



California Independent  
System Operator Corporation

April 29, 2010

*VIA OVERNIGHT DELIVERY*

The Honorable Kimberly D. Bose  
Secretary  
Federal Energy Regulatory Commission  
888 First Street, NE  
Washington, DC 20246

**Re: *California Independent System Operator Corporation*  
Docket No. ER10-500-\_\_\_\_**

**Response to the March 31, 2010 Letter and  
Revised Tariff Amendment**

Dear Secretary Bose:

On December 24, 2009, the California Independent System Operator Corporation (ISO)<sup>1</sup> filed an amendment to its tariff in the above-referenced proceeding to enhance its scarcity reserve pricing design.<sup>2</sup> The ISO believes its December proposal complied with the Commission's directive that the ISO refine its scarcity pricing design within twelve months of operation of the ISO's new market to be comparable to the designs of the New York Independent System Operator, Inc. (New York ISO) and ISO New England Inc. (ISO New England).<sup>3</sup> To satisfy this requirement, the ISO held multiple meetings with stakeholders to refine the proposal, developed necessary software changes and performed a market simulation in advance of April 1, 2010.

On March 31, 2010, more than 90 days after the ISO's tariff amendment filing, the Commission's Office of Energy Market Regulation issued a letter requesting additional information concerning the ISO's tariff amendment. The letter states that the ISO's response will constitute an amendment to the ISO's proposed tariff

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<sup>1</sup> The ISO is sometimes referred to as the CAISO. Capitalized terms not otherwise defined herein have the meanings set forth in Appendix A to the ISO tariff.

<sup>2</sup> The ISO sent its proposed tariff amendment to the Commission via overnight delivery on December 23, 2009.

<sup>3</sup> *California Independent System Operator Corp.*, 116 FERC ¶ 61,274, at PP 1078-79 (2006) (*September 2006 Order*).

amendment.<sup>4</sup> In addition to responding to the Commission's request for information, the ISO is taking the opportunity to augment its scarcity reserve pricing design to include a scarcity reserve demand curve applicable to regulation down procured in ancillary services sub-regions. Pursuant to Section 205 of the Federal Power Act,<sup>5</sup> the ISO respectfully requests that the Commission approve its revised scarcity reserve pricing design based on the information provided in this letter as well as the record already developed in this proceeding. The ISO provides six copies of the instant filing.

Three additional copies of this filing are also being provided to the Commission Staff, consistent with the directives in the March 31, 2010 letter. An additional copy of this filing is provided to be date-stamped and returned to the ISO's office in the self-addressed, postage prepaid envelope contained herein.

## I. Responses to Questions in the March 31 Letter

The following are the ISO's responses to the questions contained in the March 31, 2010 letter.

**Question 1.** *The CAISO proposes to apply lower scarcity prices to the sub-regions than the Expanded System Region. It justifies lower sub-regional scarcity prices based upon its interpretation of the applicable reliability standards.<sup>6</sup> Please explain how these standards justify the application of lower scarcity prices to the sub-regions than the Expanded System Region.*

**Response.** Question 1 references the following language from page 10 of the ISO's December 24, 2009 transmittal letter requesting approval of its scarcity pricing design:

. . . the ISO may set minimum procurement requirements for ancillary services in its ancillary service sub-regions in order to disburse ancillary services appropriately throughout the ISO balancing authority area. *When supplies in these sub-regions are insufficient to meet the requirements, there is no violation of NERC [North American Electric Reliability Corporation] and WECC [Western Electricity Coordinating Council] reliability standards and less of a threat to system reliability as compared to a scarcity condition in the expanded system region. The ISO proposes to set the demand curve values for the sub-regions at a lower level than the demand curve values for the expanded system region when a shortage condition exists in both an ancillary services*

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<sup>4</sup> The letter requests that the ISO provide a form of notice pursuant to 18 C.F.R. § 35.8(b). The ISO understands that this rule is no longer in effect and therefore has not provided a form of notice with this transmittal.

<sup>5</sup> 16 U.S.C. § 824d.

<sup>6</sup> CAISO Filing at 10.

sub region and the expanded system region. This design reflects the relative value of these scarce resources. [Emphasis added]

The North American Electric Reliability Corporation and Western Electricity Coordinating Council reliability standards to which the ISO referred in the above-quoted language are contained in WECC Standard BAL-STD-002-0, entitled "Operating Reserves".<sup>7</sup> This standard requires each Balancing Authority within the WECC – including the ISO – to maintain minimum operating reserve which is the sum of the following: (i) regulating reserve (spinning reserve immediately responsive to automatic generation control); (ii) contingency reserve (spinning and non-spinning reserve); (iii) additional reserve for interruptible imports; and (iv) additional reserve for on-demand obligations.<sup>8</sup> Compliance with the WECC standard is measured based on "Average Generation," defined in the WECC standard as "the total MWh generated within the Balancing Authority Operator's Balancing Authority Area during the prior year divided by" the number of hours in the prior year.<sup>9</sup> The WECC standard applies solely to the level of operating reserve for the entire area served by a balancing authority such as the ISO, not to any ancillary service "sub-regions" within the service area.

As explained in the attached declaration of Dr. Shucheng Liu,<sup>10</sup> the ISO can comply with the WECC standard by procuring ancillary services to address needs in the ISO's "expanded system region" (*i.e.*, the ISO's balancing authority area and intertie scheduling points with interconnected balancing authority areas) without any specific reserve procurement requirement in ancillary service sub-regions. When there is a shortage of reserves in the expanded system region, the ISO must procure additional reserves to comply with WECC's standard. Procurement of ancillary services on a sub-regional basis, however, gives the ISO the flexibility to address operational needs within different parts of its service area. For example, in the event of a contingency event, sub-regional ancillary services procurement allows the ISO to address generation imbalance within the sub-region more effectively. That flexibility would not exist if the ISO did not procure ancillary services on a sub-regional basis. However, when the ISO is unable to meet its minimum procurement requirements for ancillary services in the ancillary service sub-regions, there is no violation of the WECC standard (which only applies to the expanded system region). A scarcity condition which prevents the ISO from obtaining reserves in a specific ancillary service sub-region is less of a threat to system reliability as compared to a scarcity condition in the expanded system region.

Dr. Liu explains that the ISO has determined that it is appropriate to establish lower demand curve values for the ancillary service sub-regions as compared to the

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<sup>7</sup> The Commission-approved WECC Operating Reserves Standard is available on NERC's website at <http://www.nerc.com/files/BAL-STD-002-0.pdf>, and is provided as Attachment D hereto.

<sup>8</sup> WECC Operating Reserves Standard at Paragraph B.

<sup>9</sup> WECC Operating Reserves Standard at Paragraph D.2 and Definitions.

<sup>10</sup> Dr. Liu's declaration is provided in Attachment A hereto.

scarcity values applicable to the expanded system region. This design feature reflects the incremental value of scarce resources in the ancillary service sub-regions vis-à-vis the expanded system region. When supplies in the ancillary service sub-regions are insufficient to meet the ISO's minimum procurement requirements, the sub-regional demand curve value will set the incremental ancillary service marginal price (market clearing price) for the resources in the scarce sub-region over that of the expanded system region. The higher ancillary service marginal price for the resources in the sub-region ensures that ancillary services are dispersed appropriately throughout the ISO balancing authority area and accurately reflects the ISO operational needs. In this respect, the ISO *has not* proposed to apply lower scarcity prices to ancillary service sub-regions as Question 1 suggests. The scarcity reserve demand curve values are incremental to the ancillary services marginal prices in the expanded system region. By using the same scarcity demand curve values for the ancillary service sub-regions and the expanded system region, the ISO would overstate the value of a service that is not necessary to satisfy WECC's standard.

The ISO's scarcity pricing design is also consistent with the Commission approved principle of ancillary services substitution. This principle allows a higher quality reserve in an ancillary service sub-region to substitute for a lower quality reserve in that sub-region or in the expanded system region. The ancillary service marginal price for an ancillary service will reflect the sum of the ancillary service shadow prices for all ancillary services for which that ancillary service may substitute.<sup>11</sup> If the Commission were to direct the ISO to apply a different principle in its scarcity pricing design, the ISO may need to modify its software. A software change would also require additional time to design, test and implement.<sup>12</sup>

It also is important to recognize that a resource in an ancillary services-sub-region will never be paid less than the ancillary services marginal price in the expanded system region. The demand curve is not a cap on the ancillary services marginal price. Instead the demand curve affects shadow prices within the sub-region when scarcity conditions occur. The price paid to a resource providing ancillary services in a sub-region will be made up of the ancillary services shadow price in the expanded system region *plus* the sub-regional shadow price. This "nesting" ensures that the incremental value of locating a resource in an ancillary service sub-region is reflected in scarcity demand curve values and ultimately in ancillary service marginal prices.

The ISO's approach of establishing different demand curves for the expanded system region system and for sub-regions is comparable to the scarcity pricing features of the New York ISO and ISO New England. The New York ISO establishes different demand curves for Total (*i.e.*, system-wide) Spinning Reserves, Spinning Reserves in the Eastern and Long Island "sub-region," and Spinning

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<sup>11</sup> ISO tariff sections 8.2.35, 27.1.2.1.

<sup>12</sup> The ISO's proposed effective date for the scarcity pricing tariff revisions is discussed further in Section II, below. As discussed below, the ISO may need to request additional time to implement scarcity pricing if a Commission order requires software changes.

Reserves in just the Long Island “sub-region.” The New York ISO also has different demand curves for the total system and these sub-regions for 10-Minute Non-Synchronized Reserves and 30-Minute Reserves.<sup>13</sup> Similarly, in ISO New England, if there is insufficient operating reserve available to meet the operating reserve requirements for the entire system and/or for any reserve (*i.e.*, local) zone, the applicable real-time reserve clearing prices are set based on different reserve constraint penalty factor values applicable to specified ancillary services in reserve zones and system-wide.<sup>14</sup> The ISO’s proposed approach is consistent with the directive in the Commission’s September 2006 order in Docket No. ER06-615 that the ISO adopt scarcity pricing rules comparable to those employed by the New York ISO and ISO New England.<sup>15</sup>

**Question 2.** *In the proceeding on CAISO’s Order No. 719 compliance filing, in Docket No. ER09-1048-000, the CAISO stated that it plans to file a standard authorization request with the Western Electric Coordinating Council (WECC), asking it to create a standards drafting team to rewrite WECC standards for regulation and spinning reserves in order to allow non-generation resources to provide these services.<sup>16</sup> The CAISO has also stated that it plans to develop, independently, a set of standards that WECC may or may not adopt, but which the CAISO will ultimately file with the Commission as proposed revisions to its tariff.<sup>17</sup> Please explain the status of these efforts.*

**Response.** On April 28, 2009, the ISO filed a compliance report and proposed tariff amendments in Docket No. ER09-1048 to comply with the Commission’s directives in Order No. 719.<sup>18</sup> As reflected in Question 2, the ISO’s filing included the following comments on the expansion of demand response in the ISO’s ancillary service market:

The CAISO recognizes that it is the Commission’s intent that demand response resources have the opportunity to participate in all competitive ancillary service markets. As discussed above, it is the CAISO’s plan to provide that functionality through enhancements to its

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<sup>13</sup> See New York Independent System Operator, Inc., Original Volume No. 2, ISO Market Administration and Control Area Services Tariff, at Schedule 3, Section 7.0, and Schedule 4, Section 7.0.

<sup>14</sup> See ISO New England Inc., FERC Electric Tariff No. 3, Section III.2.7A(c).

<sup>15</sup> See *September 2006 Order* at P 1079 & n.473 (directing the ISO to “develop a reserve shortage scarcity pricing mechanism that applies administratively-determined graduated prices to various levels of reserve shortage” and citing the mechanisms employed by the New York ISO and ISO New England as complying with this directive). See also ISO’s December 24, 2009 transmittal letter at 7 (discussing the directives in the September 2006 order).

<sup>16</sup> See CAISO’s April 28, 2009 filing in Docket No. ER09-1048 at 30-31.

<sup>17</sup> *Id.* at 31.

<sup>18</sup> *Wholesale Competition in Regions with Organized Electric Markets*, Order No. 719, FERC Stats & Regs. ¶ 31,281 (2008) (“Order No. 719”).

current market design. Accordingly, the CAISO is undertaking a stakeholder process to explore mechanisms by which demand response resources may be capable of providing Regulation and Spinning Reserve. This process may lead to redefinition of these products in the CAISO Tariff. The CAISO plans to file a SAR (standard authorization request) with the WECC, asking it to create a standards drafting team to rewrite WECC standards for regulation and spinning reserves in order to allow non-generation resources to provide these services. The CAISO also plans to develop, independently, a set of standards that WECC may or may not adopt, but which the ISO will ultimately file with FERC as proposed revisions to its tariff. [Footnotes omitted]

Although the ISO is pleased to provide the following status report on these matters,<sup>19</sup> the ISO emphasizes that Order No. 719 did not displace current ISO timelines to develop market and software enhancements to enhance opportunities for non-generation resources to provide ancillary services.<sup>20</sup>

The ISO completed a stakeholder process earlier this year to examine increased participation by non-generation resources in the ISO's ancillary service market.<sup>21</sup> This process culminated with specific recommendations to reduce the operational requirements applicable to resources providing ancillary services in order to permit greater participation by non-generation resources.<sup>22</sup> Specifically, the ISO recommended the following modifications to the ISO's operating and technical requirements for existing ancillary services:

1. Reduce the minimum rated capacity requirement to 500 kW from the existing 1 MW requirement;

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<sup>19</sup> Question 2 raises issues that are beyond the scope of the Commission's directives in the *September 2006 Order*. Although the ISO supports the Commission's objectives of enhancing the role of demand response in wholesale electricity markets, the *September 2006 Order* does not in any way suggest that the ISO should address issues related to demand response in order to comply with the Commission's directives concerning scarcity pricing.

<sup>20</sup> See Order No. 719 at P 579 ("In response to Ameren and CAISO, we clarify that the compliance requirement [of Order No. 719] is not meant to displace the timelines of any market improvements that RTOs or ISOs are currently undertaking.").

<sup>21</sup> The ISO commenced this stakeholder initiative in order to comply with a directive in Order No. 719 (at P 49) to 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 feasible response times, and to comply with directives in the Commission's Order No. 890 requiring ISOs and RTOs 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. See Order No. 719 at P 49; *Preventing Undue Discrimination and Preference in Transmission Service*, Order No. 890, FERC Stats. & Regs. ¶ 31,241, at PP 479, 888 (2007).

<sup>22</sup> Additional background on the ISO's stakeholder process, including stakeholder comments, is available on the ISO's website at <http://www.caiso.com/2415/24157662689a0.html>.

2. Clarify that the measurement of the continuous energy requirement will start from the point a resource reaches its award capacity rather than the existing measurement starting after the 10-minute ramp requirement;
3. Reduce the continuous energy requirement for ancillary services from the existing two-hour requirement to:
  - 30 minutes for spinning and non-spinning reserves;
  - 60 minutes for day-ahead regulation up/down; and
  - 30 minutes for real-time regulation up/down.

On March 25, 2010, the ISO's Board of Governors authorized the ISO to request authority to modify its tariff to reflect these recommendations. The ISO is currently developing proposed tariff modifications which it intends to discuss with interested stakeholders. The ISO expects to implement these changes later this year after the ISO submits and the Commission reviews and accepts the proposed tariff changes. The ISO hopes these tariff modifications will initially increase the pool of resources capable of participating in the ISO's non-spinning reserve market and ultimately provide the framework for non-generation resources to provide other ancillary services in the ISO market on a non-discriminatory basis. In furtherance of Order No. 719 and the Commission's strategic objectives<sup>23</sup>, the ISO continues to work to increase the level of non-generation resources in its ancillary services market.

During the process of planning a stakeholder initiative to examine increased participation by non-generation resources in the ISO's ancillary service market, the ISO decided not to submit a standard authorization request to WECC to seek revisions to the standards for regulation and spinning reserve to allow non-generating resources to provide these services. The ISO made this determination in part based on the petition of NERC for approval of WECC Standard BAL-002-WECC-1, entitled "Contingency Reserves."<sup>24</sup> The ISO decided to wait until the Commission addressed NERC's petition before soliciting further action from WECC. The ISO recognizes that, on March 18, 2010, the Commission issued a notice of proposed rulemaking to remand the WECC contingency reserve standard.<sup>25</sup> In the notice, the Commission proposed that WECC should explicitly recognize that demand side resources that are technically capable of providing contingency reserve

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<sup>23</sup> Federal Energy Regulatory Commission Strategic Plan for FY 2009-2014, objective 1.1: Establish rules that enhance competition by allowing non-discriminatory market access to all supply-side and demand-side energy resources <http://www.ferc.gov/about/strat-docs/FY-09-14-strat-plan-print.pdf>

<sup>24</sup> Petition of NERC for Commission Approval of WECC Contingency Reserve Standard, Docket No. RM09-15-000 (Mar. 25, 2009). The proposed WECC contingency reserve standard is available on NERC's website at [http://www.nerc.com/files/BAL-002-WECC-1\\_Final.pdf](http://www.nerc.com/files/BAL-002-WECC-1_Final.pdf), and is provided as Attachment E hereto.

<sup>25</sup> *Version One Regional Reliability Standard for Resource and Demand Balancing*, Notice of Proposed Rulemaking, 130 FERC ¶ 61,202 (2010).

may provide this service.<sup>26</sup> The Commission also proposed to direct NERC to recognize demand side management resources in its definitions of certain ancillary services products.<sup>27</sup>

As explained above, the ISO intends to propose modifications to its tariff that will facilitate increased participation by non-generation resources in the ISO's ancillary service market. Furthermore, the ISO is planning a comprehensive review of its current ancillary services products later this year. In the context of that review, it may be appropriate to consider whether to develop new ancillary services products for which non-generation resources may compete with generation resources, irrespective of whether those resources satisfy the current WECC definition for regulation and spinning reserve.

**Question 3.** *In explaining in part how it meets the six criteria of Order No. 719's directive related to the pricing of energy and ancillary services during periods of operating reserve shortages,<sup>28</sup> the CAISO states:*

*Price responsive demand bid into the [CA]ISO's markets can also respond by reducing the need to dispatch energy that the [CA]ISO may otherwise co-optimize as operating reserves in the next dispatch interval.<sup>[29]</sup> . . .*

*. . . [D]emand can operate to reduce and eliminate the shortage either by participating in the [CA]ISO's ancillary services markets or as part of a load serving entities' program to reduce usage and thereby increase the availability of resources otherwise dispatched for energy to provide operating reserves.<sup>[30]</sup>*

*Please explain the basis for your statement that "demand can operate to reduce and eliminate the shortage either by participating in the [CA]ISO's ancillary services markets or as part of a load serving entities' program to reduce usage,"<sup>31</sup> given that demand resources are not currently eligible to participate in the CAISO spinning and regulation services markets. Where possible, support your response with data and evidence.*

**Response.** Although demand resources are not technically eligible to participate in the ISO's current spinning reserve and regulation services markets, demand

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<sup>26</sup> *Id.* at P 44.

<sup>27</sup> *Id.* at PP 45-47.

<sup>28</sup> See Order No. 719 at P 247.

<sup>29</sup> See CAISO Filing at 8.

<sup>30</sup> *Id.* at 9.

<sup>31</sup> *Id.*

resources are eligible to participate – and do participate – in the non-spinning reserve market. The ISO has provided data to the Commission regarding the level of participation of demand resources (specifically, participating load resources) in the non-spinning reserve market in 2009.<sup>32</sup> The ISO has also submitted proposed tariff language to the Commission to allow a new demand response product, the proxy demand resource, to offer non-spinning reserve, upon implementation.<sup>33</sup> The ISO hopes to implement this new demand response product shortly after the Commission accepts its proposed tariff language in Docket ER10-765. The ISO filed the proxy demand resource tariff amendments on February 16, 2010 and requested an effective date of May 1, 2010 to implement this functionality. On April 16, 2010, Commission staff issued another letter requesting additional information to evaluate the ISO's proxy demand resource tariff amendment. The ISO is currently preparing its response to that letter.

In addition, the price-responsive demand of load serving entities can help to mitigate scarcity conditions. Load serving entities have load reduction programs that would allow the load serving entities to curtail loads under specific situations. For example, Pacific Gas and Electric Company (PG&E) has an Electric Schedule Demand Bidding Program that offers customers incentives for reducing energy consumption and demand when requested by PG&E. PG&E will issue a request when the ISO's day-ahead load forecast exceeds 43,000 MW or when the ISO issues an Alter Notice.<sup>34</sup> As a result, when a supply scarcity is expected, load serving entities may voluntarily reduce their loads to avoid the high market prices. Such load reduction will eventually help the ISO reduce the likelihood of experiencing a scarcity condition.

As explained in the ISO's response to Question 2, the ISO is already taking steps that ultimately will allow demand resources and participating loads to provide other types of ancillary services. As noted above, the ISO's Board of Governors has authorized the ISO to request that the Commission accept modifications to the ISO's operating and technical requirements for existing ancillary services that will facilitate the provision of ancillary services by demand response and other non-generation resources. For example, by reducing the minimum rated capacity for regulation, spinning reserve, and non-spinning reserve from 1 MW to 500 kW, the ISO expects to increase opportunities to demand response resources to provide ancillary services.

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<sup>32</sup> See Third Annual Report of the California Independent System Operator Evaluating Demand Response Participation in the ISO, Docket No. ER06-615-000 (Jan. 15, 2010), at 5, 8-9.

<sup>33</sup> Transmittal Letter for Tariff Amendment to Implement Proxy Demand Resource Product, Docket No. ER10-765-000 (Feb. 16, 2010), at 18.

<sup>34</sup> *Pacific Gas and Electric Tariff Book* at: [http://www.pge.com/tariffs/tm2/pdf/ELEC\\_SCHEDS\\_E-DBP.pdf](http://www.pge.com/tariffs/tm2/pdf/ELEC_SCHEDS_E-DBP.pdf)

Reducing the continuous energy requirement for ancillary services from the existing two-hour requirement will also facilitate demand response participation in the ISO's ancillary services market because demand response resources may not be able to satisfy the current two-hour requirement. The ISO expects to implement these changes later this year after the ISO submits and the Commission reviews and accepts the proposed tariff changes. Thereafter, subject to technical certification, additional demand response resources will be able to participate in the ISO's ancillary services market.

**Question 4.** *The CAISO explains why the scarcity prices contained in the Expanded System Region provide adequate price signals for customers to invest in generation and demand response technologies and for customers to participate in the CAISO's markets. Explain how the lower sub-regional scarcity prices provide adequate price signals for customers to invest in generation and demand response technologies and to participate in the markets.*

**Response.** The ISO's proposed scarcity values are intended to provide adequate price signals for new investment in the ancillary service sub-regions. As explained below, the ISO's scarcity pricing design will not result in a lower sub-regional scarcity ancillary service marginal price. In fact, the ancillary service marginal price in an ancillary service sub-region will rise above the ancillary sieve marginal price in the expanded system region, if a shortage condition exists in both. If a shortage condition exists only in the expanded system region, and a sub-regional constraint is also binding such that the ISO procures ancillary services on a sub-regional basis, then the value for a scarce ancillary service in an ancillary service sub-region also will rise above the scarcity value in the expanded system region. Moreover, as explained above, sub-regional values will always be as high as or higher than values in the expanded system region whether or not a scarcity condition occurs, since the sub-regions are contained within the expanded system region. This nesting ensures that the incremental value of locating a resource in an ancillary service sub-region is reflected in scarcity demand curve values and ultimately in ancillary service marginal prices.

As the ISO noted in its answer in this proceeding, the proposed scarcity demand reserve values for the ancillary service sub-regions create significant ancillary service premiums when there is insufficient supply.<sup>35</sup> Specifically, during the time that the maximum energy bid price is \$750/MWh (*i.e.*, until March 31, 2011),<sup>36</sup> if a scarcity condition arises in an ancillary service sub-region, ancillary service marginal prices for non-spinning reserve, spinning reserve, and regulation service could immediately rise to as high as \$188, \$263, and \$338 above the ancillary

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<sup>35</sup> See Motion of the California Independent System Operator Corporation for Leave to File Answer and Answer to Protests and Comments, Docket No. ER10-500-000 (Jan. 29, 2010), at 6 ("January 29 Answer").

<sup>36</sup> See ISO tariff, section 39.6.1.1 ("After the twelfth month following the effective date of this Section [*i.e.*, after March 31, 2010], the maximum Energy Bid price shall be \$750/MWh. After the twenty-fourth month following the effective date of this Section [*i.e.*, after March 31, 2011], the maximum Energy Bid price shall be \$1,000/MWh.").

service marginal prices of non-spinning reserve, spinning reserve, and regulation service in the expanded system region respectively. During the time that the maximum energy bid price increases to \$1,000/MWh (*i.e.*, after March 31, 2011),<sup>37</sup> these ancillary service marginal prices could rise to \$250, \$350, and \$450 above the ancillary service marginal prices in the expanded system region, respectively. All else being equal, new resources will likely choose to invest in the sub-regions where scarcity conditions are more likely to occur when making decisions where to invest in generation resources and demand response technologies or participate in the ISO market. When scarcity conditions exist, ancillary service marginal prices in the sub-regions can rise beyond the maximum energy bid price. Based on the ISO's review of bid data that predates the new ISO market that went into effect on March 31, 2009, these premiums should be sufficient to provide adequate price signals for new investments and market participation.<sup>38</sup>

Moreover, in its scarcity pricing design submitted to the Commission in December 2009, the ISO proposed to include in Section 27.1.2.3 of the ISO tariff language stating that the ISO will "review the performance of the Scarcity Reserve Demand Curves and assess whether changes are necessary every three (3) years or more frequently, if the CAISO determines more frequent reviews are appropriate." The ISO will conduct such a periodic review more frequently than every three years if scarcity events warrant a review or if ISO stakeholders express a collective desire for a review through existing stakeholder processes or through requests to the ISO's Market Surveillance Committee or Department of Market Monitoring.<sup>39</sup> The ISO's periodic reviews of the scarcity pricing mechanism will include reviews to ensure on an ongoing basis that the market prices for the ancillary service sub-regions and the expanded system region are providing adequate price signals to address shortages.

The ISO emphasizes that the price signals for resource investment and market participation provided by scarcity pricing will not operate in a vacuum. Ancillary service compensation is only one component of the ISO's new market which also includes energy pricing provisions and long-term resource adequacy mechanisms intended to provide incentives for investment in needed resources. While ancillary service scarcity values will signal the need to site new resources in specific sub-regions, ancillary service scarcity values alone should not be expected to be sufficient to cover new investment, but should complement other market structures providing incentives for investment.

For the reasons explained above, the ISO believes that its proposed scarcity reserve demand curve values provide appropriate price signals for customers to

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<sup>37</sup> *Id.*

<sup>38</sup> Even if the scarcity demand curve value of a specific ancillary service within an ancillary services sub-region does not exceed the highest economic bid for that ancillary service, bidders will still receive bid cost recovery under existing tariff rules. As a result, price signals resulting from the ISO's proposed scarcity reserves demand curve values during a scarcity condition within an ancillary services sub-region should still create incentives for investment.

<sup>39</sup> January 29 Answer at 7-8.

invest in generation and demand response technologies and for customers to participate in the ISO's market. As explained in response to Question 1, the ISO's scarcity pricing design reflects the incremental value of investing in resources located within ancillary services sub-region. The ISO's proposed periodic review process provides a forum for addressing, on an ongoing basis, the question of whether these price signals continue to be adequate.

**Question 5.** *Please justify the omission of a demand curve for sub-regional regulation down service. Explain why a shortage of regulation down on a sub-regional basis is not possible. If sub-regional shortage conditions are possible, explain why a sub-regional demand curve is not appropriate.*

**Response.** As Dr. Liu explains in his declaration, at the time the ISO first developed its scarcity pricing design — well before March 31, 2009 — the ISO did not intend to procure regulation down in any ancillary service sub-region. Accordingly, the ISO concluded that there was no need to establish a sub-regional demand curve for regulation down service during the initial implementation of this market enhancement and did not include a demand curve for sub-regional regulation down service in the December 2009 tariff amendment.

Despite prior expectations, the ISO has procured regulation down in an ancillary service sub-region. Currently, the ISO is procuring at least 35 percent of its system wide regulation down requirements within the SP-26 expanded ancillary service sub-region.<sup>40</sup> Accordingly, the ISO believes it is appropriate to include a scarcity reserve demand curve value for regulation down at the sub-regional level.

The ISO held a stakeholder conference call on February 25, 2010 to explain that, based on actual operational experience with the new ISO market, the ISO was in fact enforcing a minimum regulation down procurement constraint on a sub-regional basis. Therefore, the ISO told stakeholders that it intended to include a demand curve value for sub-regional regulation down service as part of its scarcity pricing design and proposed a demand curve value of 25 percent of the maximum energy bid price.<sup>41</sup> Stakeholders did not express any objection to this demand curve value. The ISO intended to augment its scarcity pricing design to reflect this value after implementation on April 1, 2010. The ISO had a subsequent call with stakeholders on April 13, 2010 to confirm that it would propose this scarcity reserve demand curve value in the context of this response.

In the instant filing, the ISO is proposing revisions to Section 27.1.2.3.1 of the ISO tariff to include a demand curve value for regulation down procured in an

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<sup>40</sup> The expanded SP-26 ancillary service sub-region is defined to include all generators south of Path 26 and specific intertie resources. See, ISO tariff section 8.3.3 and ISO Business Practice Manual for Market Operations at p. 61.

<sup>41</sup> The ISO's presentation to stakeholders at the February 2010 meeting is available on the ISO's website at <http://www.caiso.com/2746/2746d64c21ec0.pdf>, and is provided in Attachment G hereto.

ancillary service sub-region.<sup>42</sup> That demand curve value is 25 percent of the maximum energy bid price, which is the same as the ISO's proposed demand curve value for non-spinning reserve in an ancillary service sub-region.<sup>43</sup> The level of this demand curve value is higher than the sub-regional demand curve value for regulation up because regulation down is the only downward reserve. In contrast, the value of regulation up can cascade to spinning reserve and non-spinning reserve and thereby receive a higher ancillary service marginal price when those reserves are scarce under the principle of ancillary services substitution.<sup>44</sup> The initial sub-regional demand curve value for regulation down will be subject to review as part of the ISO's proposal to review of its scarcity pricing design on an ongoing basis. The ISO asks that the Commission approve this addition to the ISO's scarcity pricing design.

**Question 6.** *Explain why Table 1 does not constitute practices, rules and regulations that affect rates, such that it should be included in the tariff.*

**Response.** As referenced in Question 6, the ISO included a table in its December 2009 transmittal letter requesting acceptance of its scarcity pricing design that identifies scarcity reserve demand curve values for ancillary services at the expanded system and sub-region level. The table reflects these values as percentages of the applicable maximum energy bid price and identifies the administrative prices that result from calculating the demand curve values for each service when there is a shortage condition across different types of ancillary services. The ISO did not include this table in its tariff because it contains information already stated in the proposed tariff language or easily derived from that language. Furthermore, the table reflects administrative prices derived from the ISO's scarcity reserve demand curve values under maximum energy bid prices currently in effect and to take effect on April 1, 2011. Table 1 does not reflect the fact that the percentages included in the ISO's filed tariff language could apply to maximum energy bid prices which might apply in the future. In other words, the table is simply illustrative and only partially illustrative, at that.

In determining which details a public utility should include in its tariff, the Commission applies a "rule of reason" which requires each public utility to include in its Commission-jurisdictional tariff "only those practices that affect rates and service significantly, that are realistically susceptible of specification, and that are not so generally understood in any contractual arrangement as to render recitation superfluous."<sup>45</sup> Table 1 from the ISO's December 2009 transmittal letter does not

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<sup>42</sup> The proposed revisions to Section 27.1.2.3.1 of the ISO tariff are provided in clean and black-line format in Attachments B and C, respectively, to the instant filing. The ISO is not proposing any additional amendments to its proposed tariff language submitted in December 2009.

<sup>43</sup> See proposed section 27.1.2.3.2 of the ISO tariff.

<sup>44</sup> As explained above, a resource providing regulation down service in a sub-region will receive the expanded system region regulation shadow price plus the sub-regional premium when the sub-regional constraint is binding.

<sup>45</sup> *City of Cleveland v. FERC*, 773 F.2d 1368, 1376 (D.C. Cir. 1985) (emphasis omitted).

need to be included in the ISO tariff pursuant to this rule of reason. The table reflects the following information used to derive administrative prices for ancillary services during a shortage condition: (1) percentages of maximum energy bid prices in the expanded system region and each sub-region (including the system region) for the listed ancillary services (regulation up, spinning reserve, non-spinning reserve, and regulation down); (2) supply shortage categories applicable to two of those ancillary services (non-spinning reserve and regulation down); and (3) demand curve values for each maximum energy bid price (\$750/MWh and \$1,000/MWh).<sup>46</sup> Each of the percentages of energy maximum bid prices and the supply shortage categories included in the table are already set forth in more detailed language in tariff sections 27.1.2.3.1, 27.1.2.3.2, 27.1.2.3.3, and 27.1.2.3.4 as proposed by the ISO in this proceeding.<sup>47</sup> Moreover, each of the maximum energy bid prices listed in the table are already set forth in existing Section 39.6.1.1 of the ISO tariff,<sup>48</sup> and proposed tariff sections 27.1.2.3.1, 27.1.2.3.2, 27.1.2.3.3, and 27.1.2.3.4 each state that the scarcity reserve demand curve value reflects specified percentages of maximum energy bid prices set forth in Section 39.6.1.1.<sup>49</sup> Therefore, the ISO's proposed or existing tariff language already includes all of the practices that affect rates and service significantly, and includes those practices in greater detail than does Table 1 of the ISO's December 2009 transmittal letter.<sup>50</sup> The Commission's rule of reason does not require a utility to include duplicative information in a filed tariff if the utility has developed a method of illustrating the same information in a different format. Indeed, requiring the inclusion of duplicative information in a utility's tariff could lead to confusion in the future if parties were to assume that the duplicative table must supplement or differ in some respect from the information provided in the plain text of the tariff.

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<sup>46</sup> For example, the table reflects that, for non-spinning reserve, 70 percent of the energy maximum bid price in the expanded system region applies when the shortage of supply to meet the non-spinning reserve requirement is greater than 210 MW, and that when the maximum energy bid price is \$750/MWh, the demand curve value for that percentage and shortage of supply is \$525/MWh (*i.e.*, \$750/MWh multiplied by 70 percent).

<sup>47</sup> For example, the 70 percent and greater than 210 MW figures discussed in footnote 46 above, are explained in more detail in the following language of Section 27.1.2.3.2 of the ISO tariff as proposed in the December Tariff Amendment: "When the shortage of supply to meet the Non-Spinning Reserve requirement in the Expanded System Region is greater than two-hundred ten (210) MW, the Scarcity Reserve Demand Curve Value for Non-Spinning Reserve shall be seventy (70) percent of the maximum Energy Bid price permitted under Section 39.6.1.1."

<sup>48</sup> Existing Section 39.6.1.1 states in relevant part as follows: "After the twelfth month following the effective date of this Section [*i.e.*, after March 31, 2010], the maximum Energy Bid price shall be \$750/MWh. After the twenty-fourth month following the effective date of this Section [*i.e.*, after March 31, 2011], the maximum Energy Bid price shall be \$1,000/MWh."

<sup>49</sup> See, for example, the language from proposed Section 27.1.2.3.2 of the ISO tariff that is quoted in footnote 44, above.

<sup>50</sup> Table 1 also includes a row labeled "Upward Sum" that adds up the percentages of energy maximum bid prices and demand curve values that are listed above the Upward Sum row. This summing up of the percentages of energy maximum bid prices and demand curve values is merely for the reader's reference and has no effect on the rates or service provided by ISO.

Table 1 is a reference tool that collects, in a single table and in an abbreviated format, certain information based on the application of the proposed and existing tariff language discussed above. As explained in the ISO's December 2009 transmittal letter, the ISO plans to include the table in the applicable Business Practice Manual, along with examples of scarcity conditions and resulting administrative prices used to clear the ISO's ancillary services markets.<sup>51</sup> This planned approach is consistent with the Commission's general recognition that the ISO may include certain details in the Business Practice Manuals rather than in the ISO tariff.<sup>52</sup>

If, in the future, the ISO determines that the language in Section 27.1.2.3.1, 27.1.2.3.2, 27.1.2.3.3, or 27.1.2.3.4 of the ISO tariff should be modified in any way, the ISO will modify that language using the procedures required by Section 205 of the Federal Power Act and the Commission's regulations: the ISO will submit a tariff amendment which will be subject to public comment and Commission review and approval. Based on any tariff modifications approved by the Commission, the ISO will revise its applicable Business Practice Manual accordingly.

## II. Request for Modified Effective Date

Consistent with the directive of the Commission's *September 2006 Order* the ISO requested that the Commission approve its proposed scarcity pricing design tariff provisions to be effective as of April 1, 2010, *i.e.*, within one year of the implementation of the ISO's new market.<sup>53</sup> In light of the request for additional information to consider the ISO's scarcity pricing design, the ISO hereby proposes to modify its requested effective date.<sup>54</sup> The ISO now requests that the Commission make the tariff revisions to implement scarcity pricing, including the ISO's proposed demand curve value for regulation down in an ancillary services sub-region effective on July 7, 2010, provided that the Commission issues an order within 60 days of this

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<sup>51</sup> ISO December 2009 transmittal letter at 6.

<sup>52</sup> See *September 2006 Order* at P 1358 ("Business Practice Manuals document through procedures, examples and timelines the manner in which the CAISO conducts its operations under the MRTU Tariff. The manuals will serve as guides for internal operations and inform market participants of the CAISO's practices. The information contained in the Business Practice Manuals is meant to provide further explanation of the CAISO's practices but not significantly affect any rates, terms or conditions, consistent with the Commission's 'rule of reason.'"); *California Independent System Operator Corp.*, 119 FERC ¶ 61,076, at P 656 (2007) ("[The] assertion that the Commission should have conditioned implementation of the MRTU Tariff on the acceptance of Business Practice Manuals is simply another request to have the entire text of the Business Practice Manuals on file with the Commission. We have consistently rejected arguments that every manual or operating procedure should be on file with the Commission. Requiring such documents to be on file would thwart our 'rule of reason,' and undermine the practical purpose of having a tariff on file with the Commission, supported by detail included in Business Practice Manuals not on file.").

<sup>53</sup> ISO December 2009 transmittal letter at 1, 12 (citing *September 2006 Order* at PP 1078-79).

<sup>54</sup> The Commission's March 31, 2010 letter made it impossible for the ISO to implement scarcity pricing measures within one year of the date the ISO's new market was implemented, as the Commission initially directed in the *September 2006 Order*.

response, or by June 29, 2010. This effective date would provide for adequate time for the Commission to consider the information in this amendment (and any comments on this amendment) and issue an order addressing the ISO's proposed scarcity pricing tariff language while ensuring that the ISO has time to prepare to implement the new functionality. Alternatively, the ISO requests that the Commission specify an effective date for the ISO's scarcity pricing design in any order that is no sooner than five business days from the date of the order. If the Commission directs modifications to the ISO's scarcity pricing design, the ISO may need to request additional time to implement scarcity pricing to accommodate software changes and additional testing. The ISO will endeavor to inform the Commission and all affected parties of any impacts of a Commission order on the effective date of the scarcity pricing enhancements as soon as practicable.

### **III. Attachments**

The following attachments support the instant filing:

Attachment A	Declaration of Shucheng Liu on behalf of the ISO
Attachment B	Clean ISO tariff sheet showing the revisions described in the instant filing
Attachment C	Black-lined ISO tariff sheet showing the revisions described in the instant filing
Attachment D	WECC Standard BAL-STD-002-0
Attachment E	WECC Standard BAL-002-WECC-1
Attachment F	Scarcity Pricing – Proposed Changes in Values (ISO presentation to stakeholders dated February 25, 2010)

### **IV. Communications**

Communications regarding this filing should be addressed to the same individuals that were designated to receive service in the December Tariff Amendment, namely:

Sidney M. Davies, Assistant General Counsel  
Andrew Ulmer, Senior Counsel  
California Independent System  
Operator Corporation  
151 Blue Ravine Road  
Folsom, CA 95630  
Tel: (916) 608-7209  
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[aulmer@caiso.com](mailto:aulmer@caiso.com)

**V. Service**

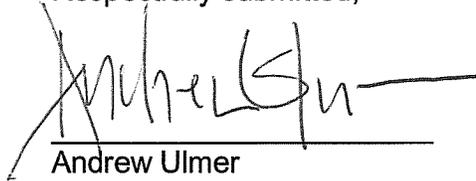
The ISO has served copies of the instant filing, including all attachments thereto, upon all parties in the above-referenced proceeding. The ISO has also served copies of the instant filing on the California Public Utilities Commission, the California Energy Commission, and all parties with effective Scheduling Coordinator Service Agreements. In addition, the ISO is posting this filing and all attachments thereto on its website. The ISO has also provided additional copies to Mr. Robert Petrocelli of the Commission.

**VI. Conclusion**

The ISO respectfully requests that the Commission accept this filing as fully providing the additional information requested in the Commission's March 31, 2010 letter. The Commission should approve this tariff amendment as just and reasonable and complying with the Commission's directives concerning scarcity pricing in the *September 2006 Order*.

If you have any further questions or comments, please feel free to contact the undersigned.

Respectfully submitted,



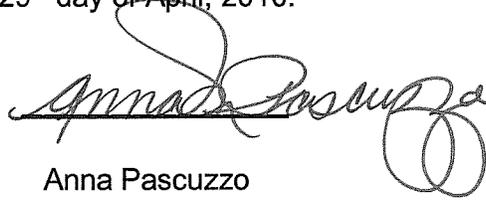
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## CERTIFICATE OF SERVICE

I hereby certify that I have served the foregoing document upon the parties listed on the official service list in the above-referenced proceeding, in accordance with the requirements of Rule 2010 of the Commission's Rules of Practice and Procedure (18 C.F.R. § 385.2010). The ISO has also served copies of the foregoing document on the California Public Utilities Commission, the California Energy Commission, and all parties with effective Scheduling Coordinator Service Agreements.

Dated at Folsom, California this 29<sup>th</sup> day of April, 2010.

  
Anna Pascuzzo

**Attachment A**

**Declaration of Shucheng Liu**

**Scarcity Pricing – Response to March 31, 2010 Letter**

**ER10-500-000**

**April 30, 2010**

UNITED STATES OF AMERICA  
BEFORE THE  
FEDERAL ENERGY REGULATORY COMMISSION

California Independent System )  
Operator Corporation )

Docket No. ER10-500-\_\_\_\_

DECLARATION OF SHUCHENG LIU ON BEHALF OF THE CALIFORNIA  
INDEPENDENT SYSTEM OPERATOR CORPORATION

**I. Introduction**

**Q. Please state your name and business address.**

**A.** My name is Shucheng Liu. My business address is 151 Blue Ravine Road,  
Folsom, California 95630.

**Q. By whom and in what capacity are you employed?**

**A.** I am employed as Principal of Market Development for the California  
Independent System Operator Corporation ("ISO").

**Q. Please describe your professional and educational background.**

**A.** I have worked at the ISO since February 2007 on a number of matters related to  
the ISO's electricity market, including the design of scarcity pricing for reserve  
shortages as well as credit policies for congestion revenue rights and  
convergence bidding. I served as the policy lead in developing the ISO's scarcity  
pricing design presented to the Commission in this proceeding. Prior to joining  
the ISO, I worked as a consultant on various electricity market issues, including  
among others simulating location marginal pricing, managing risk of energy  
portfolios, and assessing value of energy assets. I hold a Ph.D. from Stanford

University in Engineering-Economic Systems and Operations Research. I also earned a Master of Science in Management Science and a Bachelor of Science in Nuclear Engineering from Tsinghua University in China.

**Q. What is the purpose of your declaration in this proceeding?**

**A.** I will discuss the reasons that the ISO proposes to employ different demand curve values in the ISO's ancillary service sub-regions (including the system region) and the expanded system region (*i.e.*, the ISO's balancing authority area and intertie scheduling points with interconnected balancing authority areas). It is my opinion that the proposed sub-regional scarcity demand curve values will provide incentives for generation and demand resources investment in the ancillary service sub-regions. I will also explain why the ISO's December 2009 tariff amendment in this proceeding did not include a sub-regional demand curve for regulation down service, and why the ISO has decided to revise its tariff amendment in this filing to include a sub-regional demand curve for regulation down service.

**II. The ISO's Proposed Use of Different Demand Curve Values in the Ancillary Service Sub-Regions and the Expanded System Region**

**Q. Does the ISO propose to use different demand curve values when a shortage condition exists in both an ancillary service sub-region and the expanded system region?**

**A.** Yes. As explained in the tariff amendment the ISO filed in this proceeding in December 2009, the ISO proposes to set demand curve values for the ancillary service sub-regions that are different from the demand curve values for the expanded system region.

**Q. Is there any Western Electricity Coordinating Council (“WECC”) reliability standard that applies to operating reserve levels in the ISO expanded system region?**

**A.** Yes. WECC Standard BAL-STD 002-0, entitled “Operating Reserves” (“WECC Operating Reserve Standard”),<sup>1</sup> applies to balancing authorities within the WECC. The WECC standard requires each Balancing Authority to maintain minimum operating reserve which is the sum of the following: (i) regulating reserve (spinning reserve immediately responsive to automatic generation control); (ii) contingency reserve (spinning and non-spinning reserve); (iii) additional reserve for interruptible imports; and (iv) additional reserve for on-demand obligations. This standard applies to the ISO in the expanded system region.

**Q. Does the WECC Operating Reserve Standard apply to ancillary service sub-regions within the ISO?**

**A.** No. Compliance with the WECC standard is measured based on “Average Generation,” defined as “the total MWh generated within the Balancing Authority Operator’s Balancing Authority Area during the prior year divided by” the number of hours in the prior year. Thus, the WECC Operating Reserve Standard applies solely to the level of operating reserve for the entire area served by a balancing authority such as the ISO, not to any ancillary service sub-regions within the balancing authority area.

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<sup>1</sup> See <http://www.nerc.com/files/BAL-STD-002-0.pdf>

**Q. Why does the ISO employ ancillary service sub-regions instead of just employing the expanded system region?**

**A.** In order to comply with the WECC standard, the ISO could procure ancillary services to address needs in the expanded system region without employing any ancillary service sub-regions. However, the ISO's ability to establish minimum procurement requirements for ancillary service sub-regions gives the ISO greater flexibility to address operational needs within different parts of its service area. For example, in the event of a contingency event, a sub-regional ancillary services procurement requirement will allow the ISO to address generation imbalance within the sub-region more effectively. By procuring reserves that are dispersed throughout its balancing authority, the ISO can ensure that reserves are deliverable regardless of the triggering event requiring the reserves.

**Q. Please explain how the ISO accounts for its ancillary services sub-regions in its scarcity pricing design.**

**A.** When supplies in an ancillary service sub-region are insufficient to meet the ISO's minimum procurement requirements for ancillary services for the sub-region, there is no violation of the WECC Operating Reserve Standard (which only applies to the expanded system region) or other applicable reliability standards. The ISO will still procure sufficient ancillary service in the expanded system region to comply with the WECC Operating Reserve Standard. There is certainly much less of a threat to system reliability in the event there is insufficient ancillary services to meet an ISO established sub-regional requirement when compared to a scarcity condition in the expanded system

region. The ISO has therefore determined that it is appropriate to establish lower demand curve values for the ancillary service sub-regions - where there is no WECC procurement requirement - as compared to the demand curve values applicable to the expanded system region, which is subject to WECC procurement requirement. As explained below, the sub-regional demand curve values reflect the incremental values of scarce resources in the ancillary service sub-regions vis-à-vis the expanded system region. When a scarcity condition arises in an ancillary service sub-region, the incremental value in the ancillary service marginal price will be reflected in the energy market clearing price as a lost opportunity cost. That will raise energy price by the magnitude of the demand curve value. The increased energy price will allow the ISO to re-dispatch generation and deploy demand response resources in a manner that disperses ancillary services appropriately throughout the ISO balancing authority area. If the ISO were to use the same demand curve values for the ancillary service sub-regions and the expanded system region, the ISO would over state the value of ancillary services in sub-regions based on requirements that are established by the ISO for operational reasons and that are not necessary to satisfy WECC reliability standards.

**Q. Will ancillary service marginal price in the sub-region be lower than that in the expanded system region?**

**A.** No. According to the ISO tariff, the ancillary service marginal prices (ancillary service market clearing prices) are calculated based on the shadow prices of the

ancillary service minimum procurement requirement constraints.<sup>2</sup> Assume  $s_{r0}$ ,  $s_{s0}$ , and  $s_{n0}$  are the shadow prices for minimum procurement requirement constraints for regulation-up service, spinning reserve, and non-spinning reserve in the expanded system region. These shadow prices are always greater than or equal to zero. Assume  $ASMP_{r0}$ ,  $ASMP_{s0}$ , and  $ASMP_{n0}$  are the ancillary service marginal prices of regulation-up service, spinning reserve, and non-spinning reserve in the expanded system region, and similarly  $s_{r1}$ ,  $s_{s1}$ , and  $s_{n1}$  are the shadow price and  $ASMP_{r1}$ ,  $ASMP_{s1}$ , and  $ASMP_{n1}$  are the ancillary service marginal prices in a sub-region. The ancillary service marginal price for each reserve are calculated as follows:

$$ASMP_{n0} = s_{n0}; \quad ASMP_{s0} = s_{s0} + s_{n0}; \quad ASMP_{r0} = s_{r0} + s_{s0} + s_{n0};$$

$$ASMP_{n1} = s_{n1} + s_{n0}; \quad ASMP_{s1} = s_{s1} + s_{s0} + s_{n1} + s_{n0};$$

$$ASMP_{r1} = s_{r1} + s_{r0} + s_{s1} + s_{s0} + s_{n1} + s_{n0},$$

Therefore the marginal price of an ancillary service in a sub-region is always higher than or equal to that of the same ancillary service in the expanded system region, with or without a scarcity condition. In the event of a scarcity the demand curve values of scarce ancillary services will set the corresponding shadow prices. When there is a scarcity condition in a sub-region, the ancillary service marginal prices in the scarce sub-region can be significantly higher than the ancillary service marginal prices in the expanded system region. Specifically, based on the ISO scarcity pricing proposal, during the period that the maximum

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<sup>2</sup> See ISO tariff, section 27.1.2.1

energy bid price is \$750/MWh (i.e., until March 31, 2011),<sup>3</sup> ancillary service marginal prices of non-spinning reserve, spinning reserve, and regulation-up service in the sub-region could immediately rise to as high as \$188, \$263, and \$338 above the ancillary service marginal prices of non-spinning reserve, spinning reserve, and regulation-up service in the expanded system region. During the period that the maximum energy bid price increases to \$1000/MWh (i.e., after March 31, 2011),<sup>4</sup> ancillary service marginal prices in the sub-region could rise to \$250, \$350, and \$450 above the ancillary service marginal prices in the expanded system region. The following examples illustrate the mechanics of the ISO's scarcity pricing design with respect to sub-regional scarcity demand curve values.

Example 1:

- Maximum energy bid price is \$1000/MWh (after March 31, 2011);
- There is no scarcity in the expanded system region. The shadow prices of regulation-up service, spinning reserve, and non-spinning reserve minimum procurement requirement constraints are \$5/MWh, \$10/MWh, and \$25/MWh; and
- Supplies of all three ancillary services are insufficient in a sub-region.

The shadow prices of regulation-up service, spinning reserve, and non-spinning reserve in the sub-region are their respective sub-regional demand curve values. The ancillary service marginal prices are calculated based on the shadow prices as follows:

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<sup>3</sup> See ISO tariff, section 39.6.1.1

<sup>4</sup> *Id.*

Reserve	Shadow Price (\$/MWh)		Marginal Price (\$/MWh)	
	Expanded System Region	Sub-Region	Expanded System Region	Sub-Region
Regulation-up	5	100	40	490
Spinning	10	100	35	385
Non-spinning	25	250	25	275

Example 2:

- Maximum energy bid price is \$1000/MWh (after March 31, 2011);
- Supplies of all three ancillary services are insufficient in the expanded system region and in a sub-region; and
- In the expanded system region non-spinning reserve supply shortage is greater than 210 MW.

The shadow prices of non-spinning reserve, spinning reserve, and regulation-up service in the expanded system region and in the sub-region are their respective demand curve values. The ancillary service marginal prices are calculated as follows:

Reserve	Shadow Price (\$/MWh)		Marginal Price (\$/MWh)	
	Expanded System Region	Sub-Region	Expanded System Region	Sub-Region
Regulation-up	200	100	1000	1450
Spinning	100	100	800	1150
Non-spinning	700	250	700	950

**Q. Will the sub-regional demand curve values provide adequate price signals for new investments in the sub-regions?**

**A.** As demonstrated in the two examples above, the sub-regional demand curve values create significant ancillary service premiums when there is insufficient supply in the sub-region. When deciding where to invest in generation resources and demand response technologies in the ISO balancing authority area, the premiums will provide incentives to invest in the sub-regions where scarcity conditions are more likely to occur.

**Q. Is the ISO's approach of establishing different demand curves for the expanded system region and ancillary services sub-regions consistent with the scarcity pricing features of other independent system operators and regional transmission organizations?**

**A.** Yes. The ISO's proposal to use different scarcity demand curve values for the expanded system region and ancillary service sub-regions is comparable to the scarcity pricing features of the New York Independent System Operator, Inc. ("New York ISO") and ISO New England Inc. ("ISO New England"). The New York ISO establishes different demand curves for Total (*i.e.*, system-wide) Spinning Reserves, Spinning Reserves in the Eastern and Long Island "sub-region," and Spinning Reserves in just the Long Island "sub-region." The New York ISO also has different demand curves for the total system and these sub-regions for 10-Minute Non-Synchronized Reserves and 30-Minute Reserves. Similarly, in ISO New England, if there is insufficient Operating Reserve available to meet the Operating Reserve requirements for the entire system and/or for any Reserve (*i.e.*, local) Zone, the applicable Real-Time Reserve Clearing Prices are

set based on different Reserve Constraint Penalty Factor values applicable to specified ancillary services in Reserve Zones and system-wide.

**III. Demand Curve for Sub-Regional Regulation Down Service**

**Q. Did the ISO's December 2009 tariff amendment in this proceeding include a sub-regional demand curve for regulation down service?**

**A.** No.

**Q. Why not?**

**A.** At the time the ISO first developed the scarcity pricing design proposal submitted in this proceeding, the ISO operations did not plan to establish maximum or minimum regulation down service procurement requirement in any ancillary service sub-region. Accordingly, the ISO did not propose a sub-regional demand curve for regulation down service.

**Q. Did the situation subsequently change?**

**A.** Yes. Based on actual operational experience with the new ISO market design that went into effect in April 2009, the ISO was in fact establishing a minimum regulation down procurement requirement on a sub-regional basis. Therefore, the ISO told stakeholders on February 25, 2010 that it intended to include a demand curve for sub-regional regulation down service as part of the scarcity pricing design and presented a proposal. On April 13, 2010, the ISO confirmed with stakeholders its intention to propose a sub-regional demand curve for regulation-down service.

**Q. Is a proposed sub-regional demand curve value for regulation down service included in the ISO's revised tariff amendment in this proceeding?**

**A.** Yes. The ISO has included in this filing revised tariff provisions that include a proposed demand curve value for regulation down service procured in an ancillary service sub-region. That demand curve value is twenty-five (25) percent, which is the same as the proposed demand curve value for non-spinning reserve service in an ancillary service sub-region.

**Q. How did the ISO determine the demand curve value for regulation down in an ancillary service sub-region?**

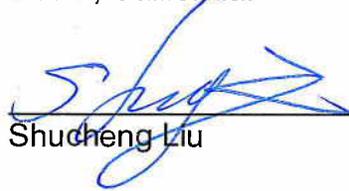
**A.** The proposed demand curve value is an administrative price. The ISO selected the sub-regional demand curve value for regulation down based on the sub-regional demand curve value for non-spinning reserve, which is the lowest quality upward reserve. Like regulation down, non-spinning reserve cannot substitute for other ancillary services. The sub-regional demand curve value for regulation down is higher than the sub-regional demand curve value for regulation up because regulation down is the only downward reserve. In contrast, the value of regulation up can cascade to spinning reserve and non-spinning reserve and thereby receive a higher scarcity premium when those reserves are scarce under the principle of ancillary services substitution.

**Q. Does this conclude your declaration?**

**A.** Yes.

I declare under penalty of perjury that the foregoing statements are true and correct to the best of my knowledge, information, and belief.

Executed this 29<sup>th</sup> day of April, 2010 in Folsom, California.

  
Shucheng Liu

**Attachment B – Clean Sheets**

**Scarcity Pricing – Response to March 31, 2010 Letter**

**CAISO Fourth Replacement Tariff**

**ER10-500-000**

**April 30, 2010**

## **8.2 Ancillary Services Standards.**

All Ancillary Services shall meet the CAISO's Ancillary Services standards.

### **8.2.1 Determination of Ancillary Service Standards.**

The CAISO shall set the required standard for each Ancillary Service necessary to maintain the reliable operation of the CAISO Controlled Grid. Ancillary Services standards shall meet NERC and WECC reliability standards, including any requirements of the NRC. In setting Ancillary Service standards, the CAISO shall consider reasonableness, cost-effectiveness, and adherence to NERC and WECC reliability standards, including any requirements of the NRC. The standards developed by the CAISO shall be used as a basis for determining the quantity and type of each Ancillary Service which the CAISO requires to be available. These requirements and standards apply to all Ancillary Services whether self-provided or procured by the CAISO.

### **8.2.2 Time-frame For Revising Ancillary Service Standards**

The CAISO shall periodically undertake a review of the CAISO Controlled Grid operation to determine any revision to the Ancillary Services standards to be used in the CAISO Balancing Authority Area. At a minimum the CAISO shall conduct such reviews to accommodate revisions to NERC and WECC Reliability Standards and any requirements of the NRC. If the CAISO modifies its Ancillary Services standards, including its rules to determine minimum procurement requirements for Ancillary Services, the CAISO will notify Market Participants. The CAISO may adjust the Ancillary Services standards temporarily to take into account, among other things variations in system conditions, Real-Time Dispatch constraints, contingencies, and voltage and dynamic stability assessments. Where practicable, the CAISO will provide notice, via the CAISO Website, of any temporary adjustments to Ancillary Service standards by 6:00 p.m. two (2) days ahead of the Operating Day to which the adjustment will apply. Periodic reviews by the CAISO may

include, but are not limited to: (a) analysis of the deviation between actual and forecast Demand; (b) analysis of patterns of unplanned Generating Unit Outages; (c) analysis of compliance with NERC and WECC Reliability Standards and any requirements of the NRC; (d) analysis of operation during system disturbances; (e) analysis of patterns of shortfalls between Day-Ahead Schedules and actual Generation and Demand; and (f) analysis of patterns of unplanned transmission Outages.

### **8.2.3 Quantities of Ancillary Services Required and Use of Ancillary Service Regions.**

For each of the Ancillary Services, the CAISO shall determine the quantity and location of the Ancillary Service which is required using Ancillary Service Regions as described in Section 8.3.3. For each of the Ancillary Services, the CAISO shall determine the required locational dispersion in accordance with CAISO Controlled Grid reliability requirements. The Ancillary Services provided must be under the direct Dispatch control of the CAISO on a Real-Time Dispatch Interval basis. The CAISO shall determine the quantities it requires as provided for in Sections 8.2.3.1 to 8.2.3.3.

#### **8.2.3.1 Regulation Service.**

The CAISO shall maintain sufficient Generating Units immediately responsive to AGC in order to provide sufficient Regulation service to allow the CAISO Balancing Authority Area to meet NERC and WECC reliability standards, including any requirements of the NRC by continuously balancing Generation to meet deviations between actual and scheduled Demand and to maintain Interchange Schedules. The quantity of Regulation Down and Regulation Up capacity needed for each Settlement Period of the Day-Ahead Market and in each fifteen (15) minute period in Real-Time shall be determined by the CAISO as a percentage of the applicable CAISO Forecast of CAISO Demand for the Day-Ahead and Real-Time Markets. The CAISO's determination is based upon its need to meet the NERC and WECC reliability standards, including any requirements of the NRC.

shall assess the cost of Transmission Losses to Scheduling Coordinators using each such facility based on the quantity of losses agreed upon with the neighboring Balancing Authority multiplied by the LMP at the PNode of the Transmission Interface with the neighboring Balancing Authority Area. The MCLs calculated for Locations within the CAISO Balancing Authority Area shall not reflect the cost of Transmission Losses on those facilities.

#### **27.1.1.3 Marginal Cost of Congestion.**

The Marginal Cost of Congestion at a PNode reflects a linear combination of the Shadow Prices of all binding Constraints in the network, each multiplied by the corresponding Power Transfer Distribution Factor (PTDF). The Marginal Cost of Congestion may be positive or negative depending on whether a power injection (i.e., incremental Load increase) at that Location marginally increases or decreases Congestion.

#### **27.1.2 Ancillary Service Prices**

##### **27.1.2.1 Ancillary Service Marginal Prices**

As provided in Section 8.3, Ancillary Services are procured and awarded through the IFM and the Real-Time Market. The IFM calculates hourly Day-Ahead Ancillary Service Awards and establishes Ancillary Service Marginal Prices (ASMPs) for the accepted Regulation Up, Regulation Down, Spinning Reserve and Non-Spinning Reserve Bids. The IFM co-optimizes Energy and Ancillary Services subject to resource, network and regional constraints. In the Real-Time Market, the RTUC process that is performed every fifteen (15) minutes establishes fifteen (15) minute Ancillary Service Schedules, Awards, and prices for the upcoming quarter of the given Trading Hour. ASMPs are determined by first calculating the Ancillary Services Shadow Prices for each Ancillary Service type and the applicable Ancillary Services Constraints. The Ancillary Services Shadow Prices are produced as a result of the co-optimization of Energy and Ancillary Services for each Ancillary Service Region through the IFM and the Real-Time Market, subject to resource, network, and requirements constraints. The Ancillary Services Shadow Prices

represent the cost sensitivity of the relevant binding regional Constraint at the optimal solution, or the marginal reduction of the combined Energy and Ancillary Service procurement cost associated with a marginal relaxation of that Constraint. If the regional Constraint is not binding for an Ancillary Services Region, then the corresponding Ancillary Services Shadow Price in the Ancillary Services Region is zero. The ASMP for a particular Ancillary Service type and Ancillary Services Region is then the sum of the Ancillary Services Shadow Prices for the specific type of Ancillary Service and all the other types of Ancillary Services for which the subject Ancillary Service can substitute, as described in Section 8.2.3.5, for the given Ancillary Service Region and all the other Ancillary Service Regions that include that given Ancillary Service Region.

#### **27.1.2.2 Opportunity Cost in Ancillary Services Marginal Prices**

The Ancillary Services Shadow Price, which, as described above, is a result of the Energy and Ancillary Service co-optimization, includes the forgone opportunity cost of the marginal resource, if any, for not providing Energy or other types of Ancillary Services the marginal resource is capable of providing in the relevant market. The ASMPs determined by the IFM or RTUC optimization process for each resource whose Ancillary Service Bid is accepted will be no lower than the sum of (i) the Ancillary Service capacity Bid price submitted for that resource, and (ii) the foregone opportunity cost of Energy in the IFM or RTUC for that resource. The foregone opportunity cost of Energy is measured as the positive difference between the IFM or RTUC LMP at the resource's Pricing Node and the resource's Energy Bid price. If the resource's Energy Bid price is higher than the LMP, the opportunity cost is \$0. If a resource has submitted an Ancillary Service Bid but no Energy Bid and is under an obligation to offer Energy in the DAM (e.g. a non-hydro Resource Adequacy Resource), its Default Energy Bid will be used, and its opportunity cost will be calculated accordingly. If a resource has submitted an Ancillary Service Bid but no Energy Bid and is not under an obligation to offer Energy in the DAM, its Energy opportunity cost is \$0 since it cannot be dispatched for Energy.

**27.1.2.3 Ancillary Services Pricing - Insufficient Supply**

The CAISO will develop Scarcity Reserve Demand Curves as further described in an applicable Business Practice Manual that will apply to both the Day-Ahead Market and the Real-Time Market during periods in which supply is insufficient to meet the minimum procurement requirements for Regulation Down, Non-Spinning Reserve, Spinning Reserve and Regulation Up as required by Section 8.3. The CAISO shall review the performance of the Scarcity Reserve Demand Curves and assess whether changes are necessary every three (3) years or more frequently, if the CAISO determines more frequent reviews are appropriate. When supply is insufficient to meet the minimum procurement requirements for Regulation Down, Non-Spinning Reserve, Spinning Reserve and Regulation Up, the Scarcity Reserve Demand Curve Values for the affected Ancillary Services shall apply as set forth in this Section 27.1.2.3.

**27.1.2.3.1 Regulation Down Pricing – Insufficient Supply**

When the shortage of supply to meet the Regulation Down requirement in the Expanded System Region is less than or equal to thirty-two (32) MW, the Scarcity Reserve Demand Curve Value for Regulation Down shall be fifty (50) percent of the maximum Energy Bid price permitted under Section 39.6.1.1. When the shortage of supply to meet the Regulation Down requirement in the Expanded System Region is less than or equal to eighty-four (84) MW but greater than thirty-two (32) MW, the Scarcity Reserve Demand Curve Value for Regulation Down shall be sixty (60) percent of the maximum Energy Bid price permitted under Section 39.6.1.1. When the shortage of supply to meet the Regulation Down requirement in the Expanded System Region is greater than eighty-four (84) MW, the Scarcity Reserve Demand Curve Value for Regulation Down shall be seventy (70) percent of the maximum Energy Bid price permitted under Section 39.6.1.1. The Scarcity Reserve Demand Curve Value for Regulation Down in an Ancillary Service Sub-Region, including the System Region, shall be twenty-five (25) percent of the maximum Energy Bid price permitted under Section 39.6.1.1.

**27.1.2.3.2 Non-Spinning Reserve Pricing – Insufficient Supply**

When the shortage of supply to meet the Non-Spinning Reserve requirement in the Expanded System Region is less than or equal to seventy (70) MW, the Scarcity Reserve Demand Curve Value for Non-Spinning Reserve shall be fifty (50) percent of the maximum Energy Bid price permitted under Section 39.6.1.1. When the shortage of supply to meet the Non-Spinning Reserve requirement in the Expanded System Region is less than or equal to two-hundred ten (210) MW but greater than seventy (70) MW, the Scarcity Reserve Demand Curve Value for Non-Spinning Reserve shall be sixty (60) percent of the maximum Energy Bid price permitted under Section 39.6.1.1. When the shortage of supply to meet the Non-Spinning Reserve requirement in the Expanded System Region is greater than two-hundred ten (210) MW, the Scarcity Reserve Demand Curve Value for Non-Spinning Reserve shall be seventy (70) percent of the maximum Energy Bid price permitted under Section 39.6.1.1. The Scarcity Reserve Demand Curve Value for Non-Spinning Reserve in an Ancillary Service Sub-Region, including the System Region, shall be twenty-five (25) percent of the maximum Energy Bid price permitted under Section 39.6.1.1.

**27.1.2.3.3 Spinning Reserve Pricing – Insufficient Supply**

The Scarcity Reserve Demand Curve Value for Spinning Reserve in the Expanded System Region shall be ten (10) percent of the maximum Energy Bid price permitted under Section 39.6.1.1. The Scarcity Reserve Demand Curve Value for Spinning Reserve in an Ancillary Service Sub-Region shall be ten (10) percent of the maximum Energy Bid price permitted under Section 39.6.1.1.

**27.1.2.3.4 Regulation Up Pricing – Insufficient Supply**

The Scarcity Reserve Demand Curve Value for Regulation Up in the Expanded System Region shall be twenty (20) percent of the maximum Energy Bid price permitted under Section 39.6.1.1. The Scarcity Reserve Demand Curve Value for Regulation Up in an Ancillary Service Sub-Region shall be ten (10) percent of the maximum Energy Bid price permitted under Section 39.6.1.1.

**27.1.2.4 Opportunity Cost in LMPs for Energy**

In the event that there is insufficient supply to meet an Ancillary Services procurement requirement in a particular Ancillary Service Region or Sub-Region, the Ancillary Services Shadow Prices will rise automatically to the Scarcity Reserve Demand Curve Values in that Ancillary Service Region or Sub-Region. LMPs for Energy will reflect the forgone opportunity cost of the marginal resource, if any, for not providing the scarce Ancillary Services consistent with the CAISO's co-optimization design.

**27.1.3 Maximum and Minimum CAISO Markets Prices**

For Settlements purposes, all LMPs, ASMPs and RUC Availability Prices for the IFM, RUC, HASP and Real-Time Market, as applicable, shall not exceed \$2500 per MWh and shall not be less than negative \$2500 per MWh. All prices produced by the CAISO Markets will be posted in accordance with the posting of market results as further provided in Section 6.5, and subject to the price validation and correction procedures provided in Section 35; provided that the only prices that will be initially withheld from publication are those prices that exceed the above specified maximum and minimum CAISO Market prices. Prices exceeding \$2500 or less than negative \$2500 will be modified for Settlements purposes pursuant to price correction process in Section 35 and the CAISO will post the results. In addition to the analysis provided in the CAISO quarterly market performance reports on the maximum and minimum prices and price trends, the CAISO shall include in the weekly price correction report specified in Section 35.6 all prices at a non-aggregated level that exceed the minimum and maximum settlement prices specified in this Section 27.1.3. This Section 27.1.3 will no longer be in effect twelve months after the effective date of this section 27.1.3.

<b>RUC Market Revenues</b>	The sum of a resource's RUC Availability Payment for a Trading Hour divided by the number of Settlement Intervals in a Trading Hour or the purposes of calculating Bid Cost Recovery for RUC.
<b>RUC Price</b>	The price calculated by the RUC optimization for each Trading Hour of the next Trading Day which reflects the price (\$/MW per hour) for the next increment of RUC Capacity at a specified PNode for each Trading Hour.
<b>RUC Schedule</b>	The total MW per hour amount of capacity committed by RUC including the MW per hour amounts committed in the Day-Ahead Schedule.
<b>RUC Zone</b>	A forecast region representing a UDC or MSS Service Area, Local Capacity Area, or other collection of Nodes for which the CAISO has developed sufficient historical CASIO Demand and relevant weather data to perform a Demand Forecast for such area, for which as further provided in Section 31.5.3.7 the CAISO may adjust the CAISO Forecast of CAISO Demand to ensure that the RUC process produces adequate local capacity procurement.
<b>Rules of Conduct</b>	The rules set forth in Sections 37.2 through 37.7.
<b>Sanction</b>	A consequence specified in Section 37 for the violation of a Rule of Conduct, which may include a) a warning letter notifying the Market Participant of the violation and future consequences specified under Section 37 if the behavior is not corrected, or b) financial penalties. Neither referral to FERC nor rescission of payment for service not provided shall constitute a Sanction.
<b>SC</b>	Scheduling Coordinator
<b>SCA</b>	Scheduling Coordinator Agreement

<b>SCADA</b>	Supervisory Control and Data Acquisition
<b>Scarcity Reserve Demand Curve</b>	A demand curve used to clear the Ancillary Services markets when supply is insufficient in an Ancillary Service Region or Sub-Region to meet Ancillary Services minimum procurement requirements.
<b>Scarcity Reserve Demand Curve Values</b>	Fixed percentages of the maximum Energy Bid price permitted under Section 39.6.1.1 reflected in the Scarcity Reserve Demand Curve that the CAISO uses to calculate Ancillary Service Shadow Prices for Regulation Up, Spinning Reserve, Non-Spinning Reserve and Regulation Down from which the CAISO determines Ancillary Service Marginal Prices when there is insufficient supply in an Ancillary Service Region or Sub-Region to meet an Ancillary Services minimum procurement requirement.
<b>SCED</b>	Security Constrained Economic Dispatch

**Attachment C - Blacklines**

**Scarcity Pricing – Response to March 31, 2010 Letter**

**CAISO Fourth Replacement Tariff**

**ER10-500-000**

**April 30, 2010**

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## **8.2.2 Time-frame For Revising Ancillary Service Standards-**

The CAISO shall periodically undertake a review of the CAISO Controlled Grid operation to determine any revision to the Ancillary Services standards to be used in the CAISO Balancing Authority Area. At a minimum the CAISO shall conduct such reviews to accommodate revisions to NERC and WECC ~~r~~Reliability ~~s~~Standards, ~~including and~~ any requirements of the NRC. If the CAISO modifies its Ancillary Services standards, including its rules to determine minimum procurement requirements for Ancillary Services, the CAISO will notify Market Participants. The CAISO may adjust the Ancillary Services standards temporarily to take into account, among other things, variations in system conditions, Real-Time Dispatch constraints, contingencies, and voltage and dynamic stability assessments. Where practicable, the CAISO will provide notice, via the CAISO Website, of any temporary adjustments to Ancillary Service standards by 6:00 p.m. two (2) days ahead of the Operating Day to which the adjustment will apply. Periodic reviews by the CAISO may include, but are not limited to: (a) analysis of the deviation between actual and forecast Demand; (b) analysis of patterns of unplanned Generating Unit Outages; (c) analysis of compliance with NERC and WECC ~~r~~Reliability ~~s~~Standards, ~~including and~~ any requirements of the NRC; (d) analysis of operation during system disturbances; (e) analysis of patterns of shortfalls between Day-Ahead Schedules and actual Generation and Demand; and (f) analysis of patterns of unplanned transmission Outages.

\* \* \*

## **27.1.2 Ancillary Service Prices-**

### **27.1.2.1 Ancillary Service Marginal Prices-**

As provided in Section 8.3, Ancillary Services are procured and awarded through the IFM and the Real-Time Market. The IFM calculates hourly Day-Ahead Ancillary Service Awards and establishes Ancillary Service Marginal Prices (ASMPs) for the accepted Regulation Up, Regulation Down, Spinning Reserve and Non-Spinning Reserve Bids. The IFM co-optimizes Energy and Ancillary Services subject to resource, network and regional constraints. In the Real-Time Market, the RTUC process that is performed every fifteen (15) minutes establishes fifteen

(15) minute Ancillary Service Schedules, Awards, and prices for the upcoming quarter of the given Trading Hour. ASMPs are determined by first calculating the Ancillary Services ~~s~~Shadow ~~p~~Prices for each Ancillary Service type and the applicable Ancillary Services ~~Regions Constraints~~. The Ancillary Services ~~s~~Shadow ~~p~~Prices are produced as a result of the co-optimization of Energy and Ancillary Services for each Ancillary Service Region through the IFM and the Real-Time Market, subject to resource, network, and requirements constraints. The Ancillary Services ~~s~~Shadow ~~p~~Prices represent the cost sensitivity of the relevant binding regional ~~e~~Constraint at the optimal solution, or the marginal reduction of the combined Energy and Ancillary Service procurement cost associated with a marginal relaxation of that ~~e~~Constraint. If the regional ~~e~~Constraint is not binding for an Ancillary Services Region, then the corresponding Ancillary Services ~~s~~Shadow ~~p~~Price in the Ancillary Services Region is zero. The ASMP for a particular Ancillary Service type and Ancillary Services Region is then the sum of the Ancillary Services ~~s~~Shadow ~~p~~Prices for the specific type of Ancillary Service and all the other types of Ancillary Services for which the subject Ancillary Service can substitute, as described in Section 8.2.3.5, ~~and~~ for the given Ancillary Service Region and all the other Ancillary Service Regions that include that given Ancillary Service Region.

#### **27.1.2.2 Opportunity Cost in Ancillary Services Marginal Prices.**

The Ancillary Services ~~s~~Shadow ~~p~~Price, which, as described above, is a result of the Energy and Ancillary Service co-optimization, includes the forgone opportunity cost of the marginal resource, if any, for not providing Energy or other types of Ancillary Services the marginal resource is capable of providing in the relevant market. The ASMPs determined by the IFM or RTUC optimization process for each resource whose Ancillary Service Bid is accepted will be no lower than the sum of (i) the Ancillary Service capacity Bid price submitted for that resource, and (ii) the foregone opportunity cost of Energy in the IFM or RTUC for that resource. The foregone opportunity cost of Energy is measured as the positive difference between the IFM or RTUC LMP at the resource's Pricing Node and the resource's Energy Bid price. If the resource's Energy Bid price is higher than the LMP, the opportunity cost is \$0. If a resource has submitted an Ancillary Service Bid but no Energy Bid and is under an obligation to offer Energy in the DAM (e.g. a non-

hydro Resource Adequacy Resource), its Default Energy Bid will be used, and its opportunity cost will be calculated accordingly. If a resource has submitted an Ancillary Service Bid but no Energy Bid and is not under an obligation to offer Energy in the DAM, its Energy opportunity cost is \$0 since it cannot be dispatched for Energy.

**27.1.2.3 Ancillary Services Pricing ~~in the Event of a~~ - Insufficient Supply  
Insufficiency.**

~~In the event that there is not sufficient supply to meet an Ancillary Services procurement requirement in a particular Ancillary Services Region in the IFM or RTM as required by Section 8.3, the applicable market will relax the relevant Ancillary Service procurement requirement and will use the maximum Ancillary Service Bid price permitted under Section 39.6.1.3 as the pricing parameter for determining the price of the deficient Ancillary Service.~~

The CAISO will develop Scarcity Reserve Demand Curves as further described in an applicable Business Practice Manual that will apply to both the Day-Ahead Market and the Real-Time Market during periods in which supply is insufficient to meet the minimum procurement requirements for Regulation Down, Non-Spinning Reserve, Spinning Reserve and Regulation Up as required by Section 8.3. The CAISO shall review the performance of the Scarcity Reserve Demand Curves and assess whether changes are necessary every three (3) years or more frequently, if the CAISO determines more frequent reviews are appropriate. When supply is insufficient to meet the minimum procurement requirements for Regulation Down, Non-Spinning Reserve, Spinning Reserve and Regulation Up, the Scarcity Reserve Demand Curve Values for the affected Ancillary Services shall apply as set forth in this Section 27.1.2.3.

**27.1.2.3.1 Regulation Down Pricing – Insufficient Supply**

When the shortage of supply to meet the Regulation Down requirement in the Expanded System Region is less than or equal to thirty-two (32) MW, the Scarcity Reserve Demand Curve Value for Regulation Down shall be fifty (50) percent of the maximum Energy Bid price permitted under Section 39.6.1.1. When the shortage of supply to meet the Regulation Down requirement in the Expanded System Region is less than or equal to eighty-four (84) MW but greater than thirty-two (32) MW, the Scarcity Reserve Demand Curve Value for Regulation Down shall be sixty (60)

percent of the maximum Energy Bid price permitted under Section 39.6.1.1. When the shortage of supply to meet the Regulation Down requirement in the Expanded System Region is greater than eighty-four (84) MW, the Scarcity Reserve Demand Curve Value for Regulation Down shall be seventy (70) percent of the maximum Energy Bid price permitted under Section 39.6.1.1. The Scarcity Reserve Demand Curve Value for Regulation Down in an Ancillary Service Sub-Region, including the System Region, shall be twenty-five (25) percent of the maximum Energy Bid price permitted under Section 39.6.1.1.

#### **27.1.2.3.2 Non-Spinning Reserve Pricing – Insufficient Supply**

When the shortage of supply to meet the Non-Spinning Reserve requirement in the Expanded System Region is less than or equal to seventy (70) MW, the Scarcity Reserve Demand Curve Value for Non-Spinning Reserve shall be fifty (50) percent of the maximum Energy Bid price permitted under Section 39.6.1.1. When the shortage of supply to meet the Non-Spinning Reserve requirement in the Expanded System Region is less than or equal to two-hundred ten (210) MW but greater than seventy (70) MW, the Scarcity Reserve Demand Curve Value for Non-Spinning Reserve shall be sixty (60) percent of the maximum Energy Bid price permitted under Section 39.6.1.1. When the shortage of supply to meet the Non-Spinning Reserve requirement in the Expanded System Region is greater than two-hundred ten (210) MW, the Scarcity Reserve Demand Curve Value for Non-Spinning Reserve shall be seventy (70) percent of the maximum Energy Bid price permitted under Section 39.6.1.1. The Scarcity Reserve Demand Curve Value for Non-Spinning Reserve in an Ancillary Service Sub-Region, including the System Region, shall be twenty-five (25) percent of the maximum Energy Bid price permitted under Section 39.6.1.1.

#### **27.1.2.3.3 Spinning Reserve Pricing – Insufficient Supply**

The Scarcity Reserve Demand Curve Value for Spinning Reserve in the Expanded System Region shall be ten (10) percent of the maximum Energy Bid price permitted under Section 39.6.1.1. The Scarcity Reserve Demand Curve Value for Spinning Reserve in an Ancillary Service Sub-Region shall be ten (10) percent of the maximum Energy Bid price permitted under Section 39.6.1.1.

#### **27.1.2.3.4 Regulation Up Pricing – Insufficient Supply**

The Scarcity Reserve Demand Curve Value for Regulation Up in the Expanded System Region shall be twenty (20) percent of the maximum Energy Bid price permitted under Section 39.6.1.1.

The Scarcity Reserve Demand Curve Value for Regulation Up in an Ancillary Service Sub-Region shall be ten (10) percent of the maximum Energy Bid price permitted under Section 39.6.1.1.

#### **27.1.2.4 Opportunity Cost in LMPs for Energy**

In the event that there is insufficient supply to meet an Ancillary Services procurement requirement in a particular Ancillary Service Region or Sub-Region, the Ancillary Services Shadow Prices will rise automatically to the Scarcity Reserve Demand Curve Values in that Ancillary Service Region or Sub-Region. LMPs for Energy will reflect the forgone opportunity cost of the marginal resource, if any, for not providing the scarce Ancillary Services consistent with the CAISO's co-optimization design.

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### **CAISO Tariff Appendix A**

#### **Master Definitions Supplement**

##### **Scarcity Reserve Demand Curve**

A demand curve used to clear the Ancillary Services markets when supply is insufficient in an Ancillary Service Region or Sub-Region to meet Ancillary Services minimum procurement requirements.

##### **Scarcity Reserve Demand Curve Values**

Fixed percentages of the maximum Energy Bid price permitted under Section 39.6.1.1 reflected in the Scarcity Reserve Demand Curve that the CAISO uses to calculate Ancillary Service Shadow Prices for Regulation Up, Spinning Reserve, Non-Spinning Reserve and Regulation Down from which the CAISO determines Ancillary Service Marginal Prices when there is insufficient supply in an Ancillary Service Region or Sub-Region to meet an Ancillary Services minimum procurement requirement.

**Attachment D**

**Scarcity Pricing – Response to March 31, 2010 Letter**

**ER10-500-000**

**April 30, 2010**

### A. Introduction

- 1. Title:** Operating Reserves
- 2. Number:** BAL-STD-002-0
- 3. Purpose:** Regional Reliability Standard to address the Operating Reserve requirements of the Western Interconnection.

#### 4. Applicability

4.1.1 This criterion applies to each Responsible Entity that is (i) a Balancing Authority or a member of a Reserve Sharing Group that does not designate its Reserve Sharing Group as its agent, or (ii) a Reserve Sharing Group. A Responsible Entity that is a Balancing Authority and a member of a Reserve Sharing Group is subject to this criterion only as described in Section A.4.1.2. A Responsible Entity that is a member of a Reserve Sharing Group is not subject to this criterion on an individual basis.

4.1.2 Responsible Entities that are members of a Reserve Sharing Group may designate in writing to WECC a Responsible Entity to act as agent for purposes of this criterion for each such Reserve Sharing Group. Such Reserve Sharing Group agents shall be responsible for all data submission requirements under Section D of this Reliability Agreement. Unless a Reserve Sharing Group agent identifies individual Responsible Entities responsible for noncompliance at the time of data submission, sanctions for noncompliance shall be assessed against the agent on behalf of the Reserve Sharing Group, and it shall be the responsibility of the members of the Reserve Sharing Group to allocate responsibility for such noncompliance. If a Responsible Entity that is a member of a Reserve Sharing Group does not designate in writing to WECC a Responsible Entity to act as agent for purposes of this criterion for each such Reserve Sharing Group, such Responsible Entity shall be subject to this criterion on an individual basis.

- 5. Effective Date:** This Western Electricity Coordinating Council Regional Reliability Standard will be effective when approved by the Federal Energy Regulatory Commission under Section 215 of the Federal Power Act. This Regional Reliability Standard shall be in effect for one year from the date of Commission approval or until a North American Standard or a revised Western Electricity Coordinating Council Regional Reliability Standard goes into place, whichever occurs first. At no time shall this regional Standard be enforced in addition to a similar North American Standard.

### B. Requirements

WR1.

The reliable operation of the interconnected power system requires that adequate generating capacity be available at all times to maintain scheduled frequency and avoid loss of firm load following transmission or generation contingencies. This generating capacity is necessary to:

- supply requirements for load variations.
- replace generating capacity and energy lost due to forced outages of generation or transmission equipment.
- meet on-demand obligations.

## **WECC Standard BAL-STD-002-0 – Operating Reserves**

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- replace energy lost due to curtailment of interruptible imports.
- a. Minimum Operating Reserve. Each Balancing Authority shall maintain minimum Operating Reserve which is the sum of the following:
  - (i) Regulating reserve. Sufficient Spinning Reserve, immediately responsive to Automatic Generation Control (AGC) to provide sufficient regulating margin to allow the Balancing Authority to meet NERC's Control Performance Criteria (see BAL-001-0).
  - (ii) Contingency reserve. An amount of Spinning Reserve and Nonspinning Reserve (at least half of which must be Spinning Reserve), sufficient to meet the NERC Disturbance Control Standard BAL-002-0, equal to the greater of:
    - (a) The loss of generating capacity due to forced outages of generation or transmission equipment that would result from the most severe single contingency; or
    - (b) The sum of five percent of the load responsibility served by hydro generation and seven percent of the load responsibility served by thermal generation.

The combined unit ramp rate of each Balancing Authority's on-line, unloaded generating capacity must be capable of responding to the Spinning Reserve requirement of that Balancing Authority within ten minutes

  - (iii) Additional reserve for interruptible imports. An amount of reserve, which can be made effective within ten minutes, equal to interruptible imports.
  - (iv) Additional reserve for on-demand obligations. An amount of reserve, which can be made effective within ten minutes, equal to on-demand obligations to other entities or Balancing Authorities.
- b. Acceptable types of Nonspinning Reserve. The Nonspinning Reserve obligations identified in subsections a(ii), a(iii), and a(iv), if any, can be met by use of the following:
  - (i) interruptible load;
  - (ii) interruptible exports;
  - (iii) on-demand rights from other entities or Balancing Authorities;
  - (iv) Spinning Reserve in excess of requirements in subsections a(i) and a(ii); or
  - (v) off-line generation which qualifies as Nonspinning Reserve.
- c. Knowledge of Operating Reserve. Operating Reserves shall be calculated such that the amount available which can be fully activated in the next ten minutes will be known at all times.

## **WECC Standard BAL-STD-002-0 – Operating Reserves**

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- d. Restoration of Operating Reserve. After the occurrence of any event necessitating the use of Operating Reserve, that reserve shall be restored as promptly as practicable. The time taken to restore reserves shall not exceed 60 minutes (Source: WECC Criterion)

### **C. Measures**

#### **WM1.**

Except within the first 60 minutes following an event requiring the activation of Operating Reserves, a Responsible Entity identified in Section A.4 must maintain 100% of required Operating Reserve levels based upon data averaged over each clock hour. Following every event requiring the activation of Operating Reserves, a Responsible Entity identified in Section A.4 must re-establish the required Operating Reserve levels within 60 minutes. (Source: Compliance Standard)

### **D. Compliance**

#### **1. Compliance Monitoring Process**

##### **1.1 Compliance Monitoring Responsibility**

**Western Electricity Coordinating Council (WECC)**

##### **1.2 Compliance Monitoring Period**

At Occurrence and Quarterly

By no later than 5:00 p.m. Mountain Time on the first Business Day following the day on which an instance of non-compliance occurs (or such other date specified in Form A.1(a)), the Responsible Entities identified in Section A.4 shall submit to the WECC office Operating Reserve data in Form A.1(a) (available on the WECC web site) for each such instance of non-compliance. On or before the tenth day of each calendar quarter (or such other date specified in Form A.1(b)), the Responsible Entities identified in Section A.4 (including Responsible Entities with no reported instances of non-compliance) shall submit to the WECC office a completed Operating Reserve summary compliance Form A.1(b) (available on the WECC web site) for the immediately preceding calendar quarter.

##### **1.3 Data Retention**

Data will be retained in electronic form for at least one year. The retention period will be evaluated before expiration of one year to determine if a longer retention period is necessary. If the data is being reviewed to address a question of compliance, the data will be saved beyond the normal retention period until the question is formally resolved. (Source: NERC Language)

##### **1.4. Additional Compliance Information**

For purposes of applying the sanctions specified in [Sanction Table](#) for violations of this criterion, the “Sanction Measure” is Average Generation and the “Specified Period” is the most recent calendar month.(Source: Sanctions)

#### **2. Levels of Non-Compliance**

**Sanction Measure:** Average Generation

## **WECC Standard BAL-STD-002-0 – Operating Reserves**

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**2.1. Level 1:** There shall be a Level 1 non-compliance if any of the following conditions exist:

2.1.1 One instance during a calendar month in which the Balancing Authority's or the Reserve Sharing Group's Operating Reserve is less than 100% but greater than or equal to 90% of the required Operating Reserve.

**2.2. Level 2:** There shall be a Level 2 non-compliance if any of the following conditions exist:

2.2.1 One instance during a calendar month in which the Balancing Authority's or the Reserve Sharing Group's Operating Reserve is less than 90% but greater than or equal to 80% of the required Operating Reserve.

**2.3. Level 3:** There shall be a Level 3 non-compliance if any of the following conditions exist:

2.3.1 One instance during a calendar month in which the Balancing Authority's or the Reserve Sharing Group's Operating Reserve is less than 80% but greater than or equal to 70% of the required Operating Reserve.

**2.4. Level 4:** There shall be a Level 4 non-compliance if any of the following conditions exist:

2.4.1 One instance during a calendar month in which the Balancing Authority's or the Reserve Sharing Group's Operating Reserve is less than 70% of the required Operating Reserve.

### **E. Regional Differences**

**Version History – Shows Approval History and Summary of Changes in the Action Field**

<b>Version</b>	<b>Date</b>	<b>Action</b>	<b>Change Tracking</b>
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## Sanction Table

Sanctions for non-compliance with respect to each criterion in Section B Requirements shall be assessed pursuant to the following table. All monetary sanctions shall also include sending of Letter (B).

Level of Non-compliance	Number of Occurrences at a Given Level within Specified Period			
	1	2	3	4 or more
Level 1	Letter (A)	Letter (B)	Higher of \$1,000 or \$1 per MW of Sanction Measure	Higher of \$2,000 or \$2 per MW of Sanction Measure
Level 2	Letter (B)	Higher of \$1,000 or \$1 per MW of Sanction Measure	Higher of \$2,000 or \$2 per MW of Sanction Measure	Higher of \$4,000 or \$4 per MW of Sanction Measure
Level 3	Higher of \$1,000 or \$1 per MW of Sanction Measure	Higher of \$2,000 or \$2 per MW of Sanction Measure	Higher of \$4,000 or \$4 per MW of Sanction Measure	Higher of \$6,000 or \$6 per MW of Sanction Measure
Level 4	Higher of \$2,000 or \$2 per MW of Sanction Measure	Higher of \$4,000 or \$4 per MW of Sanction Measure	Higher of \$6,000 or \$6 per MW of Sanction Measure	Higher of \$10,000 or \$10 per MW of Sanction Measure

Letter (A): Letter to Responsible Entity’s Chief Executive Officer informing the Responsible Entity of noncompliance with copies to NERC, WECC Member Representative, and WECC Operating Committee Representative<sup>1</sup>.

Letter (B): Identical to Letter (A), with additional copies to (i) Chairman of the Board of Responsible Entity (if different from Chief Executive Officer), and to (ii) state or provincial regulatory agencies with jurisdiction over Responsible Entity, and, in the case of U.S. entities, FERC, and Department of Energy, if such government entities request such information.

The “Specified Period” and the “Sanction Measure” are as specified in Section D1.4 for each criterion.

Sanctions shall be assessed for all instances of non-compliance within a Specified Period. For example, if a Responsible Entity had two instances of Level 1 non-compliance and

<sup>1</sup> Copies of Letter A and Letter B will be sent to WECC Member Representative and WECC Operating Committee Representative when the Generator Operator is a WECC member.

one instance of Level 3 non-compliance for a specific criterion in the first Specified Period, it would be assessed the sanction from Column 2 of the Level 1 row, and the sanction from Column 1 of the Level 3 row.

If the Responsible Entity fails to comply with a given criterion for two or more consecutive Specified Periods, the sanctions assessed at each level of noncompliance for the most recent Specified Period shall be the sanction specified in the column immediately to the right of the indicated sanction. For example, if a Responsible Entity fails to comply with a given criterion for two consecutive Specified Periods, and in the second Specified Period the Responsible Entity has one instance of Level 1 non-compliance and two instances of Level 3 non-compliance, it would be assessed the sanction from Column 2 of the Level 1 row, and the sanction from Column 3 of the Level 3 row. If the sanction assessed at the highest level is the sanction in Column 4, no such modification of the specified sanction shall occur.

## **DEFINITIONS**

Unless the context requires otherwise, all capitalized terms shall have the meanings assigned in this Standard and as set out below:

**Area Control Error** or **ACE** means the instantaneous difference between net actual and scheduled interchange, taking into account the effects of Frequency Bias including correction for meter error.

**Automatic Generation Control** or **AGC** means equipment that automatically adjusts a Control Area's generation from a central location to maintain its interchange schedule plus Frequency Bias.

**Average Generation** means the total MWh generated within the Balancing Authority Operator's Balancing Authority Area during the prior year divided by 8760 hours (8784 hours if the prior year had 366 days).

**Business Day** means any day other than Saturday, Sunday, or a legal public holiday as designated in section 6103 of title 5, U.S. Code.

**Disturbance** means (i) any perturbation to the electric system, or (ii) the unexpected change in ACE that is caused by the sudden loss of generation or interruption of load.

**Extraordinary Contingency** shall have the meaning set out in Excuse of Performance, section B.4.c.

**Frequency Bias** means a value, usually given in megawatts per 0.1 Hertz, associated with a Control Area that relates the difference between scheduled and actual frequency to the amount of generation required to correct the difference.

**Nonspinning Reserve** means that Operating Reserve not connected to the system but capable of serving demand within a specified time, or interruptible load that can be removed from the system in a specified time.

**Operating Reserve** means that capability above firm system demand required to provide for regulation, load-forecasting error, equipment forced and scheduled outages and local area protection. Operating Reserve consists of Spinning Reserve and Nonspinning Reserve.

**Spinning Reserve** means unloaded generation which is synchronized and ready to serve additional demand. It consists of Regulating reserve and Contingency reserve (as each are described in Sections B.a.i and ii).

## **EXCUSE OF PERFORMANCE**

### **A. Excused Non-Compliance**

Non-compliance with any of the reliability criteria contained in this Standard shall be excused and no sanction applied if such non-compliance results directly from one or more of the actions or events listed below.

### **B. Specific Excuses**

#### **1. Governmental Order**

The Reliability Entity's compliance with or action under any applicable law or regulation or other legal obligation related thereto or any curtailment, order, regulation or restriction imposed by any governmental authority (other than the Reliability Entity, if the Reliability Entity is a municipal corporation or a federal, state, or provincial governmental entity or subdivision thereof).

#### **2. Order of Reliability Coordinator**

The Reliability Entity's compliance or reasonable effort to comply with any instruction, directive, order or suggested action ("Security Order") by the WECC Reliability Coordinator for the WECC sub-region within which the Reliability Entity is operating, provided that the need for such Security Order was not due to the Reliability Entity's non-compliance with (a) the WECC Reliability Criteria for Transmission System Planning, (b) the WECC Power Supply

Design Criteria, (c) the WECC Minimum Operating Reliability Criteria, or (d) any other WECC reliability criterion, policy or procedure then in effect (collectively, “WECC Reliability Standards”), and provided further that the Reliability Entity in complying or attempting to comply with such Security Order has taken all reasonable measures to minimize Reliability Entity’s non-compliance with the reliability criteria.

**3. Protection of Facilities**

Any action taken or not taken by the Reliability Entity which, in the reasonable judgment of the Reliability Entity, was necessary to protect the operation, performance, integrity, reliability or stability of the Reliability Entity’s computer system, electric system (including transmission and generating facilities), or any electric system with which the Reliability Entity’s electric system is interconnected, whether such action occurs automatically or manually; provided that the need for such action or inaction was not due to Reliability Entity’s non-compliance with any WECC Reliability Standard and provided further that Reliability Entity could not have avoided the need for such action or inaction through reasonable efforts taken in a timely manner. Reasonable efforts shall include shedding load, disconnecting facilities, altering generation patterns or schedules on the transmission system, or purchasing energy or capacity, except to the extent that the Reliability Entity demonstrates to the WECC Staff and/or the RCC that in the particular circumstances such action would have been unreasonable.

**4. Extraordinary Contingency**

- a.** Any Extraordinary Contingency (as defined in subsection c); provided that this provision shall apply only to the extent and for the duration that the Extraordinary Contingency actually and reasonably prevented the Reliability Entity from complying with any applicable reliability criteria; and provided further that Reliability Entity took all reasonable efforts in a timely manner to mitigate the effects of the Extraordinary Contingency and to resume full compliance with all applicable reliability criteria contained in this Reliability Agreement. Reasonable efforts shall include shedding load, disconnecting facilities, altering generation patterns or schedules on the transmission system, or purchasing energy or capacity, except to the extent that the Reliability Entity

demonstrates to the WECC Staff and/or the RCC that in the particular circumstances such action would have been unreasonable. Reasonable efforts shall not include the settlement of any strike, lockout or labor dispute.

- b.** Any Reliability Entity whose compliance is prevented by an Extraordinary Contingency shall immediately notify the WECC of such contingency and shall report daily or at such other interval prescribed by the WECC the efforts being undertaken to mitigate the effects of such contingency and to bring the Reliability Entity back into full compliance.
- c.** An Extraordinary Contingency means any act of God, actions by a non-affiliated third party, labor disturbance, act of the public enemy, war, insurrection, riot, fire, storm or flood, earthquake, explosion, accident to or breakage, failure or malfunction of machinery or equipment, or any other cause beyond the Reliability Entity's reasonable control; provided that prudent industry standards (e.g., maintenance, design, operation) have been employed; and provided further that no act or cause shall be considered an Extraordinary Contingency if such act or cause results in any contingency contemplated in any WECC Reliability Standard (e.g., the "Most Severe Single Contingency" as defined in the WECC Reliability Criteria or any lesser contingency).

**5. Participation in Field Testing**

Any action taken or not taken by the Reliability Entity in conjunction with the Reliability Entity's involvement in the field testing (as approved by either the WECC Operating Committee or the WECC Planning Coordination Committee) of a new reliability criterion or a revision to an existing reliability criterion where such action or non-action causes the Reliability Entity's non-compliance with the reliability criterion to be replaced or revised by the criterion being field tested; provided that Reliability Entity's non-compliance is the result of Reliability Entity's reasonable efforts to participate in the field testing.

**Attachment E**

**Scarcity Pricing – Response to March 31, 2010 Letter**

**ER10-500-000**

**April 30, 2010**

## **WECC Standard BAL-002-WECC-1 - Contingency Reserves**

### **Standard Development Roadmap**

*This section is maintained by the drafting team during the development of the standard and will be removed when the standard becomes effective.*

#### **Development Steps Completed:**

<b>Completed Actions</b>	<b>Completion Date</b>
1. Post Draft Standard for initial industry comments	September 14, 2007
2. Drafting Team to review and respond to initial industry comments	November 20, 2007
3. Post second Draft Standard for industry comments	November 20, 2007
4. Drafting Team to review and respond to industry comments	January 25, 2008
5. Post Draft Standard for Operating Committee approval	January 25, 2008
6. Operating Committee approved proposed standard	March 6, 2008
7. Post Draft Standard for WECC Board approval	March 12, 2008
8. Post Draft Standard for NERC comment period	April 14, 2008
9. WECC Board approved proposed standard	April 16, 2008
10. NERC comment period ended	May 20, 2008
11. Drafting Team completes review and consideration of NERC industry comments	May 30, 2008

#### **Description of Current Draft:**

The purpose of this standard is to create a permanent replacement standard for BAL-STD-002-0. BAL-002-WECC-1 is designed to implement the directives of FERC and recommendations of NERC when BAL-STD-002-0 was approved as a NERC reliability standard. The drafting team implemented in the standard additional refinements to address concerns as explained in the document titled, "WECC Standard BAL-002-WECC-1 Contingency Reserves." To assist in understanding the refinements made to the standard, the drafting team has developed a document that compares BAL-002-WECC-1, the permanent replacement standard, with the existing BAL-STD-002-0 (see BAL-002-WECC-1 Comparison).

This version of the BAL-002-WECC-1 standard is for NERC Board of Trustee ballot. The WECC Board of Directors approved the standard April 16, 2008. WECC Operating Committee approved the standard March 6, 2008. The WECC Board of Directors and Operating Committee request that the NERC Board of Trustees approve the BAL-002-WECC-1 Standard as a permanent replacement standard for BAL-STD-002-0 and that the NERC Board of Trustees submits the standard to FERC for approval and replacement of BAL-STD-002-0.

## **WECC Standard BAL-002-WECC-1 - Contingency Reserves**

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### **Future Development Plan:**

<b>Anticipated Actions</b>	<b>Anticipated Date</b>
1. NERC Board approval request	June 2008
2. Request FERC approval	June 2008

## **WECC Standard BAL-002-WECC-1 - Contingency Reserves**

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### **Definitions of Terms Used in Standard**

*This section includes all newly defined or revised terms used in the proposed standard. Terms already defined in the Reliability Standards Glossary of Terms are not repeated here. New or revised definitions listed below become approved when the proposed standard is approved. When the standard becomes effective, these definitions will be removed from the standard and added to the Glossary.*

## WECC Standard BAL-002-WECC-1 - Contingency Reserves

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### A. Introduction

1. **Title:** Contingency Reserves
2. **Number:** BAL-002-WECC-1
3. **Purpose:** Contingency Reserve is required for the reliable operation of the interconnected power system. Adequate generating capacity must be available at all times to maintain scheduled frequency, and avoid loss of firm load following transmission or generation contingencies. This generating capacity is necessary to replace generating capacity and energy lost due to forced outages of generation or transmission equipment.
4. **Applicability**
  - 4.1 Balancing Authority
  - 4.2 Reserve Sharing Group
5. **Effective Date:** On the first day of the next quarter, after receipt of applicable regulatory approval.

### B. Requirements

- R1. Each Reserve Sharing Group or Balancing Authority that is not a member of a Reserve Sharing Group shall maintain as a minimum Contingency Reserve that is the sum of the following: [*Violation Risk Factor: Medium*] [*Time Horizon: Real-time Operations*]
  - R1.1. The greater of the following:
    - R1.1.1. An amount of reserve equal to the loss of the most severe single contingency; or
    - R1.1.2. An amount of reserve equal to the sum of three percent of the load (generation minus station service minus Net Actual Interchange) and three percent of net generation (generation minus station service).
  - R1.2. If the Source Balancing Authority designates an Interchange Transaction(s) as part of its Non-Spinning Contingency Reserve, the Sink Balancing Authority shall carry an amount of additional Non-Spinning Contingency Reserve equal to the Interchange Transaction(s). This type of transaction cannot be designated as Spinning Reserves by the source BA. If the Source Balancing Authority does not designate the Interchange Transaction as part of its Contingency Reserve, the Sink Balancing Authority is not required to carry any additional Contingency Reserves under this Requirement.
  - R1.3. If the Sink Balancing Authority is designating an Interchange Transaction(s) as part of its Contingency Reserve either Spinning

## **WECC Standard BAL-002-WECC-1 - Contingency Reserves**

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or Non-Spinning, the Source Balancing Authority shall increase its Contingency Reserves equal in amount and type, to the capacity transaction(s) where the Sink Balancing Authority is designating the transaction(s) as a resource to meet its Contingency Reserve requirements. These types of transactions could be designated as either spinning or non-spinning reserves. If designated as Spinning Reserves, all of the requirements of section R2.1 & R2.2 must be met.

- R2.** Each Reserve Sharing Group or Balancing Authority that is not a member of a Reserve Sharing Group shall maintain at least half of the Contingency Reserve in R1.1 as Spinning Reserve. Any Spinning Reserve specified in R1 shall meet the following requirements. [*Violation Risk Factor: High*] [*Time Horizon: Real-time Operations*]
  - R2.1.** Immediately and automatically responds proportionally to frequency deviations, e.g. through the action of a governor or other control systems.
  - R2.2.** Capable of fully responding within ten minutes.
  
- R3.** Each Reserve Sharing Group or Balancing Authority shall use the following acceptable types of reserve which must be fully deployable within 10 minutes of notification to meet R1: [*Violation Risk Factor: Medium*] [*Time Horizon: Real-time Operations*]
  - R3.1.** Spinning Reserve
  - R3.2.** Interruptible Load;
  - R3.3.** Interchange Transactions designated by the source Balancing Authority as non-spinning contingency reserve;
  - R3.4.** Reserve held by other entities by agreement that is deliverable on Firm Transmission Service;
  - R3.5.** An amount of off-line generation which can be synchronized and generating; or
  - R3.6.** Load, other than Interruptible Load, once the Reliability Coordinator has declared a capacity or energy emergency.

### **C. Measures**

- M1.** The Reserve Sharing Group or Balancing Authority that is not a member of a Reserve Sharing Group has documentation that it maintained 100% of required Contingency Reserve levels based upon data integrated over each clock hour except within the first 105 minutes (15 minute Disturbance Recovery Period, plus

## **WECC Standard BAL-002-WECC-1 - Contingency Reserves**

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90 minute Contingency Reserve Restoration Period) following an event requiring the activation of Contingency Reserves. For each hour Reserve Sharing Group or Balancing Authority shall have and provide upon request their Contingency Reserve Requirement in MW, how the requirement was calculated, and amount of Contingency Reserve available in MW. E-tags and/or contracts shall be provided to document any transactions under R1.2 and R1.3.

- M2.** The Reserve Sharing Group or Balancing Authority that is not a member of a Reserve Sharing Group has documentation that it maintained at least 100% of minimum Spinning Contingency Reserve required based upon data averaged over each clock hour except within the first 105 minutes following an event requiring the activation of Contingency Reserves. For each hour, Reserve Sharing Group or Balancing Authority that is not a member of a Reserve Sharing Group shall have and provide upon request the Spinning Reserve Requirement in MW and amount of Spinning Reserve available in MW that is automatically responsive to frequency and can be fully deployed in 10 minutes.
- M3.** The Reserve Sharing Group or Balancing Authority that is not a member of a Reserve Sharing Group has documentation that it used the acceptable types of reserve for each hour to meet R3.
- M3.1** Any Reserve Sharing Group or Balancing Authority utilizing Load other than Interruptible Load shall submit documentation demonstrating that the Reliability Coordinator declared a Capacity and/or Energy Emergency prior to utilizing Load for Contingency Reserves.

### **D. Compliance**

#### **1. Compliance Monitoring Process**

##### **1.1 Compliance Monitoring Responsibility**

Compliance Enforcement Authority

##### **1.2 Compliance Monitoring Period**

The Compliance Enforcement Authority may use one or more of the following methods to assess compliance:

- Reports conducted quarterly
- Spot check audits conducted anytime with 30 days notice given to prepare
- Periodic audit as scheduled by the Compliance Enforcement Authority
- Investigations
- Other methods as provided for in the Compliance Monitoring Enforcement Program

Reserve Sharing Groups and Balancing Authorities shall submit to their Compliance Enforcement Authority a Contingency Reserve verification report on or before the tenth business day following the end of each calendar quarter.

## **WECC Standard BAL-002-WECC-1 - Contingency Reserves**

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**1.2.1** Compliance Monitoring Period: One Clock Hour.

**1.2.2** The Performance-reset Period is calendar quarter.

### **1.3 Data Retention**

Reserve Sharing Groups and Balancing Authorities shall keep evidence for Measure M.1 through M3 for three years plus current, or since the last audit, whichever is longer.

### **1.4. Additional Compliance Information**

**1.4.1.** This Standard shall apply to a Reserve Sharing Group that has registered with the WECC as provided in Section 1.4.2, and each Balancing Authority identified in the registration shall be responsible for compliance with this Standard through its participation in the Reserve Sharing Group and not on an individual basis.

**1.4.2.** A Reserve Sharing Group may register as the Responsible Entity for purposes of compliance with this Standard by providing written notice to the WECC (a) indicating that the Reserve Sharing Group is registering as the Responsible Entity for purposes of compliance with this Standard, (b) identifying each Balancing Authority that is a member of the Reserve Sharing Group, and (c) identifying the person or organization that will serve as agent on behalf of the Reserve Sharing Group for purposes of communications and data submissions related to or required by this Standard.

**1.4.3.** If an agent properly designated in accordance with Section 1.4.2 identifies individual Balancing Authorities within the Reserve Sharing Group responsible for noncompliance at the time of data submission, together with the percentage of responsibility attributable to each identified Balancing Authority, then, except as may otherwise be finally determined through a duly conducted review or appeal of the initial finding of noncompliance, (a) any penalties assessed for noncompliance by the Reserve Sharing Group shall be allocated to the individual Balancing Authorities identified in the applicable data submission in proportion to their respective percentages of responsibility as specified in the data submission, (b) each Balancing Authority shall be solely responsible for all penalties allocated to it according to its percentage of responsibility as provided in subsection (a) of this Section 1.4.3, and (c) neither the Reserve Sharing Group nor any member of the Reserve Sharing Group shall be responsible for any portion of a penalty assessed against another member of the Reserve Sharing Group in accordance with subsection (a) of this Section 1.4.3 (even if the member of Reserve Sharing Group against which the penalty is assessed is not subject to or otherwise fails to pay its allocated share of the penalty).

## **WECC Standard BAL-002-WECC-1 - Contingency Reserves**

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- 1.4.4. If an agent properly designated in accordance with Section 1.4.2 fails to identify individual Balancing Authorities within the Reserve Sharing Group responsible for noncompliance at the time of data submission or fails to specify percentages of responsibility attributable to each identified Balancing Authority, any penalties for noncompliance shall be assessed against the agent on behalf of the Reserve Sharing Group, and it shall be the responsibility of the members of the Reserve Sharing Group to allocate responsibility for such noncompliance.
- 1.4.5. Any Balancing Authority that is a member of a Reserve Sharing Group that has failed to register as provided in Section 1.4.2 shall be subject to this Standard on an individual basis.

### **2. Violation Severity Levels for Requirement R1**

- 2.1. **Lower:** There shall be a Lower Level of non-compliance if there is one hour during a calendar month in which the Balancing Authority's or the Reserve Sharing Group's Contingency Reserve is less than 100% but greater than or equal to 90% of the required Contingency Reserve.
- 2.2. **Moderate:** There shall be a Moderate Level of non-compliance if there is one hour during a calendar month in which the Balancing Authority's or the Reserve Sharing Group's Contingency Reserve is less than 90% but greater than or equal to 80% of the required Contingency Reserve.
- 2.3. **High:** There shall be a High Level of non-compliance if there is one hour during a calendar month in which the Balancing Authority's or the Reserve Sharing Group's Contingency Reserve is less than 80% but greater than or equal to 70% of the required Contingency Reserve.
- 2.4. **Severe:** There shall be a Severe Level of non-compliance if there is one hour during a calendar month in which the Balancing Authority's or the Reserve Sharing Group's Contingency Reserve is less than 70% of the required Contingency Reserve.

### **3. Violation Severity Level for Requirement R2**

- 3.1 **Lower:** There shall be a Lower Level of non-compliance if there is one hour during a calendar month in which the Balancing Authority's or the Reserve Sharing Group's Spinning Reserve is less than 100% but greater than or equal to 90% of the required Spinning Reserve.
- 3.2. **Moderate:** There shall be a Moderate Level of non-compliance if there is one hour during a calendar month in which the Balancing Authority's or the Reserve Sharing Group's Spinning Reserve is less than 90% but greater than or equal to 80% of the required Spinning Reserve.
- 3.3. **High:** There shall be a High Level of non-compliance if there is one hour during a calendar month in which the Balancing Authority's or the Reserve Sharing Group's Spinning Reserve is less than 80% but greater than or equal to 70% of the required Spinning Reserve.

## **WECC Standard BAL-002-WECC-1 - Contingency Reserves**

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**3.4. Severe:** There shall be a Severe Level of non-compliance if there is one hour during a calendar month in which the Balancing Authority's or the Reserve Sharing Group's Spinning Reserve is less than 70% of the required Spinning Reserve.

### **4. Violation Severity Level for Requirement R3**

**4.1 Lower:** Not Applicable

**4.2 Moderate:** Not Applicable

**4.3 High:** There shall be a High Level of non-compliance if there is one hour during a calendar month in which the Balancing Authority or Reserve Sharing Group used unacceptable resources for Contingency Reserves.

**4.4 Severe:** Not Applicable

**Version History** – Shows Approval History and Summary of Changes in the Action Field

<b>Version</b>	<b>Date</b>	<b>Action</b>	<b>Change Tracking</b>
1	April 16, 2008	Permanent Replacement Standard for BAL-STD-002-0	

**Attachment F**

**Scarcity Pricing – Response to March 31, 2010 Letter**

**ER10-500-000**

**April 30, 2010**



# Scarcity Pricing – Proposed Changes in Values

Stakeholder Conference Call

Mark Rothleder

Director, Market Analysis and Development

February 25, 2010

# No SRDCV specified for sub-regional regulation down in final scarcity pricing design

- Expectation prior to new market, fall 2008, was that Regulation would be procured only at System level
- Actual operational experience with new market is ISO can procure Regulation Down on sub-regional basis therefore a value should be specified
- Based on Final Proposal Reserve Scarcity Pricing Design, November 4, 2009:
  - “The SRVDC’s for Regulation Down mirror that of Non-Spinning Reserve”
- ISO does not anticipate delay in implementation of scarcity pricing.

# ISO proposes to mirror values specified in the sub region for Non-Spinning Reserve

Reserve	Percent of Energy Bid Cap		Bid Cap = \$750/MWh (\$/MWh)		Bid Cap = \$1000/MWh (\$/MWh)	
	Region	Sub-Region	Region	Sub-Region	Region	Sub-Region
Regulation Up	20%	10%	\$150	\$75	\$200	\$100
Spinning Reserve	10%	10%	\$75	\$75	\$800	\$100
Non-Spinning Reserve		25%		\$188		\$250
Shortage > 210 MW	70%		\$525		\$700	
Shortage > 70 & ≤ 210 MW	60%		\$450		\$600	
Shortage ≤ 70 MW	50%		\$375		\$500	
Upward Reserve Sum	100%	45%	\$750	\$338	\$1000	\$450
Regulation Down		25%		\$188		\$250
Shortage > 84MW	70%		\$525		\$700	
Shortage > 32 & ≤ 84 MW	60%		\$450		\$600	
Shortage ≤ 32 MW	50%		\$375		\$500	