



California ISO
Shaping a Renewed Future

Standards for Imports of Regulation

 California ISO <i>Shaping a Renewed Future</i>	Regulation Standards	ISO Version:	3.0
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REVISION HISTORY

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Introduction

These standards have been developed to implement the California Independent System Operator's ("CAISO") Tariff provisions relating to imports of Regulation, either bid or self-provided, by Scheduling Coordinators ("SCs") with System Resources (i.e., resources located outside the CAISO Balancing Authority Area). Consistent with the provisions of the CAISO Tariff, SCs may bid or self-provide external imports of Regulation from System Resources located outside the CAISO Balancing Authority Area (i.e., located in another Balancing Authority Area jurisdiction), where technically feasible and consistent with all applicable WECC and NERC Reliability Standards, policies, requirements, and guidelines; provided that the operator of such Balancing Authority Area ("Host Balancing Authority") has entered into an operating agreement and provided that such SC has been certified by the CAISO as to their ability to dynamically adjust Interchange Schedules based on control signals issued by the CAISO Energy Management System ("EMS") at any time during a Settlement Period (i.e., relevant Operating Hour) at the sole discretion of the CAISO. Such certification will include a demonstration of the parties' ability to support the dynamic Interchange of Regulation service based on CAISO EMS control signals received by the Host Balancing Authority EMS via dedicated communications links in accordance with these and other relevant CAISO standards and procedures posted on the CAISO Website.

System Resource is defined in the CAISO Tariff and, in the context of these standards, may include a single resource or generating plant, or a portion thereof, located within the Host Balancing Authority Area, or an allocated portion of the Host Balancing Authority Area's EMS/Automatic Generation Control that is directly responsive to the Host Balancing Authority Area EMS/AGC, or other resources available to the Host Balancing Authority.

These standards shall be interpreted in the context of the CAISO Tariff and the applicable agreements. These standards are not intended to alter or change the meaning of any material provision thereof. Unless the context otherwise indicates, any word or expression defined in the Appendix A, Master Definitions Supplement to the CAISO Tariff and capitalized herein shall have the same meaning where used in these standards.

Applicability

Standards Applicable to Scheduling Coordinators, Balancing Authorities, and the CAISO

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1.0. Contractual Relationships

- 1.1. A Host Balancing Authority Area is the Balancing Authority Area where the System Resource that is bidding or self-providing Regulation resides. The Host Balancing Authority Area may, or may not, be directly interconnected with the CAISO Balancing Authority Area.
- 1.2. The Host Balancing Authority must execute an operating agreement with the CAISO particular to the operation of the functionality supporting dynamic imports of Regulation to the CAISO Balancing Authority Area.
- 1.3. Any intermediary Balancing Authority through whose EMS the dynamic Regulation signal passes and that has the authority to modify the Dynamic Schedule EMS signal must execute an operating agreement with the CAISO committing to install equipment sufficient to meet the communications and telemetry requirements set forth in these standards to facilitate the imports of Regulation into the CAISO Balancing Authority Area
- 1.4. The SC for the System Resource must have the necessary operational and contractual arrangements in place with the Host Balancing Authority. Such arrangements must include the Host Balancing Authority's ability to receive telemetry from the System Resource and to send control signals to the System Resource. Proof of such arrangements must be provided to the CAISO.
- 1.5. The SC must request the certification of a System Resource to provide Regulation for the CAISO Balancing Authority Area and cooperate in the testing of such System Resource in accordance with Section 2.0 below.
- 1.6. Only CAISO tested and certified System Resources will be allowed to bid and/or self-provide Regulation service into the CAISO Balancing Authority Area.

2.0. Certification, Testing, and Performance Monitoring

- 2.1. The SC must request the certification of a System Resource to provide Regulation for the CAISO Balancing Authority Area and cooperate, along with the Host Balancing Authority, in testing of such System Resource in accordance with the CAISO Tariff and applicable CAISO Operating Procedures.

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- 2.2. Regulation imports will be tested, for certification, in accordance with the applicable CAISO Operating Procedures. All requests for certification of Regulation imports will be reviewed and approved by the CAISO with respect to any technical limitations imposed by existing operational considerations, such as Remedial Action Schemes, operating Nomograms, and scheduling procedures. These reviews may impose certain Regulation import limits in addition to those outlined below in Section 4.0. Therefore, interested parties are advised and encouraged to contact the CAISO before they begin the process of the necessary systems design, preparation, and implementation for import of Regulation to the CAISO Balancing Authority Area.
- 2.3. The CAISO will measure the performance of accepted Regulation service against (1) the awarded range of Regulation capacity (in the applicable direction(s) for upward Regulation and downward Regulation); (2) the certified limits; and (3) the bid Ramp Rate, which shall be validated by the CAISO against the certified Ramp Rate.
- 2.4. The SC for the System Resource must notify the CAISO should any changes, modifications, or upgrades affecting control and/or performance of the System Resource be made. Upon such notification, the CAISO, at its discretion, may require that the System Resource be re-certified to import Regulation into the CAISO Balancing Authority Area.

3.0. Communications

- 3.1. Dedicated dual redundant digital communications links between the CAISO's EMS and the Host Balancing Authority Area EMS are required.
- 3.2. The dedicated dual redundant circuits will be T1-class, or equivalent, and diversely routed between the Host Balancing Authority Area EMS and the CAISO Balancing Authority Area EMS on separate physical paths and devices, utilizing the inter-control center communications protocol ("ICCP") or other agreed-upon protocol.

4.0. Limits

- 4.1. The CAISO reserves the right to establish limits applicable to the amount of Regulation service imported into the CAISO Balancing Authority Area. Such limits may be established based on any one, or a combination, of the following considerations: a percentage of total CAISO Balancing Authority Area Regulation requirements; a percentage at a particular Intertie or a Transmission Interface; a percentage of total Regulation requirements in a

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specific Ancillary Service Region; or operating factors which may include, but are not limited to, operating Nomograms, Remedial Action Schemes, Special Protection Systems, scheduling and Curtailment procedures, or any potential single points of failure associated with the actual delivery process.

- 4.2. The CAISO will give Market Participants at least seven days advance notice of any changes to the established limits of Regulation imports (e.g., via Market Notices and/or posting on the CAISO Website). Notwithstanding this intention, the CAISO may change such limits on a shorter notice should unexpected changes in system conditions warrant such decision to maintain System Reliability. In this instance, the CAISO will notify the Market Participants as soon as practical.
- 4.3. Notwithstanding potential Regulation import limits described in Section 4.1, the following rules shall apply:
 - 4.3.1. Regulation can only be imported to the extent that it is awarded through the market optimization and other processes in the Day-Ahead Market and Real-Time Market.
 - 4.3.2. Regulation service cannot be imported on the direct current ("DC") Interties (e.g., Regulation service cannot be scheduled at the Nevada-Oregon Border ("NOB") on the Pacific DC Intertie ("PDCI")).

5.0. Scheduling

- 5.1. The CAISO will assign a unique identification to the System Resource to be certified and scheduled by the SC.
 - 5.1.1. The CAISO and each SC will agree to uniquely identify Dynamic Schedules associated with the System Resource (i.e., by stating the SC name, name of the Intertie, and assigning unique Schedule identification).
 - 5.1.2. For purposes of bidding and scheduling, the SC will attribute: (1) Regulation to the System Resource ID (i.e., a unique identification of the SC and System Resource) and (2) Energy to Dynamic Schedules at the particular Intertie.

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- 5.2. All imports of Regulation capacity must be self-provided or bid in either the Day-Ahead Market (DAM) or Real-Time Market (RTM).
- 5.3. Each import of Regulation capacity must be flagged as either self provided or bid in each applicable hour of the relevant Trading Day at a particular Intertie with the CAISO Balancing Authority Area.
- 5.4. Each import of Regulation capacity must be bid with a Ramp Rate that is less than or equal to the Ramp Rate that has been certified by the CAISO.
 - 5.4.1. The CAISO will validate each bid or self-provided amount of Regulation against the certified Ramp Rate and the certified maximum and minimum capability (PMax and PMin), whichever is applicable, of the System Resource.
 - 5.4.2. Bids and self-provision of Regulation that do not comport with the certified Ramp Rate, PMax, and PMin will be rejected by the CAISO during the scheduling process.
 - 5.4.3. The amount of upward Regulation service will be limited by the bid Ramp Rate (which will be validated to be less than or equal to the certified Ramp Rate).
 - 5.4.4. The amount of downward Regulation service will be limited by the amount of Energy scheduled into the CAISO Balancing Authority Area at the Intertie attributed to the System Resource (and thus establishing its Dispatch Operating Point (DOP)) and by the bid Ramp Rate (which will be validated to be less than or equal to the certified Ramp Rate) and either the certified or bid operating limits.
- 5.5. All scheduling standards related to the CAISO Tariff, WECC scheduling practices and NERC Reliability Standards, as well as any subsequent scheduling and operating standards adopted by WECC and/or NERC, will apply.
- 5.6. The Host Balancing Authority Area will be identified in the scheduling templates submitted by the Scheduling Coordinator.
- 5.7. Consistent with WECC and NERC requirements, firm transmission service must be arranged by the responsible parties on all transmission segments comprising the scheduling path from the System Resource to the pertinent Intertie.

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6.0. Real-time Telemetry and Control

- 6.1. All CAISO telemetry and control associated with the delivery of imported Regulation service will be received from and sent to the Host Balancing Authority Area.
- 6.2. The CAISO EMS will communicate with the Host Balancing Authority Area EMS based on the following time standard for Regulation service:
 - 6.2.1. Host Balancing Authority Area EMS receives CAISO EMS control signals on a two-second rate;
 - 6.2.2. Host Balancing Authority Area EMS issues control signals to, and receives return signals from, the System Resource on a four-second rate;
 - 6.2.3. Host Balancing Authority Area EMS sends data back to the CAISO EMS (including the dynamic Interchange associated with the System Resource) on a two-second rate; and
 - 6.2.4. The CAISO time standards for Regulation service apply in both the sending and return directions, resulting in a total maximum eight (8) second round trip for signals to travel from the CAISO EMS to the System Resource, through the Host Balancing Authority Area EMS, and back to the CAISO EMS.
- 6.3. Control signals issued by CAISO EMS:
 - 6.3.1. The Host Balancing Authority Area EMS will be able to receive control signals (e.g., desired set-point) in real-time, from the CAISO EMS, via the ICCP or other agreed-upon protocol, causing the System Resource to vary its Energy production or allocation level from the prescheduled production level (i.e., the Dispatch Operating Point) by the amount equal to the difference between the new set-point issued and the DOP, times the Ramp Rate. [Note: In the context of these standards, "set-point" may not necessarily refer to the governor set-point of a physical resource, but may rather describe a MW production level or allocation level request sent to a System Resource which is mapped in the Host Balancing Authority Area EMS.]
 - 6.3.2. For each Operating Hour for which a System Resource is scheduled to deliver Regulation service, the CAISO will provide, at a minimum, via the ICCP or other agreed-upon protocol to the Host Balancing Authority Area EMS, the following data for each System Resource:
 - 6.3.2.1. MW Set-Point: If the delivered amount is different from the desired System Resource MW in accordance with the CAISO's AGC request, the Host Balancing Authority Area's AGC will cause the delivered amount to be ramped to this value at the specified Ramp Rate. If this value is outside the specified high or low Regulation limits, ramping will

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stop when the limit is reached. This value will be supplied every 4 seconds.

- 6.3.2.2. Regulation Low Limit: Minimum deliverable MW (adjusted for the associated DOP). Deliveries will not be ramped below this limit.
- 6.3.2.3. Regulation High Limit: Maximum deliverable MW (adjusted for the associated DOP). Deliveries will not be ramped above this limit.
- 6.3.2.4. Sustained Ramp Rate: Rate at which the actual delivered MW will be ramped to the set-point in MW/minute (as calculated by the CAISO AGC, but not faster than the lesser of, the certified or bid Ramp Rate).

6.4. Telemetry received by CAISO EMS

- 6.4.1. Telemetered quantities of more than one System Resource associated with a particular Host Balancing Authority Area may not be aggregated (i.e., telemetry received by the CAISO EMS must be associated with each prescheduled amount of Regulation capacity that is self-provided or awarded by the CAISO to a Scheduling Coordinator in DAM or RTM Schedules for a particular System Resource).
- 6.4.2. Dynamic Interchange attributed to a particular System Resource must be available and telemetered to the CAISO EMS from the Host Balancing Authority Area EMS. Each System Resource/SC may be certified to import Regulation at only one CAISO Intertie.
 - 6.4.2.1. The telemetered megawatts of dynamic Interchange, during the relevant Operating Hour, must reflect the response of the System Resource to control signals issued by the CAISO's EMS to the Host Balancing Authority Area EMS.
 - 6.4.2.2. Telemetered megawatt-hours of dynamic Interchange, at the end of each Operating Hour, must separately and independently reflect the integrated sum of MW delivered from each System Resource responding to CAISO EMS control signals.
- 6.4.3. For each Operating Hour for which a System Resource is scheduled to deliver Regulation service, the Host Balancing Authority Area will provide, at a minimum, via the ICCP or other agreed-upon protocol to the CAISO EMS, the following data for each System Resource:
 - 6.4.3.1. On/Off Line Status: "On" if one of the following values is non-zero: MW being delivered, or the delivered MW for the current AGC cycle. "Off" if both of the foregoing values are zero.
 - 6.4.3.2. On/Off AGC Control Status: "On" if the System Resource is capable of responding to AGC control, "off" otherwise. When the System Resource is available, this will be "on" unless the Host Balancing Authority Area's AGC is tripped or suspended. When the System Resource is unavailable, this will be "off."

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- 6.4.3.3. Regulating Energy Being Delivered: Whenever the CAISO sends a new set-point, the Host Balancing Authority Area’s AGC will cause the System Resource to be ramped to the set-point at the specified Ramp Rate (within the specified low and high limits). Based on the requested set-point and agreed upon Ramp Rate, the amount of Energy being delivered to the Intertie with the CAISO Balancing Authority Area will be telemetered to the CAISO EMS every 4 seconds, and will establish the dynamic Regulation schedule accounted to the specified CAISO Intertie.
- 6.4.3.4. Operating Low Limit: This will be the Host Balancing Authority Area’s scheduled low limit for the System Resource. This value is the operating point established by subtracting the accepted downward Regulation schedule from the operating base point established by an accepted associated Energy import schedule at the relevant Intertie (see Section 5.1.1).
- 6.4.3.5. Operating High Limit: This will be the Host Balancing Authority Area’s scheduled high limit for the System Resource. This value is the operating point established by adding the accepted upward Regulation schedule to the operating base point established by an accepted associated Energy import schedule at the relevant Intertie (see Section 5.1.1).

6.5. No Regulation Award:

System Resources that are not awarded Regulation service for an Operating Hour must follow the Automated Dispatch System (ADS) instructions when the CAISO is communicating Dispatch Instructions to the SC.

7.0. Financial Settlements

- 7.1. All CAISO financial Settlements, including any applicable compliance related adjustments, are with SCs based on the established and delivered dynamic Regulation schedule, not with the Host Balancing Authority or operator/owner of the System Resource.
- 7.2. All CAISO financial penalties and sanctions, including any relevant WECC or NERC fines attributed to the CAISO, are applicable to SCs based on their established and delivered Regulation schedule, not with the Host Balancing Authority or operator/owner of the System Resource.
- 7.3. The CAISO has no responsibility or obligation in any financial or after the fact settlements between the Host Balancing Authority and the owner/operator of the System Resource. All financial and after the fact settlements with respect to the capacity utilization and Energy production of the pertinent System Resource will be handled directly between the

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Host Balancing Authority and the resource owner or its appointed representative.

- 7.4. The CAISO will include delivered Regulation Energy in the reconciliation of scheduled and metered quantities for the purpose of inadvertent Interchange accounting.

Document Approval

Responsible Manager's Signature: Signature on file

Mike Russell, Manager, Meter Engineering and Analysis
