



California ISO
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Revised Draft Final Proposal for Participation of Non-Generator Resources in California ISO Ancillary Services Markets

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1 Executive Summary

This proposal recommends modifications to existing California Independent System Operator Corporations (ISO) operating and technical requirements for ancillary services in order to facilitate participation by non-generator resources in the ISO's ancillary services markets.

The ISO commenced this initiative to comply with FERC Order Nos. 719 and 890. FERC Order No. 719, *Wholesale Competition in Regions with Organized Electric Markets*, directs regional transmission organizations (RTOs) and independent system operators (ISOs) to allow demand response resources to participate in ancillary services markets assuming the demand response resources are technically capable of providing the ancillary service within response times and other reasonable requirements adopted by the RTO or ISO. FERC Order No. 890, *Preventing Undue Discrimination and Preference in Transmission Service*, requires RTOs and ISOs to evaluate non-generation resources, such as demand response and storage, on a comparable basis to services provided by generation resources in meeting mandatory reliability standards, providing ancillary services and planning the expansion of the transmission grid.

Based on its review and discussions with stakeholders, the ISO proposes the following modifications to existing operating characteristics and technical requirements:

- Reduce the current ancillary services continuous energy requirement from two hours to the following:
 - Day-ahead Regulation (Up & Down) is 60 minutes;
 - Real-time Regulation (Up & Down) is 30 minutes;
 - Spinning reserve is 30 minutes;
 - Non-spinning reserve is 30 minutes.
- Clarify that the measurement of the continuous energy requirement will start from the point a resource reaches their award capacity rather than the existing measurement starting after the 10 minute ramp requirement.
- Reduce the minimum rated capacity requirement to 500KW from the existing 1MW requirement.

The ISO recognizes that WECC standards currently define spinning reserve as “unloaded generation which is synchronized and ready to serve additional demand.” This current definition limits A/S market participation to generation resources for regulation and spinning reserves. The ISO has reviewed WECC BAL-002-WECC-1 – Contingency Reserves which is currently awaiting approval by FERC. This new standard for contingency reserves removes the definitional limits for spinning reserves and now defines spinning reserves as a resource that “immediately and automatically responds proportionally to frequency deviations, e.g. through the action of a governor or other control systems.” Once FERC approves WECC BAL-002-WECC-1, the ISO changes in this proposal will be consistent with the WECC requirements.

The ISO believes that the modifications to the requirements for the current ancillary services will greatly increase the pool of resources and technologies able to participate in the ISO market. The ISO views the completion of this initiative as a step to enhance ancillary services markets that support the integration of renewable resources and deploy technological innovations surrounding smart grid.

The ISO recognizes that loads, energy storage and other resources have different operating characteristics and different implementation issues. It is the ISO's intent, where

appropriate, to examine these issues with stakeholders through separate discussion papers, pilots and/or stakeholder meetings.

2 Changes from February 10, 2010 Draft Final Proposal

- Removed regulation energy management from the Participation of Non-Generator Resources in AS Markets initiative. Regulation energy management will be reviewed in the AS Market Product Review initiative scheduled to begin in Q2, 2010.

3 Introduction

FERC Order No. 719 directs RTOs and ISOs to allow demand response resources to participate in ancillary services markets. Subject to certain requirements such as registration and creditworthiness, demand response resources that are technically capable of providing an ancillary service within the response time requirements, and that meet reasonable requirements adopted by the RTO or ISO as to size, telemetry, metering and bidding, must be eligible to bid to supply energy imbalance, spinning reserves, supplemental reserves, reactive and voltage control, and regulation and frequency response.¹ The ISO recognizes that current technical requirements defined in the ISO Tariff limit the participation of demand response resources (or other non-generator resources such as energy storage) to a greater extent than Order No. 719 contemplates. Accordingly, the ISO is undertaking a stakeholder process to explore mechanisms by which non-generator resources may provide Regulation and Spinning Reserve comparable to a generator.

The ISO is not considering the development of new ancillary services as part of this stakeholder initiative, but will continue to consider new ancillary services as part of the Market Initiatives Roadmap process. Market participants have highlighted the potential for new ancillary services through this process, such as Frequency Only Regulation. The ISO plans to initiate a broader review of ancillary services later in 2010. This effort will include examining the development of new ancillary services.

4 Plan for Stakeholder Engagement

Item	Date
Post Revised Draft Final Proposal	March 8, 2010
Stakeholder Conference Call	March 15, 2010
Board Meeting	March 26, 2010
Post Draft Tariff Language	April 2010
Stakeholder Conference Call	April or May 2010
FERC Filing	May 2010

5 FERC Order No. 719

FERC Order No. 719, directs RTOs and ISOs to allow demand response resources to participate in ancillary services markets. Specifically, the Commission required each RTO or ISO to accept bids from demand response resources, on a basis comparable to any other

¹ Order No. 719, 125 FERC ¶ 61,071 (Issued October 17, 2008) at P 49.

resources, for ancillary services that are acquired in a competitive bidding process if the demand response resources (1) are technically capable of providing the ancillary service and meet the necessary technical requirements; and (2) submit a bid under the generally applicable bidding rules at or below the market clearing price.² Order No. 719 directs that demand response resources that are technically capable of providing the ancillary service within the response time requirements, and that meet reasonable requirements adopted by the RTO or ISO as to size, telemetry, metering and bidding, must be eligible to bid to supply energy imbalance, spinning reserves, supplemental reserves, reactive and voltage control, and regulation and frequency response.³

The Commission declined to adopt a standardized set of technical requirements for demand response resources (or other non-generator resources such as storage) participating in ancillary services markets. Rather, the Commission authorized each RTO and ISO, in conjunction with its stakeholders, to develop its own minimum requirements. The Commission directed the RTOs and ISOs to set forth a proposal to adopt reasonable standards necessary for system operators to call on non-generator resources for ancillary services, and mechanisms to measure, verify, and ensure compliance with any standards for the provision of ancillary services.⁴

6 FERC Order No. 890

In Order No. 890, the Commission adopted numerous measures to implement a coordinated, open, and transparent transmission planning process that satisfies nine planning principles enunciated in the order. The Commission also adopted a number of changes to the *pro forma* Open Access Transmission Tariff ("OATT") requirements of Order No. 888, including a change to indicate that, in addition to generating units, non-generation resources such as demand resources may, where appropriate, provide certain ancillary services – namely, reactive supply and voltage control, regulation and frequency response, energy imbalance, spinning reserves, supplemental reserves and generator imbalance services.⁵ In the *pro forma* OATT, the Commission modified Schedules 2--6 and 9 to add language that allows each Ancillary Service to be provided by other non-generation resources capable of providing the service.

7 NERC Requirements

7.1 Standard BAL-001-0 - Real Power Balancing Control Performance

The purpose of Real Power Balancing Control Performance is to maintain Interconnection steady-state frequency within defined limits by balancing real power demand and supply in real-time. There are two requirements: CPS1 and CPS2.

CPS1 requires each Balancing Authority to operate such that, on a rolling 12-month basis, the average of the clock-minute averages of the Balancing Authority's Area Control Error (ACE) divided by 10B (B is the clock-minute average of the Balancing Authority Area's

² *Id.* at P 47. The Commission exempted circumstances where the laws or regulations of the relevant electric retail regulatory authority do not permit a retail customer to participate.

³ *Id.* at P 49.

⁴ *Id.* at P 61.

⁵ Order No. 890 at P 888.

Frequency Bias) times the corresponding clock-minute averages of the Interconnection's Frequency Error is less than a specific limit.

CPS2 requires each Balancing Authority to operate such that its average ACE for at least 90% of clock-ten-minute periods (6 non-overlapping periods per hour) during a calendar month is within a specific limit.

7.2 Standard BAL-002-0 – Disturbance Control Performance

The purpose of the Disturbance Control Standard (DCS) is to ensure the Balancing Authority is able to utilize its Contingency Reserve to balance resources and demand and return interconnection frequency to within defined limits following a Reportable Disturbance.

Contingency Reserve may be supplied from generation, controllable load resources, or coordinated adjustments to Interchange Schedules.

For 100% of Reportable Disturbances, a Balancing Authority must return its ACE to zero if just prior to the Reportable Disturbance was positive or equal to zero. For negative initial ACE values the Balancing Authority must return ACE to its pre-Disturbance level. The default Disturbance Recovery Period is 15 minutes after the start of a Reportable Disturbance. The Balancing Authority shall fully restore its Contingency Reserves with 90 minutes of the end of the Disturbance Recovery Period.

8 WECC Requirements

8.1 BAL-STD-002-0 – Operating Reserves

The purpose of this standard is to address the Operating Reserves of the Western Interconnection. The standard separates operating reserves in to two categories: regulating reserve and contingency reserve. WECC also defines spinning reserve as unloaded generation which is synchronized and ready to serve additional demand.

The requirement for regulating reserve is spinning reserve, immediately responsive to Automatic Generation Control (AGC) to allow the Balancing Authority to meet the NERC Real Power Balancing Control Performance (see BAL-001-0 above).

The requirement for contingency reserve is spinning reserve and non-spinning reserve sufficient to meeting the NERC Disturbance Control Standard (see BAL-002-0 above). In addition, at least 50% of the contingency reserve must be spinning reserve. The quantity of reserves is set at the greater of the most severe single contingency or 5% of load served by hydro generation+ 7% of load served by thermal generation.

Acceptable non-spinning reserves include interruptible load, interruptible exports, on-demand rights from other entities or Balancing Authorities, spinning reserve in excess of 50% contingency reserve, regulating reserve, and off-line quick-start generation.

Contingency reserves must be fully deployable within 10 minutes of a disturbance and must be restored within 60 minutes following an event. The WECC recovery time requirements are stricter than those outlined in the NERC Disturbance Control Standard.

9 Current ISO Ancillary Services Requirements Protocol

The detailed operating characteristics and technical requirements are outlined in ISO Tariff Appendix K – Ancillary Service Requirements Protocol.

For all ancillary services the minimum rated capacity must be 1MW or greater unless the generating unit or system resource is participating in an aggregation arrangement approved by the ISO.

9.1 Regulation Up and Regulation Down Requirements

A Generator wishing to provide Regulation as an Ancillary Service from a Generating Unit must meet the following operating characteristics and technical requirements:

- the maximum amount of Regulation to be offered must be reached within a period that may range from a minimum of 10 minutes to a maximum of 30 minutes.
- a direct, digital, unfiltered control signal generated from the ISO Energy Management System (EMS) through a standard ISO direct communication.
- power output response (in MW) to a control signal must respond immediately without manual operator intervention for each minute of control response.
- direct communication and direct control system to send signals to EMS to dynamically monitor, at a minimum: actual power output (MW), high limit, low limit and rate limit, and in-service status indication.
- primary and back up voice communication between ISO Control Center, Scheduling Coordinator and Operator.

The WECC definition of spinning reserves limits the system resources able to provide Regulation to unloaded generation which is synchronized and ready to serve additional demand.

9.2 Spinning Reserve Requirements

A Generator wishing to provide Spinning Reserve as an Ancillary Service from a Generating Unit or System Resource must meet the following operating characteristics and technical requirements.

- minimum governor performance of 5% droop, dead band plus or minus 0.036Hz and the power output must change within one second for any frequency deviation outside the governor dead band.
- operator must have a means of receiving dispatch Instructions to initiate an increase in real power output (MW) within one minute.
- must be able to increase real power output (MW) by the maximum amount of Spinning Reserve to be offered within 10 minutes.
- primary and back up voice communication between ISO Control Center and the operator.

The WECC definition of spinning reserves limits the system resources able to provide Spinning Reserves to unloaded generation which is synchronized and ready to serve additional demand.

9.3 Non-Spinning Reserve Requirements

An Ancillary Service Provider wishing to provide Non-Spinning Reserve as and Ancillary Service from a Generating Unit, System Resource, or Interruptible Load must meet the following operating characteristics and technical requirements.

- must be able to increase output (disconnect load) as soon as possible to the value indicated in a dispatch Instruction, reaching the indicated value within 10 minutes after issue of the instruction and be capable of maintaining output for 2 hours.
- operator must have a means of receiving dispatch Instructions to initiate an increase in real power output (MW) or disconnect load within one minute.

The WECC definition of non-spinning reserves expands system resources able to provide Non-Spinning Reserve to unloaded generation and interruptible load.

9.4 Voltage Support

This proposal does not extend to voltage support.

9.5 Black Start Capability

This proposal does not extend to black start capability.

10 ISO Analysis of Ancillary Services Market

10.1 Analysis of Major DCS Events in September 2009

The ISO analyzed major Disturbance Control Standard (DCS) events during the month of September 2009 to determine how long operating reserves are actually dispatched to supply energy in response to a major DCS event. The data of the major DCS events is summarized in table 1 below:

	MW Loss	Recovery Time	Return to Set Point
Event #1	459	13 Min	15 Min
Event #2	200	2 Min	2 Min
Event #3	478	6.5 Min	9 Min
Event #4	297	2 Min	2 Min
Event #5	495	8 Min	15 Min
Event #6	892	11 Min	15 Min
Event #7	76	< 1 Min	< 1 Min
Event #8	489	7 Min	10 Min
Event #9	1514	8.5 Min	10 Min

Table 1

The ISO recovered frequency and Area Control Error (ACE) within a 15 minute period and returned contingency resources to their pre contingency point within 15 minutes. The ISO market responded quickly to the loss of generation by dispatching other generating units to cover the loss of generation.

10.2 Analysis of RTCD since implementation of new markets

The ISO analyzed the Real-Time Contingency Dispatch (RTCD) since April 1, 2009 through September 19, 2009. RTCD mode is invoked under conditions resulting from a contingency. The ISO analyzed the number of RTCD occurrences and determined the length of a contingency resolution by summing RTCD runs with sequential dispatch intervals. The data is summarized in table 2 below:

	5 MIN	10 MIN	15 MIN	Total
RTCD Invoked	14	10	1	25
	56%	40%	4%	100%

Table 2

The data reflects that conditions which required the ISO to use RTCD were resolved within a 15 minute period. The ISO market then returned to RTED for 5 minute energy dispatches.

10.3 Real Time Market Timeline: RTUC, RTED, RTCD

Real-Time Unit Commitment (RTUC) is a market process for committing Fast and Short-Start Units and awarding additional ancillary services at 15-minute intervals. The RTUC function runs every 15 minutes and looks ahead in 15-minute intervals spanning the current Trading Hour and next Trading Hour.

The Real-Time Economic Dispatch (RTED) is a market process that dispatches imbalance energy⁶ and dispatches energy from ancillary services and normally runs automatically every five minutes to produce dispatch instructions. The following two alternative modes to RTED are invoked under abnormal conditions: Real-Time Contingency Dispatch (RTCD) and Real-Time Manual Dispatch (RTMD).

The Real-Time Contingency Dispatch (RTCD) function executes upon ISO Operator action, usually following a Generating Unit or transmission system contingency. The RTCD execution is for a single 10-minute interval and includes all Operating Reserves and all Real-Time Energy Bids in the optimization process.

Assuming a contingency event occurs, (RTCD) will commit resources to recover within 15 minutes as the analysis in section 10.1 and 10.2 support. Two iterations of RTUC are required to commit non-reserve resources and return to a normal market state. The first RTUC run after the contingency event will seek to solve energy supply and demand and procure incremental ancillary services as operating reserves ramp to their energy awards. The second RTUC run after the contingency event will seek to solve energy supply and demand after contingency resources have resolved the contingency event returning the market to a normal state.

⁶ The ISO tariff defines imbalance energy as follows: The deviation of Supply or Demand from Day Ahead Schedule, positive or negative, as measured by metered Generation, metered Load, or Real-Time Interchange Schedules.

11 WECC Request for Standard Revision

The WECC definition of spinning reserves limits the type of resources able to provide regulation and spinning reserves to unloaded generation that is synchronized and ready to serve additional demand. The new standard for contingency reserves, WECC BAL-002-WECC-1, which is currently awaiting approval by FERC, removes the definitional limits for spinning reserves and now defines spinning reserves as a resource that “immediately and automatically responds proportionally to frequency deviations, e.g. through the action of a governor or other control systems.” Once approved, ISO changes made through this stakeholder initiative will be consistent with proposed WECC BAL-002-WECC-1.

12 Proposed ISO Ancillary Services Requirements Protocol Modifications

The ISO proposes to make the following changes to its ancillary services operating characteristics and technical requirements.

For all ancillary services the resource definition will utilize non-prescriptive language. Ancillary service providers for regulation, spinning and non-spinning reserves will not be technology specific. The ISO proposes to define ancillary service providers as any resource meeting the operating characteristics and technical requirements for each ancillary service.

12.1 Proposed Minimum Capacity Requirement

For all ancillary services the minimum rated capacity will be 500KW or greater unless the system resource is participating in an aggregation arrangement approved by the ISO.

12.2 Proposed Continuous Energy Requirement

Continuous energy requirement is defined as the amount of energy a resource is required to deliver at a sustained level for a determined interval.

The continuous energy requirement for spinning and non-spinning reserves will be 30 minutes. The 30 minute time period is based upon the data in Section 10 supporting contingency recovery within 15 minutes and allows another 15 minutes for the market to return to a normal state. Since the RTUC process runs every 15 minutes, the first RTUC run after a contingency event will occur while the ISO dispatches contingency reserves. The next RTUC run will occur after the ISO recovers from the contingency event and the ISO no longer needs to dispatch contingency reserves.

The continuous energy requirement for regulation up and regulation down will be 60 minutes for the day-ahead market and 30 minutes for the real-time market. The regulation continuous energy requirements align with the awarded interval’s time duration and allow for substitution as spinning reserves. A resource’s awarded regulation is required to provide energy for the entire awarded interval for regulation up and consume (reduce) energy for the entire awarded interval for regulation down.

12.3 Proposed Clarification of Measurement of Continuous Energy

The ISO will measure the continuous energy requirements outlined in section 12.2 from the point at which a resource reaches its awarded capacity. The requirement that resources ramp to their awarded capacity within 10 minutes remains unchanged. Thus, if a resource

reaches its awarded capacity in a time period less than the 10 minute ramp requirement, the measurement of the continuous energy requirement will start at the point the resource reaches its awarded capacity and not the end of the 10 minute ramp.

13 Next Steps

The ISO will hold a stakeholder teleconference on March 15, 2010 to discuss the recommendations presented in this Revised Draft Final Proposal. Stakeholders should submit written comments by March 12, 2010 to Non-GenAS@caiso.com