

California Independent System Operator Corporation  
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**Appendix M**

**Dynamic Scheduling Protocol (DSP)**

**1. DYNAMIC SCHEDULES OF IMPORTS TO THE CAISO BALANCING AUTHORITY AREA**

**1.1 Consistency with NERC/WECC Policies and Requirements**

**1.1.1** Scheduling and operation of Dynamic Schedule functionalities must comply with all applicable NERC and WECC reliability standards, policies, requirements, and guidelines regarding inter-Balancing Authority Area scheduling, in accordance with Section 4.5.4.3 of the CAISO Tariff.

**1.2 Contractual Relationships**

**1.2.1** The Host Balancing Authority must execute an operating agreement with the CAISO particular to the operation of the functionality supporting dynamic imports of Energy, and/or Energy associated with non-Regulation Ancillary Services to the CAISO Balancing Authority Area.

**1.2.2** The Scheduling Coordinator for the System Resource must execute a Dynamic Scheduling Agreement for Scheduling Coordinators with the CAISO governing the operation of the Dynamic Schedule functionality, which agreement will include a provision for its termination based on failure to comply with these standards.

**1.2.3** The Scheduling Coordinator for the System Resource must have the necessary operational and contractual arrangements in place with the Host Balancing Authority to implement Section 1.3 and other provisions of this Appendix M. Such arrangements must include the Host Balancing Authority's ability to receive telemetry from the System Resource and to issue a Dynamic Schedule signal pertinent to that System Resource to the CAISO. Proof of such arrangements must be provided to the CAISO.

**1.3 Communications, Telemetry, and Other Technical Requirements**

**1.3.1** The communication and telemetry requirements set forth in the CAISO's Standards for Imports of Regulation, or any successor CAISO standards regarding the technical arrangements for imports of Regulation posted on the CAISO Website, will apply to all Dynamic Schedules, except for (a) those dynamic functionalities established prior to the CAISO Operations Date, (b) the requirements that are specific solely to Regulation, and (c) the requirements set forth below.

**1.3.2** A dedicated primary communications link and a backup communications link between the CAISO's EMS and the Host Balancing Authority Area EMS are required.

**1.3.3** The primary circuit will be T1-class, or equivalent, utilizing the inter-control center communications protocol ("ICCP"). The backup communications link will be diversely routed between the Host Balancing Authority Area EMS and the CAISO Balancing Authority Area EMS on separate physical paths and devices, provided that the CAISO may approve an alternative means of providing backup communications if the circumstances warrant.

**1.3.4** A dedicated primary communications link and a backup communications link between the Host Balancing Authority Area EMS and any Intermediary Balancing Authority Area EMS are required, if requested by the Intermediary Balancing Authority Area.

**1.3.5** The Balancing Authority Area hosting a Dynamic System Resource must have a mechanism implemented to override the associated dynamic signal.

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- 1.3.6 The dynamic signal must be properly incorporated into all involved Balancing Authority Areas' ACE equations.
- 1.3.7 The System Resource must have communications links with the Host Balancing Authority Area consistent with this Appendix M.

**1.4 Limits on Dynamic Imports**

- 1.4.1 The CAISO reserves the right to establish limits applicable to the amount of any Ancillary Services and/or Energy imported into the CAISO Balancing Authority Area, whether delivered dynamically or statically. Such limits may be established based on any one, or a combination, of the following considerations: a percentage of, or a specific import limit applicable to, total CAISO Balancing Authority Area requirements; a percentage at, or a specific import limit applicable to, a particular Intertie or a Transmission Interface; a percentage of, or a specific import limit applicable to, total requirements in a specific Ancillary Service Region; or operating factors which may include, but are not limited to, operating Nomograms, Remedial Action Schemes, protection schemes, scheduling and curtailment procedures, or any potential single points of failure associated with the actual delivery process. The CAISO may implement a moratorium on the establishment of new Dynamic Schedules associated with a particular Intertie in the event it determines that the volume of dynamic transfers could have an adverse effect on System Reliability. In the event the CAISO implements such a moratorium, the CAISO shall undertake studies to determine an appropriate allocation of the capacity of the affected Intertie to dynamic transfers.
- 1.4.2 The CAISO may, at its discretion, either limit or forego procuring Ancillary Services at particular Balancing Authority Area Interties to ensure that Operating Reserves are adequately dispersed throughout the CAISO Balancing Authority Area as required by NERC and WECC reliability standards and any requirements of the NRC.
- 1.4.3 A Dynamic System Resource and its Dynamic Schedules must be permanently associated with a particular CAISO Intertie (the CAISO may, from time to time and at its discretion, allow for a change in such pre-established association of the Dynamic System Resource with a particular CAISO Intertie).

**1.5 Operating and Scheduling Requirements**

- 1.5.1 For any Operating Hour for which Ancillary Services (and associated Energy) is scheduled dynamically to the CAISO from the System Resource, firm transmission service must be reserved across the entire Dynamic Schedule transmission path external to the CAISO Balancing Authority Area. For any Operating Hour for which only Energy is scheduled dynamically to the CAISO from the System Resource, transmission service must be reserved across the entire Dynamic Schedule transmission path external to the CAISO Balancing Authority Area, or must be available within the Operating Hour, sufficient to support the Schedule and Dispatch of the System Resource. In the event that the System Resource has not established a sufficient transmission reservation prior to the Operating Hour, and will not be able to use additional transmission within the Operating Hour, to support Dispatch up to its maximum available capacity, a derate must be reported in the CAISO's Outage management system to limit its Dispatch to its available transmission.
- 1.5.2 All Dynamic Schedules associated with Dynamic System Resources must be electronically tagged (by use of an E-Tag).
- 1.5.3 Formal inter-Balancing Authority Area Dynamic Schedules may be issued only by the Dynamic System Resource's Host Balancing Authority Area and must be routed through the EMSs of any Intermediary Balancing Authority Area, if requested by the Balancing Authority for the Intermediary Balancing Authority Area.

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- 1.5.4** The CAISO will procure (or allow for self-provision of) Operating Reserves and Regulation for Loads served by imports from Dynamic System Resources, unless otherwise agreed to or as reflected in the Dynamic Scheduling Host Balancing Authority Operating Agreement.
- 1.5.5** All Energy Interchange Schedules associated with dynamically scheduled imports of Spinning Reserve and Non-Spinning Reserve will be afforded similar treatment (i.e., resource contingent firm).
- 1.5.6** The dynamic signal must be integrated over time by the Host Balancing Authority Area for every Operating Hour.
- 1.5.7** Notwithstanding any Dispatches of the System Resource in accordance with the CAISO Tariff, the CAISO shall have the right to issue operating orders as defined in Section 37.2.1.1 of the CAISO Tariff to the System Resource either directly or through the Host Balancing Authority Area for emergency or contingency reasons, or to ensure the CAISO's compliance with operating requirements based on WECC or NERC requirements and policies (e.g., WECC's Unscheduled Flow Reduction Procedure). However, such operating orders may be issued only within the range of the CAISO-accepted Energy and Ancillary Services, Bids for a given Operating Hour (or the applicable "sub-hour" interval).
- 1.5.8** If there is no Dynamic Schedule in the CAISO's Day-Ahead Market or RTM, the dynamic signal must be at "zero" ("0") except when in response to CAISO's Dispatch Instructions associated with accepted Ancillary Services or Energy Bids.
- 1.5.9** The Scheduling Coordinator for the Dynamic System Resource must have the ability to override the associated Dynamic Schedule in order to respond to the operating orders of the CAISO or the Host Balancing Authority.
- 1.5.10** Unless the Dynamic System Resource (1) is implemented as a directly-telemetered Load following functionality, (2) is base-loaded Regulatory Must-Take Generation, (3) responds to a CAISO intra-hour Dispatch Instruction, or (4) is an Eligible Intermittent Resource, the Dynamic Schedule representing such resource must follow WECC-approved practice of 20-minute ramps centered at the top of the hour. The CAISO does not provide any special Settlements treatment nor offer any CAISO Tariff exemptions for dynamic Load following functionalities.
- 1.5.11** In Real-Time the Dynamic Schedule may not exceed the CAISO's Dispatch Operating Point. The Dispatch Operating Point represents not only the estimated Dynamic System Resource's Energy but also, in combination with any Ancillary Service Award that has not been dispatched as Energy, the transmission reservation on the associated CAISO Intertie.
- 1.5.12** Only one Dynamic System Resource may be associated with any one physical generating resource, unless the CAISO approves an implementation plan to establish multiple Dynamic System Resources for that generating resource.
- 1.5.13** If the Scheduling Coordinator for the Dynamic System Resource desires to participate in CAISO's Regulation market, all provisions of the CAISO's Standards for Imports of Regulation, or any successor CAISO standards regarding the technical arrangements for imports of Regulation posted on the CAISO Website, shall apply.

**1.6 Certification, Testing, and Performance Monitoring of Dynamic Imports of Ancillary Services**

Scheduling Coordinators must be certified separately for each Ancillary Service. Scheduling Coordinators that wish to be certified for imports of Regulation shall be subject to certification under the Standards for Imports of Regulation, or any successor CAISO standards regarding the technical arrangements for imports of Regulation posted on the CAISO Website, subject to verification of consistency with the requirements of this Appendix M.

- 1.6.1** The Scheduling Coordinator must request the certification of a System Resource to provide Ancillary Services for the CAISO Balancing Authority Area and cooperate, along with the Host Balancing Authority, in the testing of such System Resource in accordance with the CAISO Tariff and applicable CAISO Operating Procedures.
- 1.6.2** Only CAISO tested and certified System Resources will be allowed to bid and/or self-provide Ancillary Services into the CAISO Balancing Authority Area.
- 1.6.3** Dynamic Ancillary Services imports will be certified through testing, in accordance with the applicable CAISO Operating Procedures. All requests for certification of dynamic Ancillary Services 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 Ancillary Services import limits in addition to those outlined in Section 1.4.1 of this Appendix M. 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 Ancillary Services to the CAISO Balancing Authority Area.
- 1.6.4** The CAISO will measure the performance of the Dynamic Schedule of Energy associated with an accepted Ancillary Services Bid against (1) the awarded range of Ancillary Service capacity; (2) the certified limits; and (3) the bid Ramp Rate, which shall be validated by the CAISO against the certified Ramp Rate.
- 1.6.5** The Scheduling Coordinator 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 Ancillary Services into the CAISO Balancing Authority Area.

**1.7 Compliance, Losses, and Financial Settlements**

- 1.7.1** Energy delivered in association with Dynamic System Resources will be subject to all provisions of the CAISO's imbalance energy markets (just as is the case with CAISO intra-Balancing Authority Area Generating Units of Participating Generators).
- 1.7.2** Dynamically scheduled and delivered Ancillary Services will be subject to the CAISO's compliance monitoring and remedies, just as any CAISO intra-Balancing Authority Area Generating Units of Participating Generators.
- 1.7.3** All Day-Ahead Market and RTM submitted Dynamic Schedules shall be subject to CAISO Congestion Management and as such may not exceed their transmission reservations in Real-Time (with the exception of intra-hour Dispatch Instructions of the Energy associated with accepted Ancillary Services Bids or Dispatch Instructions for imbalance energy).

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- 1.7.4 All Dynamic Schedules and delivered Energy shall be subject to the standard CAISO Transmission Loss calculation as described in Section 27.5.1.1 and Appendix C of the CAISO Tariff.
- 1.7.5 Any transmission losses attributed to the Dynamic Schedule on transmission system(s) external to the CAISO Balancing Authority Area will be the responsibility of the owner(s)/operator(s) of the Dynamic System Resource.
- 1.7.6 Responsible Scheduling Coordinators will be able to report de-rates affecting the Dynamic System Resource through the CAISO's outage management system.
- 1.7.7 Should there be any need or requirement, whether operational or procedural, for the CAISO to make Real-Time adjustments to the CAISO's inter-Balancing Authority Area Interchange Schedules (to include curtailments), Dynamic Schedules shall be treated in the same manner as similarly situated and/or effective static CAISO Interchange Schedules.

**2. DYNAMIC SCHEDULES OF EXPORTS OF ENERGY FROM GENERATING UNITS IN THE CAISO BALANCING AUTHORITY AREA**

**2.1 Consistency with NERC/WECC Policies and Requirements**

- 2.1.1 Scheduling and operation of Dynamic Schedule functionalities must comply with all applicable NERC and WECC reliability standards, policies, requirements, and guidelines regarding inter-Balancing Authority Area scheduling, in accordance with Section 4.5.4.3 of the CAISO Tariff.

**2.2 Contractual Relationships**

- 2.2.1 A Balancing Authority receiving a Dynamic Schedule of an export of Energy from a Generating Unit in the CAISO Balancing Authority Area must execute an operating agreement with the CAISO particular to the operation of the functionality supporting dynamic exports of Energy from the CAISO Balancing Authority Area.
- 2.2.2 The Scheduling Coordinator for a Dynamic Schedule of an export of Energy from a Generating Unit must execute a Dynamic Scheduling Agreement for Scheduling Coordinators with the CAISO governing the operation of the Dynamic Schedule functionality, which agreement will include a provision for its termination based on failure to comply with these standards.
- 2.2.3 The Scheduling Coordinator for a Dynamic Schedule of an export of Energy from a Generating Unit must have the necessary operational and contractual arrangements in place with the Balancing Authority receiving the export Dynamic Schedule to implement Section 2.3 and other provisions of this Appendix M. Such arrangements must include the Balancing Authority's ability to receive telemetry from the Generating Unit and to receive a Dynamic Schedule signal pertinent to that Generating Unit from the CAISO. Proof of such arrangements must be provided to the CAISO.

**2.3 Communications, Telemetry, and Other Technical Requirements**

- 2.3.1 The communication and telemetry requirements set forth in the applicable CAISO Business Practice Manual will apply to a Generating Unit that is the source of the Energy for a Dynamic Schedule of exports of Energy, in addition to the requirements set forth in this Appendix M applicable to Dynamic Schedules of exports of Energy.
- 2.3.2 A dedicated primary communications link and a backup communications link between the CAISO's EMS and the EMS of the Balancing Authority Area receiving the Dynamic Schedule are

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required.

- 2.3.3** The primary circuit will be T1-class, or equivalent, utilizing the inter-control center communications protocol ("ICCP"). The backup communications link will be diversely routed between the EMS of the Balancing Authority Area receiving the Dynamic Schedule and the CAISO Balancing Authority Area EMS on separate physical paths and devices, provided that the CAISO may approve an alternative means of providing backup communications if the circumstances warrant.
- 2.3.4** A primary dedicated communications link and a backup communications link between the EMS of the Balancing Authority Area receiving the Dynamic Schedule and any Intermediary Balancing Authority Area EMS are required, if requested by the Intermediary Balancing Authority Area.
- 2.3.5** The CAISO shall have a mechanism implemented to override the associated dynamic signal for a Dynamic Schedule of an export of Energy from a Generating Unit.
- 2.3.6** The dynamic signal must be properly incorporated into all involved Balancing Authority Areas' ACE equations.
- 2.3.7** The Generating Unit must have communications links with the Balancing Authority Area receiving a Dynamic Schedule consistent with this Appendix M.
- 2.3.8** The dynamic signal must be properly incorporated into the CAISO's market systems.

**2.4 Limits on Dynamic Exports**

- 2.4.1** The CAISO reserves the right to establish limits applicable to the amount of any Energy exported from the CAISO Balancing Authority Area, whether delivered dynamically or statically. Such limits may be established based on any one, or a combination, of the following considerations: a percentage of, or a specific export limit applicable to, total CAISO Balancing Authority Area requirements; a percentage at, or a specific export limit applicable to, a particular Intertie or a Transmission Interface; a percentage of, or a specific export limit applicable to, total requirements in a specific Ancillary Service Region; or operating factors which may include, but are not limited to, operating Nomograms, Remedial Action Schemes, protection schemes, scheduling and curtailment procedures, or any potential single points of failure associated with the actual delivery process. The CAISO may implement a moratorium on the establishment of new Dynamic Schedules associated with a particular Intertie in the event it determines that the volume of dynamic transfers could have an adverse effect on System Reliability. In the event the CAISO implements such a moratorium, the CAISO shall undertake studies to determine an appropriate allocation of the capacity of the affected Intertie to dynamic transfers.
- 2.4.2** A Dynamic Schedule of an export of Energy from a Generating Unit in the CAISO Balancing Authority Area must be permanently associated with a particular CAISO Intertie (the CAISO may, from time to time and at its discretion, allow for a change in such pre-established association of the Generating Unit with a particular CAISO Intertie).

**2.5 Operating and Scheduling Requirements**

- 2.5.1** All Dynamic Schedules associated with exports of Energy from a Generating Unit must be electronically tagged (by use of an E-Tag).
- 2.5.2** Formal inter-Balancing Authority Area Dynamic Schedules of the export of Energy from a Generating Unit may be issued only by the CAISO as the Host Balancing Authority Area and must be routed through the EMSs of any Intermediary Balancing Authority Area, if requested by the Intermediary Balancing Authority Area.

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- 2.5.3** The Balancing Authority receiving the Dynamic Schedule of the export of Energy from the CAISO Balancing Authority Area is responsible for Operating Reserves and Regulation for Loads served by such exports of Energy, unless the receiving Balancing Authority and the CAISO otherwise agree as reflected in the Dynamic Scheduling Host Balancing Authority Operating Agreement.
- 2.5.4** The dynamic signal must be integrated over time by the CAISO for every Operating Hour.
- 2.5.5** Notwithstanding any Dispatches of the Generating Unit in accordance with the CAISO Tariff, the CAISO shall have the right to issue operating orders as defined in Section 37.2.1.1 of the CAISO Tariff to the Generating Unit either directly or through the receiving Balancing Authority Area for emergency or contingency reasons, or to ensure the CAISO's compliance with operating requirements based on WECC or NERC requirements and policies (e.g., WECC's Unscheduled Flow Reduction Procedure). However, such operating orders may be issued only within the range of the CAISO-accepted Energy Bids for a given Operating Hour (or the applicable "sub-hour" interval).
- 2.5.6** If there is no Dynamic Schedule in the CAISO's Day-Ahead Market or RTM, the dynamic signal must be at "zero" ("0").
- 2.5.7** The Scheduling Coordinator for a Dynamic Schedule of an export of Energy from a Generating Unit must have the ability to override the associated Dynamic Schedule in order to respond to the operating orders of the CAISO or the Host Balancing Authority.
- 2.5.8** Unless the Dynamic Schedule of an export of Energy from a Generating Unit (1) is implemented as a directly-telemetered load following functionality, (2) is base-loaded Regulatory Must-Take Generation, (3) responds to an intra-hour dispatch instruction from the receiving Balancing Authority, or (4) is an Eligible Intermittent Resource, the Dynamic Schedule representing such resource must follow WECC-approved practice of 20-minute ramps centered at the top of the hour. The CAISO does not provide any special Settlements treatment nor offer any CAISO Tariff exemptions for dynamic load following functionalities.
- 2.5.9** In Real-Time the Dynamic Schedule may not exceed the CAISO's Dispatch Operating Point, which reflects the dynamic signal received by the CAISO from the Balancing Authority receiving the dynamically-scheduled Energy. The CAISO's Dispatch Operating Point represents not only the estimated Energy from the Generating Unit for export but also the transmission reservation on the associated CAISO Intertie.
- 2.5.10** Only one Dynamic Schedule may be associated with any one physical Generating Unit, unless the CAISO approves an implementation plan to establish multiple Dynamic Schedules for that Generating Unit.
- 2.6 Compliance, Losses, and Financial Settlements**
- 2.6.1** Energy delivered in association with a Dynamic Schedule of an export of Energy from a Generating Unit will be subject to all provisions of the CAISO's imbalance energy markets (just as is the case with CAISO intra-Balancing Authority Area Generating Units of Participating Generators).
- 2.6.2** All Day-Ahead Market and RTM submitted Dynamic Schedules shall be subject to CAISO Congestion Management and as such may not exceed their transmission reservations in Real-Time (with the exception of intra-hour Dispatch Instructions for imbalance energy issued by the CAISO and responses to the dynamic signal from the Balancing Authority receiving the Dynamic Schedule of the export of Energy).



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- 2.6.3** All Dynamic Schedules and delivered Energy shall be subject to the standard CAISO Transmission Loss calculation as described in Section 27.5.1.1 and Appendix C of the CAISO Tariff.
- 2.6.4** Any transmission losses attributed to the Dynamic Schedule on transmission system(s) external to the CAISO Balancing Authority Area will be the responsibility of the owner(s)/operator(s) of the Generating Unit associated with a Dynamic Schedule of an export of Energy.
- 2.6.5** Should there be any need or requirement, whether operational or procedural, for the CAISO to make Real-Time adjustments to the CAISO's inter-Balancing Authority Area Interchange Schedules (to include curtailments), Dynamic Schedules shall be treated in the same manner as similarly situated and/or effective static CAISO Interchange Schedules.