![California ISO - Your Link to Power]

California Independent
System Operator Corporation

December 23, 2009

VIA OVERNIGHT DELIVERY

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

Re: California Independent System Operator Corporation
Tariff Amendment to Implement Scarcity Reserve Pricing
Docket No. ER_____-000

Dear Secretary Bose:

Pursuant to Section 205 of the Federal Power Act,[1] and Section 35.13 of the
Federal Energy Regulatory Commission's regulations,[2] the California Independent
System Operator Corporation ("ISO") respectfully submits for filing an original and five
copies of an amendment to its tariff.[3] The ISO requests an effective date for the
changes to its tariff of April 1, 2010. The purpose of this tariff modification is to comply
with the directive of the Commission that the ISO refine its scarcity pricing design within
twelve (12) months of operation of the ISO's new markets.[4] Two additional copies of
this filing are enclosed to be date-stamped and returned to the ISO's office in the self-
addressed, postage prepaid envelope contained herein.

I.   Background and Summary

As part of its review of the ISO's new markets, the Commission directed that the
ISO "develop a reserve shortage scarcity pricing mechanism that applies
administratively-determined graduated prices to various levels of reserve shortage."[5]

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[1]   16 U.S.C. § 824d.

[2]   18 C.F.R. § 35.13.

[3]   The ISO is sometimes referred to CAISO. Capitalized terms not otherwise defined herein have
the meanings set forth in the Master Definitions Supplement, Appendix A to the ISO tariff.

[4]   *Calif. Indep. Sys. Operator Corp.*, 116 FERC ¶ 61,274 (2006) ("*September 2006 Order*") at PP
1078-1079.

[5]   *Id.* at P 1079.

Through its stakeholder process, the ISO developed a scarcity pricing design proposal to address reserve shortages.[6] The proposal is consistent with the ISO's approved market design and one of the options indentified by the Commission in Order 719 to implement scarcity pricing; specifically, to establish a demand curve for operating reserves that raises prices "in a previously agreed-upon way as operating reserves grow short."[7] The ISO's proposal has the general support of its stakeholders as well as the ISO's Market Surveillance Committee. On December 16, 2009, the ISO Board of Governors approved the proposal and authorized the ISO to file the attached tariff language with the Commission.[8]

The ISO's scarcity pricing proposal applies to the procurement of regulation, spinning reserve and non-spinning reserve in the ISO's ancillary service regions and sub-regions as they are currently defined in the ISO tariff.[9] Scarcity pricing will apply to both the ISO's day-ahead and real-time markets when supply is insufficient to meet minimum ancillary service procurement requirements. The ISO's scarcity pricing mechanism will improve reliability by reducing demand and increasing generation availability during periods of scarcity.

The ISO tariff defines two ancillary service regions: the *system region* (*i.e.*, the ISO balancing authority area) and the *expanded system region* (*i.e.*, the system region and the intertie scheduling points with adjacent balancing authority areas), and eight sub-regions within them. [10] The reliability standards of the North American Electric Reliability Corporation ("NERC") and Western Electricity Coordinating Council ("WECC") set minimum procurement requirements for ancillary services in the ISO's expanded system region.[11] The ISO may establish minimum procurement requirements for ancillary services in the system region and sub-regions to ensure that ancillary services are dispersed appropriately throughout its balancing authority area.[12]

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[6]   A copy of the ISO's Final Proposal for Reserve Scarcity Pricing Design dated November 4, 2009 is available on the ISO website at: http://www.caiso.com/245c/245cd04327ae0.pdf.

[7]   *Wholesale Competition in Regions with Organized Electric Markets*, FERC Stats. & Regs. ¶ 31,281 (2008) ("*Order 719*") at PP 208, 234-235.

[8]   A copy of the ISO's December 9, 2009 memorandum to its Governing Board is available on the ISO website at: http://www.caiso.com/2480/2480aa0f3a6b0.pdf.

[9]   CAISO Tariff section 8.3.3.

[10]   *Id.*

[11]   CAISO Tariff section 8.3.3.1.

[12]   CAISO Tariff sections 8.2.1, 8.3.3.2.

Under the ISO's proposal, when supply is insufficient to meet any of the ISO's ancillary service procurement requirements within an ancillary service region or sub-region, whether in the day-ahead market or real-time market, the ISO's scarcity reserve demand curves will clear the ancillary services market with administratively determined prices. The ISO has proposed values for each demand curve and has proposed to adopt tiered demand curves for non-spinning and regulation down reserves in the expanded system region. Demand curve values will apply in the region or sub-region in which the shortage occurs. The ISO will consider the system region as an ancillary service sub-region in its scarcity pricing design. When a shortage triggers the scarcity pricing mechanism in multiple nested sub-regions, the ISO will apply the demand curve for the sub-region only to the outer most sub-region with a scarcity condition, so that all other nested sub-regions will have the same scarcity prices.

Based on the principle of ancillary service substitution reflected in the ISO's current tariff, 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.[13] For example, the scarcity price for regulation up in the expanded system region will reflect the sum of the shadow prices for regulation up, spinning reserve and non-spinning reserve in the expanded system region. As a result, the price for a higher-quality ancillary service that can substitute for another ancillary service will always be higher than the price for a lower-quality ancillary service. In addition, the ISO's proposal allows for the ancillary service marginal prices during a shortage to rise above the maximum energy bid cap in some instances. The ISO intends to review the performance of its reserve scarcity pricing design at least every three years.

II.   Proposed Changes to the ISO Tariff

In section 8.2.2 of its tariff, the ISO proposes to include language that reflects a commitment to notify market participants in the event the ISO changes its rules to determine the minimum procurement requirements for ancillary services. During the stakeholder process, the ISO received comments that a change in a minimum procurement requirement for ancillary services may impact the possible trigger of a shortage condition. Stakeholders requested that they receive notice of any such change. The proposed language in section 8.2.2 responds to this request. The remaining changes in section 8.2.2 are the capitalization of the term "Reliability Standards" to reflect that it is already a defined term in Appendix A to the ISO tariff, and a minor grammatical change to clarify that the ISO will analyze NERC and WECC reliability standards *and* any requirements of the Nuclear Regulatory Commission in its review of ancillary service standards applicable to the ISO balancing authority area.

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[13]   CAISO Tariff sections 8.2.35, 27.1.2.1.

In section 27.1.2.1, the ISO proposes to capitalize the terms "Shadow Price" and "Constraint" to reflect that they are already defined terms in Appendix A to the ISO tariff. The ISO also proposes to modify its description of calculating ancillary service shadow prices to reflect that they are calculated for an applicable constraint as opposed to an ancillary services region. Finally, the ISO proposes to make a minor grammatical change to clarify that the ancillary services marginal price for a particular ancillary service reflects the sum of the shadow price for that ancillary service as well as the shadow prices of all other types of ancillary services for which the ancillary service can substitute. This language reflects the principle of ancillary substitution and nesting of ancillary service sub-regions with the expanded system region on which the ISO has based its scarcity reserve demand curves.

In section 27.1.2.2, the ISO proposes to capitalize the term "Shadow Price" to reflect that it is already a defined term in Appendix A to the ISO tariff.

In section 27.1.2.3, the ISO proposes to delete language that authorizes the ISO to pay the maximum ancillary service bid price under tariff section 39.6.1.3 (*i.e.*, $250/MWh) in the event that supply is insufficient for a particular ancillary service. In place of that language, the ISO proposes to add language that explains that the ISO will develop scarcity reserve demand curves that will apply to the ISO's day-ahead market and 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 and that the scarcity reserve demand curve values set forth in the tariff section shall apply to the affected ancillary service. The ISO also commits to review the performance of these demand curves at least every three years.

In proposed section 27.1.2.3.1, the ISO describes the demand curve values for the regulation down ancillary service under scarcity pricing. For regulation down, the ISO proposes to adopt a tiered demand curve that applies to the expanded system region with values that increase with the levels of shortage. No demand curve applies to an ancillary services sub-region for regulation down. The proposed demand curve tiers reflect ancillary service bid deficiency data between 2006 and 2007.[14] Although this data is from periods prior to implementation of the new ISO market design, in the period since the startup of the new markets on March 31, 2009, the ISO has not experienced ancillary service supply shortages, and new market data does not support the adoption of different tiers for regulation down at this time. As explained in the proposed tariff language, the scarcity reserve demand curve values for regulation down are a percentage of the applicable maximum energy bid price. The ISO proposes demand curve values for each tier based on the maximum ancillary services bids in 2006 and 2007. In all cases, these values result in ancillary service marginal prices that are higher than the current maximum ancillary service bid price. The ISO's proposed use of specified demand curve values generally is consistent

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[14]   *See* http://www.caiso.com/241c/241ccfc422550.pdf.

with scarcity pricing provisions contained in the Market Services Tariff of the New York Independent System Operator, Inc.[15]

In proposed section 27.1.2.3.2, the ISO describes the demand curve values for non-spinning reserve under scarcity pricing. For non-spinning reserve, the ISO has proposed a tiered demand curve that applies to the expanded system region with values that increase with the levels of shortage. Similar to regulation down, the proposed demand curve tiers for non-spinning reserves reflect ancillary service bid deficiency data between 2006 and 2007. Also, the scarcity reserve demand curve values for non-spinning reserve are a percentage of the applicable maximum energy bid price. The ISO proposes demand curve values for each tier based on the maximum ancillary services bids in 2006 and 2007. In all cases, these values result in ancillary service marginal prices that are higher than the existing maximum ancillary service bid price. When non-spinning reserve is scarce within an ancillary service sub-region, including the system region, the ISO proposes an additional demand curve value of twenty-five (25) percent of the maximum energy bid price. As explained above, the ISO's proposed use of specified demand curve values generally is consistent with scarcity pricing provisions contained in the NYISO's Market Services Tariff.[16]

In proposed section 27.1.2.3.3, the ISO describes the demand curve values for spinning reserve under scarcity pricing. For spinning reserve, the ISO has proposed a single demand curve value of ten (10) percent of the maximum energy bid price that applies to the expanded system region. When spinning reserve is scarce within an ancillary service sub-region, including the system region, the ISO proposes to apply an additional demand curve value of ten (10) percent of the maximum energy bid price.

In proposed section 27.1.2.3.4, the ISO describes the demand curve values for regulation up under scarcity pricing. For regulation up, the ISO has proposed a single demand curve value of twenty (20) percent of the maximum energy bid price that applies to the expanded system region. When regulation up is scarce within an ancillary service sub-region, including the system region, the ISO proposes to apply an additional demand curve value of ten (10) percent of the maximum energy bid price.

Table 1 of this filing letter reflects the scarcity reserve demand curve values for regulation down, non-spinning reserve, spinning reserve and regulation up under the applicable maximum energy bid price.[17] The ISO's proposed demand curve values reflect the economic values of the reserves necessary to resolve the shortage but not expose

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[15] *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.

[16] *Id.*

[17] CAISO Tariff section 39.6.1 provides: "For the twelve (12) months following the effective date of this Section, the maximum Energy Bid prices shall be $500/MWh. After the twelfth month following the effective date of this Section, the maximum Energy Bid price shall be $750/MWh. After the twenty-fourth month following the effective date of this Section, the maximum Energy Bid price shall be $1,000/MWh."

consumers to unreasonably high prices. The maximum scarcity price in the expanded system region equals the maximum energy bid price. When supplies of all reserves are short in the expanded system region and a sub-region, the scarcity price may rise as high as 145 percent of maximum energy bid price. The ISO believes this scarcity price approximates the maximum opportunity cost that could occur for reserves and will allow the ISO to make full use of economic generation and demand response resources in a scarcity condition.

Table 1. Proposed Scarcity Reserve Demand Curves

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

The ISO intends to reproduce Table 1 as well as provide examples of scarcity conditions and resulting administrative prices used to clear the ISO's ancillary services markets in its applicable Business Practice Manual.

In proposed section 27.1.2.4, the ISO explains that ancillary service shadow prices will rise automatically to the scarcity reserve demand curve values in an ancillary service region or sub-region in which the ancillary service is scarce. In order to ensure that both ancillary service and energy prices rise as the severity of a shortage increases,[18] this proposed section also provides that locational marginal prices for energy will reflect the foregone opportunity cost of the marginal resource, if any, for not providing the scarce ancillary services consistent with the ISO's market design for co-optimizing energy and ancillary services.

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[18] *September 2006 Order* at P 1079.

Finally, the ISO is proposing to add two defined terms that are used in the preceding tariff sections to Appendix A of the ISO tariff. The first term is "Scarcity Reserve Demand Curve."[19] The second term is "Scarcity Reserve Demand Curve Values."[20]

III.   The Proposed Tariff Changes Are Consistent with Commission Orders

In its *September 2006 Order*, the Commission required the ISO to implement a scarcity pricing design within twelve (12) months of operation of the ISO's new markets. The Commission directed that the proposal ensure that "prices are not inappropriately suppressed during periods of genuine scarcity."[21] The Commission provided guidance that "prices should rise to reflect the increased need for reserves or energy, whether or not the shortage arises in conjunction with a generation or transmission outage, in both the day ahead and real time markets."[22] The Commission stated that, under the scarcity pricing mechanism, "the prices for both reserves and energy in California should increase automatically as the severity of the shortage increases," and cited favorably the New York ISO and ISO New England scarcity pricing rules as complying with this directive.[23]

On rehearing, the Commission affirmed its direction to implement a reserve scarcity pricing mechanism.[24] The Commission recognized that scarcity prices will reflect a predetermined, administratively set demand curve that will not create incentives for entities to change their bidding behavior based on speculation as to when a shortage may occur.[25]

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[19]   The ISO proposes to define the term Scarcity Reserve Demand Curve as follows: "A demand curve used to clear the Ancillary Service markets when there is insufficient supply in an Ancillary Service Region or Sub-Region to meet Ancillary Services minimum procurement requirements."

[20]   The ISO proposes to defines the term Scarcity Reserve Demand Curve Values as follows: "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."

[21]   *September 2006 Order* at P 1078.

[22]   *Id.* at P 1077.

[23]   *Id.* at P 1079 and n.473.

[24]   *Calif. Indep. Sys. Operator Corp.*, 119 FERC ¶ 61,076 (2007) at P 518.

[25]   *Id.*

The ISO's proposal satisfies these Commission's requirements. The ISO is proposing to adopt graduated prices that will reflect the various levels of shortage. The prices for reserves are set automatically when a scarcity condition occurs. The locational marginal prices for energy dispatched during scarcity conditions will reflect the foregone opportunity cost, if any, of not providing reserves at the scarcity pricing level. In this respect, the ISO's proposal is comparable to the New York ISO and ISO New England scarcity pricing rules cited by the Commission as a model in the *September 2006* Order. Market participants do not need to change their bidding behavior in anticipation of a scarcity condition. The demand curve values also act as price caps that can prevent the exercise of market power.

As part of Order 719, the Commission identified several criteria in connection with proposals for pricing operating reserves during a shortage and requested that the ISO explain how its proposal satisfies these criteria.[26] The ISO's proposal satisfies each of these criteria:

Improve reliability by reducing demand and increasing generation during periods of operating reserve shortage: The ISO's proposal will provide immediate and automatic price signals to both demand and generation if there is a shortage of operating reserves. Participating demand response that is certified to provide operating reserves can respond to the shortage. Price responsive demand bid into the ISO's markets can also respond by reducing the need to dispatch energy that the ISO may otherwise co-optimize as operating reserves in the next dispatch interval. Generation certified to provide operating reserves will have the opportunity to respond to the increased prices arising from the shortage. Furthermore, as California implements its renewables portfolio standard, renewable resources may generate a large portion of their electricity during off-peak periods. As a result, the ISO may experience over-generation conditions and increased need for regulation down. The ISO's scarcity pricing proposal will send a strong price signal when the ISO needs this ancillary service.

Make it more worthwhile for customers to invest in demand response Technologies: Scarcity pricing will provide an additional opportunity for demand response resources to earn revenues. During a shortage condition, demand response resources that provide operating reserves will receive an administrative price that is greater than the current maximum ancillary service bid price of $250/MWh for non-spinning reserve and regulation down in the expanded system region.[27]   If there is also scarcity for spinning reserves and regulation up in the expanded system region, the resulting administrative price for these ancillary services can continue to rise based on the applicable demand curve. Overall, the ISO believes its proposal will make it more

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[26]   Order 719 at P 247.

[27]   *See* CAISO Tariff section 39.6.1.3.

worthwhile for customers to invest in demand response technologies and participate in the ISO's markets.

Encourage existing generation and demand resources to continue to be relied upon during an operating reserve shortage: During a shortage condition, demand response resources that provide operating reserves will receive an administrative price that is greater than the current maximum ancillary service bid price of $250/MWh for non-spinning reserve and regulation down in the expanded system region. If there is also scarcity for spinning reserves and regulation up in the expanded system region, the resulting administrative price for these ancillary services can continue to rise based on the applicable demand curve. This financial incentive should encourage existing generation and demand resources to remain available during an operating reserve shortage.

Encourage entry of new generation and demand resources: As explained above, shortage conditions may lead to increased payments for various ancillary services and energy. In addition, if a shortage condition reoccurs within an ancillary service region, this fact may signal the need for load serving entities to contract for additional generation or demand response resources that can alleviate that shortage.

Ensure that the principle of comparability in treatment of and compensation to all resources is not discarded during periods of operating reserve shortage: Under the ISO's proposal, all resources providing a scarce ancillary service within an ancillary service region in which a shortage exists will receive the same administrative price. At the same time, locational marginal prices for energy will reflect the foregone opportunity cost of the marginal resource, if any, for not providing the scarce ancillary service consistent with the ISO's co-optimization design.

Ensure market power is mitigated and gaming behavior is deterred during periods of operating reserve shortages including, but not limited to, showing how demand resources discipline bidding behavior to competitive levels: Under the ISO's scarcity pricing proposal, market participants do not need to change their bidding behavior in anticipation of a scarcity condition. If a shortage arises, all bids that have cleared the ancillary services market for that ancillary service will receive the same administrative price. Furthermore, demand can operate to reduce and eliminate the shortage either by participating in the 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.

IV.   Summary of Stakeholder Process and Market Surveillance Committee Opinion

The ISO's stakeholder process for scarcity pricing began in May 2007, with a break from July 2008 through August 2009 to focus on the startup of the new markets.

The ISO completed its stakeholder process earlier this month.[28] As part of that stakeholder process, the ISO issued a number of whitepapers and held multiple meetings and conference calls. Most recently, the ISO held a series of meetings and conference calls with stakeholders during the fall of 2009 to solicit and incorporate feedback from stakeholders into its final proposal. Among other things, the ISO has incorporated stakeholder recommendations to establish tiered demand curves for non-spinning reserves and regulation down, a process to inform stakeholders before the ISO changes its rules regarding minimum ancillary service requirements, and a process to monitor and review the performance of the scarcity pricing design. These measures are reflected in the ISO's proposed tariff language. Stakeholders also requested that the ISO issue a market notice when a scarcity condition arises. The ISO intends to include this procedure as part of its applicable Business Practice Manual governing scarcity pricing. The ISO believes the majority of stakeholders support the proposal adopted by the ISO Board of Governors, although the ISO acknowledges different perspectives remain regarding the design of a scarcity reserve pricing proposal.

Some stakeholders argued that a scarcity pricing design should reflect the same scarcity premiums regardless of whether the shortages are in the expanded system region or in ancillary services sub-regions. As explained above, the ISO may set minimum procurement requirements for ancillary services in its ancillary service sub-regions in order to disperse 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 and WECC 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 conditions exists in both an ancillary services sub region and the expanded system region. This design reflects the relative value of these scarce resources.

Stakeholders have also raised concerns that the level of the scarcity demand reserve curve values is either too low or too high. As discussed above, the ISO believes the values are sufficient to redispatch generation and demand response resources to address any shortage while providing consumers with protection against unnecessarily high administrative prices.

Stakeholders suggested delaying scarcity pricing for another year to allow sufficient time to develop proxy demand response resources. The ISO does not believe a delay is necessary. Demand response already participates in the ISO's markets. Also, load serving entities' price-responsive bid-in demand can help mitigate scarcity conditions. By implementing scarcity pricing, the ISO will provide another incentive for resources to participate in demand response programs.

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[28]   The ISO has posted materials and stakeholder comments regarding the scarcity pricing stakeholder process on the ISO's website at: http://www.caiso.com/1bef/1bef12b9b420b0.html.

The ISO's Market Surveillance Committee has provided an opinion on the ISO's scarcity pricing proposal.[29] The Market Surveillance Committee supports the proposal and also recommends, among other things, that the ISO undertake additional assessments of demand curve values based on loss-of-load probability and value of lost load, and undertake additional studies to confirm whether the demand curve values appropriately reflect the reliability costs of relaxing operating constraints for both the expanded system region and ancillary service sub-regions. As recognized in the Market Surveillance Committee's opinion, analytical assessments based on loss-of-load probability and value of lost load require a significant amount of complex and time-consuming work. The ISO has proposed to review its scarcity pricing design at least every three years and will consider the suggestions of the Market Surveillance Committee in consultation with its stakeholders as part of the effort to refine the scarcity pricing mechanism.

The Market Surveillance Committee also recommends that the ISO consider starting a stakeholder process to address refinements to the co-optimization of energy and ancillary services in the real-time market. Although the ISO procures one-hundred (100) percent of its anticipated ancillary service requirements in the day-ahead market, the ISO makes incremental procurements of ancillary services as part of the real-time market.[30] During the stakeholder process, the ISO discussed the fact that real-time prices for ancillary services and energy are determined in two different market clearing processes in its current market design. The real-time market procurement occurs in the *real-time unit commitment* ("RTUC") process every 15 minutes. Energy and ancillary services are co-optimized in the RTUC process, but only ancillary service marginal prices and awards are financially binding. Financially binding energy prices and schedules are determined in the subsequent *real-time dispatch* ("RTD") process every 5 minutes through an energy-only optimization. As a result, in some instances the RTD energy prices may not correctly reflect the ancillary service opportunity costs determined in the RTUC co-optimization. The ISO discussed this matter and its possible impact on scarcity pricing with stakeholders and believes this issue will have a relatively limited impact on market prices since the ISO procures only a small incremental amount of ancillary services in the real-time market.[31] The ISO intends to initiate a stakeholder process in 2010 to review the real-time market co-optimization of energy and ancillary services and address stakeholder interest in making further refinements to that process.

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[29] A copy of the Market Surveillance Committee Opinion is available on the ISO website at: http://www.caiso.com/2480/2480aa113a6b2.pdf.

[30] CAISO Tariff section 8.3.1.

[31] During the first months of the ISO's new market, the average procurement for each type of ancillary service ranged between 30 to 55 MW in the RTUC process.

V.   Effective Date

The ISO requests that the Commission approve the proposed tariff changes to be effective as of April 1, 2010.

VI.   Communications

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

Sidney M. Davies*, Assistant General Counsel	Andrew Ulmer* Senior Counsel
California Independent System Operator Corporation	California Independent System Operator Corporation
151 Blue Ravine Road	151 Blue Ravine Road
Folsom, CA 95630	Folsom, CA 95630
Phone: (916) 608-7144	Phone: (916) 608-7209
Fax: (916) 608-7296	Fax: (916) 608-7222
sdavies@CAISO.com	aulmer@CAISO.com

* Individuals designated for service pursuant to Rule 203(b)(3),
18 C.F.R. § 385.203(b)(3).

VII.   Service

The ISO has served copies of this transmittal letter, and all attachments, on the service list for Docket ER06-615-000 *et al.*, 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 transmittal letter and all attachments on the ISO website.

VIII.   Attachments

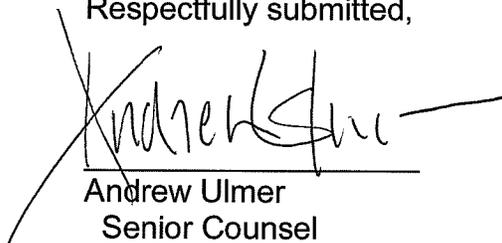The following documents, in addition to this transmittal letter, support this filing:

Attachment A	Clean tariff sheets showing the revisions described in this amendment
Attachment B	Sheets showing, in black-line format, the tariff changes described in this amendment

IX. Conclusion

The Commission should approve this tariff amendment as just and reasonable because it implements a scarcity pricing design proposal as directed by the Commission in the *September 2006 Order*. The ISO's proposed scarcity reserve prices are sufficient to address a shortage condition while not creating unnecessarily excessive costs for ratepayers. The ISO proposes to review its scarcity pricing design every three years or more frequently as needed to ensure the scarcity pricing mechanism is performing adequately.

Please do not hesitate to contact the undersigned if you have any questions.

Respectfully submitted,

Andrew Ulmer
   Senior Counsel
Nancy Saracino
   General Counsel
Sidney M. Davies
   Assistant General Counsel
   The California Independent System
   Operator Corporation
151 Blue Ravine Road
Folsom, CA 95630
Tel: (916) 608-7209
Fax: (916) 608-7246
E-mail: aulmer@CAISO.com

December 23, 2009

CERTIFICATE OF SERVICE

I hereby certify that I have served the foregoing document upon the parties listed on the official service list in the captioned proceedings, in accordance with the requirements of Rule 2010 of the Commission's Rules of Practice and Procedure (18 C.F.R. § 385.2010).

Dated at Folsom, California this 23rd day of December, 2009.

Jane Ostapovich

Attachment A – Clean Sheets

Scarcity Pricing Amendment

CAISO Fourth Replacement Tariff

December 24, 2009

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. There is no Scarcity

Reserve Demand Curve for Regulation Down in any Ancillary Service Sub-Region, including the

System Region.

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.

RUC Market Revenues	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.
RUC Price	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.
RUC Schedule	The total MW per hour amount of capacity committed by RUC including the MW per hour amounts committed in the Day-Ahead Schedule.
RUC Zone	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.
Rules of Conduct	The rules set forth in Sections 37.2 through 37.7.
Sanction	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.
SC	Scheduling Coordinator
SCA	Scheduling Coordinator Agreement

SCADA   Supervisory Control and Data Acquisition

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

Scarcity Reserve Demand   Fixed percentages of the maximum Energy Bid price permitted under
Curve Values   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.

SCED   Security Constrained Economic Dispatch

Attachment B - Blacklines

Scarcity Pricing Amendment

CAISO Fourth Replacement Tariff

December 24, 2009

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 rReliability sStandards, 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 rReliability sStandards, 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 sShadow pPrices for each Ancillary Service type and the applicable Ancillary Services Regions Constraints. The Ancillary Services sShadow pPrices 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 sShadow pPrices represent the cost sensitivity of the relevant binding regional cConstraint at the optimal solution, or the marginal reduction of the combined Energy and Ancillary Service procurement cost associated with a marginal relaxation of that cConstraint. If the regional cConstraint is not binding for an Ancillary Services Region, then the corresponding Ancillary Services sShadow pPrice 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 sShadow pPrices 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 sShadow pPrice, 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. There is no Scarcity Reserve Demand Curve for Regulation Down in any Ancillary Service Sub-Region, including the System Region.

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.

* * *

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.