes Start-Up Costs, Minimum Load Costs, Transition Costs, and Energy Bids along with any Bids for Ancillary Services as well as Self-Schedules submitted by Scheduling Coordinators. The IFM selects the optimal MSG Configuration from a maximum of ten MSG Configurations of each Multi-Stage Generating Resource as mutually exclusive resources. If a Scheduling Coordinator submits a Self-Schedule or a Submission to Self-Provide Ancillary Services for a given MSG Configuration in a given Trading Hour, the IFM will consider the Start-Up Cost, Minimum Load Cost, and Transition Cost associated with any Economic Bids for other MSG Configurations as incremental costs between the other MSG Configurations and the self-scheduled MSG Configuration. In such cases, incremental costs are the additional costs incurred to transition or operate in an MSG Configuration in addition to the costs associated with the self-scheduled MSG Configuration. The IFM also provides for the optimal management of Use-Limited Resources. The ELS Resources committed through the ELC Process conducted two days before the day the IFM process is conducted for the next Trading Day as described in Section 31.7 are binding.

### **31.3.1 Market Clearing And Price Determination**

#### **31.3.1.1 Integrated Forward Market Output**

The IFM produces: (1) a set of hourly Day-Ahead Schedules, AS Awards, and AS Schedules for all participating Scheduling Coordinators that cover each Trading Hour of the next Trading Day; and (2) the hourly LMPs for Energy and the ASMPs for Ancillary Services to be used for settlement of the IFM. For a Multi-Stage Generating Resource, the IFM produces a Day-Ahead Schedule for no more than one MSG Configuration per Trading Hour. In addition, the IFM will produce the MSG Transition and the MSG Configuration indicators for the Multi-Stage Generating Resource, which would establish the expected MSG Configuration in which the Multi-Stage Generating Resource will operate. During a transition, the committed MSG Configuration is considered to be the “from” MSG Configuration. The CAISO will publish the LMPs at each PNode as calculated in the IFM. In determining Day-Ahead Schedules, AS Awards, and AS Schedules the IFM optimization will minimize total Bid Costs based on submitted and mitigated Bids while respecting the operating characteristics of resources, the operating limits of transmission facilities, and a set of scheduling priorities that are described in Section 31.4. In performing its optimization, the IFM first tries to complete its required functions utilizing Effective Economic Bids without adjusting Self-Schedules, and skips Ineffective Economic Bids and adjusts Self-Schedules only if it is not possible to balance Supply and Demand and manage Congestion in an operationally prudent manner with available Effective Economic Bids. The process and criteria by which the IFM adjusts Self-Schedules and other Non-priced Quantities are described in Sections 27.4.3, 31.3.1.3 and 31.4. The Day-Ahead Schedules are binding commitments, including the commitment to Start-Up, if necessary, to comply with the Day-Ahead Schedules. The CAISO will not issue separate Start-Up Instructions for Day-Ahead commitments. A resource’s status, however, can be modified as a result of additional market processes occurring in the HASP and RTM.

#### **31.3.1.2 Treatment of Ancillary Services Bids in IFM**

As provided in Section 30.7.6.2 the CAISO shall co-optimize the Energy and Ancillary Services Bids in clearing the IFM. To the extent that capacity subject to an Ancillary Services Bid submitted in the Day-Ahead Market is not associated with an Energy Bid, there is no co-optimization, and therefore, no opportunity cost associated with that resource for that Bid for the purposes of calculating the Ancillary

Services Marginal Price as specified in Section 27.1.2.2. When the capacity associated with the Energy Bid overlaps with the quantity submitted in the Ancillary Services Bid, then the Energy Bid will be used to determine the opportunity cost, if any, in the co-optimization to the extent of the overlap. Therefore, the capacity that will be considered when co-optimizing the procurement of Energy and Ancillary Services from Bids in the IFM will consider capacity up to the total capacity of the resource as reflected in the Ancillary Services Bid as derated through SLIC, if at all. In the case of Regulation, the capacity that will be considered is the lower of the capacity of the resource offered in the Ancillary Services Bid or the upper Regulation limit of the highest Regulating Range as contained in the Master File. For any Trading Hour within the period in which the Multi-Stage Generating Resource is transitioning from one MSG Configuration to another, the IFM will not award Ancillary Services and any Submission to Self-Provide Ancillary Services will be disqualified. Any Ancillary Services Awards in the IFM to Multi-Stage Generating Resources will carry through to the Real-Time Market in the same MSG Configuration that the Multi-Stage Generating Resource is awarded in the IFM.

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#### **31.3.1.4 Eligibility to Set the Day-Ahead LMP**

All Generating Units, Participating Loads, non-Participating Loads, System Resources, System Units, or Constrained Output Generators subject to the provisions in Section 27.7, with Bids, including Generated Bids, that are unconstrained due to Ramp Rates, MSG Transitions, Forbidden Operating Regions, or other temporal constraints are eligible to set the LMP, provided that (a) the Schedule for the Generating Unit or Resource-Specific System Resource is between its Minimum Operating Limit and the highest MW value in its Economic Bid or Generated Bid, or (b) the Schedule for the Participating Load, non-Participating Load, non-Resource-Specific System Resource, or System Unit is between zero (0) MW and the highest MW value in its Economic Bid or Generated Bid. If (a) a resource's Schedule is constrained by its Minimum Operating Limit or the highest MW value in its Economic Bid or Generated Bid, (b) the CAISO enforces a resource-specific constraint on the resource due to an RMR or Exceptional Dispatch, (c) the resource is constrained by a boundary of a Forbidden Operating Region or is Ramping through a Forbidden Operating Region, or (d) the resource's full Ramping capability is constraining its inter-hour change in Schedule, the resource cannot be marginal and thus is not eligible to set the LMP. Resources

identified as MSS Load following resources are not eligible to set the LMP. A Constrained Output Generator will be eligible to set the hourly LMP if any portion of its Energy is necessary to serve Demand.

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### **31.5 Residual Unit Commitment**

The CAISO shall perform the RUC process after the IFM. In the event that the IFM did not commit sufficient resources to meet the CAISO Forecast of CAISO Demand and account for other factors such as Demand Forecast error, as described in the Business Practice Manuals, the RUC shall commit additional resources and identify additional RUC Capacity to ensure sufficient on-line resources to meet Demand for each hour of the next Trading Day. RUC Capacity is selected by a SCUC optimization that uses the same Base Market Model used in the IFM adjusted as described in Section 27.5.1 and 27.5.6 to help ensure the deliverability of Energy from the RUC Capacity. In the case of Multi-Stage Generating Resources, the RUC will optimize Transition Costs in addition to the Start-Up and Minimum Load Costs. If a Scheduling Coordinator submits a Self-Schedule or a Submission to Self-Provide Ancillary Services for a given MSG Configuration in a given Trading Hour, the RUC will consider the Start-Up Cost, Minimum Load Cost, and Transition Cost associated with any Economic Bids for other MSG Configurations as incremental costs between the other MSG Configurations and the self-scheduled MSG Configuration. In such cases, incremental costs are the additional costs incurred to transition or operate in an MSG Configuration in addition to the costs associated with the self-scheduled MSG Configuration.

#### **31.5.1 RUC Participation**

##### **31.5.1.1 Capacity Eligible for RUC Participation**

RUC participation is voluntary for capacity that has not been designated as Resource Adequacy Capacity. Scheduling Coordinators may make such capacity available for participation in RUC by submitting a RUC Availability Bid, provided the Scheduling Coordinator has also submitted an Energy Bid for such capacity into the IFM. Capacity from Non-Dynamic System Resources that has not been designated Resource Adequacy Capacity is not eligible to participate in RUC. Capacity from resources including System Resources that has been designated as qualified Resource Adequacy Capacity must participate in RUC. RUC participation is required for Resource Adequacy Capacity to the extent that Resource Adequacy Capacity is not committed following the IFM. System Resources eligible to

participate in RUC will be considered on an hourly basis; that is, RUC will not observe any multi-hour block constraints. In RUC the CAISO may commit a Multi-Stage Generating Resource with a Resource Adequacy must-offer obligation at any MSG Configuration with capacity equal to or greater than the MSG Configuration committed in the Integrated Forward Market. RUC will observe the Energy Limits that may have been submitted in conjunction with Energy Bids to the IFM. RMR Unit capacity will be considered in RUC in accordance with Section 31.5.1.3. MSS resources may participate in RUC in accordance with Section 31.5.2.3. COG resources are accounted for in RUC, but may not submit or be paid RUC Availability Payments. The ELS Resources committed through the ELC Process conducted two days before the day the RUC process is conducted for the next Trading Day as described in Section 31.7 are binding.

#### **31.5.1.2 RUC Availability Bids**

Scheduling Coordinators may only submit RUC Availability Bids for capacity (above the Minimum Load) for which they are also submitting an Energy Bid to participate in the IFM. The RUC Availability Bid for the Resource Adequacy Capacity submitted by a Scheduling Coordinator must be \$0/MW per hour for the entire Resource Adequacy Capacity. If the Scheduling Coordinator fails to submit a \$0/MW per hour for Resource Adequacy Capacity, the CAISO will insert the \$0/MW per hour for the full amount of Resource Adequacy Capacity for a given resource reduced by any upward Ancillary Services Awards. For Multi-Stage Generating Resources that fail to submit a \$0/MW per hour for the Resource Adequacy Capacity, the CAISO will insert the \$0/MW per hour for the resource's Resource Adequacy Capacity at the MSG Configuration level up to the minimum of the Resource Adequacy Capacity or the PMax of the MSG Configuration. Scheduling Coordinators may submit non-zero RUC Availability Bids for the portion of a resource's capacity that is not Resource Adequacy Capacity.

\* \* \*

#### **31.5.1.4 Eligibility to Set the RUC Price**

All resources that are eligible for RUC participation as described in Section 31.5.1.1 with RUC Bids that are unconstrained due to Ramp Rates or other temporal constraints, including MSG Transitions, are eligible to set the RUC Price, provided that (a) the RUC Schedule for the Generating Unit or Resource-Specific System Resource is between its Minimum Operating Limit and the highest MW value in its

Economic Bid or Generated Bid, or (b) the Schedule for the eligible resource other than a Generating Unit or Resource-Specific System Resource is between zero (0) MW and the highest MW value in its Economic Bid or Generated Bid. If (a) a resource's Schedule is constrained by its Minimum Operating Limit or the highest MW value in its Economic Bid or Generated Bid, (b) the CAISO enforces a resource-specific constraint on the resource due to an RMR or Exceptional Dispatch or (c) the resource's full Ramping capability is constraining its inter-hour change in Schedule, the resource cannot be marginal and thus is not eligible to set the RUC Price. Resources identified as MSS Load following resources are not eligible to set the RUC Price.

\* \* \*

### **31.5.5 Selection And Commitment Of RUC Capacity**

Capacity that is not already scheduled in the IFM may be selected as RUC Capacity through the RUC process of the DAM. The RUC optimization will select RUC Capacity and produce nodal RUC Prices by minimizing total Bid cost based on RUC Availability Bids and Start-Up, Minimum Load Bids and Transition Costs. RUC will not consider Start-Up, Minimum Load Bids, or Transition Costs for resources already committed in the IFM. The RUC Capacity of a resource is the incremental amount of capacity selected in RUC above the resource's Day-Ahead Schedule. The resource's Day-Ahead Schedule plus its RUC Capacity comprise the resource's RUC Schedule. The CAISO will only issue RUC Start-Up Instructions to resources committed in RUC that must receive a Start-Up Instruction in the Day-Ahead in order to be available to meet Real-Time Demand. RUC Schedules will be provided to Scheduling Coordinators even if a RUC Start-Up Instruction is not issued at that time. RUC shall not Shut Down resources scheduled through the IFM and RUC will not commit a Multi-Stage Generating Resource to a lower MSG Configuration that is unable to support the Energy scheduled in the IFM. If the RUC process cannot find a feasible solution given the resources committed in the IFM, the RUC process will adjust Constraints as described in Section 31.5.4 to arrive at a feasible solution that accommodates all the resources committed in the IFM, and any necessary de-commitment of IFM committed units shall be effectuated through an Exceptional Dispatch.



### **31.5.6 Eligibility For RUC Compensation**

All RUC Capacity is eligible for the RUC Availability Payment except for: (i) RUC Capacity from RMR Units that has been designated as RMR Dispatch and included in RUC as a Self-Schedule; (ii) Resource Adequacy Capacity; and (iii) RUC Capacity that corresponds to the resource's Minimum Load, which is compensated through the Bid Cost Recovery as described in Section 11.8. Resources not committed in the IFM that are committed in RUC, including RMR Units that were not designated for RMR Dispatches and Resource Adequacy Resources, are also eligible for RUC Cost Compensation, which includes Start-Up, Transition Costs, and Minimum Load Cost compensation, and Bid Cost Recovery, subject to the resource actually following its Dispatch Instructions as verified by the CAISO pursuant to procedures set forth in the Business Practice Manuals.

\* \* \*

#### **31.5.7.1 Rescission of Payments for Undispatchable RUC Capacity**

The CAISO shall calculate the Real-Time ability of each Generating Unit, Participating Load, System Unit or System Resource to deliver Energy from or capacity committed in RUC for each Settlement Interval based on its maximum operating capability, actual telemetered output, and Operational Ramp Rate as described in Section 30.10, which for a Multi-Stage Generating Resource is evaluated by MSG Configuration. If the Undispatchable Capacity is capacity committed in RUC and is from a Generating Unit, System Unit or System Resource that is a Resource Adequacy Resource, there is no payment obligation to the CAISO for the Undispatchable Capacity. The CAISO will report the instance of non-compliance by the Resource Adequacy Resource to the appropriate Local Regulatory Authority.

#### **31.5.7.2 Rescission of Payments for Undelivered RUC Capacity**

For each Settlement Interval in which a Generating Unit, Participating Load, System Unit or System Resource fails to supply Energy from capacity committed in RUC in accordance with a Dispatch Instruction, or supplies only a portion of the Energy specified in the Dispatch Instruction, the RUC Availability Payment will be reduced to the extent of the deficiency, in accordance with the provisions of Section 11.2.2.2.2, which for a Multi-Stage Generating Resource is evaluated for the Generating Unit or Dynamic Resource-Specific System Resource and not by the MSG Configuration.

### **34. Real-Time Market**

The RTM is the market conducted by the CAISO during any given Operating Day in which Scheduling Coordinators may provide Real-Time Imbalance Energy and Ancillary Services. The Real-Time Market consists of the Real-Time Unit Commitment (RTUC), the Short-Term Unit Commitment (STUC) and the Real-Time Dispatch (RTD) processes. The Short-Term Unit Commitment (STUC) runs once per hour near the top of the hour and utilizes the SCUC optimization to commit Medium Start, Short Start and Fast Start Units to meet the CAISO Demand Forecast. The CAISO shall dispatch all resources, including Participating Load pursuant to submitted Bids or pursuant to the provisions below on Exceptional Dispatch. In Real-Time, resources are required to follow Real-Time Dispatch Instructions. The Time Horizon of the STUC starts with the third fifteen-minute interval of the current Trading Hour and extending for the next four Trading Hours. The RTUC runs every fifteen (15) minutes and utilizes the SCUC optimization to commit Fast Start and some Short Start resources and to procure any needed AS on a fifteen-minute basis. Any given run of the RTUC will have a Time Horizon of approximately sixty (60) to 105 minutes (four to seven fifteen-minute intervals) depending on when during the hour the run occurs. Not all resources committed in a given STUC or RTUC run will necessarily receive CAISO commitment instructions immediately, because during the Trading Day the CAISO may issue a commitment instruction to a resource only at the latest possible time that allows the resource to be ready to provide Energy when it is expected to be needed. The RTD uses a Security Constrained Economic Dispatch (SCED) algorithm every five minutes throughout the Trading Hour to determine optimal Dispatch Instructions to balance Supply and Demand. Updates to the Base Market Model adjusted as described in Sections 27.5.1 and 27.5.6 used in the RTM optimization include current estimates of real-time unscheduled flow at the Interties. The RTD optimization utilizes up to a sixty-five-minute Time Horizon (thirteen (13) five-minute intervals), but the CAISO issues Dispatch Instructions only for the next target five-minute Interval. The RTUC, STUC and RTD processes of the RTM use the same Base Market Model adjusted as described in Sections 27.5.1 and 27.5.6 used in the DAM and the HASP, subject to any necessary updates of the Base Market Model adjusted as described in Sections 27.5.1 and 27.5.6 pursuant to changes in grid conditions after the DAM has run. In the case of Multi-Stage Generating Resources, the RTM procedures will optimize Transition Costs in addition to the Start-Up and Minimum Load Costs. If a Scheduling Coordinator submits a Self-Schedule or a Submission to Self-Provide Ancillary Services for a given MSG

Configuration in a given Trading Hour, all of the RTM processes will consider the Start-Up Cost, Minimum Load Cost, and Transition Cost associated with any Economic Bids for other MSG Configurations as incremental costs between the other MSG Configurations and the self-scheduled MSG Configuration. In such cases, incremental costs are the additional costs incurred to transition or operate in an MSG Configuration in addition to the costs associated with the self-scheduled MSG Configuration.

\* \* \*

### **34.2 Real-Time Unit Commitment**

The Real-Time Unit Commitment (RTUC) process uses SCUC and is run every fifteen (15) minutes to: (1) make commitment decisions for Fast Start and Short Start resources having Start-Up Times within the Time Horizon of the RTUC process, and (2) procure required additional Ancillary Services and calculate ASMP used for settling procured Ancillary Service capacity for the next fifteen-minute Real-Time Ancillary Service interval. In any fifteen (15) minute RTUC interval that falls within a time period in which a Multi-Stage Generating Resource is transitioning from one MSG Configuration to another MSG Configuration, the CAISO: (1) will not award any incremental Ancillary Services; (2) will disqualify any Day-Ahead Ancillary Services Awards; (3) will disqualify Day-Ahead qualified Submissions to Self-Provide Ancillary Services Award, and (4) will disqualify Submissions to Self-Provide Ancillary Services in RTM. For Multi-Stage Generating Resources the RTUC will issue a binding Transition Instruction separately from the binding Start-Up or Shut Down instructions. The RTUC can also be run with the Contingency Flag activated, in which case the RTUC can commit Contingency Only Operating Reserves. If RTUC is run without the Contingency Flag activated, it cannot commit Contingency Only Operating Reserves. RTUC is run four times an hour, at the following times for the following Time Horizons: (1) at approximately 7.5 minutes prior to the next Trading Hour, in conjunction with the HASP run, for T-45 minutes to T+60 minutes; (2) at approximately 7.5 minutes into the current hour for T-30 minutes to T+60 minutes; (3) at approximately 22.5 minutes into the current hour for T-15 minutes to T+60 minutes; and (4) at approximately 37.5 minutes into the current hour for T to T+60 minutes where T is the beginning of the next Trade Hour. The HASP, described in Section 33, is a special RTUC run that is performed at approximately 7.5 minutes before each hour and has the additional responsibility of: (1) pre-dispatching Energy and awarding Ancillary Services for hourly dispatched System Resources for the Trading Hour

that begins 67.5 minutes later, and (2) performing the necessary MPM-RRD for that Trading Hour. A Day-Ahead Schedule or RUC Schedule for an MSG Configuration that is later impacted by the resource's derate or outages, will be reconsidered in the RTUC process taking into consideration the impacts of the derate or outage on the available MSG Configurations.

### **34.2.1 Commitment Of Fast Start And Short Start Resources**

RTUC produces binding and advisory Start-Up and Shut-Down Dispatch Instructions for Fast Start and Short Start resources that have Start-Up Times that would allow the resource to be committed prior to the end of the relevant Time Horizon of the RTUC run. A Start-Up Dispatch Instruction is considered binding in any given RTUC run if the Start-Up Time of the resource is such that there would not be sufficient time for a subsequent RTUC run to Start-Up the resource. A Start-Up Instruction is considered advisory if it is not binding, such that the resource could achieve its target Start-Up Time as determined in the current RTUC run in a subsequent RTUC run based on its Start-Up Time. A Shut-Down Instruction is considered binding if the resource could achieve the target Shut-Down Time as determined in the current RTUC in a subsequent RTUC run. A Shut-Down Dispatch Instruction is considered advisory if the resource Shut-Down Instruction is not binding such that the resource could achieve its target Shut-Down time as determined in the current RTUC run in a subsequent RTUC run. A binding Dispatch Instruction that results in a change in Commitment Status will be issued, in accordance with Section 6.3, after review and acceptance of the Start-Up Instruction by the CAISO Operator. An advisory Dispatch Instruction changing the Commitment Status of a resource may be modified by the CAISO Operator to a binding Dispatch Instruction and communicated in accordance with Section 6.3 after review and acceptance by the CAISO Operator. Only binding and not advisory Dispatch Instructions will be issued by the CAISO. For Multi-Stage Generating Resources the CAISO will also issue binding Transition Instructions when the Multi-Stage Generating Resource must change from one MSG Configuration to another. A Transition Instruction is considered binding in any given RTUC run if the Transition Time for the Multi-Stage Generating Resource is such that there would not be sufficient time for a subsequent RTUC run to transition the resource.

\* \* \*

#### **34.4 Short-Term Unit Commitment**

At the top of each Trading Hour, immediately after the RTUC run is completed, the CAISO performs an approximately five (5) hour Short-Term Unit Commitment (STUC) run using SCUC and the CAISO Forecast of CAISO Demand to commit Medium Start Units and Short Start Units with Start-Up Times greater than the Time Horizon covered by the RTUC. The Time Horizon for the STUC optimization run will extend three hours beyond the Trading Hour for which the RTUC optimization was run, and will replicate the Bids used in that Trading Hour for these additional hours. The CAISO revises these replicated Bids each time the hourly STUC is run, to utilize the most recently submitted Bids. A Start-Up Instruction produced by STUC is considered binding if the resource could not achieve the target Start-Up Time as determined in the current STUC run in a subsequent RTUC or STUC run as a result of the Start-Up Time of the resource. A Start-Up Instruction produced by STUC is considered advisory if it is not binding, such that the resource could achieve its target start time as determined in the current RTUC run in a subsequent STUC or RTUC run based on its Start-Up Time. A binding Dispatch Instruction produced by STUC that results in a change in Commitment Status will be issued, in accordance with Section 6.3, after review and acceptance of the Start-Up Instruction by the CAISO Operator. The STUC will only decommit a resource to the extent that resource's physical characteristics allow it to be cycled in the same Time Horizon for which it was decommitted. STUC does not produce prices for Settlement. A Day-Ahead Schedule or RUC Schedule for an MSG Configuration that is later impacted by the resource's derate or outages, will be reconsidered in the STUC process taking into consideration the impacts of the derate or outage on the available MSG Configurations.

#### **34.5 General Dispatch Principles**

The CAISO shall conduct all Dispatch activities consistent with the following principles:

- (1) The CAISO shall issue AGC instructions electronically as often as every four seconds from its Energy Management System (EMS) to resources providing Regulation and on Automatic Generation Control to meet NERC and WECC performance requirements;
- (2) In each run of the RTED or RTCD the objective will be to meet the projected Energy requirements over the Time Horizon of that run, subject to transmission

and resource operational Constraints, taking into account the short term CAISO Forecast of CAISO Demand adjusted as necessary by the CAISO Operator to reflect scheduled changes to Interchange and non-dispatchable resources in subsequent Dispatch Intervals;

- (3) Dispatch Instructions will be based on Energy Bids for those resources that are capable of intra-hour adjustments and will be determined through the use of SCED except when the CAISO must utilize the RTMD;
- (4) When dispatching Energy from awarded Ancillary Service capacity the CAISO will not differentiate between Ancillary Services procured by the CAISO and Submissions to Self-Provide an Ancillary Service;
- (5) The Dispatch Instructions of a resource for a subsequent Dispatch Interval shall take as a point of reference the actual output obtained from either the State Estimator solution or the last valid telemetry measurement and the resource's operational ramping capability. For Multi-Stage Generating Resources the determination of the point of reference is further affected by the MSG Configuration and the information contained in the Transition Matrix;
- (6) In determining the Dispatch Instructions for a target Dispatch Interval while at the same time achieving the objective to minimize Dispatch costs to meet the forecasted conditions of the entire Time Horizon, the Dispatch for the target Dispatch Interval will be affected by: (a) Dispatch Instructions in prior intervals, (b) actual output of the resource, (c) forecasted conditions in subsequent intervals within the Time Horizon of the optimization, and (d) operational Constraints of the resource, such that a resource may be dispatched in a direction for the immediate target Dispatch Interval that is different than the direction of change in Energy needs from the current Dispatch Interval to the next immediate Dispatch Interval, considering the applicable MSG Configuration;
- (7) Through Start-Up Instructions the CAISO may instruct resources to start up or shut down, or may reduce Load for Participating Loads, over the Time Horizon

for the RTM based on submitted Bids, Start-Up Costs and Minimum Load Costs, Pumping Costs and Pump Shut-Down Costs, as appropriate for the resource, or for Multi-Stage Generating Resource as appropriate for the applicable MSG Configuration, consistent with operating characteristics of the resources that the SCED is able to enforce. In making Start-Up or Shut-Down decisions in the RTM, the CAISO may factor in limitations on number of run hours or Start-Ups of a resource to avoid exhausting its maximum number of run hours or Start-Ups during periods other than peak loading conditions;

- (8) The CAISO shall only start up resources that can start within the Time Horizon used by the RTM optimization methodology;
- (9) The RTM optimization may result in resources being shut down consistent with their Bids and operating characteristics provided that: (1) the resource does not need to be on-line to provide Energy, (2) the resource is able to start up within the RTM optimization Time Horizon, (3) the Generating Unit is not providing Regulation or Spinning Reserve, and (4) Generating Units online providing Non-Spinning Reserve may be shut down if they can be brought up within ten (10) minutes as such resources are needed to be online to provide Non-Spinning Reserves; (10) For resources that are both providing Regulation and have submitted Energy Bids for the RTM, Dispatch Instructions will be based on the Regulation Ramp Rate of the resource rather than the Operational Ramp Rate if the Dispatch Operating Point remains within the Regulating Range. The Regulating Range will limit the Ramping of Dispatch Instructions issued to resources that are providing Regulation;
- (11) For Multi-Stage Generating Resources the CAISO will issue Dispatch Instructions by Resource ID and Configuration ID;
- (12) The CAISO may issue Transition Instructions to instruct resources to transition from one MSG Configuration to another over the Time Horizon for the RTM based on submitted Bids, Transition Costs and Minimum Load Costs, as

appropriate for the MSG Configurations involved in the MSG Transition, consistent with Transition Matrix and operating characteristics of these MSG Configurations. The RTM optimization will factor in limitations on Minimum Up Time and Minimum Down Time defined for each MSG configuration and Minimum Up Time and Minimum Down Time at the Generating Unit or Dynamic Resource-Specific System Resource.

### **34.6 Generating Unit And Participating Load Dispatch Instructions**

The CAISO may issue Dispatch Instructions covering:

- (a) Ancillary Services;
- (b) Energy, which may be used for:
  - (i) Congestion relief;
  - (ii) provision of Imbalance Energy; or
  - (iii) replacement of an Ancillary Service;
- (c) agency operation of Generating Units, Participating Loads or Interconnection schedules, for example:
  - (i) output or Demand that can be Dispatched to meet Applicable Reliability Criteria;
  - (ii) Generating Units that can be Dispatched for Black Start;
  - (iii) Generating Units that can be Dispatched to maintain governor control regardless of their Energy schedules;
- (d) the operation of voltage control equipment applied on Generating Units as described in this CAISO Tariff;
- (e) MSS Load following instructions provided to the CAISO, which the CAISO incorporates to create their Dispatch Instructions;
- (f) necessary to respond to a System Emergency or imminent emergency; or
- (g) Transition Instructions.



### **34.9 Exceptional Dispatch**

The CAISO may issue Exceptional Dispatches for the circumstances described in this Section 34.9, which may require the issuance of forced Shut-Downs, forced Start-Ups, or forced MSG Transitions and shall be consistent with Good Utility Practice. Dispatch Instructions issued pursuant to Exceptional Dispatches shall be entered manually by the CAISO Operator into the Day-Ahead or RTM optimization software so that they will be accounted for and included in the communication of Day-Ahead Schedules and Dispatch Instructions to Scheduling Coordinators. Exceptional Dispatches are not derived through the use of the IFM or RTM optimization software and are not used to establish the LMP at the applicable PNode. The CAISO will record the circumstances that have led to the Exceptional Dispatch. Except as provided in this Section 34.9, the CAISO shall consider the effectiveness of the resource along with Start-Up Costs, Transition Costs, and Minimum Load Costs when issuing Exceptional Dispatches to commit a resource to operate at Minimum Load. When the CAISO issues Exceptional Dispatches for Energy, the CAISO shall also consider Energy Bids, if available and as appropriate. The goal of the CAISO will be to issue Exceptional Dispatches on a least-cost basis. Imbalance Energy delivered or consumed pursuant to the various types of Exceptional Dispatch is settled according to the provisions in Section 11.5.6.

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#### **34.15.1 Resource Constraints**

The SCED shall enforce the following resource physical Constraints:

- (a) Minimum and maximum operating resource limits. Outages and limitations due to transmission clearances shall be reflected in these limits. The more restrictive operating or regulating limit shall be used for resources providing Regulation so that the SCED shall not Dispatch them outside their Regulating Range.
- (b) Forbidden Operating Regions. When ramping in the Forbidden Operating Region, the implicit ramp rate will be used as determined based on the time it takes for the resource to cross its Forbidden Operating Region. A resource can only be ramped through a Forbidden Operating Region after being dispatched into a Forbidden Operation Region. The CAISO will not Dispatch a resource within its Forbidden Operating Regions in the Real-Time Market, except that the CAISO may Dispatch the resource through the

Forbidden Operating Region in the direction that the resource entered the Forbidden Operating Region at the maximum applicable Ramp Rate over consecutive Dispatch Intervals. A resource with a Forbidden Operating Region cannot provide Ancillary Services in a particular fifteen (15) minute Dispatch Interval unless that resource can complete its transit through the relevant Forbidden Operating Region within that particular Dispatch Interval.

- (c) Operational Ramp Rates and Start-Up Times. The submitted Operational Ramp Rate for resources shall be used as the basis for all Dispatch Instructions, provided that the Dispatch Operating Point for resources that are providing Regulation remains within their applicable Regulating Range. The Regulating Range will limit the Ramping of Dispatch Instructions issued to resources that are providing Regulation. The Ramp Rate for Non-Dynamic System Resources cleared in the HASP will not be observed. Rather, the ramp of the Non-Dynamic System Resource will respect inter-Balancing Authority Area Ramping conventions established by WECC. Ramp Rates for Dynamic System Resources will be observed like Participating Generators in the RTD. Each Energy Bid shall be Dispatched only up to the amount of Imbalance Energy that can be provided within the Dispatch Interval based on the applicable Operational Ramp Rate. The Dispatch Instruction shall consider the relevant Start-Up Time as, if the resource is off-line, the relevant Operational Ramp Rate function, and any other resource constraints or prior commitments such as Schedule changes across hours and previous Dispatch Instructions. The Start-Up Time shall be determined from the Start-Up Time function and when the resource was last shut down. The Start-Up Time shall not apply if the corresponding resource is on-line or expected to start.
- (d) Maximum number of daily Start-Ups. The SCED shall not cause a resource to exceed its daily maximum number of Start-Ups.
- (e) Minimum Run Time and Down Time. The SCED shall not start up off-line resources before their Minimum Down Time expires and shall not shut down on-line resources before their Minimum Run Time expires. For Multi-Stage Generating Resources these

requirements shall be observed both for the Generating Unit or Dynamic Resource-Specific System Resource and MSG Configuration.

- (f) Operating (Spinning and Non-Spinning) Reserve. The SCED shall Dispatch Spinning and Non-Spinning Reserve subject to the limitations set forth in Section 34.16.3.
- (g) Non-Dynamic System Resources. If Dispatched, each Non-Dynamic System Resource flagged for hourly pre-dispatch in the next Trading Hour shall be Dispatched to operate at a constant level over the entire Trading Hour. The HASP shall perform the hourly pre-dispatch for each Trading Hour once prior to the Operating Hour. The hourly pre-dispatch shall not subsequently be revised by the SCED and the resulting HASP Intertie Schedules are financially binding and are settled pursuant to Section 11.4.
- (h) Daily Energy use limitation to the extent that Energy limitation is expressed in a resource's Bid. If the Energy Limits are violated for purposes of Exceptional Dispatches for System Reliability, the Bid will be settled as provided in Section 11.5.6.1.

#### **34.15.2 Calculation Of Dispatch Operating Points After Instructions**

The RTED process shall calculate Dispatch Operating Points as follows:

- (a) After RTUC issues a Start-Up Instruction, RTED moves the Dispatch Operating Point of a resource immediately from zero (0) MW to the PMin, as defined in the Master File or as modified via SLIC, of a Generating Unit at the start of the Dispatch Interval pertaining to the Start-Up Instruction. The Dispatch Operating Point shall then be determined using the resource's applicable Operational Ramp Rate as further described in Sections 34.15.4, 34.15.5, and 34.15.6.
- (b) After RTUC issues a Shut-Down Instruction, RTED shall first ramp the Dispatch Operating Point down to the PMin, as defined in the Master File or as modified via SLIC, of a Generating Unit at the end of the Dispatch Interval pertaining to the Shut-Down Instruction, using the resource's applicable Operational Ramp Rate. The Dispatch Operating Point shall then be set immediately to zero (0) MW.

- (c) After RTUC issues a Transition Instruction: (1) for MSG Configurations where the operating ranges of the two MSG Configurations do not overlap, the RTD will move the Dispatch Operating Point of the resource immediately from the boundary of the “from” MSG Configuration to the boundary of the “to” MSG Configuration, as defined in the Master File or as modified via the CAISO’s outages reporting mechanism, of a Multi-Stage Generating Resource; and (2) for MSG Configurations for which the operating ranges of the two MSG Configurations do overlap, RTD will move the Dispatch Operating Point of the resource within the overlapping operating range of the MSG Configuration until the MSG Transition is complete.

### **39.7.1 Calculation Of Default Energy Bids**

Default Energy Bids shall be calculated by the CAISO, for the on-peak hours and off-peak hours for both the DAM and RTMs, pursuant to one of the methodologies described in this Section. The Scheduling Coordinator for each Generating Unit owner or Participating Load must rank order the following options of calculating the Default Energy Bid starting with its preferred method. The Scheduling Coordinator must provide the data necessary for determining the Variable Costs unless the Negotiated Rate Option precedes the Variable Cost option in the rank order, in which case the Scheduling Coordinator must have a negotiated rate established with the Independent Entity charged with calculating the Default Energy Bid. If no rank order is specified for a Generating Unit or Participating Load, then the default rank order of (1) Variable Cost Option, (2) Negotiated Rate Option, (3) LMP Option will be applied. For the first ninety (90) days after changes to resource status and MSG Configurations as specified in Section 27.8.3, including the first ninety (90) days after the effective date of Section 27.8.3, the Default Energy Bid option for the resource is limited to the Negotiated Rate Option or the Variable Cost Option.

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## **CAISO Tariff Appendix A**

### **Master Definitions Supplement**

\* \* \*

**- Bid Costs**

The costs for resources manifested in the Bid components submitted, which include the Start-Up Cost, Minimum Load Cost, Energy Bid Cost, Transition Costs, Pump Shut-Down Cost, Pumping Cost, Ancillary Services Bid Cost and RUC Availability Payment.

**- Default Resource Adequacy Path**

The registered sequence of MSG Configurations a Multi-Stage Generating Resource has to Start-Up and transition from off-line to reach the default Resource Adequacy MSG Configuration.

**- IFM Bid Cost**

The sum of a BCR Eligible Resource's IFM Start-Up Cost, IFM Minimum Load Cost , IFM Pump Shut-Down Cost, IFM Transition Cost, IFM Pumping Cost, IFM Energy Bid Cost, and IFM AS Bid Cost.

**- MSG Configuration**

A qualified and registered operating mode of a Multi-Stage Generating Resource, with a distinct set of operating characteristics. All MSG Configurations for Multi-Stage Generating Resources are operable on-line modes.

**- MSG Transition**

A feasible operation from one MSG Configuration to another as registered in the Transition Matrix associated with a specific Transition Time and Transition Cost.

**- Multi-Stage Generating Resources**

A Generating Unit or Dynamic Resource-Specific System Resource that for reasons related to its technical characteristics can be operated in various MSG Configurations such that only one such MSG Configuration can be operated in any given Dispatch Interval. In addition, subject to the requirements in Section 27.8, the following technical characteristics qualify a Generating Unit or Dynamic Resource-Specific System Resource as a Multi-Stage Generating Resource if the resource; (1) is a combined cycle gas turbine resource; (2) is a Generating Unit or Dynamic Resource-Specific System Resources with multiple operating or regulating ranges but which can operate in only one of these ranges at any given time; or (3) has one or more Forbidden Operating Regions. Metered Subsystems, Pumped-Storage Hydro Units, and Pumping Loads, and System Resources that are not Dynamic Resource-Specific System Resources do not qualify as Multi-Stage Generating Resources.

**- RTM Bid Cost**

The total of a resource's RTM Start-Up Cost, RTM Minimum Load Cost, RTM Pump Shut-Down Cost, RTM Transition Cost, RTM Pumping Cost, RTM Energy Bid Cost, and RTM AS Bid Cost.

**- Transition Cost**

For a Multi-Stage Generating Resources, the dollar cost per feasible transition associated with a given MSG Configuration as registered in the Transition Matrix.

**- Transition Instructions**

A binding instruction issued by the CAISO to Multi-Stage Generating Resources in the Real-Time that directs the Multi-Stage Generating Resource to move from between MSG Configurations and indicates: (1) “from” and “to” MSG Configurations; and (2) the start time and end time of the MSG Transition.

**- Transition Matrix**

A matrix that, for Multi-State Generating Resources defines the possible MSG Transitions between all online MSG Configurations including the Transition Times and Transition Costs.

**- Transition Time**

For a Multi-Stage Generating Resources, the time to complete a MSG Transition, as registered in the Transition Matrix.

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**Appendix AA**

**Transition Plan for Multi-Stage Generating Resources**

This Appendix AA describes the registration and qualification requirements for Generating Units and Dynamic Resource-Specific System Resources that intend to qualify and participate in the CAISO Markets as Multi-Stage Generating Resources as of the first day on which the Multi-Stage Generating Resource CAISO Tariff provisions are effective.

No later than sixty (60) days prior to effective date of the CAISO Tariff provisions enabling the Multi-Stage Generating Resource functionality, Scheduling Coordinators shall commence the registration process to register and qualify Generating Units or Dynamic Resource-Specific System Resources as Multi-Stage Generating Resources as of the effective date of the CAISO Tariff provisions for the Multi-Stage Generating Resource functionality. The registration process commences with the submission by the responsible Scheduling Coordinator of the completed Multi-Stage Generating Resource registration form and the resource data template for Generating Unit or Dynamic Resource-Specific System Resource, which the CAISO provides as part of the registration process. After such submission, the CAISO will coordinate with the responsible Scheduling Coordinator to validate that the resource qualifies as a Multi-Stage Generating Resource, and that all the requisite information has been successfully provided to the

CAISO. Successful completion of the registration process will occur upon the CAISO's notification to the responsible Scheduling Coordinator that the resource has been successfully qualified as a Multi-Stage Generating Resource. Once the CAISO has provided such notice, the resource will be registered and qualified to participate as a Multi-Stage Generating Resource as of the effective date of the CAISO Tariff provisions enabling the implementation of the Multi-Stage Generating Resource functionality.

Scheduling Coordinators may register the number of MSG Configurations as are reasonably appropriate for the unit based on the operating characteristics of the unit, which may not, however, exceed a total of ten MSG Configurations and cannot be fewer than two MSG Configurations. The resource will be successfully registered and qualified for the requested status and MSG Configuration definitions on the date that the CAISO sends the notification to the responsible Scheduling Coordinator that the resource has been successfully qualified. If the CAISO has reason to believe that the resource's operating and technical characteristics are not consistent with the registered and qualified attributes, the CAISO may request that the Scheduling Coordinator provide additional information necessary to support their registered status and, if appropriate, may require that the resource be registered and qualified more consistent with the resource's operating and technical characteristics, including the revocation of its status as a Multi-Stage Generating Resource. Failure to provide such information may be grounds for revocation of Multi-Generating Resource status.

As part of the registration process, the Scheduling Coordinators must submit to the CAISO a Transition Matrix, which contains the cost and operating constraints associated with feasible transitions between MSG Configurations. The responsible Scheduling Coordinator shall submit for each MSG Configuration a single segment Operational Ramp Rate, and as applicable an Operating Reserves Ramp Rate and Regulating Reserves Ramp Rate. 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 as part of the resource data template provided in the registration process. The MSG Configurations and operational characteristics submitted to and accepted by the CAISO during this registration process will be in effect until the forty-fifth (45<sup>th</sup>) day following the effective date of Section 27.8 of the CAISO Tariff, unless modified as

specified below. Prior to that date, the Scheduling Coordinators may not make the following changes to a Generating Unit's or Dynamic Resource-Specific System Resource's attributes:

- (a) Register a Generating Unit or Dynamic Resource-Specific System Resource as a Multi-Stage Generating Resource;
- (b) Change the registered MSG Configurations for a Multi-Stage Generating Resource, which includes the:
  - (a) addition of new MSG Configurations;
  - (b) removal of an existing MSG Configuration;
  - (c) a change to the definition of a registered MSG Configuration, which includes:
    - (1) a change in the physical units supporting the MSG Configuration;
    - (2) a change to the MSG Configuration Start Up and Shut Down flags; and
    - (3) adding or removing a MSG Transition to the Transition Matrix;
  - (d) a material change in the Transition Times contained in the Master File, which consists of a change that more than doubles a Transition Time or reduces it to less than half; and
  - (e) a material change to the maximum Ramp Rate of the MSG Configuration(s) contained in the Master File, which consists of a change that more than doubles the maximum Ramp Rate or reduces it to less than half.

Thirty (30) days before the effective date of the CAISO Tariff provisions enabling the implementation of the Multi-Stage Generating Resource functionality, no changes may be made to any of the Multi-Stage Generating Resource attributes, fundamental or otherwise, except that the resources can drop out Multi-Stage Generating Resource status subject to the timing requirements of the Master file time line. When transitioning to implement these changes across the midnight hour, for any Real-Time Market run in which the changes specified above are to take effect within the Time Horizon of any of the Real-Time Market runs, the CAISO will Schedule, Dispatch, or award resources consistent with either the prior or



new status and definitions, as appropriate and required by any Real-Time conditions regardless of the resource's state Scheduled or awarded in the immediately preceding Day-Ahead Market.

Resources that will be participating in the CAISO Markets as Multi-Stage Generating Resources when the CAISO Tariff Multi-Stage Generating Resource provisions become effective must submit all Outages reports required in Section 9 of the CAISO Tariff consistent with the registered MSG Configurations for such resources no later than forty-eight hours prior to the start of the first hour of the effective date of the CAISO Tariff provisions enabling the implementation of the Multi-Stage Generating Resource functionality.

### **Definitions**

**Default Resource Adequacy Path**

The registered sequence of MSG Configurations a Multi-Stage Generating Resource has to Start-Up and transition from off-line to reach the default Resource Adequacy MSG Configuration.

**Multi-Stage Generating Resources**

A Generating Unit or Dynamic Resource-Specific System Resource that for reasons related to its technical characteristics can be operated in various MSG Configurations such that only one such MSG Configuration can be operated in any given Dispatch Interval. In addition, subject to the requirements in Section 27.8, the following technical characteristics qualify a Generating Unit or Dynamic Resource-Specific System Resource as a Multi-Stage Generating Resource if the resource; (1) is a combined cycle gas turbine resource; (2) is a Generating Unit or Dynamic Resource-Specific System Resources with multiple operating or regulating ranges but which can operate in only one of these ranges at any given time; or (3) has one or more Forbidden Operating Regions. Metered Subsystems, Pumped-Storage Hydro Units, and Pumping Loads, and System Resources that are not Dynamic Resource-Specific System Resources do not qualify as Multi-Stage Generating Resources.

**MSG Configuration**

A qualified and registered operating mode of a Multi-Stage Generating Resource, with a distinct set of operating characteristics. All MSG Configurations for Multi-Stage Generating Resources are operable on-line modes.

**Transition Matrix**

A matrix that, for Multi-Stage Generating Resources defines the possible MSG Transitions between all online MSG Configurations including the Transition Times and Transition Costs.



**Attachment B – Blacklines**  
**Multi-Stage Generating Resource Compliance Filing**  
**California Independent System Operator Corporation**  
**Fifth Replacement FERC Electric Tariff**

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#### **8.4.1 Operating Characteristics Required To Provide AS**

Each Generating Unit, System Unit, Participating Load or System Resource for which a Scheduling Coordinator wishes to submit a Bid to provide Ancillary Services must comply with the requirements for the specific Ancillary Service as set forth in Appendix K and the Business Practice Manual. The certification requirements in Section 8, Appendix K of the CAISO Tariff, and the Business Practice Manuals shall apply to Multi-Stage Generating Resources based on the MSG Configurations. Scheduling Coordinators shall submit Ancillary Services Bids or Submissions to Self-Provide Ancillary Services to the CAISO Markets only for MSG Configurations that are certified consistent with these requirements. In addition, to the extent the CAISO requires specific operating characteristics for Ancillary Services certification of Multi-Stage Generating Resources the responsible Scheduling Coordinator shall submit to the CAISO such specific operating characteristics at the MSG Configuration level. The requirements in Appendix K and the Business Practice Manuals include Ancillary Service control, capability and availability standards. The requirements also involve the following operating characteristics:

- (a) Ramp Rate increase and decrease (MW/minute);
- (b) power factor (leading and lagging) as required by Section 8.2.3.3;
- (c) maximum output (real and reactive), except that System Resources shall be required to comply only with the requirement for maximum real power;
- (d) minimum output (real and reactive), except that System Resources shall be required to comply only with the requirement for minimum real power;
- (e) AGC capability, control scheme, and range; and
- (f) minimum length of time the resource can be available to provide the relevant Ancillary Service.

In Appendix K and the Business Practice Manuals the CAISO will differentiate the operating characteristics according to the Ancillary Service being provided.

\* \* \*

## **8.9 Verification, Compliance Testing, And Auditing**

Availability of contracted and Self-Provided Ancillary Services and RUC Capacity shall be verified by the CAISO by unannounced testing of Generating Units, Loads and System Resources, by auditing of response to CAISO Dispatch Instructions, and by analysis of the appropriate Meter Data, or Interchange Schedules. The CAISO may test the capability of any Generating Unit, System Unit, System Resource, external import of a System Resource, Participating Load, or reactive device providing Ancillary Services or RUC Capacity. Participating Generators, owners or operators of Participating Loads, operators of System Units or System Resources, owners or operators of reactive devices and Scheduling Coordinators shall notify the CAISO immediately whenever they become aware that an Ancillary Service or RUC Capacity is not available in any way. All Participating Generators, owners or operators of Loads, operators of System Units or System Resources and owners or operators of reactive devices shall check, monitor and/or test their system and related equipment routinely to assure availability of the committed Ancillary Services and RUC Capacity. These requirements apply to Ancillary Services whether the Ancillary Services are contracted or self-provided. For a duration specified by the CAISO, the CAISO may suspend the technical eligibility certificate of a Scheduling Coordinator for a Generating Unit, System Unit, Load or System Resource, which repeatedly fails to perform. The CAISO shall develop measures to discourage repeated non-performance on the part of both bidders and self-providers. Further, all of these requirements apply to each MSG Configuration.

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### **8.9.2 Compliance Testing For Regulation**

The CAISO may test the capability of any Generating Unit or System Resource providing Regulation by using the CAISO EMS to move that Generating Unit's or System Resource's output over the full range of its Regulation capacity within a ten-minute period. For a Multi-Stage Generating Resource the full range of Regulation capacity is evaluated at the applicable MSG Configuration.

### **8.9.3 Compliance Testing For Non-Spinning Reserve**

#### **8.9.3.1 Compliance Testing of a Generating Unit, System Unit or System Resource**

The CAISO may test the Non-Spinning Reserve capability of a Generating Unit, System Unit or an external import of a System Resource by issuing unannounced Dispatch Instructions requiring the Generating Unit or System Unit to come on line and ramp up or, in the case of a System Resource, to affirmatively respond to Real-Time interchange schedule adjustment; all in accordance with the Scheduling Coordinator's Bid. Such tests may not necessarily occur on the hour. The CAISO shall measure the response of the Generating Unit, System Unit or external import of a System Resource to determine compliance with its stated capabilities. For a Multi-Stage Generating Resource the full range of Non-Spinning capacity is evaluated at the applicable MSG Configuration.

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### **8.9.6 Compliance Testing For RUC Capacity**

The CAISO may test the capability of a Generating Unit, System Unit or an external import of a System Resource to provide RUC Capacity by issuing unannounced Dispatch Instructions requiring the Generating Unit or System Unit to come on line and ramp up or, in the case of a System Resource, to affirmatively respond to a Real-Time Interchange Schedule adjustment; all in accordance with the Scheduling Coordinator's Bid. Such tests may not necessarily occur on the hour. The CAISO shall measure the response of the Generating Unit, System Unit or external import of a System Resource to determine compliance with its stated capabilities. For a Multi-Stage Generating Resource the range of RUC Capacity evaluated is the range for the applicable MSG Configuration.

### **8.9.9 Performance Audit For Regulation**

The CAISO will audit the performance of a Generating Unit providing Regulation by monitoring its response to CAISO EMS control or, in the case of an external import of a System Resource providing Regulation, by monitoring the dynamic Interchange response to CAISO EMS control around its Set Point within its rated MW/minute capability over the range of Regulation capacity scheduled for the current Settlement Period. For a Multi-Stage Generating Resource the range of Regulation capacity evaluated is the range for the applicable MSG Configuration.

### **8.9.10 Performance Audit For Spinning Reserve**

The CAISO will audit the performance of a Generating Unit or external import of a System Resource providing Spinning Reserve by auditing its response to Dispatch Instructions and by analysis of Meter Data associated with the Generating Unit. Such audits may not necessarily occur on the hour. A Generating Unit providing Spinning Reserve shall be evaluated on its ability to respond to a Dispatch Instruction, move at the MW/minute capability stated in its Bid, reach the amount of Spinning Reserve capacity scheduled for the current Settlement Period within ten (10) minutes of issue of the Dispatch Instruction by the CAISO, and respond to system frequency deviations outside the allowed frequency deadband. An external import of a System Resource providing Spinning Reserve shall be evaluated on its ability to respond to a Dispatch Instruction, move at the MW/minute capability stated in its Bid, reach the amount of Spinning Reserve capacity scheduled for the current Settlement Period within ten (10) minutes of issue of the Dispatch Instruction by the CAISO. For a Multi-Stage Generating Resource the range of Spinning Reserve capacity evaluated is the range for the applicable MSG Configuration.

### **8.9.11 Performance Audit For Non-Spinning Reserve**

The CAISO will audit the performance of a Generating Unit, Load, or System Resource providing Non-Spinning Reserve by auditing its response to Dispatch Instructions, and by analysis of Meter Data associated with the resource. Such audits may not necessarily occur on the hour. A Generating Unit providing Non-Spinning Reserve shall be evaluated on its ability to respond to a Dispatch Instruction, move in accordance with the time delay and MW/minute capability stated in its Bid, and reach the amount of Non-Spinning Reserve capacity under the control of the CAISO scheduled for the current Settlement Period within ten (10) minutes of issue of the Dispatch Instruction by the CAISO. An external import of a System Resource providing Non-Spinning Reserve shall be evaluated on its ability to respond to a Dispatch Instruction, move in accordance with the time delay and MW/minute capability stated in its Bid, and reach the amount of Non-Spinning Reserve capacity scheduled for the current Settlement Period within ten (10) minutes of issue of the Dispatch Instruction by the CAISO. A Load providing Non-Spinning Reserve from Curtailable Demand shall be evaluated on its ability to respond to a Dispatch Instruction, move in accordance with the time delay and MW/minute capability stated in its Bid, and reach the amount of Non-Spinning Reserve capacity scheduled for the current Settlement Period within ten (10) minutes of

issue of the Dispatch Instruction by the CAISO. For a Multi-Stage Generating Resource the range of Non-Spinning capacity evaluated is the range for the applicable MSG Configuration.

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#### **8.9.14 Performance Audit For RUC Capacity**

The CAISO will audit the performance of a Generating Unit, Participating Load, or System Resource providing RUC Capacity by auditing its response to Dispatch Instructions, and by analysis of Meter Data associated with the resource. Such audits may not necessarily occur on the hour. A Generating Unit providing RUC Capacity shall be evaluated on its ability to respond to a Dispatch Instruction, start within the designated time delay, move at the MW/minute capability stated in its Bid, reach the amount of RUC Capacity scheduled for the Settlement Period concerned and sustain operation at this level for a sufficient time to assure availability over the specified period. An external import of a System Resource providing RUC Capacity shall be evaluated on its ability to respond to a Dispatch Instruction, start within the designated time delay, move at the MW/minute capability stated in its Bid, reach the amount of RUC Capacity scheduled for the Settlement Period concerned and sustain operation at this level for a sufficient time to assure availability over the specified period. For a Multi-Stage Generating Resource range of RUC Capacity evaluated is the range for the applicable MSG Configuration.

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#### **8.10.2 Spinning Reserve**

The CAISO shall test the Spinning Reserve capability of a Generating Unit, System Unit or System Resource by issuing unannounced Dispatch Instructions requiring the Generating Unit, System Unit or System Resource to ramp up to its ten (10) minute capability. The CAISO shall measure the response of the Generating Unit, System Unit or System Resource to determine compliance with requirements. Such tests may not necessarily occur on the hour. The Scheduling Coordinator for the Generating Unit, System Unit or System Resource shall be paid pursuant to Section 11.5.6. For a Multi-Stage Generating Resource the range of Spinning capacity evaluated is the range for the applicable MSG Configuration.



### **8.10.3 Non-Spinning Reserve**

The CAISO may test the Non-Spinning Reserve capability of a Generating Unit, Load, System Unit or System Resource by issuing unannounced Dispatch Instructions requiring the Generating Unit, Load, System Unit or System Resource to come on line and ramp up or to reduce Demand to its ten (10) minute capability. The CAISO shall measure the response of the Generating Unit, System Unit, System Resource or Load to determine compliance with requirements. The Scheduling Coordinator for the Generating Unit, System Unit, Load or System Resource shall be paid pursuant to Section 11.5.6. For a Multi-Stage Generating Resource the range of Non-Spinning capacity evaluated is the range at the applicable MSG Configuration.

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#### **8.10.8.1 Rescission of Payments for Undispatchable Ancillary Service Capacity**

The CAISO shall calculate the Real-Time ability of each Generating Unit, Participating Load, System Unit or System Resource to deliver Energy from Ancillary Services capacity or Self-Provided Ancillary Services capacity for each Settlement Interval based on its maximum operating capability, actual telemetered output, and Operational Ramp Rate as described in Section 30.10. To make this determination for Multi-Stage Generating Resources the CAISO shall use the MSG-Configuration-specific Maximum Operating Limit and Operational Ramp Rate. System Resources that are awarded Ancillary Services capacity in the Day-Ahead Market are required to electronically tag (E-Tag as prescribed by the WECC) the Ancillary Services capacity. If the amounts of Ancillary Services capacity in an electronic tag differ from the amounts of Ancillary Services capacity for the System Resource, the Undispatchable Capacity will equal the amount of the difference, and will be settled in accordance with the provisions of Section 11.10.9.1.

#### **8.10.8.2 Rescission of Payments for Unavailable Ancillary Service Capacity**

If the CAISO determines that a Scheduling Coordinator has supplied Uninstructed Imbalance Energy to the CAISO during a Settlement Interval from the capacity of a Generating Unit, Participating Load, System Unit or System Resource that is obligated to supply Spinning Reserve or Non-Spinning Reserve to the CAISO, payments to the Scheduling Coordinator for the Ancillary Service capacity used to supply Uninstructed Imbalance Energy shall be eliminated to the extent of the deficiency, in accordance with the

provisions of Section 11.10.9.2. For Multi-Stage Generating Resources that have supplied Uninstructed Imbalance Energy from capacity obligated to supply Spinning or Non-Spinning Reserves, the CAISO shall calculate the capacity for which payments will be rescinded at the Generating Unit or Dynamic Resource-Specific System Resource level, as applicable, and will use the MSG Configuration-specific Maximum Operating Limit.

\* \* \*

### **9.7 Multi-Stage Generating Resources Outages**

Participating Generators of Multi-Stage Generating Resources shall report Outages in accordance with the Outage reporting requirements in Section 9 for the Generating Unit and for each MSG Configuration, as applicable. In addition, to the extent that the responsible Scheduling Coordinator modifies the registered Multi-Stage Generating Resource's characteristics as provided in Section 27.8.3, the Participating Generator for the Multi-Stage Generating Resource shall modify any information or reports previously submitted pursuant to this Section 9 to account for any registered status and characteristic changes as soon as possible after receiving notice from the CAISO acceptance of the registered status or characteristics changes and no later than two (2) business days prior to the date on which the Section 27.8.3 changes are expected to be in effect.

\* \* \*

### **11.8.1 CAISO Determination Of Self-Commitment Periods**

-For the purposes of identifying the periods during which a Bid Cost Recovery Eligible Resource is deemed self-committed and thus ineligible for Start-Up Costs, Transition Costs, Minimum Load Costs, IFM Pump Shut-Down Costs and IFM Pumping Costs, the CAISO derives the Self-Commitment Periods as described below. The CAISO will determine the Self-Commitment Periods for Multi-Stage Generating Resources based on the applicable MSG Configuration. MSS resources designated for Load following are considered to be self-committed if they have been scheduled with non-zero Load following capacity, or are otherwise used to follow Load in the Real-Time. The IFM and RUC Self-Commitment Periods will be available as part of the Day-Ahead Market results provided to the applicable Scheduling Coordinator. The interim RTM Self-Commitment Periods as reflected in the HASP will be available as part of the HASP

results for the relevant Trading Hour as provided to the applicable Scheduling Coordinator. The final RTM Self-Commitment Period is determined ex-post for Settlements purposes. ELS Resources committed through the ELC Process described in Section 31.7 are considered to have been committed in the IFM Commitment Period for the applicable Trading Day for the purposes of determining BCR settlement in this section 11.8.

#### **11.8.1.1 IFM Self-Commitment Period**

An IFM Self-Commitment Period for a Bid Cost Recovery Eligible Resource shall consist of one or more sets of consecutive Trading Hours during which the relevant Bid Cost Recovery Eligible Resource has either a Self-Schedule or, except for Self-Provided Ancillary Services for Non-Spinning Reserve by a Fast Start Unit, has a non-zero amount of Self-Provided Ancillary Services. An IFM Self-Commitment Period for a Bid Cost Recovery Eligible Resource may not be less than the relevant Minimum Run Time (MRT), rounded up to the next hour. Consequently, if a Bid Cost Recovery Eligible Resource first self-commits in hour  $h$  of the Trading Day, the self-commitment will be extended to hour  $h + \text{MRT}$ . Two IFM Self-Commitment Periods for a Bid Cost Recovery Eligible Resource may not be apart by less than the relevant Minimum Down Time (MDT) (rounded up to the next hour). Consequently, if a Bid Cost Recovery Eligible Resource has submitted a Self-Schedule or Submission to Self-Provide an Ancillary Service in hours  $h$  and  $h + n$ , and  $n$  is less than the MDT, the IFM Self-Commitment Period will be extended to the hours in between  $h$  and  $h + n$  inclusive. The number of IFM Self-Commitment Periods for a Bid Cost Recovery Eligible Resource within a Trading Day cannot exceed the relevant Maximum Daily Start-Ups (MDS), or  $\text{MDS} + 1$  if the first IFM Self-Commitment Period is the continuation of an IFM or RUC Commitment Period from the previous Trading Day. Consequently, if a Bid Cost Recovery Eligible Resource has submitted a Self-Schedule or Submission to Self-Provide an Ancillary Service, such that after applying the preceding two rules, the number of disjoint Self Commitment Periods for the Operating Day exceeds the Maximum Daily Start-Ups (MDS), or  $\text{MDS} + 1$  if the first IFM Self-Commitment Period is the continuation of an IFM or RUC Commitment Period from the previous Trading Day, the disjoint Self Commitment Periods with smallest time gap in between will be joined together to bring down the number of disjoint Self Commitment Periods to MDS or  $\text{MDS} + 1$  as relevant. To determine whether an extension of the IFM Self-Commitment Period applies for Multi-Stage Generating Resources, the CAISO will ensure

that the respective Minimum Run Time and Minimum Down Time for both the Generating Unit or Dynamic Resource-Specific System Resource and MSG Configuration levels are simultaneously respected.

#### **11.8.1.2 Real-Time Self-Commitment Period**

A Real-Time Market Self-Commitment Period for a Bid Cost Recovery Eligible Resource shall consist of all consecutive Dispatch Intervals not in an IFM Commitment Period or a RUC Commitment Period where the Bid Cost Recovery Eligible Resource has a Self-Schedule or, except for Self-Provided Ancillary Services for Non-Spinning Reserve by a Fast Start Unit, has a non-zero amount of Self-Provided Ancillary Services. A Real-Time Market Self-Commitment Period for a Bid Cost Recovery Eligible Resource may not be less than the relevant MUT (rounded up to the next 15-minute Commitment Interval) when considered jointly with any adjacent IFM Self-Commitment Period. For example, if a Bid Cost Recovery Eligible Resource self-commits at time  $h$ , the self-commitment will be extended to Commitment Interval  $h + \text{MUT}$ , unless an IFM or RUC Commitment Period exists starting after hour  $h$ , in which case the self-commitment will be extended to Commitment Interval  $h + \min(\text{MUT}, t)$ , where  $t$  represents the time interval between the Real-Time Market Self-Commitment Period and the IFM or RUC Commitment Period. A Real-Time Market Self-Commitment Period for a Bid Cost Recovery Eligible Resource may not be apart from an IFM or RUC Commitment Period by less than the relevant MDT (rounded up to the next 15-minute Commitment Interval). For example, if a Bid Cost Recovery Eligible Resource self-commits at time  $T1$  and has a RUC Schedule at time  $T2 < T1$ , the Real-Time Market Self-Commitment Period will be extended to the interim Commitment Intervals if  $T1 - T2 < \text{MDT}$ . The number of Real-Time Market Self-Commitment Periods for a Bid Cost Recovery Eligible Resource within a Trading Day, when considered jointly with any adjacent IFM Self-Commitment Period, may not exceed the relevant MDS (or  $\text{MDS} + 1$  if the first Real-Time Market Self-Commitment Period is the continuation of a Real-Time Market Commitment Period from the previous Trading Day). For example, if a Bid Cost Recovery Eligible Resource self-commits at time  $T1$  and has a RUC Schedule at time  $T2 > T1$ , the Real-Time Market Self-Commitment Period will be extended to the interim Commitment Intervals if an additional Real-Time Market Start-Up at  $T1$  would violate the MDS constraint. To determine whether an extension of the RTM Self-Commitment Period applies for Multi-Stage Generating Resources, the CAISO will ensure that the

respective Minimum Run Time and Minimum Down Time for both the Generating Unit or Dynamic Resource-Specific System Resource and MSG Configuration levels are simultaneously respected.

### **11.8.1.3 Multi-Stage Generating Resource Start-Up, Minimum Load, or Transition Costs**

For the settlement of the Multi-Stage Generating Resource Start-Up Cost, Minimum Load Cost, and Transition Cost in the IFM, RUC, and RTM, the CAISO will determine the applicable Commitment Period and select the applicable Start-Up Cost, Minimum Load Cost, and Transition Cost based on the following rules.

(1) In any given Settlement Interval, the CAISO will first apply the following rules to determine the applicable Start-Up Cost, Minimum Load Cost, and Transition Cost for the Multi-Stage Generating Resources. For a Commitment Period in which the:

(a) IFM Commitment Period and/or RUC Commitment Period MSG Configuration(s) are different than the RTM CAISO Commitment Period MSG Configuration, the Multi-Stage Generating Resource's Start-Up Cost, Minimum Load Cost, and Transition Cost will be settled based on the RTM CAISO Commitment Period MSG Configuration Start-Up Cost, Minimum Load Cost, and Transition Cost, as described in Section 11.8.4.1.

(b) IFM CAISO Commitment Period and/or RUC CAISO Commitment Period MSG Configuration(s) and there is a RTM Self-Commitment Period in any MSG Configuration, the Multi-Stage Generating Resource's Start-Up Cost, Minimum Load Cost, and Transition Cost will be settled based on the IFM CAISO Commitment Period and/or RUC CAISO Commitment Period MSG Configuration(s) Start-Up Cost, Minimum Load Cost, and Transition Cost, as described in Sections 11.8.2.1 and 11.8.3.1, and further determined pursuant to part (2) of this Section below.

(c) IFM CAISO Commitment Period and/or RUC CAISO Commitment Period MSG Configuration is the same as the RTM CAISO Commitment Period MSG Configuration, the Multi-Stage Generating Resource's Start-Up

Cost, Minimum Load Cost, and Transition Cost will be settled based on the IFM CAISO Commitment Period and/or RUC CAISO Commitment Period MSG Configuration(s) Start-Up Cost, Minimum Load Cost, and Transition Cost described in Sections 11.8.2.1 and 11.8.3.1, and further determined pursuant to part (2) of this Section below.

(d) IFM and RUC Self-Commitment Period MSG Configuration(s) are the same as the RTM CAISO Commitment Period MSG Configuration, then the Multi-Stage Generating Resource's Start-Up Cost, Minimum Load Cost, and Transition Cost will be settled based on the RTM CAISO Commitment Period MSG Configuration Start-Up Cost, Minimum Load Cost, and Transition Cost as described in Section 11.8.4.1.

(2) In any given Settlement Interval, after the rules specified in part (1) above of this Section have been executed, the ISO will apply the following rules to determine whether the IFM or RUC Start-Up Cost, Minimum Load Cost, and Transition Cost apply for Multi-Stage Generating Resources. For a Commitment Period in which the:

(a) IFM Commitment Period MSG Configuration is different than the RUC CAISO Commitment Period MSG Configuration the Multi-Stage Generating Resource's Start-Up Cost, Minimum Load Cost, and Transition Cost will be settled based on the RUC CAISO Commitment Period MSG Configuration Start-Up Cost, Minimum Load Cost, and Transition Cost as described in Section 11.8.3.1.

(b) IFM CAISO Commitment Period MSG Configuration is the same as the RUC Commitment Period MSG Configuration, the Multi-Stage Generating Resource's Start-Up Cost, Minimum Load Cost, and Transition Cost will be based on the IFM CAISO Commitment Period MSG Configuration Start-Up Cost, Minimum Load Cost, and Transition Cost as described in Section 11.8.2.1.

### 11.8.2.1 IFM Bid Cost Calculation

-For each Settlement Interval, the CAISO shall calculate IFM Bid Cost for each Bid Cost Recovery Eligible Resource as the algebraic sum of the IFM Start-Up Cost, IFM Transition Cost, IFM Minimum Load Cost, IFM Pump Shut-Down Cost, IFM Energy Bid Cost, IFM Pumping Cost, and IFM AS Bid Cost. For Multi-Stage Generating Resources, in addition to the specific IFM Bid Cost rules described in Section 11.8.2.1, the CAISO will apply the rules described in Section 11.8.1.3 to further determine the applicable MSG Configuration-based CAISO Market Start-Up Cost, Transition Cost and Minimum Load Cost in any given Settlement Interval. For Multi-Stage Generating Resources, the incremental IFM Start-Up, Minimum Load, and Transition Costs to provide Energy Scheduled in the Day-Ahead Schedule or awarded RUC or Ancillary Service capacity for an MSG Configuration other than the self-scheduled MSG Configuration are determined by the IFM rules specified in Section 31.3.

#### 11.8.2.1.1 IFM Start-Up Cost

-The IFM Start-Up Cost for any IFM Commitment Period shall equal to the Start-Up Costs submitted by the Scheduling Coordinator to the CAISO for the IFM divided by the number of Settlement Intervals ~~in~~within the applicable IFM Commitment Period. For each Settlement Interval, only the IFM Start-Up Cost in a CAISO IFM Commitment Period is eligible for Bid Cost Recovery. The CAISO will determine the IFM Start-Up Costs for Multi-Stage Generating Resources based on the CAISO-committed MSG Configuration. The following rules shall apply sequentially to qualify the IFM Start-Up Cost in an IFM Commitment Period:

- (a) The IFM Start-Up Cost for an IFM Commitment Period shall be zero if there is an IFM Self-Commitment Period within or overlapping with that IFM Commitment Period.
- (b) The IFM Start-Up Cost for an IFM Commitment Period shall be zero if 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 in the Day-Ahead Market anywhere within the applicable IFM Commitment Period.

- (c) The IFM Start-Up Cost for an IFM Commitment Period shall be zero if there is no actual Start-Up at the start of the applicable IFM Commitment Period because the IFM Commitment Period is the continuation of an IFM, RUC, or RTM Commitment Period from the previous Trading Day.
- (d) The IFM Start-Up Cost for an IFM Commitment Period shall be zero if the Start-Up is delayed by the Real-Time Market past the IFM Commitment Period in question or cancelled by the Real-Time Market before the start-up process has started.
- (e) If an IFM Start-Up is terminated in the Real-Time within the applicable IFM Commitment Period through an Exceptional Dispatch Shut-Down Instruction issued while the Bid Cost Recovery Eligible Resource was starting up, the IFM Start-Up Cost for that IFM Commitment Period shall be prorated by the ratio of the Start-Up Time before termination over the total IFM Start-Up Time.
- (f) The IFM Start-Up Cost is qualified if an actual Start-Up occurs within the applicable IFM Commitment Period. An actual Start-Up is detected between two consecutive Settlement Intervals when the relevant metered Energy in the applicable Settlement Intervals increases from below the Minimum Load Energy and reaches or exceeds the relevant Minimum Load Energy. The Minimum Load Energy is the product of the relevant Minimum Load and the duration of the Settlement Interval. The CAISO will determine the Minimum Load Energy for Multi-Stage Generating Resources based on the CAISO Commitment Period applicable MSG Configuration.
- (g) The IFM Start-Up Cost will be qualified if an actual Start-Up occurs earlier than the start of the IFM Commitment Period if the advance Start-Up is as a result of a Start-Up instruction issued in a RUC or Real-Time Market process subsequent to the IFM, or the advance Start-Up is uninstructed but is still within the same



Trading Day and the Bid Cost Recovery Eligible Resource actually stays on until the targeted IFM Start-Up.

#### **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 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, 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.

\* \* \*

#### **11.8.2.1.5 IFM Energy Bid Cost**

For any Settlement Interval, the IFM Energy Bid Cost for Bid Cost Recovery Eligible Resources, except Participating Loads, shall be the integral of the relevant Energy Bid submitted to the IFM, if any, from the higher of the registered Bid Cost Recovery Eligible Resource's Minimum Load and the Day-Ahead Total Self-Schedule up to the relevant MWh scheduled in the Day-Ahead Schedule, divided by the number of Settlement Intervals in a Trading Hour. The IFM Energy Bid Cost for Bid Cost Recovery Eligible Resources, except Participating Loads, for any Settlement Interval is set to zero for any portion of the Day-Ahead Schedule that is not delivered from the otherwise Bid Cost Recovery Eligible Resource that has metered Generation below its Day-Ahead Schedule; any portion of the Day-Ahead Schedule that is actually delivered remains eligible for IFM Energy Bid Cost Recovery. The CAISO will determine the IFM

Energy Bid Cost for a Multi-Stage Generating Resource at the Generating Unit or Dynamic Resource-Specific System Resource level.

#### **11.8.2.1.6 IFM AS Bid Cost**

For any Settlement Interval, the IFM AS Bid Cost shall be the product of the IFM AS Award from each accepted IFM AS Bid and the relevant AS Bid Price, divided by the number of Settlement Intervals in a Trading Hour. The CAISO will determine and calculate IFM AS Bid Cost for a Multi-Stage Generating Resource at the Generating Unit or Dynamic Resource-Specific System Resource level.

#### **11.8.2.1.7 IFM Transition Cost**

For each Settlement Interval, the IFM Transition Costs shall be based on the MSG Configuration to which the Multi-Stage Generating Resource is transitioning and is allocated to the CAISO Commitment Period of that MSG Configuration.

\* \* \*

#### **11.8.2.2 IFM Market Revenue**

-For any Settlement Interval in a CAISO IFM Commitment Period the IFM Market Revenue for a Bid Cost Recovery Eligible Resource is the algebraic sum of: (1) the product of the delivered MWh, in the relevant Day-Ahead Schedule in that Trading Hour where for Pumped-Storage Hydro Units and Participating Load operating in the pumping mode or serving Load, the MWh is negative, and the relevant IFM LMP, divided by the number of Settlement Intervals in a Trading Hour; and (2) the product of the IFM AS Award from each accepted IFM AS Bid and the relevant Resource-Specific ASMP, divided by the number of Settlement Intervals in a Trading Hour. In the case of a Multi-Stage Generating Resource, the CAISO will calculate the market revenue at the Generating Unit or Dynamic Resource-Specific System Resource level. For any Settlement Interval in a IFM Self-Commitment Period the IFM Market Revenue for a Bid Cost Recovery Eligible Resource is the algebraic sum of: (1) the product of the delivered MWh above the greater of Minimum Load and Self-Scheduled Energy, in the relevant Day-Ahead Schedule in that Trading Hour and the relevant IFM LMP, divided by the number of Settlement Intervals in a Trading Hour; and (2) the product of the IFM AS Award from each accepted IFM AS Bid and the relevant Resource-Specific ASMP, divided by the number of Settlement Intervals in a Trading Hour.

\* \* \*

### 11.8.3.1 RUC Bid Cost Calculation

-For each Settlement Interval, the CAISO shall determine the RUC Bid Cost for a Bid Cost Recovery Eligible Resource as the algebraic sum of the RUC Start-Up Cost, RUC Transition Cost, RUC Minimum Load Cost and RUC Availability Bid Cost. For Multi-Stage Generating Resources, in addition to the specific RUC Bid Cost rules described in Section 11.8.3.1, the rules described in Section 11.8.1-RUC.3 will be applied to further determine the applicable MSG Configuration-based CAISO Market Start-Up Cost, Transition Cost, and Minimum Load Cost in any given Settlement Interval. For Multi-Stage Generating Resources, the incremental RUC Start-Up, Minimum Load, and Transition Costs to provide RUC awarded capacity for an MSG Configuration other than the self-scheduled MSG Configuration are determined by the RUC optimization rules in specified in Section 31.5.

#### 11.8.3.1.1 RUC Start-Up Cost

The RUC Start-Up Cost for any Settlement Interval in a RUC Commitment Period shall consist of Start-Up Cost of the Bid Cost Recovery Eligible Resource submitted to the CAISO for the applicable RUC Commitment Period divided by the number of Settlement Intervals in the applicable RUC Commitment Period. For each Settlement Interval, only the RUC Start-Up Cost in a CAISO RUC Commitment Period is eligible for Bid Cost Recovery. The CAISO will determine the RUC Start-Up Cost for a Multi-Stage Generating Resource based on the MSG Configuration committed by the CAISO in RUC.

The following rules shall be applied in sequence and shall qualify the RUC Start-Up Cost in a RUC Commitment Period:

- (a) The RUC Start-Up Cost for a RUC Commitment Period is zero if there is an IFM Commitment Period within that RUC Commitment Period.
- (b) The RUC Start-Up Cost for a RUC Commitment Period is zero if the Bid Cost Recovery Eligible Resource is manually pre-dispatched under an RMR Contract prior to the Day-Ahead Market or is flagged as an RMR Dispatch in the Day-Ahead Schedule anywhere within that RUC Commitment Period.

- (c) The RUC Start-Up Cost for a RUC Commitment Period is zero if there is no RUC Start-Up at the start of that RUC Commitment Period because the RUC Commitment Period is the continuation of an IFM, RUC, or RTM Commitment Period from the previous Trading Day.
- (d) The RUC Start-Up Cost for a RUC Commitment Period is zero if the Start-Up is delayed beyond the RUC Commitment Period in question or cancelled by the Real-Time Market prior to the Bid Cost Recovery Eligible Resource starting its start-up process.
- (e) If a RUC Start-Up is terminated in the Real-Time within the applicable RUC Commitment Period through an Exceptional Dispatch Shut-Down Instruction issued while the Bid Cost Recovery Eligible Resource is starting up the, RUC Start-Up Cost is prorated by the ratio of the Start-Up Time before termination over the RUC Start-Up Time.
- ~~(f)~~ (f) The RUC Start-Up Cost for a RUC Commitment Period is qualified if an actual Start-Up occurs within that RUC Commitment Period. An actual Start-Up is detected between two consecutive Settlement Intervals when the relevant metered Energy in the applicable Settlement Intervals increases from below the Minimum Load Energy and reaches or exceeds the relevant Minimum Load Energy. The Minimum Load Energy is the product of the relevant Minimum Load and the duration of the Settlement Interval. The CAISO will determine the Minimum Load Energy for Multi-Stage Generating Resources based on the CAISO-committed MSG Configuration.
- (g) The RUC Start-Up Cost shall be qualified if an actual Start-Up occurs earlier than the start of the RUC Start-Up, if the relevant Start-Up is still within the same Trading Day and the Bid Cost Recovery Eligible Resource actually stays on until the RUC Start-Up, otherwise the Start-Up Cost is zero for the RUC Commitment Period.

#### 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 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, it is determined to be Off. The CAISO will determine the RUC Minimum Load Cost for a Multi-Stage Generating Resource based on the MSG Configuration committed by the CAISO in RUC.

#### **11.8.3.1.3 RUC Availability Bid Cost**

The RUC Availability Bid Cost is calculated as the product of the RUC Award with the relevant RUC Availability Bid price, divided by the number of Settlement Intervals in a Trading Hour. The RUC Availability Bid Cost for a Bid Cost Recovery Eligible Resource for a Settlement Interval is zero if the Bid Cost Recovery Eligible Resource is operating below its RUC Schedule, and also has a negative Uninstructed Imbalance Energy (UIE) magnitude in that Settlement Interval in excess of: (1) five (5) MWh divided by the number of Settlement Intervals in the Trading Hour; or (2) three percent (3%) of its maximum capacity divided by the number of Settlement Intervals in a Trading Hour. The CAISO will determine the RUC Availability Bid Cost based on the Multi-Stage Generating Resource Generating Unit level.

#### **11.8.3.1.4 RUC Transition Cost**

For each Settlement Interval, the RUC Transition Costs shall be based on the MSG Configuration to which the Multi-Stage Generating Resource is transitioning and is allocated to the CAISO commitment period of that MSG Configuration.

### 11.8.3.2 RUC Market Revenues

For any Settlement Interval, the RUC Market Revenue for a Bid Cost Recovery Eligible Resource is the RUC Availability Payment as specified in Section 11.2.2.1 divided by the number of Settlement Intervals in a Trading Hour. If the RUC Availability Bid Cost of a BCR Eligible Resource is reduced to zero (0) in a Settlement Interval because of Uninstructed Deviation as stated in Section 11.8.3.1.3, then the RUC Market Revenue for that resource for that Settlement Interval shall also be set to zero (0) since the resource is subject to rescission of RUC Availability Payments as specified in Section 31.5.7. The CAISO will determine the RUC Market Revenues for Multi-Stage Generating Resources based on the Generating Unit or Dynamic Resource-Specific System Resource level.

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### 11.8.4.1 RTM Bid Cost Calculation

-For each Settlement Interval, the CAISO shall calculate RTM Bid Cost for each Bid Cost Recovery Eligible Resource, as the algebraic sum of the RTM Start-Up Cost, RTM Minimum Load Cost, RTM Transition Cost, RTM Pump Shut-Down Cost, RTM Energy Bid Cost, RTM Pumping Cost and RTM AS Bid Cost. For Multi-Stage Generating Resources, in addition to the specific RTM Bid Cost rules described in Section 11.8.4.1, the rules described in Section 11.8.1.3 will be applied to further determine the applicable MSG Configuration-based CAISO Market Start-Up Cost, Transition Cost, and Minimum Load Cost in given Settlement Interval. For Multi-Stage Generating Resources, the incremental RTM Start-Up Cost, Minimum Load Cost, and Transition Cost to provide RTM committed Energy or awarded Ancillary Services capacity for an MSG Configuration other than the self-scheduled MSG Configuration are determined by the RTM optimization rules in specified in Section 34.

#### 11.8.4.1.1 RTM Start-Up Cost

-For each Settlement Interval of the applicable Real-Time Market Commitment Period, the Real-Time Market Start-Up Cost shall consist of the Start-Up 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 the applicable Real-Time Market Commitment Period. For each Settlement Interval, only the Real-Time Market Start-Up Cost in a CAISO Real-Time Market Commitment Period is eligible for Bid Cost Recovery.

The CAISO will determine the RTM Start-Up Cost for a Multi-Stage Generating Resource based on the MSG Configuration committed by the CAISO in RTM. The following rules shall be applied in sequence

and shall qualify the Real-Time Market Start-Up Cost in a Real-Time Market Commitment Period:

- (a) The Real-Time Market Start-Up Cost is zero if there is a Real-Time Market Self-Commitment Period within the Real-Time Market Commitment Period.
- (b) The Real-Time Market Start-Up Cost is zero if the Bid Cost Recovery Eligible Resource has been manually pre-dispatched under an RMR Contract or the resource is flagged as an RMR Dispatch in the Day-Ahead Schedule or Real-Time Market anywhere within that Real-Time Market Commitment Period.
- (c) The Real-Time Market Start-Up Cost is zero if the Bid Cost Recovery Eligible Resource is started within the Real-Time Market Commitment Period pursuant to an Exceptional Dispatch issued in accordance with Section 34.9.2 to (1) perform Ancillary Services testing; (2) perform pre-commercial operation testing for Generating Units; or (3) perform PMax testing.
- (d) The Real-Time Market Start-Up Cost is zero if there is no Real-Time Market Start-Up at the start of that Real-Time Market Commitment Period because the Real-Time Market Commitment Period is the continuation of an IFM or RUC Commitment Period from the previous Trading Day.
- (e) If a Real-Time Market Start-Up is terminated in the Real-Time within the applicable Real-Time Market Commitment Period through an Exceptional Dispatch Shut-Down Instruction issued while the Bid Cost Recovery Eligible Resource is starting up the Real-Time Market Start-Up Cost is prorated by the ratio of the Start-Up Time before termination over the Real-Time Market Start-Up Time.
- (f) The Real-Time Market Start-Up Cost shall be qualified if an actual Start-Up occurs within that Real-Time Market Commitment Period. An actual Start-Up is detected between two consecutive Settlement Intervals when the relevant

metered Energy in the applicable Settlement Intervals increases from below the Minimum Load Energy and reaches or exceeds the relevant Minimum Load Energy. The Minimum Load Energy is the product of the relevant Minimum Load and the duration of the Settlement Interval. The CAISO will determine the Minimum Load Energy for Multi-Stage Generating Resources based on the CAISO-committed MSG Configuration.

- (g) The Real-Time Market Start-Up Cost for a Real-Time Market Commitment Period shall be qualified if an actual Start-Up occurs earlier than the start of the Real-Time Market Start-Up, if the relevant Start-Up is still within the same Trading Day and the Bid Cost Recovery Eligible Resource actually stays on until the Real-Time Market Start-Up, otherwise the Start-Up Cost is zero for the RUC Commitment Period.

#### **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 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. 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 applicable Dispatch Intervals.

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#### **11.8.4.1.5 RTM Energy Bid Cost**

-For any Settlement Interval, the RTM Energy Bid Cost for the Bid Cost Recovery Eligible Resource except Participating Loads shall be computed as the sum of the products of each Instructed Imbalance Energy (IIE) portion, except Standard Ramping Energy, Residual Imbalance Energy, Exceptional Dispatch Energy, Derate Energy, MSS Load Following Energy, Ramping Energy Deviation and Regulating Energy, with the relevant Energy Bid prices, if any, for each Dispatch Interval in the Settlement Interval. The RTM Energy Bid Cost for a Bid Cost Recovery Eligible Resource except Participating Loads for a Settlement Interval is set to zero for any undelivered Real-Time Instructed Imbalance Energy by the Bid Cost Recovery Eligible Resource. Any Uninstructed Imbalance Energy in excess of Instructed Imbalance Energy is also not eligible for Bid Cost Recovery. For a Multi-Stage Generating Resource the CAISO will determine the RTM Energy Bid Cost based on the Generating Unit or Dynamic Resource-Specific System Resource level.

#### **11.8.4.1.6 RTM AS Bid Cost**

-For each Settlement Interval, the Real-Time Market AS Bid Cost shall be the product of the average Real-Time Market AS Award from each accepted AS Bid submitted in the Settlement Interval for the Real-Time Market, reduced by any relevant tier-1 No Pay capacity in that Settlement Interval (but not below zero), with the relevant AS Bid price. The average Real-Time Market AS Award for a given AS in a Settlement Interval is the sum of the 15-minute Real-Time Market AS Awards in that Settlement Interval, each divided by the number of 15-minute Commitment Intervals in a Trading Hour and prorated to the duration of the Settlement Interval (10/15 if the Real-Time Market AS Award spans the entire Settlement Interval, or 5/15 if the Real-Time Market AS Award spans half the Settlement Interval). For a Multi-Stage Generating Resource the CAISO will determine the RTM AS Bid Cost based on the Generating Unit or Dynamic Resource-Specific System Resource level.

#### **11.8.4.1.7 RTM Transition Cost**

For each Settlement Interval, the RTM Transition Costs shall be based on the MSG Configuration to which the Multi-Stage Generating Resource is transitioning and is allocated to the CAISO commitment period of that MSG Configuration.

#### **11.8.4.2 RTM Market Revenue Calculations**

**11.8.4.2.1** \_\_\_\_ For each Settlement Interval in a CAISO Real-Time Market Commitment Period, the RTM Market Revenue for a Bid Cost Recovery Eligible Resource is the algebraic sum of the ~~following elements~~ listed below in this Section. For Multi-Stage Generating Resources the RTM Market Revenue calculations will be made at the Generating Unit or Dynamic Resource-Specific System Resource level.

- (a) The sum of the products of the Instructed Imbalance Energy (including Energy from Minimum Load of Bid Cost Recovery Eligible Resources committed in RUC where for Pumped-Storage Hydro Units and Participating Load operating in the pumping mode or serving Load, the MWh is negative), except Standard Ramping Energy, Residual Imbalance Energy, Exceptional Dispatch Energy, Derate Energy, MSS Load following Energy, Ramping Energy Deviation and Regulation Energy, with the relevant Real-Time Market LMP, for each Dispatch Interval in the Settlement Interval;
- (b) The product of the Real-Time Market AS Award from each accepted Real-Time Market AS Bid in the Settlement Interval with the relevant ASMP, divided by the number of fifteen (15)-minute Commitment Intervals in a Trading Hour (4), and prorated to the duration of the Settlement Interval.
- (c) The relevant tier-1 No Pay charges for that Bid Cost Recovery Eligible Resource in that Settlement Interval.

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#### **11.8.5 Unrecovered Bid Cost Uplift Payment**

~~Scheduling Coordinators shall receive an Unrecovered Bid Cost Uplift Payment for a Bid Cost Recovery Eligible Resource, including resources for MSS Operators that have elected gross Settlement, if the net of~~

all IFM Bid Cost Shortfalls and IFM Bid Cost Surpluses calculated pursuant to Section 11.8.2, RUC Bid Cost Shortfalls and RUC Bid Cost Surpluses calculated pursuant to Section 11.8.3, and the RTM Bid Cost Shortfalls and RTM Bid Cost Surpluses calculated pursuant to Section 11.8.4 for that Bid Cost Recovery Eligible Resource over a Trading Day is positive. For Multi-Stage Generating Resources, Unrecovered Bid Cost Uplift Payments will be calculated and made at the Generating Unit level or Dynamic Resource-Specific System Resource and not the MSG Configuration level. For MSS Operators that have elected net Settlement, the Unrecovered Bid Cost Uplift Payment is at the MSS level. The MSS IFM, RUC, and RTM Bid Cost Shortfall or IFM, RUC, and RTM Bid Cost Surplus for each market for each Trading Hour is the sum of the IFM, RUC, and RTM Bid Cost Shortfalls and IFM, RUC, and RTM Bid Cost Surpluses for all resources in the MSS. Scheduling Coordinators for MSS Operators that have elected net Settlement will receive an Unrecovered Bid Cost Uplift Payment if the net of all IFM, RUC, and RTM Bid Cost Shortfalls and IFM, RUC, and RTM Bid Cost Surpluses for that MSS over a Trading Day is positive.

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## **27.8 Multi-Stage Generating Resources**

### **27.8.1 Registration and Qualification**

Scheduling Coordinators must comply with the registration and qualification process described in this Section 27.8.1, in order to effectuate any of the changes described in Section 27.8.3. No less than sixteen (16) days prior to the date that Scheduling Coordinator seeks to have the resource participate in the CAISO Markets under the new settings or MSG Configuration details, the Scheduling Coordinator must complete and submit to the CAISO the registration form and the resource data template provided by the CAISO for registration and qualification purposes. After the Scheduling Coordinator submits a request for registration of a Generating Unit or Dynamic Resource-Specific System Resource as a Multi-Stage Generating Resource or a change in the attributes in Section 27.8.3, the CAISO will coordinate with that Scheduling Coordinator to validate that the resource qualifies for the requested status and that all the requisite information has been successfully provided to the CAISO. The resource will be successfully registered and qualified as a Multi-Stage Generating Resource, or the requested changes in the attributes listed in Section 27.8.3 will be successfully registered and qualified as of the date on which

the CAISO sends the responsible Scheduling Coordinator a notice that the resource has been successfully qualified as such. After the date on which the CAISO has provided such notice, any changes to the items listed in Section 27.8.3 will be subject to the timing and process requirements in this Section 27.8.1 and 27.8.3. The Scheduling Coordinator may modify all other Multi-Stage Generating Resource registered characteristics pursuant to the timing and processing requirements specified elsewhere in this CAISO Tariff, as they may apply. If the CAISO has reason to believe that the resource's operating and technical characteristics are not consistent with the registered and qualified attributes, the CAISO may request that the Scheduling Coordinator provide additional information necessary to support their registered status and, if appropriate, may require that the resource be registered and qualified more consistent with the resource's operating and technical characteristics, including the revocation of its status as a Multi-Stage Generating Resource. Failure to provide such information may be grounds for revocation of Multi-Stage Generating Resource status. Such changes in status or MSG Configuration details would be subject to the registration and qualification requirements in this Section 27.8. Scheduling Coordinators may register the number MSG Configurations as are reasonably appropriate for the resource based on the technical and operating characteristics of the resource, which may not, however, exceed a total of ten MSG Configurations and cannot be fewer than two MSG Configurations. The information requirements specified in Section 27.8.2 will apply.

### **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 responsible Scheduling Coordinator shall submit for each MSG Configuration a single segment Operational Ramp Rate, and as applicable an Operating Reserves ramp rate and Regulating Reserves ramp rate. 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.

### 27.8.3 Changes in Status and Configurations of Resource

Scheduling Coordinators may seek modifications to the Multi-Stage Generating Resource attributes listed below consistent with the process and timing requirements specified in Section 27.8.1 and the additional requirements discussed below in this Section 27.8.3:

- (1) Registration and qualification of a Generating Unit or Dynamic Resource-Specific System Resource as a Multi-Stage Generating Resource.
- (2) Changes to the MSG Configurations attributes, which include:
  - a. addition of new MSG Configurations;
  - b. removal of an existing MSG Configuration;
  - c. a change in the physical units supporting the MSG Configuration;
  - d. a change to the MSG Configuration Start Up and Shut Down flags;
  - e. adding or removing an MSG Transition to the Transition Matrix;
  - f. a material change in the Transition Times contained in the Master File, which consists of a change that more than doubles the Transition Times or reduces it to less than half; and
  - g. a material change to the maximum Ramp Rate of the MSG Configuration(s) contained in the Master File, which consists of a change that more than doubles the maximum Ramp Rate or reduces it to less than half.

When transitioning to implement these changes across the midnight hour, for any Real-Time Market run in which the changes specified in this Section 27.8.3 are to take effect within the Time Horizon of any of the Real-Time Market runs, the CAISO will Schedule, Dispatch, or award resources consistent with either the prior or new status and definitions, as appropriate, and required by any Real-Time conditions regardless of the resource's state scheduled or awarded in the immediately preceding Day-Ahead Market. A Scheduling Coordinator may unregister a Generating Unit or Dynamic Resource-Specific System Resource from its Multi-Stage Generating Resource status subject to the timing requirements for

Master File changes, and such changes are not subject to the timing requirements in Section 27.8.3. For the first forty-five (45) days after the effective date of this Section, Scheduling Coordinators may not change any of Multi-Stage Generating Resource attributes listed above in this Section. On the forty-sixth (46) day following the effective day of this Section, changes to the attributes listed above in this Section may take effect, including the registration of new Multi-Stage Generating Resources, provided Scheduling Coordinators have previously followed the registration process requirements listed in Section 27.8.1. Subsequently, further changes to the attributes listed above in this Section 27.8.3 may not take effect until after the one hundred-tenth (110) day following the effective date of this Section, subject to the procedures described in Section 27.8.1. As of the one hundred-tenth (110) day following the effective date of this Section, changes to these attributes may only be made every sixty (60) days after the day on which any such changes have taken effect.

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### **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) for either the same MSG Configuration scheduled or awarded in the Integrated Forward Market or committed in RUC. In addition, the Scheduling Coordinator for such Multi-Stage Generating Resources may also submit Bids into the Real-Time Market for three other MSG Configurations 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 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.



- (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.

## **30.5.2 Supply Bids**

### **30.5.2.1 Common Elements for Supply Bids**

In addition to the resource-specific Bid requirements of this Section, all Supply Bids must contain the following components: Scheduling Coordinator ID Code; Resource ID and the MSG Configuration ID, as applicable; Resource Location; PNode or Aggregated Pricing Node as applicable; Energy Bid Curve; Self-Schedule component; Ancillary Services Bid; RUC Availability Bid; the Market to which the Bid applies; Trading Day to which the Bid applies; Priority Type (if any). Supply Bids offered in the CAISO Markets must be monotonically increasing. Energy Bids in the RTM must also contain a Bid for Ancillary Services to the extent the resource is certified and capable of providing Ancillary Service in the RTM up to the registered certified capacity for that Ancillary Service less any Day-Ahead Ancillary Services Awards.

Scheduling Coordinators must submit the applicable Supply Bid components, including Self-Schedules, for the submitted MSG Configuration.

### **30.5.2.2 Supply Bids for Participating Generators**

In addition to the common elements listed in Section 30.5.2.1, Supply Bids for Participating Generators shall contain the following components: Start-Up Bid, Minimum Load Bid, Ramp Rate, Minimum and Maximum Operating Limits; Energy Limit, Regulatory Must-Take/Must-Run Generation; Contingency Flag; and Contract Reference Number (if any). Scheduling Coordinators submitting these Bid components for a Multi-Stage Generating Resource must do so for the submitted MSG Configuration. A

Scheduling Coordinator for a Physical Scheduling Plant or a System Unit may include Generation Distribution Factors as part of its Supply Bid. If the Scheduling Coordinator has not submitted the Generation Distribution Factors applicable for the Bid, the CAISO will use default Generation Distribution Factors stored in the Master File. All Generation Distribution Factors used by the CAISO will be normalized based on Outage data that is available to the automated market systems. ~~Combined-cycle~~

~~Generating Units may only be registered under a single Resource ID.~~ A Multi-Stage Generating Resource and its MSG Configurations are registered under a single Resource ID and Scheduling Coordinator for the Multi-Stage Generating Resource must submit all Bids for the resource's MSG Configurations under the same Resource ID. For a Multi-Stage Generating Resources Scheduling Coordinators may submit bid curves for up to ten individual MSG Configurations of their Multi-Stage Generating Resources into the Day-Ahead Market and up to three individual MSG Configurations into the Real-Time Market. Scheduling Coordinators for Multi-Stage Generating Resources must submit a single

Operational Ramp Rate for each MSG Configuration for which it submits a supply Bid either in the Day-Ahead Market or Real-Time Market. For Multi-Stage Generating Resources the Scheduling Coordinator may submit the Transition Times, which cannot be greater than the maximum Transition Time registered in the Master File. To the extent the Scheduling Coordinator does not submit the Transition Time that is a registered feasible transition the CAISO will use the registered maximum Transition Time for that MSG Transition for the specific Multi-Stage Generating Resource.

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### **30.5.2.6 Ancillary Services Bids**

There are four distinct Ancillary Services: Regulation Up, Regulation Down, Spinning Reserve and Non-Spinning Reserve. Participating Generators are eligible to provide all Ancillary Services. Dynamic System Resources are eligible to provide Operating Reserves and Regulation. Non-Dynamic System Resources are eligible to provide Operating Reserves only. Scheduling Coordinators may use Dynamic System Resources to Self-Provide Ancillary Services as specified in Section 8. Scheduling Coordinators may not use Non-Dynamic System Resources to Self-Provide Ancillary Services. All System Resources, including Dynamic System Resources and Non-Dynamic System Resources, will be charged the Shadow Price as prescribed in Section 11.10, for any awarded Ancillary Services. Participating Loads are eligible to provide Non-Spinning Reserve only. A Scheduling Coordinator may submit Ancillary Services Bids for Regulation Up, Regulation Down, Spinning Reserve, and Non-Spinning Reserve for the same capacity by providing a separate price in \$/MW per hour as desired for each Ancillary Service. The Bid for each Ancillary Services is a single Bid segment. Only resources certified by the CAISO as capable of providing Ancillary Services are eligible to provide Ancillary Services and submit Ancillary Services Bids. In addition to the common elements listed in Section 30.5.2.1, all Ancillary Services Bid components of a Supply Bid must contain the following: (1) the type of Ancillary Service for which a Bid is being submitted; (2) Ramp Rate (Operating Reserve Ramp Rate and Regulation Ramp Rate, if applicable); and (3)

Distribution Curve for Physical Scheduling Plant or System Unit. A Scheduling Coordinator may only submit an Ancillary Services Bid or Submission to Self-Provide an Ancillary Service for Multi-Stage Generating Resources for the Ancillary Service for which the specific MSG Configurations are certified. For any such certified MSG Configurations the Scheduling Coordinator may submit only one Operating

Reserve Ramp Rate and Regulation Ramp Rate. An Ancillary Services Bid submitted to the Day-Ahead Market when submitted to the Day-Ahead Market may be, but is not required to be, accompanied by an Energy Bid that covers the capacity offered for the Ancillary Service. Submissions to Self-Provide an Ancillary Services submitted to the Day-Ahead Market when submitted to the Day-Ahead Market may be, but are not required to be, accompanied by an Energy Bid that covers the capacity to be self-provided. If a Scheduling Coordinator's Submission to Self-Provide an Ancillary Service is qualified as specified in Section 8.6, the Scheduling Coordinator must submit an Energy Bid that covers the self-provided capacity prior to the close of the Real-Time Market for the day immediately following the Day-Ahead Market in which the Ancillary Service Bid was submitted. Except as provided below, the Self-Schedule for Energy need not include a Self-Schedule for Energy from the resource that will be self-providing the Ancillary Service. If a Scheduling Coordinator is self-providing an Ancillary Service from a Fast Start Unit, no Self-Schedule for Energy for that resource is required. If a Scheduling Coordinator proposes to self-provide Spinning Reserve, the Scheduling Coordinator is obligated to submit a Self-Schedule for Energy for that particular resource, unless as discussed above the particular resource is a Fast Start Unit. When submitting Ancillary Service Bids in the HASP and Real-Time Market, Scheduling Coordinators for resources that either have been awarded or self-provide Spinning Reserve or Non-Spinning Reserve capacity in the Day-Ahead Market must submit an Energy Bid for at least the awarded or self-provided Spinning Reserve or Non-Spinning Reserve capacity, otherwise the CAISO will apply the Bid validation rules described in Section 30.7.6.1.

As provided in Section 30.5.2.6.4, a Submission to Self-Provide an Ancillary Service shall contain all of the requirements of a Bid for Ancillary Services with the exception of Ancillary Service Bid price information. In addition, Scheduling Coordinators must comply with the Ancillary Services requirements of Section 8. Scheduling Coordinators submitting Ancillary Services Bids for System Resources in the HASP or Real-Time Market must also submit an Energy Bid for the associated Ancillary Services Bid under the same Resource ID, otherwise the bid validation rules in Section 30.7.6.1 will apply to cover any portion of the Ancillary Services Bid not accompanied by an Energy Bid. As described in Section 33.7, if the resource is a Non-Dynamic System Resource, the CAISO will only use the Ancillary Services Bid in the HASP optimization and will not use the associated Energy Bid for the same Resource ID to schedule

Energy from the Non-Dynamic System Resource in the HASP. Scheduling Coordinators must also comply with the bidding rules associated with the must offer requirements for Ancillary Services specified in Section 40.6.

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### **30.5.2.7 RUC Availability Bids**

Scheduling Coordinators may submit RUC Availability Bids for specific Generating Units in the DAM; however, Scheduling Coordinators for Resource Adequacy Capacity or ICPM Capacity must submit RUC Availability Bids for that capacity to the extent that the capacity has not been submitted in a Self-Schedule or already been committed to provide Energy or capacity in the IFM. For Multi-Stage Generating Resources the RUC Availability Bids shall be submitted at the MSG Configuration. Capacity that does not have Bids for Supply of Energy in the IFM will not be eligible to participate in the RUC process. The RUC Availability Bid component is MW-quantity of non-Resource Adequacy Capacity in \$/MW per hour, and \$0/MW for Resource Adequacy Capacity or ICPM Capacity.

\* \* \*

## **30.7.3 DAM Validation**

### **30.7.3.1 Validation Prior to Market Close and Master File Update**

The CAISO conducts Bid validation in three steps: as described below. For a Multi-Stage Generating Resource the validation described herein is done for each submitted MSG Configuration.

-Step 1: The CAISO will validate all Bids after submission of the Bid for content validation which determines that the Bid adheres to the structural rules required of all Bids as further described in the Business Practices Manuals. If the Bid fails any of the content level rules the CAISO shall assign it a rejected status and the Scheduling Coordinator must correct and resubmit the Bid.

Step 2: After the Bids are successfully validated for content, but prior to the Market Close of the DAM, the Bids will continue through the second level of validation rules to verify that the Bid adheres to the applicable CAISO Market rules and if applicable, limits based on Master File data. If the Bid fails any level two validation rules, the CAISO shall assign the Bid as invalid and the Scheduling Coordinator must either correct or resubmit the Bid.

Step 3: If the Bid successfully passes validation in Step 2, it will continue through the third level of validation where the Bid will be analyzed based on its contents to identify any missing Bid components that must be either present for the Bid to be valid consistent with the market rules contained in Article III of this CAISO Tariff and as reflected in the Business Practice Manuals. At this stage the Bid will either be automatically modified for correctness and assigned a status of conditionally modified or modified, or if it can be accepted as is, the Bid will be assigned a status of conditionally valid, or valid. A Bid will be automatically modified and assigned a status of modified or conditionally modified Bid, whenever the CAISO inserts or modifies a Bid component. The CAISO will insert or modify a Bid component whenever (1) a Self-Schedule quantity is less than the lowest quantity specified as an Economic Bid for either an Energy Bid or Demand Bid, in which case the CAISO extends the Self-Schedule to cover the gap; (2) for non-Resource Adequacy Resources, the CAISO will extend the Energy Bid Curve using Proxy Costs to cover any capacity in a RUC Bid component, if necessary; and (3) for a Resource Adequacy Resource that is not a Use-Limited Resource, the CAISO will extend the Energy Bid Curve using Proxy Costs to cover any capacity in a RUC Bid component and, if necessary, up to the full registered Resource Adequacy Capacity. The CAISO will generate a Proxy Bid or extend an Energy Bid or Self-Schedule to cover any RUC Award or Day-Ahead Schedule in the absence of any Self-Schedule or Economic Bid components, or to fill in any gaps between any Self-Schedule Bid and any Economic Bid components to cover a RUC Award or Day-Ahead Schedule. To the extent that an Energy Bid to the HASP/RTM is not accompanied by an Ancillary Services Bid, the CAISO will insert a Spinning Reserve and Non-Spinning Reserve Ancillary Services Bid at \$ 0/MW for any certified Operating Reserve capacity. The CAISO will also generate a Self-Schedule Bid for any Generating Unit that has a Day-Ahead Schedule but has not submitted Bids in HASP/RTM, up to the quantity in the Day-Ahead Schedule. Throughout the Bid evaluation process, the Scheduling Coordinator shall have the ability to view the Bid and may choose to cancel the Bid, modify and re-submit the Bid, or leave the modified, conditionally modified or valid, conditionally valid Bid as is to be processed in the designated CAISO Market. The CAISO will not insert or extend any Bid for a Resource Adequacy Resource that is a Use-Limited Resource.

\* \* \*

### **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 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. 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 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 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.

### **30.7.8 Format And Validation Of Start-Up And Shut-Down Times**

For a Generating Unit or a Resource-Specific System Resource, the submitted Start-Up Time expressed in minutes (min) as a function of down time expressed in minutes (min) must be a staircase function with up to three (3) segments defined by a set of 1 to 4 down time and Start-Up Time pairs. The Start-Up Time is the time required to start the resource if it is offline longer than the corresponding down time. The CAISO shall model Start-Up Times for Multi-Stage Generating Resource at the MSG Configuration level and Transition Times are validated based on the Transition Matrix submitted as provided in Section 27.8.

The last segment will represent the time to start the unit from a cold start and will extend to infinity. The submitted Start-Up Time function shall be validated as follows:

- (a) The first down time must be zero (0) min.
- (b) The down time entries must match exactly (in number, sequence, and value) the corresponding down time breakpoints of the maximum Start-Up Time function, as registered in the Master File for the relevant resource.
- (c) The Start-Up Time for each segment must not exceed the Start-Up Time of the corresponding segment of the maximum Start-Up Time function, as registered in the Master File for the relevant resource.



- (d) The Start-Up Time function must be strictly monotonically increasing, i.e., the Start-Up Time must increase as down time increases.

For Participating Load, a single Shut-Down time in minutes is the time required for the resource to Shut-Down after receiving a Dispatch Instruction.

### **30.7.9 Format And Validation Of Start-Up Costs And Shut-Down Costs**

For a Generating Unit or a Resource-Specific System Resource, the submitted Start-Up Cost expressed in dollars (\$) as a function of down time expressed in minutes must be a staircase function with up to three (3) segments defined by a set of 1 to 4 down time and Start-Up Cost pairs. The Start-Up Cost is the cost incurred to start the resource if it is offline longer than the corresponding down time. The last segment will represent the cost to start the resource from cold Start-Up and will extend to infinity. The submitted Start-Up Cost function shall be validated as follows:

- (a) The first down time must be zero (0) min.
- (b) The down time entries must match exactly (in number, sequence, and value) the corresponding down time breakpoints of the Start-Up Cost function, as registered in the Master File for the relevant resource as either the Proxy Cost or Registered Cost.
- (c) The Start-Up Cost for each segment must not be negative and must be equal to the Start-Up Cost of the corresponding segment of the Start-Up Cost function, as registered in the Master File for the relevant resource. If a value is submitted in a Bid for the Start-Up Cost, it will be overwritten by the Master File value as either the Proxy Cost or Registered Cost based on the option elected pursuant to Section 30.4. If no value for Start-Up Cost is submitted in a Bid, the CAISO will insert the Master File value, as either the Proxy Cost or Registered Cost based on the option elected pursuant to Section 30.4.
- (d) The Start-Up Cost function must be strictly monotonically increasing, i.e., the Start-Up Cost must increase as down time increases.

For Participating Loads, a single Shut-Down Cost in dollars (\$) is the cost incurred to Shut-Down the resource after receiving a Dispatch Instruction. The submitted Shut-Down Cost must not be negative.

For Multi-Stage Generating Resources, the Scheduling Coordinator must provide Start-Up Costs for each MSG Configuration into which the resource can be started.

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#### **31.2.2.2 Non-RMR Units**

If the dispatch level produced through the ACR is greater than the dispatch level produced through CCR, then the resource is subject to Local Market Power Mitigation, in which case the entire portion of the unit's Energy Bid Curve that is above the CCR dispatch level will be mitigated to the lower of the Default Energy Bid as specified in Section 39, or the DAM Bid, but no lower than the unit's highest Bid price that cleared the CCR. To the extent a Multi-Stage Generating Resource's MWh dispatch level produced in in the All Constraints Run is greater than the MWhs dispatch level produced in the Competitive Constraints Run, for purposes of mitigation, all the MSG Configurations will be mitigated similarly and the CAISO will evaluate all submitted Energy Bids for all MSG Configurations based on the relevant Default Energy Bids for the applicable MSG Configuration. The CAISO will calculate the Default Energy Bids for Multi-Stage Generating Resources by submitted MSG Configuration. When the ACR dispatch level is higher than the CCR level, the market Bid at and below the CCR dispatch level will be retained in the IFM. If the dispatch level produced through the ACR is not greater than the dispatch level produced through the CCR, the unit's original, unmitigated DAM Bid will be retained in its entirety.

### **31.3 Integrated Forward Market**

After the MPM-RRD and prior to RUC, the CAISO shall perform the IFM. The IFM (1) performs Unit Commitment and Congestion Management (2) clears mitigated or unmitigated Bids cleared in the MPM-RRD as well as Bids that were not cleared in the MPM-RRD process against bid-in Demand, taking into account transmission limits and honoring technical and inter-temporal operating Constraints, such as Minimum Run Times (3) and procures Ancillary Services to meet one hundred percent (100%) of the CAISO Forecast of CAISO Demand requirements. The IFM utilizes a set of integrated programs that: (1) determine Day-Ahead Schedules and AS Awards, and related LMPs and ASMPs; and (2) optimally

commits resources that are bid in to the DAM. The IFM utilizes a SCUC algorithm that optimizes Start-Up Costs, Minimum Load Costs, Transition Costs, and Energy Bids along with any Bids for Ancillary Services as well as Self-Schedules submitted by Scheduling Coordinators. The IFM selects the optimal MSG Configuration from a maximum of ten MSG Configurations of each Multi-Stage Generating Resource as mutually exclusive resources. If a Scheduling Coordinator submits a Self-Schedule or a Submission to Self-Provide Ancillary Services for a given MSG Configuration in a given Trading Hour, the IFM will consider the Start-Up Cost, Minimum Load Cost, and Transition Cost associated with any Economic Bids for other MSG Configurations as incremental costs between the other MSG Configurations and the self-scheduled MSG Configuration. In such cases, incremental costs are the additional costs incurred to transition or operate in an MSG Configuration in addition to the costs associated with the self-scheduled MSG Configuration. The IFM also provides for the optimal management of Use-Limited Resources. The ELS Resources committed through the ELC Process conducted two days before the day the IFM process is conducted for the next Trading Day as described in Section 31.7 are binding.

### **31.3.1 Market Clearing And Price Determination**

#### **31.3.1.1 Integrated Forward Market Output**

The IFM produces: (1) a set of hourly Day-Ahead Schedules, AS Awards, and AS Schedules for all participating Scheduling Coordinators that cover each Trading Hour of the next Trading Day; and (2) the hourly LMPs for Energy and the ASMPs for Ancillary Services to be used for settlement of the IFM. For a Multi-Stage Generating Resource, the IFM produces a Day-Ahead Schedule for no more than one MSG Configuration per Trading Hour. In addition, the IFM will produce the MSG Transition and the MSG Configuration indicators for the Multi-Stage Generating Resource, which would establish the expected MSG Configuration in which the Multi-Stage Generating Resource will operate. During a transition, the committed MSG Configuration is considered to be the “from” MSG Configuration. The CAISO will publish the LMPs at each PNode as calculated in the IFM. In determining Day-Ahead Schedules, AS Awards, and AS Schedules the IFM optimization will minimize total Bid Costs based on submitted and mitigated Bids while respecting the operating characteristics of resources, the operating limits of transmission facilities, and a set of scheduling priorities that are described in Section 31.4. In performing its optimization, the IFM first tries to complete its required functions utilizing Effective Economic Bids without

adjusting Self-Schedules, and skips Ineffective Economic Bids and adjusts Self-Schedules only if it is not possible to balance Supply and Demand and manage Congestion in an operationally prudent manner with available Effective Economic Bids. The process and criteria by which the IFM adjusts Self-Schedules and other Non-priced Quantities are described in Sections 27.4.3, 31.3.1.3 and 31.4. The Day-Ahead Schedules are binding commitments, including the commitment to Start-Up, if necessary, to comply with the Day-Ahead Schedules. The CAISO will not issue separate Start-Up Instructions for Day-Ahead commitments. A resource's status, however, can be modified as a result of additional market processes occurring in the HASP and RTM.

#### **31.3.1.2 Treatment of Ancillary Services Bids in IFM**

As provided in Section 30.7.6.2 the CAISO shall co-optimize the Energy and Ancillary Services Bids in clearing the IFM. To the extent that capacity subject to an Ancillary Services Bid submitted in the Day-Ahead Market is not associated with an Energy Bid, there is no co-optimization, and therefore, no opportunity cost associated with that resource for that Bid for the purposes of calculating the Ancillary Services Marginal Price as specified in Section 27.1.2.2. When the capacity associated with the Energy Bid overlaps with the quantity submitted in the Ancillary Services Bid, then the Energy Bid will be used to determine the opportunity cost, if any, in the co-optimization to the extent of the overlap. Therefore, the capacity that will be considered when co-optimizing the procurement of Energy and Ancillary Services from Bids in the IFM will consider capacity up to the total capacity of the resource as reflected in the Ancillary Services Bid as derated through SLIC, if at all. In the case of Regulation, the capacity that will be considered is the lower of the capacity of the resource offered in the Ancillary Services Bid or the upper Regulation limit of the highest Regulating Range as contained in the Master File. For any Trading Hour within the period in which the Multi-Stage Generating Resource is transitioning from one MSG Configuration to another, the IFM will not award Ancillary Services and any Submission to Self-Provide Ancillary Services will be disqualified. Any Ancillary Services Awards in the IFM to Multi-Stage Generating Resources will carry through to the Real-Time Market in the same MSG Configuration that the Multi-Stage Generating Resource is awarded in the IFM.

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#### **31.3.1.4 Eligibility to Set the Day-Ahead LMP**

All Generating Units, Participating Loads, non-Participating Loads, System Resources, System Units, or Constrained Output Generators subject to the provisions in Section 27.7, with Bids, including Generated Bids, that are unconstrained due to Ramp Rates, MSG Transitions, Forbidden Operating Regions, or other temporal constraints are eligible to set the LMP, provided that (a) the Schedule for the Generating Unit or Resource-Specific System Resource is between its Minimum Operating Limit and the highest MW value in its Economic Bid or Generated Bid, or (b) the Schedule for the Participating Load, non-Participating Load, non-Resource-Specific System Resource, or System Unit is between zero (0) MW and the highest MW value in its Economic Bid or Generated Bid. If (a) a resource's Schedule is constrained by its Minimum Operating Limit or the highest MW value in its Economic Bid or Generated Bid, (b) the CAISO enforces a resource-specific constraint on the resource due to an RMR or Exceptional Dispatch, (c) the resource is constrained by a boundary of a Forbidden Operating Region or is Ramping through a Forbidden Operating Region, or (d) the resource's full Ramping capability is constraining its inter-hour change in Schedule, the resource cannot be marginal and thus is not eligible to set the LMP. Resources identified as MSS Load following resources are not eligible to set the LMP. A Constrained Output Generator will be eligible to set the hourly LMP if any portion of its Energy is necessary to serve Demand.

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### **31.5 Residual Unit Commitment**

The CAISO shall perform the RUC process after the IFM. In the event that the IFM did not commit sufficient resources to meet the CAISO Forecast of CAISO Demand and account for other factors such as Demand Forecast error, as described in the Business Practice Manuals, the RUC shall commit additional resources and identify additional RUC Capacity to ensure sufficient on-line resources to meet Demand for each hour of the next Trading Day. RUC Capacity is selected by a SCUC optimization that uses the same {Base Market Model} used in the IFM {adjusted as described in Section 27.5.1 and 27.5.6} to help ensure the deliverability of Energy from the RUC Capacity. In the case of Multi-Stage Generating Resources, the RUC will optimize Transition Costs in addition to the Start-Up and Minimum Load Costs. If a Scheduling Coordinator submits a Self-Schedule or a Submission to Self-Provide Ancillary Services for a given MSG Configuration in a given Trading Hour, the RUC will consider the Start-Up Cost, Minimum Load Cost, and Transition Cost associated with any Economic Bids for other MSG

Configurations as incremental costs between the other MSG Configurations and the self-scheduled MSG Configuration. In such cases, incremental costs are the additional costs incurred to transition or operate in an MSG Configuration in addition to the costs associated with the self-scheduled MSG Configuration.

## **31.5.1 RUC Participation**

### **31.5.1.1 Capacity Eligible for RUC Participation**

RUC participation is voluntary for capacity that has not been designated as Resource Adequacy Capacity. Scheduling Coordinators may make such capacity available for participation in RUC by submitting a RUC Availability Bid, provided the Scheduling Coordinator has also submitted an Energy Bid for such capacity into the IFM. Capacity from Non-Dynamic System Resources that has not been designated Resource Adequacy Capacity is not eligible to participate in RUC. Capacity from resources including System Resources that has been designated as qualified Resource Adequacy Capacity must participate in RUC. RUC participation is required for Resource Adequacy Capacity to the extent that Resource Adequacy Capacity is not committed following the IFM. System Resources eligible to participate in RUC will be considered on an hourly basis; that is, RUC will not observe any multi-hour block constraints. In RUC the CAISO may commit a Multi-Stage Generating Resource with a Resource Adequacy must-offer obligation at any MSG Configuration with capacity equal to or greater than the MSG Configuration committed in the Integrated Forward Market. RUC will observe the Energy Limits that may have been submitted in conjunction with Energy Bids to the IFM. RMR Unit capacity will be considered in RUC in accordance with Section 31.5.1.3. MSS resources may participate in RUC in accordance with Section 31.5.2.3. COG resources are accounted for in RUC, but may not submit or be paid RUC Availability Payments. The ELS Resources committed through the ELC Process conducted two days before the day the RUC process is conducted for the next Trading Day as described in Section 31.7 are binding.

### **31.5.1.2 RUC Availability Bids**

Scheduling Coordinators may only submit RUC Availability Bids for capacity (above the Minimum Load) for which they are also submitting an Energy Bid to participate in the IFM. The RUC Availability Bid for the Resource Adequacy Capacity submitted by a Scheduling Coordinator must be \$0/MW per hour for the entire Resource Adequacy Capacity. If the Scheduling Coordinator fails to submit a \$0/MW per hour for

Resource Adequacy Capacity, the CAISO will insert the \$0/MW per hour for the full amount of Resource Adequacy Capacity for a given resource- reduced by any upward Ancillary Services Awards. For Multi-Stage Generating Resources that fail to submit a \$0/MW per hour for the Resource Adequacy Capacity, the CAISO will insert the \$0/MW per hour for the resource's Resource Adequacy Capacity at the MSG Configuration level up to the minimum of the Resource Adequacy Capacity or the PMax of the MSG Configuration. Scheduling Coordinators may submit non-zero RUC Availability Bids for the portion of a resource's capacity that is not Resource Adequacy Capacity.

\* \* \*

#### **31.5.1.4 Eligibility to Set the RUC Price**

All resources that are eligible for RUC participation as described in Section 31.5.1.1 with RUC Bids that are unconstrained due to Ramp Rates or other temporal constraints, including MSG Transitions, are eligible to set the RUC Price, provided that (a) the RUC Schedule for the Generating Unit or Resource-Specific System Resource is between its Minimum Operating Limit and the highest MW value in its Economic Bid or Generated Bid, or (b) the Schedule for the eligible resource other than a Generating Unit or Resource-Specific System Resource is between zero (0) MW and the highest MW value in its Economic Bid or Generated Bid. If (a) a resource's Schedule is constrained by its Minimum Operating Limit or the highest MW value in its Economic Bid or Generated Bid, (b) the CAISO enforces a resource-specific constraint on the resource due to an RMR or Exceptional Dispatch or (c) the resource's full Ramping capability is constraining its inter-hour change in Schedule, the resource cannot be marginal and thus is not eligible to set the RUC Price. Resources identified as MSS Load following resources are not eligible to set the RUC Price.

\* \* \*

#### **31.5.5 Selection And Commitment Of RUC Capacity**

Capacity that is not already scheduled in the IFM may be selected as RUC Capacity through the RUC process of the DAM. The RUC optimization will select RUC Capacity and produce nodal RUC Prices by minimizing total Bid cost based on RUC Availability Bids and Start-Up and Minimum Load Bids and Transition Costs. RUC will not consider Start-Up and Minimum Load Bids or Transition Costs for

resources already committed in the IFM. The RUC Capacity of a resource is the incremental amount of capacity selected in RUC above the resource's Day-Ahead Schedule. The resource's Day-Ahead Schedule plus its RUC Capacity comprise the resource's RUC Schedule. The CAISO will only issue RUC Start-Up Instructions to resources committed in RUC that must receive a Start-Up Instruction in the Day-Ahead in order to be available to meet Real-Time Demand. RUC Schedules will be provided to Scheduling Coordinators even if a RUC Start-Up Instruction is not issued at that time. RUC shall not ~~reverse commitments issued~~ Shut Down resources scheduled through the IFM and RUC will not commit a Multi-Stage Generating Resource to a lower MSG Configuration that is unable to support the Energy scheduled in the IFM. If the RUC process cannot find a feasible solution given the resources committed in the IFM, the RUC process will adjust Constraints as described in Section 31.5.4 to arrive at a feasible solution that accommodates all the resources committed in the IFM, and any necessary de-commitment of IFM committed units shall be effectuated through an Exceptional Dispatch.

### **31.5.6 Eligibility For RUC Compensation**

All RUC Capacity is eligible for the RUC Availability Payment except for: (i) RUC Capacity from RMR Units that has been designated as RMR Dispatch and included in RUC as a Self-Schedule; (ii) Resource Adequacy Capacity; and (iii) RUC Capacity that corresponds to the resource's Minimum Load, which is compensated through the Bid Cost Recovery as described in Section 11.8. Resources not committed in the IFM that are committed in RUC, including RMR Units that were not designated for RMR Dispatches and Resource Adequacy Resources, are also eligible for RUC Cost Compensation, which includes Start-Up, Transition Costs, and Minimum Load Cost compensation, and Bid Cost Recovery, subject to the resource actually following its Dispatch Instructions as verified by the CAISO pursuant to procedures set forth in the Business Practice Manuals.

\* \* \*

#### **31.5.7.1 Rescission of Payments for Undispatchable RUC Capacity**

The CAISO shall calculate the Real-Time ability of each Generating Unit, Participating Load, System Unit or System Resource to deliver Energy from or capacity committed in RUC for each Settlement Interval based on its maximum operating capability, actual telemetered output, and Operational Ramp Rate as described in Section 30.10, which for a Multi-Stage Generating Resource is evaluated by MSG



Configuration. If the Undispatchable Capacity is capacity committed in RUC and is from a Generating Unit, System Unit or System Resource that is a Resource Adequacy Resource, there is no payment obligation to the CAISO for the Undispatchable Capacity. The CAISO will report the instance of non-compliance by the Resource Adequacy Resource to the appropriate Local Regulatory Authority.

#### **31.5.7.2 Rescission of Payments for Undelivered RUC Capacity**

For each Settlement Interval in which a Generating Unit, Participating Load, System Unit or System Resource fails to supply Energy from capacity committed in RUC in accordance with a Dispatch Instruction, or supplies only a portion of the Energy specified in the Dispatch Instruction, the RUC Availability Payment will be reduced to the extent of the deficiency, in accordance with the provisions of Section 11.2.2.2.2, which for a Multi-Stage Generating Resource is evaluated for the Generating Unit or Dynamic Resource-Specific System Resource and not by the MSG Configuration.

## **34. Real-Time Market**

The RTM is the market conducted by the CAISO during any given Operating Day in which Scheduling Coordinators may provide Real-Time Imbalance Energy and Ancillary Services. The Real-Time Market consists of the Real-Time Unit Commitment (RTUC), the Short-Term Unit Commitment (STUC) and the Real-Time Dispatch (RTD) processes. The Short-Term Unit Commitment (STUC) runs once per hour near the top of the hour and utilizes the SCUC optimization to commit Medium Start, Short Start and Fast Start Units to meet the CAISO Demand Forecast. The CAISO shall dispatch all resources, including Participating Load pursuant to submitted Bids or pursuant to the provisions below on Exceptional Dispatch. In Real-Time, resources are required to follow Real-Time Dispatch Instructions. The Time Horizon of the STUC starts with the third fifteen-minute interval of the current Trading Hour and extending for the next four Trading Hours. The RTUC runs every fifteen (15) minutes and utilizes the SCUC optimization to commit Fast Start and some Short Start resources and to procure any needed AS on a fifteen-minute basis. Any given run of the RTUC will have a Time Horizon of approximately sixty (60) to 105 minutes (four to seven fifteen-minute intervals) depending on when during the hour the run occurs. Not all resources committed in a given STUC or RTUC run will necessarily receive CAISO commitment instructions immediately, because during the Trading Day the CAISO may issue a commitment instruction

to a resource only at the latest possible time that allows the resource to be ready to provide Energy when it is expected to be needed. The RTD uses a Security Constrained Economic Dispatch (SCED) algorithm every five minutes throughout the Trading Hour to determine optimal Dispatch Instructions to balance Supply and Demand. Updates to the Base Market Model adjusted as described in Sections 27.5.1 and 27.5.6 used in the RTM optimization include current estimates of real-time unscheduled flow at the Interties. The RTD optimization utilizes up to a sixty-five-minute Time Horizon (thirteen (13) five-minute intervals), but the CAISO issues Dispatch Instructions only for the next target five-minute Interval. The RTUC, STUC and RTD processes of the RTM use the same Base Market Model adjusted as described in Sections 27.5.1 and 27.5.6 used in the DAM and the HASP, subject to any necessary updates of the Base Market Model adjusted as described in Sections 27.5.1 and 27.5.6 pursuant to changes in grid conditions after the DAM has run. In the case of Multi-Stage Generating Resources, the RTM procedures will optimize Transition Costs in addition to the Start-Up and Minimum Load Costs. If a Scheduling Coordinator submits a Self-Schedule or a Submission to Self-Provide Ancillary Services for a given MSG Configuration in a given Trading Hour, all of the RTM processes will consider the Start-Up Cost, Minimum Load Cost, and Transition Cost associated with any Economic Bids for other MSG Configurations as incremental costs between the other MSG Configurations and the self-scheduled MSG Configuration. In such cases, incremental costs are the additional costs incurred to transition or operate in an MSG Configuration in addition to the costs associated with the self-scheduled MSG Configuration.

\* \* \*

### **34.2 Real-Time Unit Commitment**

The Real-Time Unit Commitment (RTUC) process uses SCUC and is run every fifteen (15) minutes to: (1) make commitment decisions for Fast Start and Short Start resources having Start-Up Times within the Time Horizon of the RTUC process, and (2) procure required additional Ancillary Services and calculate ASMP used for settling procured Ancillary Service capacity for the next fifteen-minute Real-Time Ancillary Service interval. In any fifteen (15) minute RTUC interval that falls within a time period in which a Multi-Stage Generating Resource is transitioning from one MSG Configuration to another MSG Configuration, the CAISO: (1) will not award any incremental Ancillary Services; (2) will disqualify any Day-Ahead Ancillary Services Awards; (3) will disqualify Day-Ahead qualified Submissions to Self-Provide Ancillary

Services Award, and (4) will disqualify Submissions to Self-Provide Ancillary Services in RTM. For Multi-Stage Generating Resources the RTUC will issue a binding Transition Instruction separately from the binding Start-Up or Shut Down instructions. The RTUC can also be run with the Contingency Flag activated, in which case the RTUC can commit Contingency Only Operating Reserves. If RTUC is run without the Contingency Flag activated, it cannot commit Contingency Only Operating Reserves. RTUC is run four times an hour, at the following times for the following Time Horizons: (1) at approximately 7.5 minutes prior to the next Trading Hour, in conjunction with the HASP run, for T-45 minutes to T+60 minutes; (2) at approximately 7.5 minutes into the current hour for T-30 minutes to T+60 minutes; (3) at approximately 22.5 minutes into the current hour for T-15 minutes to T+60 minutes; and (4) at approximately 37.5 minutes into the current hour for T to T+60 minutes where T is the beginning of the next Trade Hour. The HASP, described in Section 33, is a special RTUC run that is performed at approximately 7.5 minutes before each hour and has the additional responsibility of: (1) pre-dispatching Energy and awarding Ancillary Services for hourly dispatched System Resources for the Trading Hour that begins 67.5 minutes later, and (2) performing the necessary MPM-RRD for that Trading Hour. A Day-Ahead Schedule or RUC Schedule for an MSG Configuration that is later impacted by the resource's derate or outages, will be reconsidered in the RTUC process taking into consideration the impacts of the derate or outage on the available MSG Configurations.

### **34.2.1 Commitment Of Fast Start And Short Start Resources**

RTUC produces binding and advisory Start-Up and Shut-Down Dispatch Instructions for Fast Start and Short Start resources that have Start-Up Times that would allow the resource to be committed prior to the end of the relevant Time Horizon of the RTUC run. A Start-Up Dispatch Instruction is considered binding in any given RTUC run if the Start-Up Time of the resource ~~could~~ is such that there would not ~~achieve the target start~~ be sufficient time ~~as determined in the current RTUC run infor~~ a subsequent RTUC run ~~as a result of the~~ to Start-Up ~~Time of~~ the resource. A Start-Up Instruction is considered advisory if it is not binding, such that the resource could achieve its target Start-Up Time as determined in the current RTUC run in a subsequent RTUC run based on its Start-Up Time. A Shut-Down Instruction is considered binding if the resource could achieve the target Shut-Down Time as determined in the current RTUC in a subsequent RTUC run. A Shut-Down Dispatch Instruction is considered advisory if the resource Shut-

Down Instruction is not binding such that the resource could achieve its target Shut-Down time as determined in the current RTUC run in a subsequent RTUC run. A binding Dispatch Instruction that results in a change in Commitment Status will be issued, in accordance with Section 6.3, after review and acceptance of the Start-Up Instruction by the CAISO Operator. An advisory Dispatch Instruction changing the Commitment Status of a resource may be modified by the CAISO Operator to a binding Dispatch Instruction and communicated in accordance with Section 6.3 after review and acceptance by the CAISO Operator. Only binding and not advisory Dispatch Instructions will be issued by the CAISO. For Multi-Stage Generating Resources the CAISO will also issue binding Transition Instructions when the Multi-Stage Generating Resource must change from one MSG Configuration to another. A Transition Instruction is considered binding in any given RTUC run if the Transition Time for the Multi-Stage Generating Resource is such that there would not be sufficient time for a subsequent RTUC run to transition the resource.

\* \* \*

### **34.4 Short-Term Unit Commitment**

At the top of each Trading Hour, immediately after the RTUC run is completed, the CAISO performs an approximately five (5) hour Short-Term Unit Commitment (STUC) run using SCUC and the CAISO Forecast of CAISO Demand to commit Medium Start Units and Short Start Units with Start-Up Times greater than the Time Horizon covered by the RTUC. The Time Horizon for the STUC optimization run will extend three hours beyond the Trading Hour for which the RTUC optimization was run, and will replicate the Bids used in that Trading Hour for these additional hours. The CAISO revises these replicated Bids each time the hourly STUC is run, to utilize the most recently submitted Bids. A Start-Up Instruction produced by STUC is considered binding if the resource could not achieve the target Start-Up Time as determined in the current STUC run in a subsequent RTUC or STUC run as a result of the Start-Up Time of the resource. A Start-Up Instruction produced by STUC is considered advisory if it is not binding, such that the resource could achieve its target start time as determined in the current RTUC run in a subsequent STUC or RTUC run based on its Start-Up Time. A binding Dispatch Instruction produced by STUC that results in a change in Commitment Status will be issued, in accordance with Section 6.3, after review and acceptance of the Start-Up Instruction by the CAISO Operator. The STUC will only

decommit a resource to the extent that resource's physical characteristics allow it to be cycled in the same Time Horizon for which it was decommitted. STUC does not produce prices for Settlement. A Day-Ahead Schedule or RUC Schedule for an MSG Configuration that is later impacted by the resource's derate or outages, will be reconsidered in the STUC process taking into consideration the impacts of the derate or outage on the available MSG Configurations.

### **34.5 General Dispatch Principles**

The CAISO shall conduct all Dispatch activities consistent with the following principles:

- (1) The CAISO shall issue AGC instructions electronically as often as every four seconds from its Energy Management System (EMS) to resources providing Regulation and on Automatic Generation Control to meet NERC and WECC performance requirements;
- (2) In each run of the RTED or RTCD the objective will be to meet the projected Energy requirements over the Time Horizon of that run, subject to transmission and resource operational Constraints, taking into account the short term CAISO Forecast of CAISO Demand adjusted as necessary by the CAISO Operator to reflect scheduled changes to Interchange and non-dispatchable resources in subsequent Dispatch Intervals;
- (3) Dispatch Instructions will be based on Energy Bids for those resources that are capable of intra-hour adjustments and will be determined through the use of SCED except when the CAISO must utilize the RTMD;
- (4) When dispatching Energy from awarded Ancillary Service capacity the CAISO will not differentiate between Ancillary Services procured by the CAISO and Submissions to Self-Provide an Ancillary Service;
- (5) The Dispatch Instructions of a resource for a subsequent Dispatch Interval shall take as a point of reference the actual output obtained from either the State Estimator solution or the last valid telemetry measurement and the resource's operational ramping capability. For Multi-Stage Generating Resources the

determination of the point of reference is further affected by the MSG Configuration and the information contained in the Transition Matrix;

- (6) In determining the Dispatch Instructions for a target Dispatch Interval while at the same time achieving the objective to minimize Dispatch costs to meet the forecasted conditions of the entire Time Horizon, the Dispatch for the target Dispatch Interval will be affected by: (a) Dispatch Instructions in prior intervals, (b) actual output of the resource, (c) forecasted conditions in subsequent intervals within the Time Horizon of the optimization, and (d) operational Constraints of the resource, such that a resource may be dispatched in a direction for the immediate target Dispatch Interval that is different than the direction of change in Energy needs from the current Dispatch Interval to the next immediate Dispatch Interval; considering the applicable MSG Configuration;
- (7)- Through Start-Up Instructions the CAISO may instruct resources to start up or shut down, or may reduce Load for Participating Loads, over the Time Horizon for the RTM based on submitted Bids, Start-Up Costs and Minimum Load Costs, Pumping Costs and Pump Shut-Down Costs, as appropriate for the resource, or for Multi-Stage Generating Resource as appropriate for the applicable MSG Configuration, consistent with operating characteristics of the resources that the SCED is able to enforce. In making Start-Up or Shut-Down decisions in the RTM, the CAISO may factor in limitations on number of run hours or Start-Ups of a resource to avoid exhausting its maximum number of run hours or Start-Ups during periods other than peak loading conditions;
- (8) The CAISO shall only start up resources that can start within the Time Horizon used by the RTM optimization methodology;
- (9) The RTM optimization may result in resources being shut down consistent with their Bids and operating characteristics provided that: (1) the resource does not need to be on-line to provide Energy, (2) the resource is able to start up within the RTM optimization Time Horizon, (3) the Generating Unit is not providing

Regulation or Spinning Reserve, and (4) Generating Units online providing Non-Spinning Reserve may be shut down if they can be brought up within ten (10) minutes as such resources are needed to be online to provide Non-Spinning Reserves; ~~and~~

(10)- For resources that are both providing Regulation and have submitted Energy Bids for the RTM, Dispatch Instructions will be based on the Regulation Ramp Rate of the resource rather than the Operational Ramp Rate if the Dispatch Operating Point remains within the Regulating Range. The Regulating Range will limit the Ramping of Dispatch Instructions issued to resources that are providing Regulation-;

(11) For Multi-Stage Generating Resources the CAISO will issue Dispatch Instructions by Resource ID and Configuration ID;

(12) The CAISO may issue Transition Instructions to instruct resources to transition from one MSG Configuration to another over the Time Horizon for the RTM based on submitted Bids, Transition Costs and Minimum Load Costs, as appropriate for the MSG Configurations involved in the MSG Transition, consistent with Transition Matrix and operating characteristics of these MSG Configurations. The RTM optimization will factor in limitations on Minimum Up Time and Minimum Down Time defined for each MSG configuration and Minimum Up Time and Minimum Down Time at the Generating Unit or Dynamic Resource-Specific System Resource.

### **34.6 Generating Unit And Participating Load Dispatch Instructions**

The CAISO may issue Dispatch Instructions covering:

- (a)- Ancillary Services;
- (b)- Energy, which may be used for:
  - (i)- Congestion relief;
  - (ii)- provision of Imbalance Energy; or

- (iii)- replacement of an Ancillary Service;
- (c)- agency operation of Generating Units, Participating Loads or Interconnection schedules, for example:
  - (i)- output or Demand that can be Dispatched to meet Applicable Reliability Criteria;
  - (ii)- Generating Units that can be Dispatched for Black Start;
  - (iii)- Generating Units that can be Dispatched to maintain governor control regardless of their Energy schedules;
- (d)- the operation of voltage control equipment applied on Generating Units as described in this CAISO Tariff;
- (e)- MSS Load following instructions provided to the CAISO, which the CAISO incorporates to create their Dispatch Instructions; ~~or~~
- (f)- necessary to respond to a System Emergency or imminent emergency; ~~or~~
- (g) Transition Instructions.

### **34.9 Exceptional Dispatch**

The CAISO may issue Exceptional Dispatches for the circumstances described in this Section 34.9, which may require the issuance of forced Shut-Downs, forced Start-Ups, or forced Start-UpsMSG Transitions and shall be consistent with Good Utility Practice. Dispatch Instructions issued pursuant to Exceptional Dispatches shall be entered manually by the CAISO Operator into the Day-Ahead or RTM optimization software so that they will be accounted for and included in the communication of Day-Ahead Schedules and Dispatch Instructions to Scheduling Coordinators. Exceptional Dispatches are not derived through the use of the IFM or RTM optimization software and are not used to establish the LMP at the applicable PNode. The CAISO will record the circumstances that have led to the Exceptional Dispatch. Except as provided in this Section 34.9, the CAISO shall consider the effectiveness of the resource along with Start-Up Costs, Transition Costs, and Minimum Load Costs when issuing Exceptional Dispatches to commit a resource to operate at Minimum Load. When the CAISO issues Exceptional Dispatches for Energy, the CAISO shall also consider Energy Bids, if available and as appropriate. The goal of the CAISO will be to



issue Exceptional Dispatches on a least-cost basis. Imbalance Energy delivered or consumed pursuant to the various types of Exceptional Dispatch is settled according to the provisions in Section 11.5.6.

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### **34.15.1 Resource Constraints**

The SCED shall enforce the following resource physical Constraints:

- (a) Minimum and maximum operating resource limits. Outages and limitations due to transmission clearances shall be reflected in these limits. The more restrictive operating or regulating limit shall be used for resources providing Regulation so that the SCED shall not Dispatch them outside their Regulating Range.
- (b) Forbidden Operating Regions. When ramping in the Forbidden Operating Region, the implicit ramp rate will be used as determined based on the time it takes for the resource to cross its Forbidden Operating Region. A resource can only be ramped through a Forbidden Operating Region after being dispatched into a Forbidden Operation Region. The CAISO will not Dispatch a resource within its Forbidden Operating Regions in the Real-Time Market, except that the CAISO may Dispatch the resource through the Forbidden Operating Region in the direction that the resource entered the Forbidden Operating Region at the maximum applicable Ramp Rate over consecutive Dispatch Intervals. A resource with a Forbidden Operating Region cannot provide Ancillary Services in a particular fifteen (15) minute Dispatch Interval unless that resource can complete its transit through the relevant Forbidden Operating Region within that particular Dispatch Interval.
- (c) Operational Ramp Rates and Start-Up Times. The submitted Operational Ramp Rate for resources shall be used as the basis for all Dispatch Instructions, provided that the Dispatch Operating Point for resources that are providing Regulation remains within their applicable Regulating Range. The Regulating Range will limit the Ramping of Dispatch Instructions issued to resources that are providing Regulation. The Ramp Rate for Non-Dynamic System Resources cleared in the HASP will not be observed. Rather, the ramp

of the Non-Dynamic System Resource will respect inter-Balancing Authority Area Ramping conventions established by WECC. Ramp Rates for Dynamic System Resources will be observed like Participating Generators in the RTD. Each Energy Bid shall be Dispatched only up to the amount of Imbalance Energy that can be provided within the Dispatch Interval based on the applicable Operational Ramp Rate. The Dispatch Instruction shall consider the relevant Start-Up Time as, if the resource is off-line, the relevant Operational Ramp Rate function, and any other resource constraints or prior commitments such as Schedule changes across hours and previous Dispatch Instructions. The Start-Up Time shall be determined from the Start-Up Time function and when the resource was last shut down. The Start-Up Time shall not apply if the corresponding resource is on-line or expected to start.

- (d) Maximum number of daily Start-Ups. The SCED shall not cause a resource to exceed its daily maximum number of Start-Ups.
- (e) Minimum Run Time and Down Time. The SCED shall not start up off-line resources before their Minimum Down Time expires and shall not shut down on-line resources before their Minimum Run Time expires. For Multi-Stage Generating Resources these requirements shall be observed both for the Generating Unit or Dynamic Resource-Specific System Resource and MSG Configuration.
- (f) Operating (Spinning and Non-Spinning) Reserve. The SCED shall Dispatch Spinning and Non-Spinning Reserve subject to the limitations set forth in Section 34.16.3.
- (g) Non-Dynamic System Resources. If Dispatched, each Non-Dynamic System Resource flagged for hourly pre-dispatch in the next Trading Hour shall be Dispatched to operate at a constant level over the entire Trading Hour. The HASP shall perform the hourly pre-dispatch for each Trading Hour once prior to the Operating Hour. The hourly pre-dispatch shall not subsequently be revised by the SCED and the resulting HASP Intertie Schedules are financially binding and are settled pursuant to Section 11.4.

- (h) Daily Energy use limitation to the extent that Energy limitation is expressed in a resource's Bid. If the Energy Limits are violated for purposes of Exceptional Dispatches for System Reliability, the Bid will be settled as provided in Section 11.5.6.1.

### **34.15.2 Calculation Of Dispatch Operating Points After Instructions**

The RTED process shall calculate Dispatch Operating Points as follows:

- (a) After RTUC issues a Start-Up Instruction, RTED moves the Dispatch Operating Point of a resource immediately from zero (0) MW to the PMin, as defined in the Master File or as modified via SLIC, of a Generating Unit at the start of the Dispatch Interval pertaining to the Start-Up Instruction. The Dispatch Operating Point shall then be determined using the resource's applicable Operational Ramp Rate as further described in Sections 34.15.4, 34.15.5, and 34.15.6.
- (b) After RTUC issues a Shut-Down Instruction, RTED shall first ramp the Dispatch Operating Point down to the PMin, as defined in the Master File or as modified via SLIC, of a Generating Unit at the end of the Dispatch Interval pertaining to the Shut-Down Instruction, using the resource's applicable Operational Ramp Rate. The Dispatch Operating Point shall then be set immediately to zero (0) MW.
- (c) After RTUC issues a Transition Instruction: (1) for MSG Configurations where the operating ranges of the two MSG Configurations do not overlap, the RTD will move the Dispatch Operating Point of the resource immediately from the boundary of the "from" MSG Configuration to the boundary of the "to" MSG Configuration, as defined in the Master File or as modified via the CAISO's outages reporting mechanism, of a Multi-Stage Generating Resource; and (2) for MSG Configurations for which the operating ranges of the two MSG Configurations do overlap, RTD will move the Dispatch Operating Point of the resource within the overlapping operating range of the MSG Configuration until the MSG Transition is complete.

### 39.7.1 Calculation Of Default Energy Bids

Default Energy Bids shall be calculated by the CAISO, for the on-peak hours and off-peak hours for both the DAM and RTMs, pursuant to one of the methodologies described in this Section. The Scheduling Coordinator for each Generating Unit owner or Participating Load must rank order the following options of calculating the Default Energy Bid starting with its preferred method. The Scheduling Coordinator must provide the data necessary for determining the Variable Costs unless the Negotiated Rate Option precedes the Variable Cost option in the rank order, in which case the Scheduling Coordinator must have a negotiated rate established with the Independent Entity charged with calculating the Default Energy Bid. If no rank order is specified for a Generating Unit or Participating Load, then the default rank order of (1) Variable Cost Option, (2) Negotiated Rate Option, (3) LMP Option will be applied. For the first ninety (90) days after changes to resource status and MSG Configurations as specified in Section 27.8.3, including the first ninety (90) days after the effective date of Section 27.8.3, the Default Energy Bid option for the resource is limited to the Negotiated Rate Option or the Variable Cost Option.

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#### CAISO Tariff Appendix A

#### Master Definitions Supplement

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#### **- Bid Costs**

The costs for resources manifested in the Bid components submitted, which include the Start-Up Cost, Minimum Load Cost, Energy Bid Cost, Transition Costs, Pump Shut-Down Cost, Pumping Cost, Ancillary Services Bid Cost and RUC Availability Payment.

#### **- Default Resource Adequacy Path**

The registered sequence of MSG Configurations a Multi-Stage Generating Resource has to Start-Up and transition from off-line to reach the default Resource Adequacy MSG Configuration.

#### **- IFM Bid Cost**

-The sum of a BCR Eligible Resource's IFM Start-Up Cost, IFM Minimum Load Cost , IFM Pump Shut-Down Cost, IFM Transition Cost, IFM Pumping Cost, IFM Energy Bid Cost, and IFM AS Bid Cost.

### **- MSG Configuration**

A qualified and registered operating mode of a Multi-Stage Generating Resource, with a distinct set of operating characteristics. All MSG Configurations for Multi-Stage Generating Resources are operable on-line modes.

### **- MSG Transition**

A feasible operation from one MSG Configuration to another as registered in the Transition Matrix associated with a specific Transition Time and Transition Cost.

### **- Multi-Stage Generating Resources**

A Generating Unit or Dynamic Resource-Specific System Resource that for reasons related to its technical characteristics can be operated in various MSG Configurations such that only one such MSG Configuration can be operated in any given Dispatch Interval. In addition, subject to the requirements in Section 27.8, the following technical characteristics qualify a Generating Unit or Dynamic Resource-Specific System Resource as a Multi-Stage Generating Resource if the resource; (1) is a combined cycle gas turbine resource; (2) is a Generating Unit or Dynamic Resource-Specific System Resources with multiple operating or regulating ranges but which can operate in only one of these ranges at any given time; or (3) has one or more Forbidden Operating Regions. Metered Subsystems, Pumped-Storage Hydro Units, and Pumping Loads, and System Resources that are not Dynamic Resource-Specific System Resources do not qualify as Multi-Stage Generating Resources.

### **- RTM Bid Cost**

The total of a resource's RTM Start-Up Cost, RTM Minimum Load Cost, RTM Pump Shut-Down Cost, RTM Transition Cost, RTM Pumping Cost, RTM Energy Bid Cost, and RTM AS Bid Cost.

### **- Transition Cost**

For a Multi-Stage Generating Resources, the dollar cost per feasible transition associated with a given MSG Configuration as registered in the Transition Matrix.

### **- Transition Instructions**

A binding instruction issued by the CAISO to Multi-Stage Generating Resources in the Real-Time that directs the Multi-Stage Generating Resource to move from between MSG Configurations and indicates: (1) "from" and "to" MSG Configurations; and (2) the start time and end time of the MSG Transition.

### **- Transition Matrix**

A matrix that, for Multi-State Generating Resources defines the possible MSG Transitions between all online MSG Configurations including the Transition Times and Transition Costs.

## **- Transition Time**

For a Multi-Stage Generating Resources, the time to complete a MSG Transition, as registered in the Transition Matrix.

\* \* \*

## **Appendix AA**

### **Transition Plan for Multi-Stage Generating Resources**

This Appendix AA describes the registration and qualification requirements for Generating Units and Dynamic Resource-Specific System Resources that intend to qualify and participate in the CAISO Markets as Multi-Stage Generating Resources as of the first day on which the Multi-Stage Generating Resource CAISO Tariff provisions are effective.

No later than sixty (60) days prior to effective date of the CAISO Tariff provisions enabling the Multi-Stage Generating Resource functionality, Scheduling Coordinators shall commence the registration process to register and qualify Generating Units or Dynamic Resource-Specific System Resources as Multi-Stage Generating Resources as of the effective date of the CAISO Tariff provisions for the Multi-Stage Generating Resource functionality. The registration process commences with the submission by the responsible Scheduling Coordinator of the completed Multi-Stage Generating Resource registration form and the resource data template for Generating Unit or Dynamic Resource-Specific System Resource, which the CAISO provides as part of the registration process. After such submission, the CAISO will coordinate with the responsible Scheduling Coordinator to validate that the resource qualifies as a Multi-Stage Generating Resource, and that all the requisite information has been successfully provided to the CAISO. Successful completion of the registration process will occur upon the CAISO's notification to the responsible Scheduling Coordinator that the resource has been successfully qualified as a Multi-Stage Generating Resource. Once the CAISO has provided such notice, the resource will be registered and qualified to participate as a Multi-Stage Generating Resource as of the effective date of the CAISO Tariff provisions enabling the implementation of the Multi-Stage Generating Resource functionality. Scheduling Coordinators may register the number of MSG Configurations as are reasonably appropriate for the unit based on the operating characteristics of the unit, which may not, however, exceed a total of ten MSG Configurations and cannot be fewer than two MSG Configurations. The resource will be

successfully registered and qualified for the requested status and MSG Configuration definitions on the date that the CAISO sends the notification to the responsible Scheduling Coordinator that the resource has been successfully qualified. If the CAISO has reason to believe that the resource's operating and technical characteristics are not consistent with the registered and qualified attributes, the CAISO may request that the Scheduling Coordinator provide additional information necessary to support their registered status and, if appropriate, may require that the resource be registered and qualified more consistent with the resource's operating and technical characteristics, including the revocation of its status as a Multi-Stage Generating Resource. Failure to provide such information may be grounds for revocation of Multi-Generating Resource status.

As part of the registration process, the Scheduling Coordinators must submit to the CAISO a Transition Matrix, which contains the cost and operating constraints associated with feasible transitions between MSG Configurations. The responsible Scheduling Coordinator shall submit for each MSG Configuration a single segment Operational Ramp Rate, and as applicable an Operating Reserves Ramp Rate and Regulating Reserves Ramp Rate. 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 as part of the resource data template provided in the registration process. The MSG Configurations and operational characteristics submitted to and accepted by the CAISO during this registration process will be in effect until the forty-fifth (45<sup>th</sup>) day following the effective date of Section 27.8 of the CAISO Tariff, unless modified as specified below. Prior to that date, the Scheduling Coordinators may not make the following changes to a Generating Unit's or Dynamic Resource-Specific System Resource's attributes:

- (a) Register a Generating Unit or Dynamic Resource-Specific System Resource as a Multi-Stage Generating Resource;
- (b) Change the registered MSG Configurations for a Multi-Stage Generating Resource, which includes the:
  - (a) addition of new MSG Configurations;
  - (b) removal of an existing MSG Configuration;

(c) a change to the definition of a registered MSG Configuration, which includes:

(1) a change in the physical units supporting the MSG Configuration;

(2) a change to the MSG Configuration Start Up and Shut Down flags; and

(3) adding or removing a MSG Transition to the Transition Matrix;

(d) a material change in the Transition Times contained in the Master File, which consists of a change that more than doubles a Transition Time or reduces it to less than half; and

(e) a material change to the maximum Ramp Rate of the MSG Configuration(s) contained in the Master File, which consists of a change that more than doubles the maximum Ramp Rate or reduces it to less than half.

Thirty (30) days before the effective date of the CAISO Tariff provisions enabling the implementation of the Multi-Stage Generating Resource functionality, no changes may be made to any of the Multi-Stage Generating Resource attributes, fundamental or otherwise, except that the resources can drop out Multi-Stage Generating Resource status subject to the timing requirements of the Master file time line. When transitioning to implement these changes across the midnight hour, for any Real-Time Market run in which the changes specified above are to take effect within the Time Horizon of any of the Real-Time Market runs, the CAISO will Schedule, Dispatch, or award resources consistent with either the prior or new status and definitions, as appropriate and required by any Real-Time conditions regardless of the resource's state Scheduled or awarded in the immediately preceding Day-Ahead Market.

Resources that will be participating in the CAISO Markets as Multi-Stage Generating Resources when the CAISO Tariff Multi-Stage Generating Resource provisions become effective must submit all Outages reports required in Section 9 of the CAISO Tariff consistent with the registered MSG Configurations for such resources no later than forty-eight hours prior to the start of the first hour of the effective date of the CAISO Tariff provisions enabling the implementation of the Multi-Stage Generating Resource functionality.



## Definitions

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### Default Resource Adequacy Path

The registered sequence of MSG Configurations a Multi-Stage Generating Resource has to Start-Up and transition from off-line to reach the default Resource Adequacy MSG Configuration.

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### Multi-Stage Generating Resources

A Generating Unit or Dynamic Resource-Specific System Resource that for reasons related to its technical characteristics can be operated in various MSG Configurations such that only one such MSG Configuration can be operated in any given Dispatch Interval. In addition, subject to the requirements in Section 27.8, the following technical characteristics qualify a Generating Unit or Dynamic Resource-Specific System Resource as a Multi-Stage Generating Resource if the resource: (1) is a combined cycle gas turbine resource; (2) is a Generating Unit or Dynamic Resource-Specific System Resources with multiple operating or regulating ranges but which can operate in only one of these ranges at any given time; or (3) has one or more Forbidden Operating Regions. Metered Subsystems, Pumped-Storage Hydro Units, and Pumping Loads, and System Resources that are not Dynamic Resource-Specific System Resources do not qualify as Multi-Stage Generating Resources.

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### MSG Configuration

A qualified and registered operating mode of a Multi-Stage Generating Resource, with a distinct set of operating characteristics. All MSG Configurations for Multi-Stage Generating Resources are operable on-line modes.

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### Transition Matrix

A matrix that, for Multi-Stage Generating Resources defines the possible MSG Transitions between all online MSG Configurations including the Transition Times and Transition Costs.

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