



California Independent  
System Operator Corporation

November 20, 2009

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

**Re: California Independent System Operator Corporation  
Docket No. ER10-\_\_\_\_-000**

**California Independent System Operator Corporation  
Docket No. ER06-615-\_\_\_\_**

**Convergence Bidding Design Policy**

Dear Secretary Bose:

The California Independent System Operator Corporation (“ISO”) submits for Commission approval the ISO’s convergence bidding design policy.<sup>1</sup> After a lengthy and often contentious stakeholder process, the ISO is pleased to report that most stakeholders publicly stated that they ultimately agreed with most features of the ISO’s convergence bidding policies at the October 28, 2009, ISO Board of Governors meeting. Significantly, the ISO is proposing a nodal convergence bidding design with strong stakeholder support, a result that seemed highly unlikely a year ago. Notwithstanding the strong support for most design features, stakeholders reserved their rights to challenge policy and implementation design elements. Due to the lengthy software development timeline and the complexity of the convergence bidding design, and in light of the fact that the ISO anticipates that some parties will challenge some elements of it, the ISO believes it is in the best interests of all parties for the Commission to address the design elements of the ISO’s convergence bidding design policy

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<sup>1</sup> The ISO (which is sometimes also referred to as the CAISO) submits this filing pursuant to Section 205 of the Federal Power Act, 16 U.S.C. § 824d, and Section 35.13 of the Commission’s regulations, 18 C.F.R. § 35.13. Capitalized terms not otherwise defined herein have the meanings set forth in Appendix A to the ISO tariff.

proposal prior to the ISO's submission of tariff language.<sup>2</sup> The benefit of this approach is to allow the ISO to respond to any Commission guidance as soon as possible and to have that guidance reflected in the software under development and in the tariff language that will be filed.<sup>3</sup>

## I. EXECUTIVE SUMMARY

Convergence bidding is an important market enhancement that will enable market participants to hedge their physical market positions and manage their exposure to the differences between day-ahead and real-time prices. Convergence bids – also known as virtual bids – are purely financial bids submitted in the day-ahead market.<sup>4</sup> If these bids are cleared in the day-ahead market, they are automatically liquidated with the opposite sell/buy positions at real-time prices. The ISO's design for convergence bidding consists of the following major design elements:

- Scheduling Coordinators, on behalf of entities that enter into convergence bidding entity agreements, will be able to submit convergence bids at all internal pricing nodes, including aggregated pricing nodes (load aggregation points and trading hubs), and at the interties;
- Initial position limits, to be gradually phased out over several years, will reduce the total megawatts of convergence bids that a Scheduling Coordinator can place on behalf of a convergence bidding entity at any one internal pricing node or intertie;
- Intertie schedules will be subject to constraints that ensure compliance with applicable intertie scheduling limits. In addition, stricter position limits will be applied to convergence bids at the interties to ensure that these virtual bids do not adversely affect system reliability;

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<sup>2</sup> The ISO expects that it will be able to file the tariff language to implement convergence bidding within a few weeks after the Commission issues its order on the instant filing, if the order does not require any significant modifications to the convergence bidding design policy. If the order does require significant modifications, the ISO will need to adjust its schedule for filing the tariff language.

<sup>3</sup> As discussed further below, concurrently with the submission of the instant filing, the ISO is also submitting a motion for an extension of time to implement convergence bidding.

<sup>4</sup> The terms "convergence" and "virtual" are used interchangeably in this filing: "virtual" emphasizes the non-physical nature of the bids while "convergence" highlights one of the most significant expected benefits of this market feature – convergence of day-ahead and real-time prices.

- The ISO will continue to apply its existing local market power mitigation and reliability requirements determination process based on physical bid-in generation and the ISO's load forecast, and the ISO's Department of Market Monitoring will closely monitor virtual bidding to address the potential for use of convergence bidding to manipulate market prices or undermine local market power provisions;
- The ISO will have the ability to suspend convergence bidding for a single entity or the market as a whole at any or all nodes in the event that convergence bidding: (1) detrimentally affects grid or market operations, (2) contributes to an unwarranted divergence between prices in the integrated forward market and real-time market, or (3) otherwise distorts competitive market outcomes;
- A settlement rule will be applied to Scheduling Coordinators that represent convergence bidding entities that are also holders of congestion revenue rights (CRRs) to deter adverse incentives to engage in strategic convergence bidding that could affect revenues associated with their CRRs;
- Convergence bids will only be accepted in the day-ahead market to the extent Scheduling Coordinators satisfy a credit check which immediately compares the value of their bids to their available credit limit;
- The ISO will administer a registration process for convergence bidders to become convergence bidding entities. A convergence bidding entity must either be a Scheduling Coordinator or utilize a Scheduling Coordinator to submit convergence bids; and
- Costs attributable to convergence bidding will be allocated to Scheduling Coordinators through special transaction charges, uplift charges, and grid management charges, all based on cost-causation principles.

The ISO expects that its proposed convergence bidding feature will provide many benefits, including:

- Minimizing systematic differences between day-ahead and real-time prices, which will reduce incentives for under- or over-scheduling physical demand and supply in the day-ahead market;
- Enabling suppliers to hedge exposure to real-time prices in the event of a generator outage between day-ahead and real-time, which may be particularly useful in peak conditions;

- Increasing market liquidity at all pricing locations, which will help to discipline the market power that can be exercised by physical resources; and
- Facilitating more efficient market outcomes through the more accurate market information resulting from convergence bidding.

Virtual bidding operates successfully in all of the other independent system operators and regional transmission organizations with day-ahead markets and locational marginal pricing.<sup>5</sup> The Commission recognizes the benefits of convergence bidding and directed the ISO to pursue a convergence bidding feature expeditiously after the ISO's new market was implemented.<sup>6</sup>

The ISO has conducted an extensive, multi-year stakeholder process on the design of its convergence bidding proposal. Since the summer of 2006, that process has included over a dozen stakeholder meetings and rounds of formal comments on straw proposals and white papers issued by the ISO.

The ISO's design also reflects substantial input from the ISO's Department of Market Monitoring and Market Surveillance Committee. The Department of Market Monitoring has issued a memorandum supporting the ISO's overall proposal that was provided to the ISO Board of Governors, and the Market Surveillance Committee has issued an opinion supporting the major features of the ISO's convergence bidding design. Both of those documents are attached to this filing.

Although there were initially widely divergent views on the design of the ISO's convergence bidding market feature, the dialogue with stakeholders to date has resulted in substantial consensus on many key features of the convergence bidding design. Moreover, when the ISO Board of Governors approved the convergence bidding design policy in late October, commenters agreed that further stakeholder discussion of the convergence bidding design would not yield any greater consensus and therefore was not warranted. Commenters agreed that this design is ripe for consideration by the Commission. The ISO believes the final design presented to the Commission will allow market participants to realize the full benefits of convergence bidding while putting in

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<sup>5</sup> Virtual bidding is a feature of the markets of ISO New England Inc. ("ISO New England"), the Midwest Independent Transmission System Operator, Inc. ("Midwest ISO"), the New York Independent System Operator, Inc. ("New York ISO"), and PJM Interconnection, L.L.C. ("PJM"). The Southwest Power Pool and the Electric Reliability Council of Texas currently do not have markets based on locational marginal pricing.

<sup>6</sup> *California Independent System Operator Corp.*, 116 FERC ¶ 61,274, at P 430 n.198 (2006) ("September 2006 Order").

place appropriate safeguards to ensure that convergence bidding will not impair system reliability or allow the exercise of market power.

Although the Commission's orders did not direct the ISO to submit the convergence bidding policy for approval prior to submission of detailed tariff provisions, the ISO believes a Commission order on this filing will provide a number of benefits. A Commission order on the convergence bidding design policy will reduce regulatory uncertainty which could impede the efforts of the ISO and individual market participants to prepare their own systems and processes for the implementation of convergence bidding. To the extent the Commission concludes that some element of the ISO's proposal should be modified, an earlier Commission order will allow the ISO to make more timely adjustments in the convergence bidding software. In addition, the ISO will be able to develop tariff language that will reflect the Commission's guidance. This will increase the likelihood of filing tariff language that will ultimately be accepted by the Commission. This two step process will facilitate the efforts of the ISO and its stakeholders to develop the tariff language through a robust stakeholder process. The ISO is planning two rounds of stakeholders review, comment and discussions of draft tariff language. This process will result in filed tariff language that will reflect the necessary and appropriate details of both the high level policies approved by the Board and the implementation details. The convergence bidding design will affect many areas of the tariff and many business processes.

Finally, the ISO urges the Commission to recognize that the convergence bidding design consists of numerous interrelated elements that are designed to work as a package. To the extent any element is modified, it may alter the balance the ISO and stakeholders have achieved. For this reason, the ISO urges the Commission to find that the entire convergence bidding design is just and reasonable, without modification or condition.

## **II. BACKGROUND**

### **A. Commission's Directives to the California ISO Regarding Convergence Bidding**

The Commission, in its orders on the conceptual design of the new ISO market,<sup>7</sup> directed the ISO to pursue a convergence bidding feature.<sup>8</sup> In its

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<sup>7</sup> The new ISO market went into effect on March 31, 2009, for the day-ahead market for the April 1, 2009, trading day. The new ISO market is also sometimes referred to as the Market Redesign and Technology Upgrade ("MRTU"). The date on which the new ISO market went into effect is sometimes called "day one" or the "go-live" or "start-up" date.

<sup>8</sup> See September 2006 Order at P 447.

February 2006 tariff filing in Docket No. ER06-615, and in related pleadings addressing the ISO tariff that implements the new ISO market, the ISO explained that putting convergence bidding into effect on day one could substantially delay the launch of the new ISO market.<sup>9</sup> The ISO proposed to implement convergence bidding as part of Release 1A of its market redesign and technology update (“MRTU”) project and indicated that the ISO’s “best estimate [at that time] for a date when it would be feasible to implement convergence bidding is approximately twelve months after the start of MRTU.”<sup>10</sup>

In the September 2006 Order, the Commission found that convergence bidding “is the appropriate mechanism to address the incentive for LSEs [load serving entities] to under-schedule in the day-ahead market” and that convergence bidding can provide benefits such as improving day-ahead and real-time price convergence and reducing the exercise of market power.<sup>11</sup> Based on the ISO’s best estimate in 2006 of the earliest date when convergence bidding could be put into effect, the Commission directed the ISO to file tariff language to implement convergence bidding within twelve months after the effective date of Release 1 of MRTU.<sup>12</sup>

Simultaneously with the submission of this filing, the ISO is also submitting a motion for an extension of time to implement convergence bidding by February 1, 2011. As explained in that motion, software development considerations preclude the implementation of convergence bidding on the schedule originally contemplated by the ISO and accepted by the Commission in the September 2006 Order.

## **B. The ISO Stakeholder Process Regarding Convergence Bidding**

The convergence bidding design policy is the result of several years of effort on the part of stakeholders and the ISO. A table summarizing all key dates

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<sup>9</sup> See *id.* at P 431.

<sup>10</sup> *Id.* at PP 430, 432. Release 1A of MRTU was a term used in 2006 to denote certain market enhancements to be developed and put into effect subsequent to the implementation of Release 1 of MRTU, *i.e.*, the new ISO market as of MRTU start-up, but prior to the full scope of market enhancements under consideration for Release 2 of MRTU, approximately three years after start-up. See *id.* at P 33.

<sup>11</sup> *Id.* at PP 181, 449-51.

<sup>12</sup> *Id.* at P 452. On rehearing of the September 2006 Order, the Commission clarified that, “at the latest, within 60 days prior to the one-year anniversary of Day 1 of MRTU operation, the CAISO must file tariff sheets implementing convergence bidding with a proposed effective date of that first anniversary.” *California Independent System Operator Corp.*, 119 FERC ¶ 61,076, at P 117 (2007) (“April 2007 Order”).

of the over three-year convergence bidding stakeholder process is provided as an attachment to this filing.

From June 2006 through October 2008, the ISO and stakeholders engaged in extensive discussions on potential approaches to convergence bidding and related issues. The convergence bidding stakeholder process during that span of time included presentations given by stakeholders regarding their views on those issues and by representatives of other independent system operators (“ISOs”) and regional transmission organizations (“RTOs”) regarding the convergence bidding rules and experiences of those entities.<sup>13</sup>

A number of policy issues were largely resolved during these discussions with stakeholders, including: (1) the basic characteristics of convergence bids, (2) the basic elements of the credit policy applicable to convergence bids, and (3) a proposal to address scheduling incentives regarding seller’s choice contracts.<sup>14</sup> As of late 2008, other significant issues concerning the design of convergence bidding remained unresolved. The discussions at the meetings and on the conference calls revealed significant disagreements over a number of issues, most notably the granularity of convergence bids – whether convergence bidding should be implemented at the nodal level or, at first, at the load aggregation point (or “LAP”) level – and the allocation of uplift charges to convergence bidders.<sup>15</sup> As far back as 2007, the ISO had concluded and informed stakeholders that the fundamental decision of whether convergence bidding in the ISO should be designed on a nodal or LAP basis should be deferred until after implementation of the new market design in order to provide information about price divergence between the day-ahead and real-time markets.

The ISO resumed the stakeholder process on the policy elements of convergence bidding design in July of this year, with the publication of the July 2009 Straw Proposal on July 2. The ISO hosted six stakeholder meetings on the convergence bidding design policy between July and October 2009. In addition, on September 18, the Market Surveillance Committee (“MSC”) held a joint meeting with stakeholders to discuss the convergence bidding design.

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<sup>13</sup> Materials related to the convergence bidding stakeholder process are posted on the ISO’s website at <http://www.caiso.com/1807/1807996f7020.html>.

<sup>14</sup> See “Straw Proposal for the Design of Convergence Bidding” (ISO document dated July 2, 2009) at 5 (“July 2009 Straw Proposal”). The July 2009 Straw Proposal is available on the ISO’s website at <http://www.caiso.com/23df/23dfd29225fb0.pdf>. A seller’s choice contract allows a seller of power to designate a point of delivery within the ISO balancing authority area. *California Independent System Operator Corp.*, 111 FERC ¶ 61,138, at P 1 n.2 (2005).

<sup>15</sup> July 2009 Straw Proposal at 5.

On September 14, in anticipation of the September 18 stakeholder meeting, the ISO posted its “Draft Final Proposal for the Design of Convergence Bidding” (“Draft Final Proposal”) on its website.<sup>16</sup> On October 2, the ISO posted on its website its “Addendum to the Draft Final Proposal for the Design of Convergence Bidding” (“Addendum”).<sup>17</sup> Stakeholders were given opportunities to provide verbal and written comments on the Draft Final Proposal and the Addendum. On October 19, 2009, the MSC issued the final version of its “Opinion on Convergence Bidding” (“Final MSC Opinion”), which is attached to this filing.

The final convergence bidding design policy was presented to and approved by the ISO Board of Governors (“Board”) at its meeting on October 29, 2009.<sup>18</sup> The materials provided to the Board before the meeting included a Memorandum from Keith Casey, Vice President, Market and Infrastructure Development, to the Board regarding its decision on the convergence bidding design (“ISO Board Memorandum”), a Memorandum from Eric Hildebrandt, Interim Director, Market Monitoring, to the Board regarding the DMM’s market monitoring report on the convergence bidding design (“DMM Board Memorandum”), and a matrix of stakeholder comments and ISO responses, all of which are attached to this filing.

### **III. THE ISO’S DESIGN FOR CONVERGENCE BIDDING**

The ISO requests Commission approval of the following elements of the ISO’s convergence bidding design policy. Additional details on these design elements are provided in the attached ISO Board Memorandum, DMM Board Memorandum, and Final MSC Opinion. The Board approved the ISO’s convergence bidding policy and authorized ISO management to file all necessary and appropriate filings with the Commission to implement the policy.

#### **A. Basic Characteristics of Convergence Bids**

Convergence bids are purely financial bids for virtual supply and virtual demand submitted in the ISO’s day-ahead market. If cleared through the integrated forward market (“IFM”), a convergence bid will represent a commitment to sell (or buy) energy in the day-ahead market at the locational marginal price (“LMP”) for the

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<sup>16</sup> The Draft Final Proposal is available on the ISO’s website at <http://www.caiso.com/1807/1807996f7020.html>.

<sup>17</sup> The Addendum and attachments thereto are available on the ISO’s website at <http://www.caiso.com/1807/1807996f7020.html>.

<sup>18</sup> The materials presented to the Board for its review at the October 29 meeting are available on the ISO’s website at <http://www.caiso.com/244e/244e8eae13040.html>.

location where the convergence bid is submitted, and to buy (or sell) the same quantity of energy back in the real-time market at the LMP for the same location.<sup>19</sup>

Because they will be purely financial in nature, convergence bids will not adversely affect the tools the ISO uses to ensure reliability. Virtual bids are not part of the Residual Unit Commitment (“RUC”) process that commits additional capacity, if necessary, to meet the next day’s demand forecast, nor are virtual bids part of any real-time dispatch or market processes (except for financial settlement at the real-time LMPs).

The ISO convergence bidding design permits convergence bids to be submitted on a nodal basis. Specifically, convergence bids may be submitted at any of the 3,000-plus individual pricing nodes where a network generator, load, or intertie resource exists in the ISO’s full network model. Convergence bids may also be submitted at aggregated pricing nodes, including trading hubs and default LAPs. Each convergence bidding entity – through its Scheduling Coordinator – may only submit one virtual demand bid and one virtual supply bid per location per hour. Additional rules for convergence bidding at different types of locations, and in particular for convergence bids at the interties, are discussed further below.

Convergence bids can be submitted by Scheduling Coordinators on behalf of entities that have been certified by the ISO as convergence bidding entities. Convergence bids can only be submitted for virtual energy supply and demand.

The virtual nature of convergence bids will be explicit, which means that they will be readily distinguishable from physical bids. Similar to the rules that other ISOs and RTOs apply to virtual bids in their markets, the submission and processing of convergence bids will include an indication (a flag) that identifies them as virtual rather than physical bids. This requirement of explicit convergence bidding is important for effective market monitoring and is necessary to ensure that convergence bids are not included in the enforcement of intertie scheduling limits required by the Western Electricity Coordinating Council (“WECC”) or in the RUC process.

Each convergence bid will have prices and quantities (expressed in dollars per megawatt-hour (MWh)). Virtual bids will not include start-up or minimum load energy costs. Apart from the application of position limits described below, there

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<sup>19</sup> In the case of convergence bids at the interties, the applicable real-time market is the hour-ahead scheduling process.

is no maximum MWh size of a convergence bid, but a convergence bid can be no smaller than one megawatt.<sup>20</sup>

Virtual supply bids will be submitted using a monotonically increasing bid curve and may have up to ten segments, the same as a bid for physical supply. Virtual demand bids will be submitted using a monotonically decreasing bid curve and may have up to ten segments, the same as a bid for physical demand.<sup>21</sup>

The implementation of convergence bidding has the potential to greatly increase the number of bids in the day-ahead market, but the ISO's day-ahead market software cannot handle an unlimited volume of bids. The ISO initially proposed bid volume limits to address this limitation. Some market participants expressed concern that this limitation would adversely affect their ability to hedge risks at various nodes. In response, the ISO has decided to enhance the existing day-ahead market software to aggregate all of the virtual bids at each location, node, LAP, or trading hub to create one aggregate composite virtual bid curve for virtual supply and another for virtual demand. The ISO will conduct the day-ahead market processes using physical bids and aggregated virtual bids. The ISO will then de-aggregate the aggregated virtual bid results into individual cleared virtual bid results and will publish the day-ahead market results, including the virtual bid results.

## **B. Nodal Convergence Bidding**

As mentioned above, the ISO proposes to allow convergence bidding at the nodal level. The granularity of convergence bidding was the source of significant disagreement among stakeholders. Some stakeholders supported nodal convergence bidding, while others asserted that convergence bidding should be conducted only at the three large LAPs in the ISO balancing authority area in order to simplify the design and to minimize the risk of market manipulation. Other stakeholders felt strongly that nodal convergence bidding provides more benefits than a zonal or LAP-based convergence bidding design. With the passage of time and review of actual market data generated in the new LMP market, the ISO supported the nodal convergence bidding with the addition of position limits and other design elements discussed below that are designed to guard against concerns about market manipulation.

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<sup>20</sup> As shown in Table 1 contained in Section I.3, below, ISO New England also requires that each virtual bid be no smaller than one megawatt, and the New York ISO requires that the first segment of each virtual bid must be no smaller than one megawatt.

<sup>21</sup> The monotonic bid curves described above can also be flat, but in any event the bid curve for virtual supply bids will not decrease and the bid curve for virtual demand bids will not increase.

The ISO agrees with the Market Surveillance Committee that “the major market efficiency benefits from convergence bidding . . . can only be realized by allowing transactions at the nodal level.”<sup>22</sup> In order to realize the full range of benefits that convergence bidding can offer, it must be implemented on a nodal rather than a LAP level. As the MSC explains:

With virtual bidding at the nodal level a generation unit owner can receive the real-time price of energy for all energy produced from its unit despite the fact that the unit is fully scheduled in the day-ahead market. Virtual bidding at the LAP level does not provide the generation unit owner with this functionality. The generation unit owner’s [incremental] bid at the LAP level will be distributed to the nodes comprising the LAP using the day-ahead load distribution factors. In addition, virtual bidding at the nodal level will allow a Congestion Revenue Rights (CRR) holder to earn the real-time congestion charge between two locations in the network instead of the day-ahead congestion charge between the two locations. Virtual bidding at the LAP level does not allow this transaction if the two nodes are within a LAP, and it only allows a very imperfect form of this functionality if the two nodes are located in different LAPs.<sup>23</sup>

The ISO’s current market data show divergence of prices between the day-ahead and real-time markets at both the nodal level and the LAP level in some hours and at some locations. Nodal-level convergence bidding will drive price convergence at the nodal level and deter undesirable behavior at individual nodes. LAP-level convergence bidding would drive prices to converge at the LAP level but would allow large and systematic differences between nodal prices to persist.

In addition, virtual bids can be used for more accurate demand bidding at the nodal level. Better market information should result in day-ahead market results that are closer to real-time operational needs which will allow generation units to be efficiently committed in the day-ahead timeframe. This will result in improved grid operations, lower costs to serve demand in real-time, and greater price stability.

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<sup>22</sup> Final MSC Opinion at 2. The ISO’s Department of Market Monitoring (“DMM”) also supports the ISO’s proposal to implement nodal convergence bidding. See DMM “Comments on Straw Proposal for the Design of Convergence Bidding” (dated July 24, 2009) at 1-2 (“DMM Comments on July 2009 Straw Proposal”), available on the ISO’s website at <http://www.caiso.com/23f8/23f8a5a465aa0.pdf>.

<sup>23</sup> Final MSC Opinion at 2. As discussed in Section E.2, below, the ISO proposes a settlement rule for congestion revenue rights under convergence bidding for the purpose of reducing the possibility of market manipulation.

Convergence bidding at the nodal level will also give suppliers the ability to hedge exposure to real-time prices in the event of a generation outage between day-ahead and real-time. In contrast, LAP-based convergence bidding would not provide that benefit, because suppliers bid and are paid on a nodal basis rather than a LAP basis. Without nodal convergence bidding, a supplier selected in the day-ahead would be subject to the risk of high real-time prices if the generator goes out of service before real-time. This is a particular concern during peak conditions.

Allowing convergence bidding on a nodal basis also accords with the practices of the other ISOs and RTOs. ISO New England, the Midwest ISO, and PJM all currently have virtual bidding at the nodal level, and the New York ISO is in the process of moving towards a nodal market from a zonal market for virtual bids at the recommendation of its market monitor.<sup>24</sup> Other ISOs and RTOs have identified substantial market efficiency benefits from nodal virtual bidding.<sup>25</sup>

### **C. Position Limits at Internal Nodes**

The ISO recognizes both the benefits as well as the risks brought about by nodal convergence bidding. In order to mitigate these potential risks and provide a controlled transition to nodal virtual bidding, the ISO proposes to apply position limits on the megawatt (MW) volume of convergence bids that a Scheduling Coordinator can submit on behalf of a convergence bidding entity at an individual node. One set of position limits will apply to internal ISO nodes and a more stringent and longer-term set of position limits will apply at the interties.<sup>26</sup>

Position limits were originally suggested by the Market Surveillance Committee as a design feature that would allow the ISO's initial convergence bidding design to include nodal convergence bidding. Further, the Market Surveillance Committee also suggested that position limits be lifted as confidence in the virtual market increased. The Department of Market Monitoring also recommended position limits in its November 2007 recommendations on

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<sup>24</sup> The New York ISO currently allows virtual bidding within eleven specified zones. In early 2010, the New York ISO will implement zonal virtual bidding at 40 nodes within its New York City Zone and will introduce virtual bidding to all generation nodes after 30 days if there are no issues with system performance. See New York ISO white paper entitled "Disaggregated Virtual Trading Concept Design," available on the New York ISO's website at [http://www.nyiso.com/public/webdocs/committees/bic\\_miwg/meeting\\_materials/2009-06-26/DVT.pdf](http://www.nyiso.com/public/webdocs/committees/bic_miwg/meeting_materials/2009-06-26/DVT.pdf).

<sup>25</sup> Draft Final Proposal at 7; Final MSC Opinion at 2.

<sup>26</sup> The position limits at the interties are discussed in Section D.2, below.

convergence bidding and again in its comments on the July 2009 straw proposal.<sup>27</sup>

The purpose of the position limits is to mitigate the potential exercise of market power by any one market participant that could occur absent a deep and liquid market for convergence bidding at the initial implementation of convergence bidding. Consistent with the recommendations of its market monitors, the ISO has concluded it is appropriate to limit the megawatt volume of convergence bids that each Scheduling Coordinator can submit at a given node on behalf of a convergence bidding entity,<sup>28</sup> particularly during the initial implementation of convergence bidding, when market participants and the ISO are just beginning to gain experience with the convergence bidding mechanism. The ISO believes the market will mature rapidly and that the need for position limits will lessen over time until the need eventually vanishes.

The means of determining the position limits will differ based on whether the node at issue is associated with a physical generator or load location (*i.e.*, demand). For nodes associated with generators, the position limits for each convergence bidding entity will be based on the maximum normal capability (PMax) of a generator.<sup>29</sup> For nodes associated with demand, the position limits for each convergence bidding entity will be based on the maximum megawatt volume that flows over a node over a period of time or on the megawatt-hour volume of the peak withdrawal at the node.<sup>30</sup>

For internal ISO nodes, the ISO proposes the following schedule for the position limits applicable to a convergence bidding entity:

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<sup>27</sup> Draft Final Proposal at 9; "Convergence Bidding: Department of Market Monitoring Recommendations" (dated November 2007), available on the ISO's website at <http://www.caiso.com/1c8f/1c8ff5f46c90.pdf>; DMM Comments on July 2009 Straw Proposal at 2.

<sup>28</sup> A convergence bidding entity will be mapped to one or more Scheduling Coordinator ID codes ("SCIDs") of the Scheduling Coordinator that will be submitting bids on behalf of the convergence bidding entity at any given node. The position limit at each node will apply to the sum of the virtual bids submitted by all of an individual convergence bidder's SCIDs.

<sup>29</sup> For example, if node x is the injection point for a generator with a PMax of 100 megawatts and the position limits at node x are 10 percent, the maximum convergence bid volume that can be submitted for that generator at node x will be 10 percent of 100 megawatt-hours or 10 megawatt-hours.

<sup>30</sup> For example, if the maximum megawatt volume that flows over node y is 100 megawatts, or the megawatt-hour volume of the peak withdrawal at node y is 100 megawatt-hours, and the position limits at node y are 10 percent, the maximum convergence bid volume that can be submitted for a given demand at node y will be 10 megawatt-hours.

- Position limits of 10 percent will apply for the first eight months after the implementation of convergence bidding.
- Position limits of 50 percent will apply for the ninth month through the twelfth month after the implementation of convergence bidding.
- Position limits of 100 percent will apply for the thirteenth month through twenty-fourth month after the implementation of convergence bidding.
- No position limits will apply starting in the twenty-fifth month after the implementation of convergence bidding.

These periodic increases in position limits will occur automatically unless the ISO makes a filing with the Commission, prior to a periodic increase, to specify reasons for the then-existing position limits to remain in place (or be modified in some other manner).

The ISO will reject all virtual bids at a location of a Scheduling Coordinator representing a convergence bidding entity that exceed these position limits at that location. All position-limit evaluation will be performed based on the highest bid segment megawatt point submitted in the energy bid curve, and virtual supply bids and virtual demand bids will be evaluated separately (*i.e.*, they will not be netted). For internal nodes, the position limits will be enforced at the time of bid submission. It is possible for the enforcement of position limits on a later-submitted bid to cause a previously approved bid to be rejected, if both of those bids are submitted by a Scheduling Coordinator on behalf of the same convergence bidding entity at the same node. The ISO will timely publish the position limits for internal nodes, and market participants will be aware of the position limits for inerties.

Some stakeholders stated in the stakeholder process that they did not support the inclusion of position limits in the convergence bidding design. Others supported the position limits as a necessary prerequisite for nodal convergence bidding but suggested that position limits should only be lifted if pre-defined metrics were satisfied or if the ISO's market monitors issue a formal opinion supporting the lifting of the position limits.

The ISO believes that the position limits described above and the automatic phase-out of position limits over time strike a reasonable balance between the need to guard against market manipulation while still permitting a large number of megawatt-hours of convergence bids to be submitted at the nodes by many market participants independently of one another. The ISO expects that the California convergence bidding market will mature quickly, considering that similar markets exist in other ISOs and RTOs. The ISO also notes that pre-defined metrics for lifting position limits will be difficult to develop

prior to implementation of the new convergence bidding market feature and may prove to be an inaccurate gauge of the maturity of convergence bidding once this feature is implemented. Finally, if the ISO finds that it needs to alter the relaxation of the limits, it can file with the Commission to do so based on empirical evidence.

#### **D. Convergence Bidding at the Interties**

The ISO proposes to allow convergence bidding at the interties between the ISO balancing authority area and other balancing authority areas that are external to the ISO or embedded within the ISO. This will enable explicit convergence bidding at the interties, thereby mitigating the potential for reliability and operational difficulties created by implicit convergence bidding (e.g., scheduling physical bids in the day-ahead market with no intention of physically delivering on the schedule, for the purpose of liquidating the schedule in the hour-ahead scheduling process (“HASP”)).<sup>31</sup> Implicit convergence bidding on the interties is possible because resources associated with intertie energy bids will not be identified until intertie schedules are tagged and a resource in a neighboring balancing authority area is designated as providing energy for an intertie schedule.

Implicit convergence bidding can create reliability problems if intertie schedules on which the ISO counts for reliability purposes in the day-ahead market are ultimately unavailable in real-time. By allowing explicit convergence bidding at the interties, the ISO’s market and reliability processes will be able to distinguish between physical and purely financial intertie transactions and thus make better-informed reliability decisions, such as by using RUC to provide additional physical generation. Convergence bidding at the interties will also enable market participants to arbitrage differences between prices in the day-ahead and the hour-ahead scheduling process, which have been relatively large since the launch of the new ISO market.

The ISO’s design of the functionality for convergence bidding at the interties has two main components – the addition of constraints within the ISO’s market software for scheduling at the interties, and position limits that are more stringent and longer-lasting than the position limits applicable to non-intertie nodes.

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<sup>31</sup> The hour-ahead scheduling process occurs during the real-time time frame. ISO tariff, Section 33.

## 1. Addition of Constraints Within the ISO's Market Software for Intertie Scheduling

The design of the functionality for convergence bidding at the interties is based on a pair of fundamental principles. The first principle is that net physical schedules at the interties must remain within established scheduling limits. The reliability standards of the North American Electric Reliability Corporation ("NERC") and WECC clearly state that physical schedules cannot violate the scheduling limits on the interties coming out of the day-ahead market.<sup>32</sup> Moreover, given the extent to which load serving entities in the ISO are highly dependent on imported power to meet their obligations to serve load, enforcing the intertie scheduling limits with respect to physical schedules gives ISO operators a high level of confidence that these physical schedules will be deliverable. The second principle is that, as is the case for schedules internal to the ISO balancing authority area, virtual and physical schedules at the interties must be cleared together in the integrated forward market, *i.e.*, they must be co-determined based on their economic bid prices and must have a shared congestion price in order for the virtual transactions to be meaningful. Convergence bids also need to be able to create congestion as well as to provide counterflows to mitigate congestion.

In order to satisfy these fundamental principles, the ISO proposes to enforce two constraints within its market software for each intertie scheduling point. The first constraint (the "physical constraint") will be enforced only in the scheduling run of the integrated forward market and will require that physical imports net of physical exports must be less than or equal to the scheduling limit at the intertie scheduling point in the applicable direction (*i.e.*, either into or out of the ISO balancing authority area). This first constraint exists today even in the absence of convergence bidding. The second, newly added constraint (the "physical and virtual constraint") will be enforced in both the scheduling run and the pricing run of the integrated forward market and will require that physical and virtual imports net of physical and virtual exports must be less than or equal to the scheduling limit at the intertie scheduling point in the applicable direction.

To understand the logic behind this proposal, it is necessary to understand the general process by which the integrated forward market clears today and how that clearing process will occur at internal nodes when convergence bidding is implemented. The integrated forward market uses two runs – a scheduling run and a pricing run – to determine market-clearing schedules and prices. The scheduling run employs "penalty prices" to ensure that priorities among

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<sup>32</sup> See, e.g., NERC Reliability Standard INT-006-2, at R1.2 ("Each involved Transmission Service Provider shall confirm that the transmission service arrangements associated with the Arranged Interchange have adjacent Transmission Service Provider connectivity, are valid and prevailing transmission system limits will not be violated.").

schedules are maintained. The prices from the scheduling run, therefore, are not used for settlement purposes nor do they provide meaningful price signals. The *schedules* determined in the scheduling run are meaningful, however, and are passed to the pricing run in which valid market clearing prices are determined using market participants' submitted bids.

When convergence bidding is implemented at internal nodes, virtual and physical bids will be commingled in the clearing process for the integrated forward market. Those bids will be treated equally in the scheduling run and the pricing run, will clear against each other, and will receive the same price at any given pricing node. Schedules based on convergence bids will be able to create congestion, mitigate congestion, and displace physical generation or load. However, market participants that submit virtual bids have financial incentives that act to converge day-ahead and real-time prices.

Convergence bidding on the interties also raises the possibility, however, that virtual counterflows could allow a set of physical intertie schedules to clear the day-ahead market that would violate established scheduling limits for one or more interties, thus violating NERC and WECC reliability standards. Moreover, given California's dependence on imported power, failure to observe the scheduling limits with respect to physical imports and exports in the integrated forward market could result in that market accepting a set of import schedules that may not be fully deliverable in real-time. To avoid such problems, the ISO proposes that the design of convergence bidding at the interties include the enforcement of constraints within the integrated forward market optimization that will ensure that physical intertie schedules are within the required limits.

The enforcement of the scheduling limits on physical interchange schedules in the integrated forward market addresses the concerns underlying the first fundamental principle discussed above. In order to adhere to the second fundamental principle that virtual and physical bids must clear together in the integrated forward market, the ISO proposes to enforce the physical and virtual constraint in the pricing run. The physical and virtual constraint will ensure that physical intertie bids and convergence bids on the interties are treated in a consistent manner with the way other bids within the ISO are treated from a pricing perspective. For purposes of establishing integrated forward market prices, the shadow price of the physical and virtual constraint will determine the congestion components of intertie prices. Again, this is no different from how the integrated forward market prices are determined throughout the ISO, based on constraints applied to the combined physical and virtual bids submitted to the market.

The practices of the other ISOs and RTOs do not provide guidance as to the specific constraints the California ISO should apply to convergence bids at the interties. Although most of the other ISOs and RTOs permit virtual bidding at

their interties and apply constraints,<sup>33</sup> they do not enforce intertie scheduling limits comparable to those used by the California ISO pursuant to the NERC and WECC requirements. Therefore, the examples of the other ISOs and RTOs are not directly applicable to the California context.

For example, the ISO does not propose to limit physical imports and exports based on a transmission reservation mechanism similar to the mechanisms employed by the Midwest ISO and PJM.<sup>34</sup> The ISO approach described above has the advantage of keeping the scheduling of physical resources in the market consistent with the ISO's overall market design rather than first subjecting them to a "first come, first served" transmission reservation. Enforcing the constraints in the market will enable physical imports and exports to net against each other for scheduling purposes, which will allow more physical scheduling of imports and exports in the day-ahead market. This will not only serve to ensure that the NERC and WECC reliability standards are upheld, but it will also give the ISO operational staff confidence that the intertie energy on which California heavily relies can be reliably delivered.

The Market Surveillance Committee suggests that the ISO's convergence bidding design should "recognize that there is no distinction between physical and virtual bids at the interties in the day-ahead market."<sup>35</sup> The Market Surveillance Committee also acknowledges, however, that WECC intertie scheduling rules require the ISO to ensure intertie schedules are physically feasible.<sup>36</sup> Although the ISO acknowledges the basis for the MSC's concerns, the ISO believes the intertie bidding design it has adopted appropriately balances the economic principles underlying the ISO's markets with the requirements of applicable reliability standards. The ISO is also addressing the need for additional requirements to help ensure that intertie bids identified as physical are truly physical through a separate stakeholder process that is currently underway.

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<sup>33</sup> ISO New England allows virtual bidding at its interties, and enforces a constraint that the cleared transactions – physical and virtual combined – cannot exceed the applicable line limit. The Midwest ISO enables virtual bids at its interchanges, and applies a transmission reservation requirement prior to the close of its day-ahead market. This requirement ensures that physical bids do not exceed the Midwest ISO's scheduling or line limits. PJM allows convergence bidding at its interties, and does not enforce scheduling limits on physical schedules analogous to those in the west. PJM does require reservation of transmission, however, and this effectively requires physical transactions to be within applicable boundaries. The New York ISO does not allow virtual bidding at its tie-points at present, though it has not ruled this out as a potential future enhancement.

<sup>34</sup> See the preceding footnote.

<sup>35</sup> Final MSC Opinion at 5 n.3.

<sup>36</sup> *Id.*

## **2. Position Limits at the Interties**

As with internal nodes, the ISO proposes that gradually increasing position limits apply at each intertie. The position limits will be based on the Operating Transfer Capability (“OTC”) of the intertie and will be enforced at market closing time for convergence bids. The position limits at the interties initially will be set at a lower level, will increase more gradually, and will be in place longer than the position limits for convergence bids at internal nodes, as follows:

- Intertie position limits of 5 percent will apply for the first eight months after the implementation of convergence bidding.
- Intertie position limits of 25 percent will apply for the ninth month through the twelfth month after the implementation of convergence bidding.
- Intertie position limits of 50 percent will apply for the thirteen month through the twenty-fourth month after the implementation of convergence bidding.
- Intertie position limits of 100 percent will apply for the twenty-fifth month through the thirty-sixth month after the implementation of convergence bidding.
- No intertie position limits will apply starting in the thirty-seventh month after the implementation of convergence bidding.

These position limits will more slowly introduce the volume of virtual bids at the interties, and will give the ISO the opportunity to observe the market and determine how virtual volume on the interties may impact RUC and potential uplift costs associated with changes in the hour-ahead scheduling process.

### **E. Features of the ISO’s Design for Convergence Bidding That Address the Potential for Market Power and Market Manipulation**

The ISO acknowledges that the implementation of convergence bidding may increase opportunities for market participants to exercise market power or engage in market manipulation. The ISO’s convergence bidding design includes a number of elements that reduce the potential for market participants to exploit market power or manipulate market outcomes. One of these elements is the position limits discussed above. The ISO’s Department of Market Monitoring will have advanced monitoring tools that will enable them to analyze market outcomes both with and without convergence bids and will be closely monitoring convergence bidding behavior. In addition, the ISO proposes to reduce the

potential exercise of market power or market manipulation through the additional measures discussed below.

### **1. Application of the ISO's Existing Local Market Power Mitigation Procedures**

Upon the implementation of convergence bidding, the ISO proposes to apply its existing local market power mitigation and reliability requirements ("LMPM") procedures to mitigate physical bid-in generation only, in both the competitive constraint run and the all constraints run based on forecasted demand. In other words, virtual supply bids will not be considered in the LMPM process, and the ISO would continue to use forecast demand, rather than bid-in demand. This proposal is consistent with the conclusions the MSC reached in its Final Opinion:

We support the use of a day-ahead local market power mitigation mechanism based only on physical generation resources and the ISO's day-ahead load forecast. Specifically, the day-ahead local market power mitigation mechanism should subject enough physical generation units to mitigation to be able to supply the ISO's day-ahead load forecast without subjecting any locations in the ISO control area to the exercise of market power. We believe that this local market power mitigation mechanism is consistent with the current real-time market power mitigation mechanism which mitigates a sufficient amount of physical supply to satisfy real-time demand in the actual ISO network configuration. The ISO's proposed market power mitigation mechanism under convergence bidding is consistent with this logic.<sup>37</sup>

Further, the DMM has determined that "continued use of the current LMPM procedures provides a reasonable level of protection against the ways in which convergence bidding could undermine LMPM."<sup>38</sup>

The ISO is mindful that, in its April 2007 Order, the Commission directed the ISO to use bid-in demand rather than forecasted demand in the market power mitigation-reliability requirements determination run within three years of MRTU start-up.<sup>39</sup> In the LMPM White Paper, the DMM set forth a possible approach (called "Option B") to local market power mitigation for convergence

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<sup>37</sup> *Id.* at 4.

<sup>38</sup> DMM white paper entitled "Local Market Power Mitigation Options Under Convergence Bidding" (Oct. 2, 2009), at 7 ("LMPM White Paper"). The LMPM White Paper is available on the ISO's website at <http://www.caiso.com/1807/1807996f7020.html>.

<sup>39</sup> See April 2007 Order, at PP 496, 662.

bidding that the DMM stated “merits further consideration as a further modification of LMPM procedures, particularly as an option for complying with the directive in the April 2007 Order” to use bid-in demand.<sup>40</sup> Option B would include both virtual and physical bids in the LMPM runs. In the all constraints run, default energy bids would be used to determine what physical supply is subject to LMPM. The ISO plans to evaluate possible additional enhancements to the LMPM process, including Option B, to satisfy the Commission’s directive in the April 2007 Order.

## **2. CRR Settlement Rule**

Convergence bids can be used to alter the value of CRRs. This is a well-documented market manipulation concern that other ISOs and RTOs have addressed through the application of their own CRR settlement rules.<sup>41</sup> The ISO proposes to include an automated settlement rule (similar to an existing PJM practice) as part of the market design of convergence bidding. This settlement rule will adjust the revenue from CRRs in the event that a convergence bidding entity that is also a CRR Holder engages in convergence bidding behavior that may impact the value of the their CRRs in the day-ahead market. The automated settlement rule is as described by the DMM and provided in Appendix B to the Addendum.

The ISO’s CRR settlement rule has four steps. The first step is to calculate the combined impact of each convergence bidding entity’s portfolio of virtual bids on the flows of a constraint for each hour. The second step is to determine the hours in which the market participant’s portfolio of convergence bids significantly impacted the constraints. The third step is to compare the constraint’s impact on the day-ahead value of the convergence bidding entity’s CRR portfolio to the constraint’s impact on the real-time value of the CRR portfolio. The fourth and final step is to apply a CRR payment adjustment that is based on the results of steps one through three.

This CRR settlement rule exposes CRR holders whose convergence bids significantly affect flows over a constraint to large payments to the ISO when real-time price spikes result in the constraint’s contribution to the real-time value of the entity’s CRR portfolio being extremely negative. In a perfect convergence bidding market, the ISO expects the possibility of such real-time price spikes to be incorporated into the average day-ahead prices at the relevant nodes.

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<sup>40</sup> LMPM White Paper at 7-8. The MSC also indicated that Option B “is worthy of further study for possible implementation at a future date.” Final MSC Opinion at 4 n.2.

<sup>41</sup> See DMM document entitled “Benchmarking Against NYISO, PJM, and ISO-NE” at 3 (“DMM Benchmarking Document”), available on the ISO’s website at <http://www.caiso.com/1c8f/1c8ff55150b0.pdf>.

Therefore, CRR holders that profit by using convergence bids to reduce CRR payments paid to the ISO over the hours when there is no real-time price spike (resulting in the constraint's day-ahead contribution to the CRR portfolio value greatly exceeding its contribution to the portfolio's real-time value for the intervals of the price spike) should be exposed to the additional CRR payments triggered by this settlement rule when a real-time price spike materializes.

The ISO notes that attempts to engage in convergence bidding behavior that affects a market participant's CRR revenues could be contrary to the Commission's rules prohibiting market manipulation,<sup>42</sup> and that such behavior, if identified by the ISO, may be referred to the Commission's Office of Enforcement. The ISO will be closely monitoring the convergence bidding behavior of market participants and their affiliates to identify any practices that could constitute market manipulation.

### **3. Ability to Suspend Convergence Bidding**

In its November 2007 recommendations on convergence bidding, the DMM suggested that the ISO should have the authority to quickly respond to any problems that may occur under nodal virtual bidding by limiting or suspending virtual bidding by market participants.<sup>43</sup> The ISO requests that the Commission approve such suspension authority. Specifically:

- In the event that virtual bidding by any particular participant or group of participants is found to: (1) detrimentally affect grid or market operations, (2) contribute to an unwarranted divergence in prices in the integrated forward market and real-time market, or (3) otherwise distort competitive market outcomes, the ISO will have the authority to suspend or limit virtual bidding by individual market participants at specific nodes or at all nodes. For example, if excessively large volumes of virtual supply bids were to consistently clear on the interties, thus displacing physical intertie capacity that the ISO was unable to recover in RUC, this could constitute a reliability problem that could result in the suspension of virtual bidding on the interties.
- The ISO will determine whether a sustained divergence in prices in the day-ahead and real-time markets has occurred based on a calculation of the deviation between average hourly prices in those markets during a

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<sup>42</sup> See 18 C.F.R. § 1c.2.

<sup>43</sup> "Convergence Bidding: Department of Market Monitoring Recommendations" (dated November 2007), available on the ISO's website at <http://www.caiso.com/1c8f/1c8ff5f46c90.pdf>.

rolling four-week period, or such other period determined to be appropriate given the market participant's bidding behavior under review.<sup>44</sup>

- The ISO's determination of whether the participant's bidding behavior caused or significantly contributed to this price divergence will be based on simulations of the ISO's integrated forward market results without the virtual bids under review, when practicable, or other appropriate analytical methods as necessary.
- The ISO will be required to file supporting documentation with the Commission within ten business days of enforcing a limitation or suspension regarding convergence bidding.
- The limitation or suspension will remain in effect for 90 calendar days after the ISO submits its initial filing to the Commission, unless: (a) the Commission directs otherwise, or (b) the ISO determines that the limitation was no longer needed. After this 90-day period, the limitation or suspension will remain in effect only if approved by the Commission.

To the extent that the behavior at issue involves a potential violation of the Commission's rules prohibiting market manipulation,<sup>45</sup> the behavior will also be subject to referral to the Commission's Office of Enforcement. This proposed approach will provide the ISO with authority to quickly respond to any convergence bidding practices that manipulate market prices or reduce price convergence. At the same time, the ISO's authority to quickly protect against such scenarios is ultimately determined by the Commission, which may act on an expedited basis to remove or modify any limitations placed by the ISO. This approach is also similar to provisions in the Midwest ISO tariff which authorize the Midwest ISO's market monitor to suspend or limit virtual bidding by individual participants.<sup>46</sup>

#### **4. Scheduling Incentives Under Seller's Choice Contracts**

During the 2000-2001 western energy crisis, the State of California entered into a number of power contracts, including "seller's choice" contracts that permit the seller to select the location for the delivery of energy. The seller's

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<sup>44</sup> For instance, if the bidding behavior under review only occurred during certain hours or days, the analysis may be limited only to the sub-set of hours or days.

<sup>45</sup> See 18 C.F.R. § 1c.2.

<sup>46</sup> See Midwest ISO Open Access Transmission, Energy and Operating Reserve Markets Tariff, Sections 65.5-65.6. See *also* DMM Benchmarking Document at 3-4 (explaining that the market monitoring units of ISO New England the New York ISO have the authority to suspend or limit virtual trading based on their analyses of market participant behavior).

choice settlement in Commission Docket No. EL04-108 addresses the treatment of these contracts under the ISO's new market and allows contractual delivery at generation nodes up to the feasible level of physical supply at the nodes.

The ISO established market rules for physical inter-Scheduling Coordinator trades to prevent sellers under seller's choice contracts from choosing nodes for delivery that would alter their effective congestion charges, allowing them to pay less for inter-Scheduling Coordinator trade settlement and potentially shifting congestion costs to buyers. Pursuant to these market rules, the ISO requires physical validations for inter-Scheduling Coordinator trades and settles any quantity that is not covered by the integrated forward market schedule or the advisory hour-ahead scheduling process schedule of the generator that is supporting a physical inter-Scheduling Coordinator trade at a hub rather than a node.<sup>47</sup>

As explained in the Draft Final Proposal, there is some potential for nodal convergence bidding to undermine these physical validations, and therefore the ISO proposes a solution to this potential issue. The ISO proposes initially to monitor the integrated forward market and real-time schedules supporting inter-Scheduling Coordinator trades and seller's choice contracts to determine if market manipulation is occurring. If this monitoring uncovers market manipulation, the ISO's preferred approach is to apply behavioral restrictions on parties to seller's choice contracts, such as restricting the right to submit nodal convergence bids, either entirely or limited to nodes that affect inter-Scheduling Coordinator trades.<sup>48</sup>

#### **F. Megawatt Limits May Be Used to Ensure an AC Solution**

One issue related to allowing nodal convergence bidding concerns the use of an alternating-current ("AC") solution in the day-ahead market.<sup>49</sup> Under the ISO's proposal, the ISO will continue to achieve an AC solution in the day-ahead market with the inclusion of convergence bids to the greatest extent practicable. In order to increase the likelihood of achieving an AC solution with virtual bidding, the ISO intends to include in its software the capability of enforcing megawatt limit constraints on a location basis to limit the amount of bids that clear at a particular location or set of locations. These limits will only be used when an AC solution is not attainable. The megawatt limit will be applied within the integrated forward market processes before the day-ahead market clears. When a

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<sup>47</sup> See *California Independent System Operator Corp.*, 111 FERC ¶ 62,384 (2005).

<sup>48</sup> See Draft Final Proposal at 19-20.

<sup>49</sup> A discussion of the technical challenges associated with achieving an AC solution is available on the ISO's website at <http://www.caiso.com/240a/240a7ace60860.pdf>.

megawatt limit enforcement is needed, it will create a constraint that will affect both physical and convergence bids. Bids will be cleared based on their effectiveness in relieving the constraint and their bid price. Some stakeholders have advocated that the ISO should have a contingency plan to implement LAP-level convergence bidding if it is found through testing that an AC solution is not achievable with the inclusion of convergence bids. If the ISO identifies an AC solution issue during software testing, the ISO will discuss the issue with stakeholders and determine how best to proceed based on the software testing data.

As shown in Table 1, provided in Section I.3, below, all of the other ISOs and RTOs have the ability to impose bid limitations of different types on virtual bids. The ISO's use of megawatt limits in circumstances where an AC solution cannot be achieved is consistent with authority of other ISOs and RTOs.

### **G. Convergence Bidding Certification Requirements**

All market participants are required to meet certain certification requirements specified in the ISO tariff and the Business Practice Manuals ("BPMs") in order to participate in the ISO markets. Because convergence bidders will likewise take part in the ISO markets, the ISO proposes to require them to meet certification requirements as well. Each convergence bidder must be represented by a Scheduling Coordinator or be a Scheduling Coordinator itself, and must execute an agreement to be developed by the ISO that sets forth the respective rights and obligations of the ISO and the convergence bidder. Convergence bidders will also be required to disclose information concerning their affiliates as is also required of CRR entities.<sup>50</sup>

With regard to the CRR disclosure requirements, the Commission found that obligating "entities to disclose affiliates participating in organized electricity markets is a reasonable requirement that will potentially benefit all CAISO market participants . . . [and] is not unduly burdensome."<sup>51</sup> For similar reasons, the Commission should find that it is appropriate to require convergence bidders to disclose their affiliate relationships.

### **H. Credit Policy for Convergence Bidding**

Pursuant to the ISO's existing credit policy, each market participant is required to maintain an aggregate credit limit (consisting of an unsecured credit limit, if any, and posted financial security, if any) that equals or exceeds the

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<sup>50</sup> The ISO's proposed certification requirements for convergence bidders are detailed in the Draft Final Proposal at 27-30.

<sup>51</sup> *California Independent System Operator Corp.*, 124 FERC ¶ 61,107, at P 70 (2008).

market participant's estimated aggregate liability (consisting of all known and reasonably estimated outstanding and unpaid obligations of the market participant to the ISO) at all times. The ISO monitors these amounts and requests additional collateral from market participants as necessary to ensure that their aggregate credit limits do not fall below their estimated aggregate liabilities.<sup>52</sup>

The ISO proposes to modify its credit policy to ensure that convergence bids, like all other types of bids, meet the ISO's credit requirements.<sup>53</sup> These modifications are consistent with the two competing goals the ISO must always balance in its credit policy. The first goal is that participants in the ISO's markets, including market participants engaged in convergence bidding, must be creditworthy or post sufficient collateral to support their bids, in order to avoid exposing other market participants to undue credit risk. The second goal is that the credit requirements should not discourage bidding, including convergence bidding, and the benefits that such bidding provides.<sup>54</sup>

The ISO's proposed approach appropriately balances these two goals and uses the most current information available about a market participant's convergence bidding exposure. The proposed credit requirements for convergence bidding consist of three main components: credit checking of convergence bids, calculation of the estimated value of convergence bids, and adjustment of the value of convergence bids based on final market clearing prices.

### **1. Dynamic Credit Checking of Convergence Bids**

Whenever a Scheduling Coordinator submits convergence bids, the ISO will perform a credit check to estimate the total value of all of the submitted convergence bids on a dynamic basis. The ISO will then assess whether the Scheduling Coordinator's total estimated aggregate liability, which will include virtual bids plus all other financial obligations, is within the available credit limit. The ISO will determine the value of the submitted convergence bids by calculating the sum of the product of the absolute values of the megawatts of the convergence bids multiplied by a reference price for the convergence bids.

The reference price for virtual supply bids will be the 95<sup>th</sup> percentile value of the price difference between the real-time and day-ahead markets. The

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<sup>52</sup> See generally ISO tariff, Section 12.

<sup>53</sup> As shown in Table 1, provided in Section I.3, below, all of the other ISOs and RTOs also impose credit limits on virtual bids.

<sup>54</sup> See *California Independent System Operator Corp.*, 120 FERC ¶ 61,192, at P 6 (2007).

reference price for virtual demand bids will be the 95<sup>th</sup> percentile value of the price difference between the day-ahead and real-time energy markets. The ISO will calculate these two reference prices for each node for three-month periods (covering January-March, April-June, July-September, and October-December) of each year using the hourly actual LMPs for the same period of the previous year. Although this approach was widely supported by stakeholders, some stakeholders suggested that the use of the 95<sup>th</sup> percentile to determine the reference price is highly conservative and that the ISO should review this policy after convergence bidding is implemented. The ISO will review the reference price methodology twelve months after convergence bidding is implemented to determine if adjustments are necessary. After this initial review, the ISO will review the reference price methodology at least every three years.

The ISO will generally use the absolute value of the megawatts of all convergence bids – for both virtual supply and virtual demand – in the equation for credit checking. The only exception is when a market participant submits both virtual supply bids and virtual demand bids at the same location for the same trading hour. In that situation, the ISO will use the greater of the dollar value of the virtual supply (*i.e.*, the absolute value of the bid-in virtual supply megawatts multiplied by the reference price for virtual supply at the location) and the dollar value of the virtual demand (*i.e.*, the absolute value of the bid-in virtual demand megawatts multiplied by the reference price for virtual demand at the location) in the equation for credit checking.

If the amount calculated for a Scheduling Coordinator using the equation for credit checking for virtual bids plus other obligations, *i.e.*, the total estimated aggregate liability, is less than or equal to the Scheduling Coordinator's available credit limit, the bids will pass the credit check, and will be included in the ISO's market clearing process and the Scheduling Coordinator's estimated aggregate liability will be increased accordingly.<sup>55</sup>

If, however, the amount calculated for a Scheduling Coordinator exceeds the available credit limit, convergence bids will be rejected on a last-in, first-out basis pursuant to the time stamp the ISO assigns to the convergence bids. The market participant may submit revised convergence bids after failing a credit check, subject to the ISO's bidding timelines.

The ISO's proposed credit checking approach for convergence bids is similar to the means the ISO uses to calculate the credit requirements for holding CRRs with terms of one year or less. To determine those credit requirements, the ISO determines the value of the CRRs using a 95<sup>th</sup> percentile value of the

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<sup>55</sup> The addition of this value to the estimated aggregate liability is discussed further below.

potential variation between auction prices and CRR payment obligations.<sup>56</sup> Moreover, the ISO's proposed credit checking approach is similar to the approaches that other ISOs and RTOs use to credit-check virtual bids in their markets. ISO New England, the Midwest ISO, the New York ISO, and PJM all require market participants to pass credit checks before they are allowed to submit virtual bids, and the Midwest ISO, the New York ISO, and PJM use credit-checking mechanisms that include the use of reference prices based on specified percentiles.<sup>57</sup>

## 2. Calculation of the Estimated Value of Convergence Bids

After the day-ahead market closes but before the real-time market closes, the ISO will estimate the value of the convergence bids of each Scheduling Coordinator that passed the credit check. This estimated value will equal the sum of the product of the absolute values of the amounts of cleared megawatts of convergence bids multiplied by the 95<sup>th</sup> percentile reference price (discussed above). The ISO will then adjust the market participant's estimated aggregate liability to reflect the estimated value.

After the real-time market clears, the ISO will again estimate the value of the convergence bids of each market participant. At that time, the estimated value will equal the sum of the product of: (i) the difference between the initial market clearing prices in the day-ahead and real-time markets, with the initial market clearing prices being the LMPs of the pricing nodes that match the geographical specifications of the convergence bids, and (ii) the absolute values of the amounts of cleared megawatts of convergence bids. Pursuant to this estimate, the ISO will again adjust the Scheduling Coordinator's estimated aggregate liability.

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<sup>56</sup> ISO tariff, Section 12.6.3.2; *California Independent System Operator Corp.*, 124 FERC ¶ 61,107, at PP 46-47 ("The CAISO contends that . . . it may not have sufficient credit coverage to protect against a default with a ninety-five percent likelihood. To remedy this problem, the CAISO proposes to revise tariff section 12.6.3.2 so that each short-term CRR holder is subject to a credit requirement equal to the negative of the CRR's most recent auction or the CRR's historical expected value, whichever is lower, plus the CRR's credit margin.").

<sup>57</sup> See ISO New England Transmission, Markets and Services Tariff, General Terms and Conditions, Section I, Exhibit 1A (ISO New England Financial Assurance Policy for Market Participants), at Section II.C; ISO New England "Virtual Bid Financial Assurance Methodology," available on the ISO New England website at [http://www.iso-ne.com/stlmnts/assur\\_crdt/misc/virtual\\_bid\\_description.pdf](http://www.iso-ne.com/stlmnts/assur_crdt/misc/virtual_bid_description.pdf); Midwest ISO Open Access Transmission, Energy and Operating Reserve Markets Tariff, Attachment L, Sections III.A(4) and IV.A(3) (utilizing 50<sup>th</sup> percentile reference price); New York ISO Open Access Transmission Tariff, FERC Electric Tariff, Attachment W, Sections III.A, III.B, and VI.A (utilizing 97<sup>th</sup> percentile reference price); New York ISO Market Administration and Control Area Services Tariff, Attachment K, Sections III.A and III.B (same); PJM Open Access Transmission Tariff, Attachment Q, Section III (utilizing 97<sup>th</sup> percentile reference price).

### **3. Adjustment of the Value of Convergence Bids Based on Final Market Clearing Prices**

After the close of the real-time market, the ISO will verify the initial market clearing prices and will make corrections to them if necessary. If the initial market clearing prices are corrected, the values of the cleared convergence bids will then be re-calculated using the final market clearing prices and the estimated aggregate liability of the market participant will be adjusted accordingly.

### **4. Other Credit Policy Issues Regarding Convergence Bids**

Pursuant to the ISO's existing credit policy, each participant in the ISO markets must maintain an aggregate credit limit in excess of its estimated aggregate liability at all times. Although the ISO does not reject the bids until a market participant's aggregate credit limit exceeds its estimated aggregate liability, the ISO will request more collateral when the estimated aggregate liability exceeds 90 percent of the aggregate credit limit.<sup>58</sup> The ISO proposes to apply the same credit policy after convergence bidding is implemented.

In the event of a payment default regarding a convergence bid, the payment default will be treated the same as any other financial default in the ISO markets. The costs of a financial default resulting from convergence bidding will be allocated to market participants in the same manner as any other type of financial default.<sup>59</sup>

#### **I. Settlement of Convergence Bidding Transactions**

The ISO will settle convergence bidding energy transactions using the processes and charges discussed below.

##### **1. Basis for Settlement**

Convergence bids that are cleared in the integrated forward market will be settled based on the differences between the day-ahead LMPs and the real-time LMPs at the relevant locations. Specifically, for convergence bidding transactions at internal nodes, the ISO will multiply the day-ahead LMPs at those nodes by the day-ahead cleared megawatt-hours of virtual supply and virtual demand, will multiply the simple average of the five-minute real-time LMPs at the internal nodes by the day-ahead cleared megawatt-hours of virtual supply and

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<sup>58</sup> See ISO tariff, Section 12.4.

<sup>59</sup> Proceedings regarding the ISO's methodology for allocating financial defaults to market participants are currently ongoing before the Commission. See *Calpine Corp. et al. v. California Independent System Operator Corp.*, 128 FERC ¶ 61,271 (2009).

virtual demand, and will perform settlements based on the differences between those calculated amounts. For convergence bidding transactions at the interties, the ISO will multiply the day-ahead LMPs at those interties by the day-ahead cleared megawatt-hours of virtual supply and virtual demand, will multiply the real-time LMPs at the interties (which are based on hourly HASP prices) by the day-ahead cleared megawatt-hours of virtual supply and virtual demand, and will perform settlement based on the differences between those calculated amounts.

## **2. Grid Management Charge**

The ISO recovers its own costs through the grid management charge (“GMC”), and those costs are allocated to Scheduling Coordinators through a number of service charges, based on the principle that the market participants represented by the Scheduling Coordinators that cause the costs to be incurred should pay them.<sup>60</sup> Because convergence bidding is solely a financial transaction, cost causation principles suggest that only certain of the service charges should apply to convergence bidding. The following service charges will be applied to convergence bidding: the forward scheduling charge, the market usage day-ahead charge (only for the day-ahead market for energy), and the settlements, metering, and client relations charge.

Discussions in the convergence bidding stakeholder process revealed that market participants desired the GMC for convergence bids to be a set dollar per megawatt-hour charge that could be easily incorporated into their bidding strategies. Currently, the billing determinants for the forward scheduling charge and the market usage charge are not charged on a dollars per cleared megawatt-hour basis. Therefore, the ISO proposes to create a new service charge for convergence bidding – the convergence bidding charge. The revenue generated by the convergence bidding charge will be applied to the existing forward scheduling charge and market usage charge for the day-ahead market for energy.

The ISO estimates that the rate for the convergence bidding charge will be between \$0.065 and \$0.085 per cleared gross megawatt-hour. As indicated in Table 1, below, this rate is consistent with the rate that other ISOs and RTOs charge for virtual bidding. The exact rate will be established in the 2011 GMC extension stakeholder process that will begin January 2010.

Each market participant that becomes a Scheduling Coordinator, including each market participant that enters the ISO markets as a Scheduling Coordinator solely to engage in convergence bidding, will be charged a settlements, metering, and client relations charge fixed at \$1,000 per month for each SCID that has an invoice value greater than \$0 in a particular trading month.

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<sup>60</sup> See ISO tariff, Section 11.22; ISO tariff, Appendix F, Schedule 1, Parts A, C, and E.

### 3. Transaction Fees for Submitted Convergence Bids

The ISO anticipates that the implementation of convergence bidding will substantially increase bid volumes in the day-ahead market. The ISO has concluded that an effective convergence bidding design must have a mechanism that manages bid volumes economically and deters “bid fishing,” *i.e.*, the submission of large numbers of bid segments that are likely to be uneconomic. If left unchecked, bid fishing could lead to potential software performance issues.

The ISO anticipates that bid volumes will be somewhat reduced by features of the convergence bidding design, including the limit of one virtual demand bid and one virtual supply bid per location per convergence bidding entity, the requirement that a convergence bid be no smaller than one megawatt, and the credit-checking process. To provide further protection against bid fishing, the ISO also proposes to charge a transaction fee of \$.005 per submitted convergence bid segment. As shown in Table 1, below, this amount is less than or equal to the transaction fees that apply in the other ISOs and RTOs that employ virtual bidding transaction fees. The MSC supports the ISO’s proposed transaction fee.<sup>61</sup> The ISO will apply the revenues from the transaction fees as an offset to the GMC costs associated with convergence bidding and discussed above.

Table 1, below, compares a number of features of the ISO’s convergence bidding design with features of the virtual bidding designs of the other ISOs and RTOs, including virtual bidding transaction fees.

**Table 1**

|                                 | <b>Minimum Virtual Bid</b> | <b>ISO/RTO Administrative Fees</b>                 | <b>Transaction Fees</b> | <b>Bid Cost Recovery Uplift Fees</b>          | <b>Bid Limitations</b>  |
|---------------------------------|----------------------------|--|-------------------------|---|---|
| <b>California ISO proposals</b> | 1 MW                       | \$0.065 to \$0.085 per cleared gross megawatt-hour | \$0.005 per bid segment | Assessed to virtual supply and virtual demand | Ability to apply location-based megawatt limits when necessary to achieve an AC solution<br><br>Credit limits |

<sup>61</sup> See Final MSC Opinion at 6-7.

|                        | <b>Minimum Virtual Bid</b>                                    | <b>ISO/RTO Administrative Fees</b>                      | <b>Transaction Fees</b>   | <b>Bid Cost Recovery Uplift Fees</b>          | <b>Bid Limitations</b>  |
|------------------------|---|---|---|---|---|
| <b>PJM</b>             | .01 MW  | \$0.045 per cleared bid                                 | \$0.06 per bid segment  | Assessed to virtual supply and virtual demand | Ability to impose scheduling coordinator daily limit of 3000 bid-offer segments<br><br>Applies location-based megawatt limits necessary to achieve AC solution<br><br>Credit limits |
| <b>New York ISO</b>    | 1 MW for first bid segment and 0.1 MW for subsequent segments | Yes – \$200/MWh collateral requirement for virtual bids | \$0.10 per submitted virtual bid regardless of segments<br><br>\$0.05 for cleared bids (credited 50 percent)<br><br>Sliding scale based on security-constrained unit commitment performance (minimum of \$0.03 and maximum of \$1.00) | Assessed to virtual supply only               | Total volume of bids at each location cannot exceed two times generation capacity (plus/minus) at the location<br><br>Soft bid volume cap<br><br>Credit limits                      |
| <b>Midwest ISO</b>     | 0.1 MW  | \$0.85 per cleared bid                                  | No transaction fees   | Assessed to virtual supply and virtual demand | Can impose daily virtual megawatt limit<br><br>Credit limits  |
| <b>ISO New England</b> | 1 MW  | \$0.06 per cleared bid                                  | \$0.005 per bid segment   | Assessed to virtual supply and virtual demand | Bid limits unknown<br><br>Credit limits   |

## **J. Allocation of Cost Uplifts to Convergence Bidders**

As discussed above, cost causation principles require that convergence bidders be charged for costs they have caused to occur. Consequently, virtual demand bids should be subject to uplift costs related to the increased unit commitment in the integrated forward market caused by convergence bidding. Similarly, virtual supply bids should be subject to uplift costs related to the increased unit commitment within RUC of the day-ahead market caused by convergence bidding.<sup>62</sup>

Based on these considerations, the ISO proposes to allocate integrated forward market bid cost uplift and RUC bid cost uplift as discussed below.<sup>63</sup> The ISO crafted this proposal after taking into account comments provided in the convergence bidding stakeholder process, and believes the proposal satisfies cost causation principles, is fair and reasonable, and is administratively workable for the ISO. In this regard, the ISO notes that, short of performing a separate market run and a subsequent settlement to determine market outcomes under alternate scenarios (*i.e.*, both with convergence bids and without convergence bids), the ISO cannot determine with absolute precision the additional bid cost recovery (“BCR”) uplift costs that virtual bids may create. Even taking those onerous steps would not guarantee complete accuracy, because merely pulling virtual bids out of the market run and re-running the market may not reflect bidding behavior and market outcomes that would have occurred in the absence of virtual bids.

### **1. Allocation of IFM Bid Cost Uplift**

The ISO proposes that Scheduling Coordinators with a net virtual demand position be obligated to pay integrated forward market bid cost uplift for tier 1,<sup>64</sup> based on how much additional unit commitment was driven by system-wide net virtual demand that resulted in the integrated forward market clearing above the amount of unit commitment needed to satisfy measured demand (*i.e.*, load plus exports). If total system-wide cleared physical demand plus virtual demand minus virtual supply is less than or equal to measured demand and/or the total system-wide net of virtual demand and virtual supply results in a positive net virtual supply Scheduling Coordinators will not be charged for integrated forward market bid cost uplift for tier 1. If physical demand plus virtual demand minus virtual supply is greater than measured demand and the total system-wide net of

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<sup>62</sup> The allocation of these uplift costs is described in Section 11.8.6 of the ISO tariff.

<sup>63</sup> The MSC states that it “supports the use of the principle of cost causation to allocate . . . uplift charges to convergence bids in the ISO proposal.” Final MSC Opinion at 6.

<sup>64</sup> See ISO tariff, Section 11.8.6.4.

virtual demand and virtual supply results in positive net virtual demand, the obligation of Scheduling Coordinators with net virtual demand to pay net integrated forward market bid cost uplift for tier 1 will increase proportionately based on the quantity of net virtual demand that pushed the integrated forward market above measured demand. In this case, each Scheduling Coordinator with a positive net virtual demand position will pay a proportional share based on its quantity of net virtual demand to the total virtual demand obligation to pay IFM tier 1 uplift. The maximum obligation for integrated forward market bid cost uplift for tier 1 will be the system-wide net quantity of virtual demand minus virtual supply when net virtual demand system-wide is positive. The minimum obligation for integrated forward market bid cost uplift for tier 1 will be zero.

The convergence bidding design results in no changes to the allocation of net integrated forward market bid cost uplift for tier 1 to physical load. Physical load and virtual demand will pay the same integrated forward market Uplift rate.

## **2. Allocation of RUC Bid Cost Uplift**

The ISO proposes that Scheduling Coordinators be obligated to pay net RUC bid cost uplift for tier 1,<sup>65</sup> based on under-scheduled load and net virtual supply. To the extent that the ISO forecast of demand is less than or equal to the measured demand, the costs will be allocated to net virtual supply and under-scheduled load. To the extent that the ISO forecast of demand is greater than the measured demand, the costs will be allocated *pro rata* to measured demand.

Some stakeholders commented that virtual supply should not pay for RUC procured beyond what was needed for actual load, on the ground that virtual supply is not the cause or beneficiary of these additional costs. The ISO agrees with stakeholders on this point but also believes that under-scheduled load is neither the cause nor the beneficiary of RUC procured beyond what is needed to cover measured demand when the ISO forecast of demand is greater than measured demand. Therefore, the ISO proposes that such costs be allocated to RUC bid cost uplift for tier 2 and be paid by measured demand, since measured demand benefits from the additional RUC procurement.

The payment obligation for virtual supply will be determined by the net of the total cleared virtual demand and the total cleared virtual supply when the result is a net positive virtual supply. In addition, the ISO proposes to allocate a portion of bid cost recovery uplift currently recovered through real-time uplift bid cost recovery to net virtual supply and under-scheduled load through the RUC bid cost recovery uplift charge. Because cleared virtual supply displaces physical generation in the IFM and short-start units with RUC schedules are not started up until real-time, virtual supply as well as under-scheduled load could

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<sup>65</sup> See ISO tariff, Section 11.8.6.5.3.

contribute to the need to start-up these units in real-time, thereby contributing to the bid cost recovery uplift. Since these short-start units are started up in real-time as a result of a decision made in the RUC process, the ISO believes it makes more sense for the uplift for these units to be recovered through the RUC bid cost recovery charge than the real-time bid cost recovery charge.

The obligation of physical load to pay net RUC bid cost uplift for tier 1 is unchanged and will be determined by each Scheduling Coordinator's net negative CAISO demand deviation. The obligation for each Scheduling Coordinator will then be multiplied by the RUC tier 1 rate. Both virtual supply and physical load will pay the same RUC tier 1 rate.

The ISO proposes to allocate the portion of bid cost recovery cost related to short-start units committed in real-time as a result of a RUC schedule through RUC tier 1 uplift. Those costs currently are recovered through real-time bid cost recovery uplift. Other costs related to real-time bid cost recovery will continue to be allocated to measured demand until the ISO redesigns the real-time uplift charge to allocate costs in two tiers.<sup>66</sup>

### **3. Other Uplift Costs**

With regard to all of the ISO's uplift charges other than those discussed above, the ISO proposes to continue using its current allocation methodologies and not to allocate uplift costs to virtual transactions.<sup>67</sup>

#### **K. Convergence Bidding Implementation Schedule**

The following is the ISO's current schedule for developing and implementing the non-software components of the convergence bidding market feature:

- December 2009 - February 2010 – Stakeholder process on tariff language to implement convergence bidding
- December 2009 – Publish external business requirements (Scheduling Infrastructure Business Rules have already been published but will be updated)

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<sup>66</sup> In the April 2007 Order, the Commission ordered the ISO to develop a two-tier charge for real-time uplift within three years of MRTU start-up. April 2007 Order at P 309. The ISO will address this order through a stakeholder process separate from that for convergence bidding.

<sup>67</sup> Discussion regarding the ISO's other uplift charges is contained in the ISO's "Update on the Design for Convergence Bidding" (dated November 7, 2007) at 28-30, available on the ISO's website at <http://www.caiso.com/1c8f/1c8ff39f65a70.pdf>.

- First Quarter 2010 – Submit tariff language to implement convergence bidding for Commission approval (the specific filing date will be determined based on the date the Commission issues an order on this filing and whether there are significant modifications in the order to the convergence bidding design policy)
- Second Quarter 2010 – Publish convergence bidding technical specifications
- Third Quarter 2010 – Develop changes to the ISO’s Business Practice Manuals.

This is the ISO’s current schedule for developing and implementing the software components of the convergence bidding market feature:

- December 2009 - May 2010 – Build convergence bidding software (*i.e.*, develop, construct, and achieve factory acceptance of software)
- June 2010 - September 2010 – Test convergence bidding software and integrate it with ISO’s existing software
- October 2010 - January 2011 – Conduct market simulation of convergence bidding
- February 1, 2011 – Implement convergence bidding.

#### **IV. REQUESTED RELIEF**

The ISO urges the Commission to issue an order finding that the ISO’s convergence bidding design policies presented in this filing are just and reasonable, without modification or condition. If the order does not require any significant modifications to the convergence bidding design policy, the ISO expects that it will be able to file the tariff language to implement the design policy within a few weeks after the order is issued. If the order does require significant modifications, the ISO will need to adjust its schedule for filing the tariff language accordingly.

## V. COMMUNICATIONS

Communications regarding this filing should be addressed to the following individuals, whose names should be placed on the official service list for this proceeding:

Nancy Saracino  
General Counsel  
Sidney M. Davies\*  
Assistant General Counsel  
California Independent System  
Operator Corporation  
Tel: (916) 351-4400  
Fax: (916) 608-7296  
E-mail: [nsaracino@caiso.com](mailto:nsaracino@caiso.com)  
[sdavies@caiso.com](mailto:sdavies@caiso.com)

Sean A. Atkins\*  
Bradley R. Miliauskas  
Alston & Bird LLP  
The Atlantic Building  
950 F Street, NW  
Washington, DC 20004  
Tel: (202) 756-3300  
Fax: (202) 756-3333  
E-mail: [sean.atkins@alston.com](mailto:sean.atkins@alston.com)  
[bradley.miliauskas@alston.com](mailto:bradley.miliauskas@alston.com)

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

## VI. SERVICE

The ISO has served copies of this transmittal letter, and all attachments, on the California Public Utilities Commission, the California Energy Commission, all parties with effective Scheduling Coordinator service agreements under the ISO tariff, and all parties in Docket No. ER06-615. In addition, the ISO is posting this transmittal letter and all attachments on its website.

## VII. ATTACHMENTS

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

- |              |   |
|--------------|---|
| Attachment A | Memorandum from Keith Casey, Vice President, Market and Infrastructure Development, to ISO Board of Governors regarding decision on convergence bidding design, dated October 21, 2009    |
| Attachment B | Memorandum from Eric Hildebrandt, Interim Director, Market Monitoring, to ISO Board of Governors regarding market monitoring report on convergence bidding design, dated October 21, 2009 |

- |              |   |
|--------------|---|
| Attachment C | Final Opinion on Convergence Bidding of the Market Surveillance Committee of the California ISO, dated October 19, 2009 |
| Attachment D | Summary of Submitted Comments in the Stakeholder Process on Convergence Bidding Design                                  |
| Attachment E | Table Summarizing Key Dates in the ISO's Convergence Bidding Stakeholder Process  |

### **VIII. CONCLUSION**

For the foregoing reasons, the ISO respectfully requests that the Commission issue an order accepting this convergence bidding design policy without modification or condition. Please contact the undersigned if you have any questions regarding this matter.

Respectfully submitted,

Nancy Saracino  
General Counsel  
Sidney M. Davies  
Assistant General Counsel  
California Independent System  
Operator Corporation

/s/ Sean Atkins  
Sean A. Atkins  
Bradley R. Miliauskas  
Alston & Bird LLP  
The Atlantic Building  
950 F Street, NW  
Washington, DC 20004

Counsel for the California Independent System Operator Corporation

# **ATTACHMENT A**



# Memorandum

**To:** ISO Board of Governors

**From:** Keith Casey, Vice President, Market and Infrastructure Development

**Date:** October 21, 2009

**Re:** Decision on Convergence Bidding Design

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*This memorandum requires board action.*

## EXECUTIVE SUMMARY

Convergence bidding is an important market enhancement that enables market participants to hedge their physical market positions and arbitrage differences between day-ahead and real-time prices. This ultimately leads to better price convergence between these markets and more efficient dispatch of physical resources. Convergence bidding involves placing purely financial bids, sometimes called virtual bids, at particular pricing nodes in the day-ahead market. If these bids are cleared in the day-ahead market, they are then liquidated in the opposite position<sup>1</sup> in the real-time market. The market participant thus earns or is charged the difference between the day-ahead price and the real-time price at the location of the bid. Convergence bidding operates successfully in other independent system operators' markets, and provides those markets with the benefits described above. In recognition of the importance of convergence bidding in the healthy functioning of a location marginal price (LMP) market, the Federal Energy Regulatory Commission (FERC) mandated that the California Independent System Operator Corporation (ISO) implement convergence bidding. Some market participants, however, are concerned about the possibility of market manipulation or negative reliability impacts if convergence bidding is implemented in our still-maturing LMP market. Through a multi-year stakeholder process, the ISO and market participants have carefully developed a conservative design proposal for the convergence bidding functionality that addresses these concerns.

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<sup>1</sup> For example, a market participant with an accepted virtual supply position in the day-ahead market will earn the day-ahead price for that position but then buy-back this position at the real-time price. To the extent the real-time price is lower than the day-ahead price, the bidder will have profited from the transaction.

The implementation of convergence bidding will:

- Enable more efficient market outcomes when market participants identify convergence bidding opportunities through more accurate market information;
- Minimize systematic differences between day-ahead and real-time prices reducing incentives for under or over-scheduling physical demand in the day-ahead market;
- Enable suppliers to hedge against the possibility of a generator outage between day-ahead and real-time, which may be particularly useful in peak conditions; and
- Increase market liquidity at all pricing locations, which helps to discipline physical supplier market power.

Management's proposal for convergence bidding consists of the following key design elements:

1. Convergence bidding at all internal pricing nodes, trading hubs, and at the interties;
2. A registration process and a dynamic credit check for convergence bidders;
3. Initial position limits, to be gradually phased out over time, reducing the megawatt amount of a convergence bids that a market participant can place at any one pricing node;
4. Stricter position limits and other safeguards at the interties to ensure reliability;
5. Local market power mitigation, market monitoring tools, and the ability to suspend any convergence bidding that negatively impacts reliability;
6. A settlement rule to deter adverse incentives tied to congestion revenue rights (CRR); and
7. A scheme for the allocation of market costs and grid management charges to convergence bidders.

The following points help to underscore the fact that convergence bidding will not adversely affect the ISO's ability to ensure reliability.

- Convergence bids are allowed at the inter-ties but can not provide counter-flow (*i.e.*, congestion relief) to physical inter-tie schedules that would otherwise be infeasible;
- Convergence bids are not part of the residual unit commitment process that commits additional capacity, if necessary, to meet the next day's demand forecast;
- Convergence bids are not part of any dispatch or real time market processes (except for financial settlement at the real time LMPs); and

- Convergence bidding strategies that contribute to load or generation levels or patterns that cause a divergence between day-ahead and real-time prices are money-losing strategies. In this way, prices discipline market behavior and drive market outcomes to more efficient dispatch of physical resources.

*Moved, that the ISO Board of Governors approves the proposed market enhancement, convergence bidding, as described in the memorandum dated October 21, 2009, and;*

*Moved, that the ISO Board of Governors authorizes Management to make all necessary and appropriate filings with the Federal Energy Regulatory Commission to implement this proposal.*

## DISCUSSION AND ANALYSIS

### *Background*

Convergence bids are purely financial bids submitted in the day-ahead market. If cleared in the integrated forward market, these purely financial supply and demand bids settle at day-ahead prices and are automatically liquidated with the opposite position at real time prices. Convergence bidders typically seek profit from price differences between the day-ahead and the real-time market; thus, if price differentials grow larger, financial bidding activity should counteract these differences by pressuring day-ahead and real-time market prices to move closer together. Because these bids are strictly financial, they are not backed by physical assets, nor is there any linkage between the financial bids and any physical supply or demand bids submitted by the same entity.

### *Design elements and management recommendations*

Management has strived to develop a balanced proposal that accommodates stakeholders' divergent views and concerns as much as possible. The design proposed is fundamentally driven by the principles of reliability, market efficiency, and cost causation.

### **Convergence bidding at all internal pricing nodes, trading hubs, and at the interties**

Management's position, which is supported by a number of market participants and market experts, is that the full benefits provided by convergence bidding can only be realized by nodal level implementation. Nodal convergence bidding will add liquidity to the ISO market, enable participants to hedge their physical transactions and provide the market with more accurate and granular (locational) information.

At the onset of the stakeholder process through which this proposal evolved, Management considered limiting convergence bidding to the three large load aggregation points (LAPs) rather than at the individual PNodes. LAP level convergence bidding would provide the benefit of deterring the under or over scheduling of physical load in the day-ahead market. But it would not provide physical supply with the ability to hedge against generation outages, nor

would it provide the market with the same liquidity or price discipline as nodal convergence bidding. Although nodal convergence bidding could potentially open up more avenues for market manipulation, the safeguards proposed by Management along with the price discipline provided by nodal convergence bidding will guard against this. Additionally, we have learned from the experience of all the other independent system operators in the United States that have implemented convergence bidding and attested to its benefits in their markets. All of these independent systems operators implemented convergence bidding at the nodal level with the exception of the New York ISO, which is in the process of doing so.

In our proposed design, we also include the ability to place virtual bids at trading hubs. This allows market participants that have bilateral transactions that settle at trading hubs to effectively hedge those transactions. This is an appropriate and beneficial use of convergence bidding.

We further propose that convergence bidding be allowed at the intertie points between the ISO balancing authority area and outside balancing authority areas. This will enable explicit convergence bidding at the interties, thereby mitigating the potential for implicit convergence bidding.<sup>2</sup> Implicit convergence bidding could create reliability problems if intertie schedules that are counted on for reliability in the day-ahead market are ultimately unavailable in real-time. By allowing explicit convergence bidding at the interties, the ISO market and reliability processes will be able to distinguish between physical and purely financial intertie transactions and therefore make better reliability decisions (e.g., committing additional physical generation in residual unit commitment). Convergence bidding at the interties will also enable participants to arbitrage differences between the day ahead and hour ahead scheduling process prices, which have been relatively large since the launch of the new ISO market.

#### **Dynamic credit check for virtual traders**

When a market participant submits convergence bids in the day-ahead market, the value of these bids will immediately be compared to the market participant's available credit limit. The convergence bids that pass the credit checking will be fed into the market clearing process. At the same time, the value of the convergence bids, based on historical reference prices, will be added to the estimated aggregate liability of the participant.

#### **Initial, gradually phased-out position limits**

As an initial safety net upon the implementation of convergence bidding, we propose position limits be in place at each PNode. At the launch of convergence bidding, it is proposed that each market participant be able to bid up to ten percent (10%) of the average annual load at demand PNodes, or the maximum generation at supply PNodes. The position limits will offer some security as the market matures and develops. These limits will be lifted incrementally over a two-year period.

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<sup>2</sup> Submitting physical intertie bids in the day-ahead market with no ability or intention of physically delivering on the schedules with the sole intent of liquidating the schedules in the Hour Ahead Scheduling Process (HASP).

### **Additional safeguards at the interties to ensure reliability**

The issue of whether or not to permit convergence bidding at the interties was highly debated. Some stakeholders were concerned about allowing purely financial bids at the interties because California is highly dependent on imported energy. These stakeholders worry about the possibility that purely financial schedules at the interties could crowd out physical imports, or that such schedules would provide fictional counter-flows, that would result in infeasible real time intertie schedules. Our proposal addresses both of these concerns.

Specifically, to alleviate these concerns, we propose to limit each participant's ability to submit convergence bidding bids to five percent (5%) of an intertie's scheduling limit. Furthermore, we propose a second set of constraints that, (1) holds physical schedules to be within the applicable scheduling limit, and (2) limits both physical plus virtual schedules to be within the applicable scheduling limit. This net constraint prevents counter-flows created by accepted convergence bidding from enabling physical schedules at an intertie greater than is allowed under the Western Electricity Coordinating Council (WECC) scheduling limit.

### **Local market power mitigation, market monitoring tools, and the ability to suspend convergence bidding trading that negatively impacts reliability**

As part of our overall conservative approach to the design of convergence bidding, we propose that local market power mitigation (LMPM) be performed based on physical bid-in generation and forecast load. The mitigation mechanism for local market power is designed so that physical generation needed to meet physical load will be appropriately mitigated. Also, the ISO's Department of Market Monitoring (DMM) will have advanced monitoring tools that will enable them to analyze market outcomes both with and without convergence bids. Furthermore, in the unlikely event that convergence bidding is causing or contributing to an operational or reliability concerns, we propose that the ISO have authority to suspend convergence bidding functionality at all or individual PNodes.

### **A settlement rule to deter the manipulation of congestion revenue rights (CRR)**

Management is proposing a congestion revenue rights (CRR) settlement rule that provides a targeted way of limiting CRR payments in cases when the CRR holders' convergence bids may otherwise increase their CRR payments. This rule addresses concerns that market participants might attempt to use convergence bids to manipulate the market prices at locations where they hold CRRs and thereby increase the profitability of their CRR holdings. To address this concern, the proposed rule will net the market results across all hours of each day corresponding to the participant's CRR. For each congested constraint that is found to be affected by the participant's convergence bids, the rule will consider the aggregate (net) impact of this congestion on participant's CRRs during each hour. If it is determined that a market participant's convergence bids were used to artificially increase day-ahead congestion, CRR payments to that market participant will be reduced. While the settlement rule will be applied to each business entity separately, business entities with multiple Scheduling Coordinator (SC) IDs will have the settlement rule applied on an aggregate basis to their entire portfolio of CRRs and convergence bids.

### **A scheme for the allocation of market costs and grid management charges to convergence bidders**

In developing a full conceptual proposal for assessing costs on convergence bids, we followed the principle of cost causation which dictates that convergence bids should be charged costs for which they have caused. Therefore, virtual demand bids are subject to a portion of bid cost recovery uplift costs for unit commitment in the integrated forward market above what is needed to serve actual load. Virtual supply bids are subject to a portion of bid cost recovery uplift charges related to increased unit commitment within the residual unit commitment process. This increased unit commitment is due to the need to replace physical generation the residual unit commitment process that did not clear the integrated forward market as a result of virtual supply bids.

Because convergence bids will increase bid volume substantially in the day-ahead market, convergence bids will also be subject to a transaction fee per submitted bid segment to allow the ISO to mitigate bid volumes economically to a reasonable level.

The costs recovered through the ISO's grid management charge (GMC) are currently allocated to eight service charges.<sup>3</sup> Because convergence bidding is solely a financial transaction, not all service charges apply to convergence bidding under the principle of cost causation. The following service charges will be applied to convergence bidding: forward scheduling charge, market usage (day ahead) charge, and settlements, metering and client relations charge. During the stakeholder process, however, it became apparent that service charges for convergence bidding should be based on a flat fee that will be known up front. The current billing determinants for the forward scheduling charge and market usage (day ahead) charge are currently charged by schedule and by cleared net mega watt hour. As a result, we are proposing to create a new flat fee service charge exclusively for convergence bidding that will be charged based on cleared gross megawatt hours. The revenue generated from the convergence bidding charge will be applied to the existing forward scheduling charge and market usage (day ahead) charge.

### **POSITIONS OF THE PARTIES**

The ISO has undertaken an on-going stakeholder process to develop the key features for convergence bidding. Stakeholder engagement began in the summer of 2006 and continued through early October 2009 with a break from December 2008 through June 2009 while the ISO launched the new markets. Management's proposal incorporates feedback received from 13 stakeholder meetings, 14 rounds of formal comments on 14 white papers, and has input from the ISO's Department of Market Monitoring (DMM) and Market Surveillance Committee (MSC). Stakeholder comments are summarized in *Attachment A – Stakeholder Matrix*. The MSC has provided an opinion which is *Attachment B* to this memo.

Throughout this extensive stakeholder process, there have been consistent differences of opinion with regard to convergence bidding design. In particular, load serving entities have

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<sup>3</sup> The service charges are described in detail in Appendix F, Schedule 1, Parts A and F of the ISO tariff.

been cautious about nodal bidding because they do not believe that the new markets will mature quickly enough to ensure liquidity and thus balance positions in the market. On the other hand, generation owners and energy traders have sought nodal convergence bidding because they feel that the LMP markets will quickly develop and that nodal convergence bidding will provide more benefits to the ISO markets. Load serving entities have not been supportive of convergence bidding at the interties, whereas generation owners and energy traders have been in favor of this design element. Load serving entities have advocated for more market costs to be placed on convergence bids while suppliers and traders have advocated that additional costs be limited as high costs will limit the liquidity of convergence bids.

Management recognizes that fundamental differences in the business models of these two groups are at the root of their opposite positions on these and other facets of the convergence bidding design. For this reason and out of respect for the paramount objectives of grid reliability and efficient markets, we are taking a conservative approach which is outlined in this memorandum and detailed in the proposal. This approach includes position limits, local market power mitigation, monitoring tools, ability to suspend convergence bidding when it compromises reliability, a dynamic credit check for convergence bidders, and the implementation of the CRR settlement rule. Ultimately the proposed design is a collection of elements that reflects our consideration of input from all parties, our attempts to mitigate concerns without compromising functionality, and our careful weighing of costs and benefits in terms of reliability and market efficiency.

Some stakeholders have also raised concerns about nodal convergence bidding placing more reliance on the residual unit commitment process due to large volumes of virtual supply displacing physical generation in the integrated forward market. Specifically these stakeholders are concerned that units needed for reliability may be able to bypass the integrated forward market and potentially the local market power mitigation process. This can occur by a market participant submitting a virtual supply bid that is lower than its physical generator bid and which then clears the integrated forward market, thereby ensuring that the physical generator is taken in the residual unit commitment process. To remedy this problem, these stakeholders advocate that the ISO add local market power mitigation to the residual unit commitment process. Management believes that existing mitigation measures are adequate to address these concerns. However, Management agrees that additional mitigation measures may be warranted if more frequent bidding of start-up and minimum load costs are adopted. We will address this issue in the stakeholder process that is currently addressing start-up and minimum load bidding. The ISO Department of Market Monitoring (DMM) has also addressed this issue in their October Board memo *Market Monitoring Report*.

## **RECOMMENDATION**

Management recommends that the Board approve the proposal for convergence bidding as described in this memo. Implementation is targeted for February 2011, but, upon receiving the design at year-end 2009, Management may consider an earlier implementation date. Convergence bidding is a key feature in the healthy functioning of a LMP market, and is an important market enhancement that enables market participants to hedge their physical market

positions and arbitrage differences in day-ahead and real-time prices, which ultimately leads to better price convergence between these markets and more efficient dispatch of physical resources. We are confident of the benefits of convergence bidding based on the successful implementation of convergence bidding in the markets of the other independent system operators in the United States, and based on FERC's own confidence as evidenced by its mandate to implement this functionality. The proposed convergence bidding design embodies Management's and market participants' efforts to achieve the benefits of convergence bidding, while upholding the paramount objectives of grid reliability and fair and efficient markets.

# **ATTACHMENT B**

# Memorandum

**To:** ISO Board of Governors  
**From:** Eric Hildebrandt, Interim Director, Market Monitoring  
**Date:** October 21, 2009  
**Re:** **Market Monitoring Report**

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*This memorandum does not require Board action.*

## EXECUTIVE SUMMARY

This report provides comments and recommendations by the Department of Market Monitoring (DMM) on the ISO's proposal for convergence bidding being presented by Management to the ISO Board of Governors at the October 29, 2009 meeting. The report focuses on specific provisions of the ISO's proposal that mitigate concerns about how convergence bidding may be utilized to "game" or undermine other ISO market rules to the detriment of overall market performance or other participants. DMM is supportive of the ISO's overall proposal for convergence bidding, but is providing recommendations for potential further refinements or actions that may be taken to further mitigate concerns about convergence bidding. A summary of key recommendations is provided at the end of this report.

## OVERVIEW

Convergence bidding is a key component of the Federal Energy Regulatory Commissions' (FERC) Standard Market Design for markets based on locational marginal pricing (LMP), and offers potential for improved market efficiency under the type of two-settlement system incorporated in the ISO's new nodal market. However, DMM has cautioned that if convergence bidding is implemented on a nodal basis – rather than at a higher level such as load aggregation points (LAPs) and generation hubs (Gen Hubs) – market rules must be carefully designed and incorporate a variety of provisions to avoid the potential for market manipulation or the exploitation of market design or modeling flaws to the detriment of market efficiency and other participants. Throughout the stakeholder process on this issue, DMM identified and developed specific mitigation rules and monitoring requirements necessary to address the potential adverse impacts of convergence bidding in the event the ISO decides to initially implement convergence bidding on a nodal level. With these measures in place, DMM believes the concerns about how

convergence bidding may be utilized to “game” or undermine other ISO market rules can be effectively mitigated.

DMM supports the ISO’s overall proposal for convergence bidding, which includes implementation of nodal convergence bidding, for several reasons:

- **Mitigation Provisions.** The ISO’s proposal includes all of the specific measures identified by DMM as being important to implement in conjunction with nodal convergence bidding. These include (1) position limits, (2) an automated settlement rule to limit how owners of congestion revenue rights (CRRs) might utilize convergence bidding to increase CRR payments, and (3) a process for quickly limiting or suspending the ability of individual participants to engage in virtual bidding at specific locations. More specific recommendations and caveats relating to further steps that can be taken to protect against the potential negative impact of convergence bidding on a nodal basis are provided later in subsequent sections of this report. Most notably, DMM is recommending that the ISO continue to examine further refinements that may provide additional assurance that local market power mitigation (LMPM) procedures remain highly effective under convergence bidding.
- **Market Performance/Price Divergence.** Based on the first six months of experience under the ISO’s new nodal market design, DMM is encouraged by the performance of this new market design, and the progress of the ISO’s efforts to identify problems and implement market or operational enhancements to further improve market performance. While further improvements are needed and challenges remain, DMM is optimistic that – with the necessary support from Management – significant improvements can be made prior to the implementation of convergence bidding more than one year from now. For example, DMM believes that it is important for the ISO to continue to identify and address the root cause of systematic price divergences that have been observed between the integrated forward market (IFM), hour-ahead scheduling process (HASP) and the 5-minute real-time markets prior to implementation of nodal convergence bidding. While nodal convergence bidding is designed to help to resolve some of the price divergence between these markets, it may also be more difficult for the ISO to identify and address the root cause of such price divergences once convergence bidding is implemented.
- **Implementation Issues.** The more extended timeline for development and testing of the nodal convergence bidding (with implementation scheduled in February 2011) should provide greater assurance that additional details and potential unanticipated problems associated with nodal virtual bidding can be identified and mitigated prior to implementation. This timeline should allow the ISO to thoroughly test details of convergence bidding implementation, such as (1) technical issues that might require limitation of the volume of virtual bids that might be submitted at a nodal or overall system level, (2) potential problems with the market model reaching convergence with an AC power flow, and (3) the potential implications of greater reliance on the residual unit commitment (RUC) process to commit sufficient physical supply on a day-ahead basis to meet forecasted load. The ISO has indicated that it will re-open the stakeholder process and make market or software design changes as necessary to respond to any significant problems that are identified during this software design and testing process. Throughout the

stakeholder process, the ISO has also emphasized that the software design being developed would be capable of implementing convergence bidding on either a LAP or nodal level. Thus, should any major technical issues prevent implementation of convergence bidding at a nodal level, DMM expects that the ISO would be fully prepared to implement convergence bidding at a LAP level (or a more limited nodal level) within the planned timeline of February 2011.

The following sections of this paper provide comments and recommendations on the ISO's straw proposal as it relates to key concerns about how convergence bidding may be utilized to "game" or undermine other ISO market rules along with DMM recommendations for mitigation measures against these practices. A summary of key recommendations is provided at the end of this report.

## **KEY ISSUES**

### ***Position Limits***

The initial 10 percent position limit incorporated in the ISO's proposal would provide a controlled transition to nodal virtual bidding, and would substantially mitigate the potential for several of the specific ways in which virtual bidding might be used to "game" ISO market rules, as discussed in the following sections of this report.<sup>1</sup> In addition, DMM believes that the 10 percent position limits that will be in effect initially under the ISO's proposal provide an effective "safety net" that would significantly limit the potential for any unforeseen ways in which virtual bidding may detrimentally impact market performance or reliability.<sup>2</sup>

Although some market participants have argued that the ISO has not provided adequate justification for the 10 percent position limit, DMM recommended that position limits be set at 10 percent based on a consideration of several factors:

- First, since this limit would be applied to each participant, under a scenario in which four to six participants are placing virtual bids at a node, this would allow the volume of virtual bids to be equal to 40 to 60 percent of the physical volume at the node. This level appears roughly equivalent to the volume of virtual bidding in other ISOs, and would be sufficient to allow robust competition to exist at a nodal level.

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<sup>1</sup> Position limits only apply to the volume of bids each individual participant may submit at any single node. For example, under a 10 percent position limit, a node with 100 megawatts of generation capacity would have a limit of 10 megawatts for each market participant for each hour. For load nodes, position limits could be based on metered loads during the previous year (e.g., the maximum or an average of specific hours).

<sup>2</sup> For instance, while position limits on individual participants are not specifically designed to prevent problems in reaching AC convergence within the market model, the initial 10 percent limit can certainly help to indirectly avoid such problems by avoiding cases where an excessive cumulative volume of virtual supply or demand clears at individual nodes. In the case of AC convergence, it should be noted that the ISO's proposal includes other measures to more directly avoid cases when AC convergence is not achieved, such as the ability to place a constraint on the total net injection or withdrawal at each individual node in the market model in order to ensure AC convergence.

- At the same time, if the degree of competition among participants at a nodal level was more limited, the 10 percent position limit would be low enough to limit the ability of any individual participant to move the market.
- In practice, DMM believes that the 10 percent limit would also be sufficient to allow most generators to purchase enough virtual demand to hedge all or most of the financial risk associated with a forced outage of a unit scheduled for energy in the IFM.<sup>3</sup>
- Finally, DMM notes that no position limits will be placed on convergence bidding at a LAP or Gen Hub level, given that it is very unlikely that it would be possible or profitable for an individual participant to significantly impact LMPs at this level. This provides an additional mechanism for participants to arbitrage price differentials and hedge (albeit imperfectly) financial risks associated with unit outages or bilateral contracts.

The ISO's proposal incorporates an initial position limit of 10 percent at all nodes within the ISO, but includes provisions to raise this limit to 100 percent after the first year of convergence bidding and to be eliminated after two years. DMM has cautioned that while this schedule may be achievable, the actual decision to raise position limits should be based on actual market conditions and performance over time. DMM stands ready to provide analysis and recommendations to the ISO – along with stakeholders and the Market Surveillance Committee – on this issue based on actual market experience once convergence bidding is in effect.

### ***Local Market Power Mitigation***

Without a sufficient supply of very competitively priced virtual supply bids at a nodal level, convergence bidding has the potential to undermine the effectiveness of current ISO procedures for local market power mitigation (LMPM). While generators and traders have argued that market forces will ensure a sufficient supply of very competitively priced virtual supply bids at a nodal level, load-serving entities (LSEs) and the California Public Utilities Commission (CPUC) have urged caution about adopting a virtual bidding market design that relies heavily upon this assumption.

DMM is also cautious about adopting a market design that relies on an extremely competitive supply of relatively low-priced virtual supply bids at a nodal level to ensure that the ISO's LMPM procedures remain highly effective within transmission constrained areas. While aggressive bidding of virtual supply by LSEs and traders in transmission constrained areas could

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<sup>3</sup> In practice, the amount of a generator's total energy scheduled in the IFM that could be hedged under the 10 percent position limit would typically be well above 10 percent for two reasons. First, virtually all generation is located near demand or other generation nodes that are "electrically similar" to the generation node and, as a result, have LMPs that are extremely highly correlated. Since the generator could submit virtual bids equal to 10 percent of the peak demand or nameplate generating capacity at each of these nearby nodes, the generator could effectively hedge a very large portion of any of its generation scheduled in the IFM. In addition, most generators – particularly within the major transmission constrained areas of the ISO grid – own portfolios consisting of multiple units (e.g., 3 to 6 separate units). Probabilistically, the generator would need to only hedge against an outage at any one of these units, so that the generator need only purchase virtual demand equal to the scheduled output of one of the units. If the generator purchases additional virtual demand beyond the scheduled output of an individual unit, the generator is going beyond the level needed to "hedge" the risk of an outage, and is essentially choosing to sell more of its output at the real-time price rather than the IFM price.

mitigate the ways in which LMPM might be undermined by virtual bidding, the degree to which LSEs may be authorized to engage in virtual bidding by the CPUC is still unresolved. Consequently, as part of this stakeholder process, DMM has identified specific examples of how convergence bidding at a nodal level could be used to undermine the ISO's current LMPM procedures,<sup>4</sup> and has assessed a range of options that could be used to mitigate these concerns.<sup>5</sup>

After considering a range of LMPM options, we believe there are at least two effective options for addressing concerns about how inclusion of virtual bids in the LMPM process may undermine LMPM procedures:

- The continued use of the current LMPM procedures (which are based on forecasted load and physical supply bids only) provides a reasonable level of protection against the ways in which convergence bidding could undermine LMPM, and this approach involves fewer problems or risks than if both virtual demand and supply bids were included under current LMPM procedures. Under this approach, enough physical supply to meet forecasted load is subject to mitigation, so that a relatively limited amount of competitively priced virtual supply may be needed to prevent uncompetitively high unmitigated physical or virtual supply bids from setting LMPs in the IFM within constrained areas. Since this approach would also tend to reduce the extent to which physical supply is "crowded out" by virtual supply in the IFM, this approach would help avoid excessive reliance on commitment of resources through the RUC process (and the potential inefficiencies resulting from increased reliance on RUC).
- DMM has identified another option that it believes would also effectively eliminate concern that virtual supply and virtual demand bids may undermine LMPM, and would have the additional benefit of increasing overall market efficiency. Under this approach, virtual supply and demand bids would be included in LMPM procedures, but physical supply bids would be considered based on default energy bids (DEBs) in order to prevent physical supply with a lower cost (but higher market bid price) from being "displaced" by virtual supply bids in the bid mitigation procedures. We believe this option merits further consideration as a further modification of LMPM procedures, particularly as an option for complying with the FERC's directive for the ISO to base LMPM on bid-in demand within three years of the implementation of the ISO's nodal market design.

The ISO's straw proposal calls for the first of these two options to be implemented. As noted above, DMM believes this approach provides a reasonable level of protection against the ways in which convergence bidding could undermine LMPM. However, we urge further consideration of the second approach described above as a further improvement in LMPM that could still be further reviewed and implemented prior to convergence bidding.

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<sup>4</sup> Convergence Bidding: DMM Recommendations, Attachment A: Examples of Convergence Bidding and Local Market Power Mitigation, November 2007 (<http://www.caiso.com/1c8f1c8ff4236e8e0.pdf>)

<sup>5</sup> *Local Market Power Mitigation Options Under Convergence Bidding*, Department of Market Monitoring, October 2, 2009 (<http://www.caiso.com/243b/243bebe3228c0.pdf>) and *Illustrative Examples of Alternative Local Market Power Mitigation*. Department of Market Monitoring, October 6, 2009 (<http://www.caiso.com/243f/243fcc76bf30.pdf>).

### ***Settlement Rule for Congestion Revenue Rights***

The ISO's proposal also incorporates a variety of measures to mitigate concerns that virtual bids may be utilized by participants to impact congestion in the day-ahead market, and thereby increase their CRR payments from the ISO (or decrease payments owed to the ISO for "counterflow" CRRs). Both PJM and the New England ISO have "claw back" settlement rules designed to reduce CRR payments to a participant in cases when the participant's virtual bids may have artificially increased day-ahead congestion. As part of this stakeholder process, DMM examined the settlement rule employed by PJM, but also developed an alternative approach that is designed to more accurately target virtual bidding that may be designed to increase profits from a participant's CRR holdings by decreasing (rather than increasing) price convergence in the day-ahead and real-time markets. This alternative approach has garnered support from numerous generators, traders and LSEs as a more targeted and appropriate approach compared to the approach employed by PJM and the New England ISO. DMM believes that this settlement rule will mitigate much of the concern about the use of virtual bids to "game" CRRs. To the extent that participants may seek to circumvent this settlement rule, DMM believes such behavior can be effectively monitored and addressed by either tightening key thresholds used in the settlement rule, or, on a case-by-case, basis by other sanctions targeted at the specific behavior in question, as discussed below.

### ***Limitation or Suspension of Convergence Bidding***

Virtually all of the ways in which convergence bidding may be used to "game" market rules or distort competitive market outcomes would involve convergence bids that would exacerbate – rather than reduce – differences in day-ahead and real-time prices.<sup>6</sup> DMM believes it is preferable to prevent such behavior before-the-fact (e.g., through rules such as position limits, effective market power mitigation rules, and the type of CRR settlement rule described above). However, in order to provide a more general "safety net" against detrimental behavior not prevented by these rules, DMM has proposed that in the event virtual bidding, either in general or by any particular participant or group of participants, was found to be contributing to an unwarranted divergence in prices in the IFM and real-time market, or otherwise distorting competitive market outcomes, the ISO would have the authority to suspend virtual bidding in general or suspend or limit individual market participants' ability to submit virtual bids. In the event the ISO suspends or limits virtual bidding, either in general or for an individual market participant or group thereof, the ISO would file supporting documentation with the FERC within 10 business days of the suspension. The suspension or limitation would remain in effect for 90 calendar days unless the FERC directs otherwise. With this approach, the ISO would be able to act promptly to limit or suspend any virtual bidding activity that was creating significant detrimental impacts to the market. During this 90 day period, DMM would have the opportunity to modify market rules as necessary, and/or refer the behavior to FERC's Office of Enforcement as a potential violation of ISO and FERC market rules prohibiting market manipulation.

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<sup>6</sup> Moreover, such convergence bidding would typically be unprofitable based on the virtual bids actually accepted, but would be profitable due to the profits earned by the participant's price when the price impact of the virtual bids is leveraged through other market transactions (such as physical sales in the day-ahead or real-time markets, CRRs, and sales under seller's choice or other bilateral contracts). Thus, one of the key indicators used by other market monitors to identify potential use of convergence bidding to manipulate market prices or otherwise "game" market rules is a pattern of sustained or unusual losses from virtual bidding by a participant.

### ***Residual Unit Commitment***

An additional concern that has been raised regarding this approach is that it may place significant or excessive reliance on the RUC process due to the displacement of physical supply with greater volumes of virtual supply in the IFM.<sup>7</sup> DMM believes that given current ISO market rules and performance, additional local market power mitigation to the RUC process is not warranted. Currently, potential local market power in the RUC process is mitigated by a combination of several different elements of the ISO's overall market design:

- As part of the resource adequacy (RA) process the ISO specifies RA requirements that must be met for each local capacity area (LCA). Requirements for each LCA are designed to ensure that there is sufficient RA (or RMR) capacity to meet the requirements within each LCA under a range of contingencies. In addition to having a must-offer obligation in the IFM, this RA capacity is required to submit a \$0 bid into RUC and does not receive a RUC capacity payment if scheduled for RUC.
- In addition, start-up and minimum load bids for all units are subject to mitigation. Under current market rules, participants' start-up and minimum load bids cannot exceed 200 percent of the unit's start-up and minimum load fuel costs.<sup>8</sup>

DMM believes that the level of mitigation afforded by these elements of the current market design is sufficient, especially given that the pre-IFM LMPM provisions included in the ISO's proposal (i.e., which mitigate enough physical supply to meet the load forecast) should prevent large volumes of virtual supply from "displacing" physical supply within transmission constrained areas in the IFM.

Earlier in 2009, the ISO had initiated a stakeholder process to consider allowing participants to submit start-up and minimum load bids on a daily basis (up to 400 percent of costs), subject to mitigation to cost-based levels when units were committed to meet non-competitive constraints. Should this type of modification be made to the current caps on start-up and minimum load bids, DMM believes that market power mitigation measures would need to be developed and added to the RUC process to mitigate start-up and minimum load bids for any units committed in RUC for non-competitive constraints.

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<sup>7</sup> A concern about excessive reliance on RUC is that this may reduce market efficiency and raise overall cost (including uplifts and prices), since the RUC optimization commits units only on start-up and minimum load bids, and does not consider the units' energy bids. Thus, the units committed in RUC may represent a less efficient, higher cost mix of resources available to meet energy demand in the real-time market. Even if prices "converge" in the IFM and real-time market, prices may be at a higher overall level as a result of this less efficient unit commitment and dispatch in the real-time market.

<sup>8</sup> Participants select from one of two options for start-up and minimum load bids each month: a *cost-based* option, under which their start-up and minimum load costs are re-calculated each day based on daily gas prices, and a monthly *bid-based* option. Under this bid-based option, the participant can submit a bid of up to 200 percent of start-up and minimum load fuel costs (calculated using gas futures prices for the next month). This bid is then fixed for one month.

## ***Informational Issues***

In the stakeholder process, LSEs have identified several types of information that – if released on a relatively frequent basis – could alleviate some of their concerns about being able to quickly and effectively modify their convergence bidding to ensure better price convergence and “defend” against ways in which convergence bidding by other participants may raise overall costs. These include more frequent release of (1) aggregate virtual bid curves by node, (2) nodal load distribution factors, and (3) information on enforcement/unenforcement or biasing of constraints in the IFM and real-time markets. DMM believes that pursuing ways to make such information publicly available may provide a reasonable and effective way of increasing the potential efficiency benefits of convergence bidding and alleviating concerns about convergence bidding at a nodal level.

## **RECOMMENDATIONS**

Below is a summary of key recommendations provided in this report. The discussion supporting these recommendations has been provided in prior sections of this memo:

- Position limits should be raised from the initial 10 percent based on observed market performance, rather than a pre-determined schedule.
- The ISO should continue to examine further refinements to the convergence bidding implementation that may provide additional assurance that pre-IFM local market power mitigation (LMPM) procedures remain highly effective under convergence bidding. An alternative approach identified by DMM for modifying LMPM should fully address concerns about how convergence bidding might undermine LMPM, and would also be consistent with FERC’s directive to base LMPM on bid-in demand (rather than the demand forecast) within three years of the start of the ISO’s new nodal market.
- If the ISO relaxes current caps on start-up and minimum load bids, a market power mitigation process should be added to ensure mitigation of start-up and minimum load bids of units committed through the RUC process.
- The ISO should continue to place a high priority on identifying and addressing the root cause of systematic price divergences between the day-ahead and real-time markets over the more than 12 months that remain prior to implementation of convergence bidding.
- The ISO should be prepared to re-open the stakeholder process and make market or software design changes as necessary to respond to any significant problems that are identified or unresolved during the software design and testing process.
- Market participants have identified specific additional market data as an effective way of increasing the potential efficiency benefits of convergence bidding and alleviating concerns about convergence bidding at a nodal level. The ISO should seek to make such additional market data available to market participants in a timely fashion, to the extent possible through the stakeholder process that is currently being initiated on the issue of information release.

# **ATTACHMENT C**

FINAL

## **Opinion on Convergence Bidding**

by

**Frank A. Wolak, Chairman**

**James Bushnell, Member**

**Benjamin F. Hobbs, Member**

**Market Surveillance Committee of the California ISO**

October 19, 2009

### **1. Background**

The Market Surveillance Committee (MSC) has been asked to comment on the California ISO's convergence or virtual bidding proposal.<sup>1</sup> Convergence or virtual bids are purely financial offers to sell or buy energy in the day-ahead market that if accepted must be liquidated in the real-time market for locations inside the ISO control area and in the hour-ahead scheduling process (HASP) for interties into the ISO control area. For example, the virtual sale of 1 MWh in the day-ahead market from a location inside the California ISO control area implies a corresponding price-taking offer to purchase 1 MWh of energy in the real-time market at that same location. A major market efficiency benefit of convergence bidding is the ability to schedule physical transactions in the least-cost market and use convergence bidding to buy or sell that energy at the most attractive price. The experience of the eastern ISOs also demonstrates that convergence bidding reduces the average difference between day-ahead and real-time prices.

However, convergence bidding also has the potential to allow market participants to profit from market inefficiencies or their ability to exercise unilateral market power in the energy market. For example, if a supplier is able to take actions to cause the real-time price to be higher than the day-ahead price, then this supplier can profit from this price difference by a convergence bid to buy energy in the day-ahead market and sell this energy in the real-time market. Thus, convergence bidding at locations where market participants face little competition can reduce overall market efficiency, because it enhances the ability of those market participants to exercise unilateral market power.

The California ISO has been engaged in the process of formulating a convergence bidding proposal for the Market Redesign and Technology Upgrade (MRTU) market since the summer of 2006. The MSC has participated in a number of meetings on this issue with ISO staff and stakeholders since that time. The MSC held a joint meeting with stakeholders to discuss the ISO's convergence bidding proposal on September 18, 2009 and held an MSC meeting to discuss the ISO's proposal with stakeholders on October 15, 2009. Individual members of the MSC also held meetings and participated in phone calls with a number of stakeholders to discuss aspects of the ISO's proposal. We would like to thank these stakeholders for taking the time to provide us with their input.

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<sup>1</sup> The September 14, 2009 document, "Draft Final Proposal for the Design of Convergence Bidding," and the October 2, 2009 document "Addendum to the Draft Final Proposal for the Design of Convergence Bidding," describe the final convergence bidding proposal.

We support the major features of the ISO's convergence bidding proposal. In particular, we believe that overall market efficiency will be enhanced by allowing convergence bidding at the nodal level. We also believe that concerns about price manipulation and market power abuse are best dealt with through the stringent position limits and the local market power mitigation mechanism contained in the current ISO proposal, rather than by limiting convergence bidding to the Load Aggregation Point (LAP) level. We recognize the desire for the ISO to ensure that the interties are scheduled in a physically feasible manner and the increased potential adverse market efficiency consequences associated with allowing convergence bidding at the interties. For these reasons, we support the more stringent position limits on convergence bidding at the interties in the current ISO proposal. We also support the implementation of cost causation principles in the allocation of uplift charges to convergence bidding, although it is important to emphasize that it is difficult to assign the majority of uplift charges using cost causation principles. We also support the ISO proposal's Congestion Revenue Rights (CRR) refund rule to protect against entities using convergence bids to enhance their ability to earn CRR revenues. However, we warn that it is important to design this refund mechanism to focus on the most egregious uses of convergence bids to enhance CRR payments, because it is often difficult to determine whether a market participant's actions actually caused the market outcome that triggered the CRR refund rule. Finally, although we worry that a fee for each bid segment submitted may discourage convergence bidding, we recognize that such a fee may be necessary if the ISO finds that solving for market prices and quantities becomes problematic due to an extreme number of bid segments.

## **2. Level of Granularity in Convergence Bidding**

A number of stakeholder groups have argued in favor of starting with convergence bidding only at the load aggregation point (LAP) level. We believe that the major market efficiency benefits from convergence bidding in a locational marginal pricing (LMP) market can only be realized by allowing transactions at the nodal level. This is consistent with the experience of the PJM and New England markets, which currently allow virtual bidding at the nodal level. These ISOs have identified no adverse consequences from this functionality given the market power mitigation mechanisms they have in place and have identified substantial market efficiency benefits from nodal convergence bidding.

Restricting convergence bids to the LAP level could render the potential benefits of virtual bidding so small that few, if any, market participants would make use of this functionality. The ISO would end up spending significant sums of money to implement a market design change that is rarely used and fails to yield the benefits that it could. With virtual bidding at the nodal level a generation unit owner can receive the real-time price of energy for all energy produced from its unit despite the fact that the unit is fully scheduled in the day-ahead market. Virtual bidding at the LAP level does not provide the generation unit owner with this functionality. The generation unit owner's INC bid at the LAP level will be distributed to the nodes comprising the LAP using the day-ahead load distribution factors. In addition, virtual bidding at the nodal level will allow a Congestion Revenue Rights (CRR) holder to earn the real-time congestion charge between two locations in the network instead of the day-ahead congestion charge between the two locations. Virtual bidding at the LAP level does not allow this transaction if the two nodes are within a LAP, and it only allows a very imperfect form of this functionality if the two nodes are located in different LAPs.

It is important to emphasize that allowing virtual bidding at the nodal level could also provide market participants with greater opportunities to take privately profitable actions that could harm system reliability and market efficiency. For this reason, we support the position limits proposed by the ISO to protect against the potential for adverse market outcomes during the initial implementation of convergence bidding. Most convergence bidding behavior that causes harm to system reliability and market efficiency involves a single market participant taking a sizeable financial or virtual position in the day-ahead market. By limiting the total MWhs that any one market participant (or its affiliates) can submit in virtual supply or virtual demand bids at a location and across all locations within an hour and the day, the ISO can prevent suppliers from taking these sizeable and potentially harmful financial positions in the day-ahead market. These position limits still allow a large number of MWhs of virtual supply and virtual demand bids at any node in the ISO control area or intertie. The only requirement is that these MWhs be associated with many independent market participants, which increases the likelihood that the market efficiency benefits of virtual bidding at the nodal level are realized.

As market participants become familiar with convergence bidding, these position limits can be relaxed, although we support providing the Department of Market Monitoring with the discretion to alter the ISO's proposal for relaxing them if market participant behavior and system conditions warrant maintaining or reducing them to protect against harmful market outcomes. If the California load-serving entities (LSEs) maintain the current high level of coverage of their final demand with fixed-price forward contracts, the risk of these adverse market outcomes is small, even with very large position limits. We emphasize that the existence of convergence bidding does not imply any less need for LSEs to protect themselves against short-term price volatility or the exercise of unilateral market power in the short-term market by purchasing fixed-price forward contracts for a large fraction of energy requirements far enough in advance of delivery to allow new entrants to compete to provide these contracts. This energy procurement strategy by LSEs increases the likelihood that existence of convergence bidding increases system reliability and market efficiency.

### **3. Local Market Power Mitigation with Convergence Bidding**

There is significant stakeholder controversy over how to implement a local market power mitigation mechanism in the day-ahead market with convergence bidding. One perspective is that if a local market power mitigation mechanism exists in the real-time market, there is no need for a local market power mitigation mechanism in the day-ahead market because LSEs wanting to protect themselves against the exercise of unilateral market power in the day-ahead market can submit virtual supply bids at prices that they expect to prevail in the real-time market. These virtual supply offers will displace the day-ahead offers of generation unit owners exercising unilateral market power. In real-time, the offers of the generation units necessary to meet demand will be mitigated and this physical supply will replace the virtual supply scheduled in the day-ahead market and market prices that reflect the functioning of the local market power mitigation mechanism will prevail in real time.

There are a number of assumptions implicit in this logic that argue against this sort of approach to local market power mitigation or almost any approach that incorporates virtual

demand and supply bids with physical supply and demand bids into a local market power mitigation mechanism.<sup>2</sup> First, an over-arching goal of MRTU is to obtain schedules from the day-ahead market that reflect the market's expectations of how generation units will operate in real time. A scheme that relies primarily on real-time local market power mitigation to discipline offers in the day-ahead market can result in day-ahead schedules for generation resources that deviate significantly from expected real-time production levels. Second, it is difficult, if not impossible, to mitigate virtual demand or supply price bids because these are purely financial offers and therefore do not have not underlying cost basis. For this reason, we are not aware of any market power mitigation mechanism that attempts to mitigate the price offers of convergence bids. Therefore, any approach that attempts to incorporate convergence bids into a market power mitigation mechanism runs the risk of unintended consequences from the interaction of unmitigated virtual supply and virtual demand bids with mitigated physical demand and supply bids and this can result in day-ahead physical schedules that deviate significantly from expected real-time system operation.

For these reasons, we support the use of a day-ahead local market power mitigation mechanism based only on physical generation resources and the ISO's day-ahead load forecast. Specifically, the day-ahead local market power mitigation mechanism should subject enough physical generation units to mitigation to be able to supply the ISO's day-ahead load forecast without subjecting any locations in the ISO control area to the exercise of local market power. We believe that this local market power mitigation mechanism is consistent with the current real-time market power mitigation mechanism which mitigates a sufficient amount of physical supply to satisfy real-time demand in the actual ISO network configuration. The ISO's proposed local market power mitigation mechanism under convergence bidding is consistent with this logic.

We recognize that there may be instances when the ISO's day-ahead forecast may be less than the level of physical demand that clears the day-ahead market, so that offers from some physical generation resources that are not subject to local market power mitigation may be needed to meet this demand. However, an alternative reason for physical demand from the day-ahead market to be larger than the ISO's load forecast is that virtual supply offers were accepted to serve this demand and it was unnecessary to accept offers from unmitigated physical resources. There also may be instances when the level of physical demand that clears the market may be less than the ISO's day-ahead load forecast. By the above logic, this market outcome can result in unmitigated offers from physical resources being accepted because virtual demand bids may displace higher-priced physical demand bids and the total amount of physical resources dispatched may be greater than the ISO's load forecast. We believe that subjecting enough physical generation resources to mitigation to meet the ISO's load forecast provides the appropriate level of protection against the exercise of unilateral market power for loads while still providing sufficient opportunities for generation unit owners to recover their total costs of production.

#### **4. Convergence Bidding at the Interties**

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<sup>2</sup> The Option B proposal for local market power mitigation with convergence bids introduced during the October 9, 2009 convergence bidding stakeholder meeting may be an exception to this rule. We believe this proposal is worthy of further study for possible implementation at a future date.

Convergence bidding at the interties presents a number of market design challenges because it is impossible to identify a physical supply or demand resource that actually supplies or demands the energy bought or sold at the intertie in the day-ahead market so that the distinction between a virtual bid or offer and physical bid or offer in the day-ahead market is largely a matter of semantics.<sup>3</sup> Consequently, all day-ahead schedules at the interties can be thought of as virtual transactions until these schedules are tagged and a resource in the neighboring control is designated as providing this intertie schedule. For this reason, we question the need for the current ISO proposal to enforce two sets of constraints on intertie schedules in the day-ahead market—one for what are deemed to be physical exports and imports and another for the sum of the physical and virtual import and export schedules.

This market rule seems to complicate the day-ahead scheduling process with no corresponding reliability benefit. A day-ahead physical intertie schedule can be subject to a day-ahead congestion charge because of virtual bids and offers at the intertie, despite the fact that there is sufficient intertie capacity for all physical schedules to flow. We are concerned that the asymmetric treatment of physical and virtual intertie transactions under the current ISO proposal could have unintended consequences, because there is no difference between a physical and virtual transaction until the intertie schedule is actually tagged, yet the ISO subjects physical intertie transactions to additional constraint in the scheduling run in the day-ahead market.

In particular, the proposed two-step process (scheduling run with two constraints followed by a pricing run with only the total constraint) will result in prices and schedules that are inconsistent in the following sense. Schedules and prices are consistent (technically speaking, the prices support the schedules) if each market participant's schedule maximizes their profits, given the prices. Inconsistencies arise if bids are not taken that are below the price, or bids are taken that exceed the price; either can, in theory, occur. In general, when this occurs in markets, it provides incentives for market participants to provide bids that are not cost reflective or to otherwise misrepresent their costs or characteristics. For example, if a physical bid for 100 MW of imports is not taken in the day-ahead market due to the physical constraint in the scheduling run, but a costlier virtual bid is taken, the physical bidder has an incentive to designate its bid as virtual, not physical. If its virtual bid of 100 MW is taken, then in HASP, it could simultaneously export 100 MW virtually (matching the day-ahead virtual import schedule) and submit a fixed physical import schedule of 100 MW. This mischaracterization in the day-ahead market is costless, and increases the probability that a bid will be taken.

A potential alternative to the ISO's proposal is to treat all import and export schedules in the day-ahead market as virtual transactions. Any intertie schedule that is tagged immediately following the close the day-ahead will be treated as a physical schedule and all other schedules will be treated as virtual. This mechanism avoids the potential scheduling and pricing inconsistency described above as well as recognizes that all day-ahead intertie transactions are virtual. It would also allow the maximum amount of intertie capacity to be allocated in the day-

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<sup>3</sup> We understand that the Western Electricity Coordinating Council (WECC) rules require the ISO to ensure intertie schedules are physically feasible and therefore implicitly fail to acknowledge the purely financial nature of all day-ahead intertie transactions. Nevertheless, we recommend that the ISO virtual bidding rules recognize that there is no distinction between physical and virtual bids at the interties in the day-ahead market.

ahead market. Any untagged schedules would be treated as virtual and a price-taking INC bid would be entered for the day-ahead export schedule and price-taking DEC bid would be entered for the day-ahead import schedule in the HASP. Any tagged schedule would be treated as a self-schedule in the HASP.

An additional concern with the ISO's proposal for convergence bidding at the interties is the fact that day-ahead virtual bids at the interties will be cleared against the HASP price, whereas the day-ahead virtual bids at locations inside the ISO control area will be cleared against the real-time price. Several interties in the ISO control area also allow external resources to dynamically schedule energy in real time which means that this energy is paid the real-time price. Consequently, there may be instances when a large external supplier can use its ability to submit dynamic schedules at an intertie to profit from convergence bidding at that intertie. For example, this supplier might submit a high offer price in HASP to profit from a virtual export schedule in the day-ahead market at that location (buying at the lower day-ahead price and selling at the higher HASP price). In real-time, this supplier could then lower its offer price and dynamically schedule over this intertie to sell additional energy needed in real-time. Although the presence of an external supplier with the ability to submit dynamic schedules at an intertie can reduce the average price difference between the day-ahead, HASP and real-time prices at that intertie, there is also increased concern that this supplier may use convergence bidding to enhance its ability to exercise unilateral market power.

Although we do not believe any of these concerns with the ISO's convergence bidding proposal at the interties are a reason to delay the implementation of convergence bidding, they do provide justification for the ISO's significantly smaller position limits on convergence bids at the interties.

## **5. Uplift Costs, Transactions Costs and Grid Management Charges**

We support the use of the principle of cost causation to allocate of uplift charges to convergence bids in the ISO proposal. However, we also caution that determining cost causation is much easier in theory than in reality. We also believe that another important cost allocation principle for convergence bidding is equal treatment of physical and virtual supply and demand. As a general rule, virtual sales and purchases of energy in the day ahead market should be treated in the same way as physical sales and purchases in the day-ahead market and be subject to the transactions costs—grid management charges, operating reserves charges, and Residual Unit Commitment (RUC) charges—as physical generation and loads. There may be a need for exceptions to this general rule, but a high standard, in terms of expected market efficiency benefits, should be required to justify any deviations from this general principle. On one hand, we would like to see low barriers to virtual bidding in order to encourage the development of a deep market. On the other hand, deviations from this principle of equitable treatment could create arbitrage opportunities between the physical and financial markets for energy that may detract from overall market efficiency and system reliability.

The ISO proposal's transaction charge on bid segments appears to be consistent with this logic. Setting the bid segment charge too high may discourage participation in the day-ahead market by financial players during the initial implementation of convergence bidding when we

hope many players will learn how to participate in this market. However, setting the charge too low may result in so many bid segments that the ISO is unable to solve for market prices and schedules in a timely manner. We urge the ISO to continue to monitor the size of this charge to ensure that it balances these two competing goals.

## **6. CCR Refund Mechanism**

We also support a Congestion Revenue Right (CRR) refund mechanism but recognize the mechanism should focus on stopping most egregious problems, rather than attempt to solve all of the problems, associated with using convergence bidding to enhance CRR revenues. A too detailed and proscriptive a procedure could significantly reduce overall market efficiency.

The objective of this mechanism is to identify if convergence bidding behavior by an entity (and its affiliates) is significantly enhancing the revenues received from its CRRs by moving locational prices in day-ahead market in a way that is inconsistent with the behavior of real-time locational prices. There is no perfect way to determine if this behavior is in fact occurring. Imperfect, but computationally tractable tests are needed to identify patterns of convergence bidding that are indicative of this behavior. The design of these imperfect tests represents a balance between the need to avoid false positives and false negatives. Unfortunately, the tests used by PJM based on simulated effects of flows through congested constraints that contribute to the value of CRRs are rough, and can simultaneously have high rates of both false negatives and false positive.

For these reasons, we support a simplified CRR refund rule that guards against the most obvious cases of convergence bidding being used in this manner, rather than a more complex approach that attempts to catch all instances of this behavior. Because there is then the risk that the mechanical test will miss significant instances of distorting strategic behavior, the Department of Market Monitoring must be given the tools to carefully monitor for such instances and be prepared to act if they arise. For example, the use of a distributed load slack bus in the proposed test means that the test would miss the use of demand virtual bids in load pockets to deliberately increase the value of CRRs sunk in such areas and sourced in radially-connected generation pockets. The Department of Market Monitoring will need to watch for such types of behavior that the necessarily imperfect screening mechanism will miss.

## **7. Regulatory Issues**

There are three regulatory issues associated with the implementation of convergence bidding that will enhance the likelihood that it increases rather than decreases market efficiency and system reliability. Perhaps the most important regulatory determinant of the success of convergence bidding is how the California Public Utilities Commission (CPUC) treats the profits and losses earned from convergence bidding by the three California investor-owned utilities. The second regulatory issue is the release of information on convergence bids to market participants. The final issue concerns the discretion that the Department of Market Monitoring has to alter position limits and whether and where individual market participants can submit convergence bids.

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The CPUC has not issued any guidelines on how the costs and revenues from virtual transactions by the three investor-owned utilities—Pacific Gas and Electric, Southern California Edison, and San Diego Gas and Electric—would be treated in the CPUC rate-making process. We believe that it is essential that the CPUC have clear rules for how profits and losses to these entities from convergence bidding under MTRU will be treated before it begins. One simple mechanism that the CPUC could implement would be to place company-specific limitations on the total MW volume of virtual bids within an hour of the day, day-of-the-week, and month-of-the-year that could be submitted by each of the IOUs. Within these guidelines, the shareholders of these companies would bear the appropriate risk and receive the appropriate rewards from the IOU's virtual bidding activities.

We support the day-ahead release of all virtual bids and offers and sales with or without explicitly identifying the market participant. As we have emphasized in the past, with high levels of fixed-price forward contracting for energy and ancillary services, the bids by submitted by market participants convey little, if any, information about their underlying costs of production or any other company-specific confidential information. The release of bid information in a timely manner with the identity of the market participant would serve a very beneficial sunshine regulation function in enhancing overall market efficiency. Any market participant that wanted to bid in a manner that degrades system reliability and market efficiency would face the risk of having to explain this behavior to the press and general public. If it is not possible to release virtual bid information in a timely manner, then immediate release at the close of the day-ahead market of the net virtual position (total virtual supply bids accepts minus the total virtual demand bids accepted) at each location in the ISO control area and intertie point would help market participants become more informed participants in this financial market.

We support providing the ISO with the ability to set position limits, limit the locations where participants can submit convergence bids, and even prohibit a market participant from submitting convergence bids. We recommend that the ISO consult with the Department of Market Monitoring and the Market Surveillance Committee before making these decisions. All financial market have provisions that allow the market operators to suspend trading or even prevent certain market participants from participating the market when this behavior is determined to be harmful to market efficiency. We expect the ISO to set an appropriately high standard for taking these actions, but it must have this discretion to ensure that market participants do not suffer significant economic harm from convergence bidding.

# **ATTACHMENT D**

## Stakeholder Process: Convergence Bidding Design

### Summary of Submitted Comments

Stakeholders submitted three rounds of written comments to the ISO in 2009 on the following dates:

- Round One, 7/24/2009
- Round Two, 10/2/2009
- Round Three, 10/14/2009

11 additional rounds of comments were received from stakeholder between June 2006 and November 2008

Stakeholder comments are posted at: <http://www.caiso.com/1807/1807996f7020.html>

Other stakeholder efforts in 2009 include:

- Conference Calls<sup>1</sup>
  - 8/13/2009
  - 8/27/2009
  - 9/9/2009
- In-person meetings<sup>2</sup>
  - 7/9/2009
  - 9/18/2009
  - 10/9/2009
- Other stakeholder efforts
  - Technical working group conference calls held every other week from September to early December 2009.
  - Three in-person stakeholder meetings and two conference calls held for educational purposes with other ISOs.

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<sup>1</sup> Three additional conference calls were held between October 2006 and June 2007

<sup>2</sup> Ten additional stakeholder meetings held between June 2006 and November 2008

Market participants that provided no comment on a particular topic are not listed in the matrix.

| Management Proposal  | Load Serving Entities, CPUC, Suppliers, Traders  | Management Response<br>(Completed by the ISO)  |
|--|--|--|
| <p>Convergence Bidding will be allowed at nodes, trading hubs and interties</p>  | <p><b>Support</b></p> <p>ARem , Barclay, BPEC, CDWR, Calpine, Citigroup Energy, Constellation, DC Energy, Dynegy, EPIC, Financial Marketers, J.P. Morgan, L.S. Power Associates, Mirant, Morgan Stanley, NRG, Powerex, RRI, Shell Energy, Six Cities, Western, WPTF</p> <p><b>Oppose</b></p> <p>CPUC: ISO should start slow and allow convergence bidding at the three default LAPs only</p> <p>PG&amp;E: ISO should start slow and allow convergence bidding at the three default LAPs only. Nodal bidding at interties should not be allowed until issues raised by the ISO are resolved.</p> <p>SCE</p> | <p>Management is taking a conservative approach to convergence bidding at the nodal level and believes that the safeguards included in the proposal and the price discipline provided by nodal convergence bidding will guard against concerns about market manipulation raised by some market participants. The benefits provided by nodal convergence bidding are superior to convergence bidding at the LAP level when it comes to disciplining supplier market power, price convergence at the nodal level, more granular information provided to the market and market liquidity. LAP level convergence bidding will provide benefits as far as converging prices at the LAP level but will not provide benefits to converging prices at the nodal level which is where the ISO has seen the most price divergence. LAP level convergence bidding will also not allow market participants to hedge their physical positions in the market and would have limited effect on mitigating supplier market power on a local level.</p> |
| <p>Position limits will be set at 10% initially at the internal nodes and 5% at the interties</p>  | <p><b>Support</b></p> <p>PG&amp;E, SCE, Six Cities, Western</p> <p><b>Oppose</b></p> <p>Barclay, BPEC, Calpine, Citigroup Energy, Constellation, DC Energy, EPIC, Financial Marketers, J.P. Morgan, L. S. Power Associates, Mirant, Morgan Stanley, NRG, Powerex, RRI, Shell Energy</p> <p>Dynegy: Significantly and arbitrarily limits ability for supplier to hedge its units production at that node.</p> <p>WPTF: Position limits are arbitrary, have no precedence in other markets and no technical basis.</p>   | <p>Position limits will prevent any individual market participant from taking a large and potentially harmful position at a node. As the market matures these position limits will be lifted on a pre-determined schedule. Position limits will allow the ISO to provide full functionality while mitigating risk given the move to nodal convergence bidding. Management believes this is a superior approach to limiting convergence bidding to the three default load aggregation points which would dilute benefits provided by convergence bidding. Most market participants oppose position limits and those who support them are ultimately in favor of implementing convergence bidding at the LAP level. This is a key element of the conservative approach that the ISO is taking.</p>   |
| <p>Position limits will be lifted on a set schedule over the course of two years for the internal nodes and three years for the interties unless the ISO files with the commission to change the schedule.</p> | <p><b>Support</b></p> <p>Barclay, Calpine, Constellation, DC Energy, Dynegy, J.P. Morgan, Mirant, Morgan Stanley, NRG, Powerex, RRI, Shell Energy</p> <p>WPTF: All position limits should be lifted on an aggressive schedule. More stringent position limits on interties should be lifted if the ISO determines there are no adverse impact by convergence bids to the potential issues the ISO defined.</p>   | <p>Management believes the convergence bidding market will mature quickly considering the market already exists in other independent systems operators' markets. Position limits will be left in place longer if market results and activity show this is necessary. Management will consult with DMM and MSC as needed and does not believe a formal report or pre-defined metrics are necessary. Pre-defined metrics would also be difficult to establish and maintain.</p>  |

| Management Proposal  | Load Serving Entities, CPUC, Suppliers, Traders  | Management Response<br>(Completed by the ISO)  |
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| <p>Proposed CRR Settlement rule will net the market results across all hours of each day corresponding to the participant's CRR. For each congested constraint that is found to be affected by the participant's convergence bids, the rule will consider the aggregate (net) impact of this congestion on participant's CRRs during each hour. If it is determined that a market participant's convergence bids were used to artificially increase day-ahead congestion, CRR payments to that market participant will be reduced.</p> | <p><b>Conditional</b><br/>Six Cities</p> <p><b>Oppose</b><br/>L.S. Power Associates</p> <p>CPUC : Lifting of position limits should be based on pre-defined metrics</p> <p>Citigroup Energy: If the CAISO elects to impose position limits, they should adhere to the CAISO's previously proposed schedule of one year.</p> <p>PG&amp;E: Request a process where DMM and the MSC offer formal opinions at relaxation points regarding the appropriateness of relaxation.</p> <p>SCE: Lifting of position limits should be based on pre-defined matrix</p> <p><b>Support</b><br/>Constellation, Dynegy, J.P. Morgan, RRI, Shell Energy, Six Cities, Western</p> <p>DC Energy: Proposed rule strikes the right balance avoiding a preponderance of false positives while still flagging potential incidences of market manipulation.</p> <p>WPTF: Flow threshold defined for claw back should be defined in tariff since it has direct impact into ones' rates and terms of operation.</p> <p><b>Conditional</b><br/>EPIC, SCE</p> <p>PG&amp;E: Rules should be extensively tested in market simulation and a stakeholder meeting held to review results and consider adjustments.</p> | <p>defined metrics would also be difficult to establish and may prove to be inaccurate once the convergence bidding market is in operation. All of the market participants that oppose position limits support Management lifting those limits on a pre-defined schedule.</p> <p>The Department of Market Monitoring proposed CRR settlement rule was based on a variation of the PJM methodology, but that is more targeted based on specific flows and congestion impacts. The proposed rule generally was supported by market participants.</p> |
| <p>When a market participant submits convergence bids in the day-ahead market, the value of these bids will immediately be compared to the market participant's available credit limit. The value of the convergence</p>   | <p><b>Support</b><br/>DC Energy, EPIC, NRG, PG&amp;E, RRI, Shell Energy</p> <p>Constellation: Supports for initial implementation but 95% threshold should be reviewed after convergence bidding is implemented</p>  | <p>The proposed credit policy received widespread support from market participants. Quite a few market participants believe using the 95<sup>th</sup> percentile to determine the reference price is very conservative and that the ISO should review this policy after convergence bidding is implemented.<br/><b>Management will review the reference price 12 months</b></p>  |

| Management Proposal  | Load Serving Entities, CPUC, Suppliers, Traders   | Management Response<br>(Completed by the ISO)   |
|--|---|---|
| <p>bids, based on historical reference prices, will be added to the estimated aggregate liability of the participant.</p>  | <p>Dynegy: Requests ISO revisit use of 95<sup>th</sup> percentile after implementation.</p> <p>J.P. Morgan: Requests that the CAISO assess the feasibility (cost and impact on implementation timeline) of using the proposed dynamic credit process and application to determine and enforce available credit requirements in the overall market</p> <p>Mirant: Review 95<sup>th</sup> percentile after implementation.</p> <p>Powerex: Consider updating reference prices to previous day or week rather than from the three months of a previous year.</p> <p>SCE: Provide SCs with a daily estimate of EAL</p> <p>WPTF: Move to credit policy that is consistently robust between physical and virtual market</p> <p><b>Oppose</b></p> <p>Financial Marketers: 95<sup>th</sup> percentile used to set reference prices is excessive and will be harmful to the market. Urge the ISO to use 50<sup>th</sup> percentile which has been successfully used at MISO.</p> <p><b>Support</b></p> <p>DC Energy, Dynegy, EPIC, Mirant, NRG, RRI, Shell Energy, WPTF</p> <p>Constellation: Physical and virtual bid information should be released contemporaneously.</p> <p><b>Oppose</b></p> <p>SCE: proposal should, at a minimum, release the cleared quantities of virtual bids, on a nodal level, shortly after the IFM posts results</p> | <p>after convergence bidding is implemented to determine if adjustments are necessary. After this point Management will review the reference price every three years or more often if necessary. Stakeholders also commented that the ISO should move towards a credit policy that is just as robust for physical bids as well.</p>   |
| <p>There was no change to current information release policy proposed as part of the convergence bidding stakeholder process. Currently both physical bid information and virtual bid information will be released on a 90 day schedule.</p> | <p><b>Support</b></p> <p>Calpine, Constellation, DC Energy, Dynegy, J.P. Morgan, Mirant, RRI, Shell Energy</p>  | <p>A separate stakeholder process, which will start at the end of October, will address information release for both physical and virtual bids. The ISO needs to take a broader look at its information release policy since the implementation of the new market design. Because this issue is relevant for all bid information, Management determined that this issue should be addressed separately from the convergence bidding stakeholder process. The Market Surveillance Committee recommended in their opinion on convergence bidding that the ISO release information on virtual bids as part of the day-ahead process. Market participants remain divided on this issue as some advocate the release of physical and virtual bid information contemporaneously while others advocate for the release of only virtual bidding information on a quicker timeline than for physical bids.</p> |
| <p>Virtual Demand will be allocated a portion of IFM Tier 1 uplift and virtual supply will be allocated a portion of RUC Tier 1 uplift</p>   | <p><b>Support</b></p>   | <p>The proposal for allocating bid cost recovery uplifts for IFM and RUC to convergence bids was highly debated. A divide remains between market participants that believe the ISO is not allocating enough of these costs to market participants</p>   |

| Management Proposal   | Load Serving Entities, CPUC, Suppliers, Traders   | Management Response<br>(Completed by the ISO)   |
|---|---|---|
| <p>A transaction fee of \$.005 per bid segment will be charged for each submitted convergence bid. A separate fee for GMC will be created for convergence bidders and will be allocated based on gross cleared Mwh. This fee will allocate a portion of the day-ahead scheduling and market usage charges to convergence bidders. The ISO estimates this fee will be between \$.065 and \$.085 per gross cleared Mwh.<br/>Convergence bidders will also pay</p> | <p>NRG: Proposal reasonable emulates cost causation</p> <p>WPTF: Proposal strikes a reasonable balance between incremental costs caused by virtual transactions and does not charge virtual transactions when market outcomes are consistent with ultimate outcomes (actual demand)</p> <p><b>Conditional</b></p> <p>CDWR: CAISO should incorporate and implement two-tier Real Time Uplift along with CB</p> <p><b>Oppose</b></p> <p>CPUC</p> <p>EPIC: The ISO must prove that virtual bids create uplift costs before determining to allocate such costs</p> <p>Financial Marketers: Proposal allocates too many costs to virtual transactions that are not warranted.</p> <p>PG&amp;E: Allocation should be at more granular level since ISO is implementing nodal convergence bidding.</p> <p>SCE: Proposal does not represent cost causation and should be more granular. ISO should commit to revising methodology within one-year after convergence bidding is implemented</p> <p><b>Support</b></p> <p>CPUC, Calpine, Constellation, DC Energy, Dynegy, J.P. Morgan, Mirant, NRG, PG&amp;E, RRI, SCE, Shell Energy, WPTF</p> <p><b>Oppose</b></p> <p>EPIC</p> <p>Financial Marketers: Any lawful Convergence Bidding Charge must be based on a revenue requirement that reflects the incremental increase (if any) that virtual transactions make to the costs normally recovered through the Forward Scheduling Charge and MU-FE Charge.</p> | <p>versus market participants that believe the ISO is allocating too many costs to convergence bids that may stifle the liquidity of the market. Management's proposal for cost allocation represents cost causation by charging convergence bids for incremental costs caused while not charging convergence bids if market outcomes are consistent with real-time conditions. Management will monitor uplifts after convergence bidding is implemented and determine if a more granular cost allocation approach is necessary</p> |
|   |   | <p>The proposal to allocate a portion of existing GMC costs to convergence bids based on gross cleared Mwh had widespread support from stakeholders. The fee is estimated to be between \$.065 and \$.085 per cleared Mwh and will be finalized in the GMC stakeholder process early next year. The \$.005 bid segment fee will economically mitigate the volume of convergence bids coming into the ISO markets and discourage "fishing" bids.</p>   |

| Management Proposal   | Load Serving Entities, CPUC, Suppliers, Traders  | Management Response<br>(Completed by the ISO)   |
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| <p>the settlement and client relations fee of \$1000 per month for each SCID. Revenues from transaction fee will be used to reduce GMC charge.</p>  |  |   |
| <p>The LMPM process will be based on physical supply and the ISO load forecast. This is the same process the ISO uses currently for LMPM.</p>   | <p><b>Support</b><br/>Calpine, Constellation, DC Energy, J.P. Morgan, Mirant, NRG, RRI, Shell Energy, WPTF</p> <p>Dynegy: Support further investigation into the Option B outlined by DMM</p> <p><b>Conditional</b></p> <p>CPUC: Encouraged by ISOs proposal but would prefer Option B</p> <p>SCE: Would prefer that ISO go with Option B so the design of LMPM does not need to be revisited to meet FERC order of basing Pre-IFM runs on bid on demand.</p> <p><b>Oppose</b></p> <p>PG&amp;E: Take more time to vet Option B provided by DMM</p> | <p>As part of our overall conservative approach to the design of convergence bidding. Management propose that local market power mitigation (LMPM) be performed based on physical bid-in generation and forecast demand. The mitigation mechanism for local market power is designed so that physical generation needed to meet physical demand will be appropriately mitigated. DMM provided analysis that determined that there were two viable options, known as option A and option B for the LMPM process with the inclusion of virtual bids. Viable Option A is the current approach for LMPM and is the option Management is proposing. Management chose option A because DMM advised this is a solid approach, the MSC also recommended going with this approach and because the current approach requires no software changes while Option B requires significant software changes.</p> <p>Option B includes both virtual and physical bids in the Pre-IFM runs. In the all constraints run the default energy bids would be used to determine what physical supply is mitigated. Management will further consider Option B in a subsequent stakeholder process as a way of complying with the FERC directive to base LMPM on bid-in demand within 3-years of MRTU start-up.</p> |
| <p>Market participants that want to submit convergence bids that are not yet scheduling coordinators will have to complete the scheduling coordinator certification process with appropriate modifications.</p> | <p><b>Support</b></p> <p>Constellation, DC Energy, Dynegy, NRG, PG&amp;E, Shell Energy, WPTF</p> <p>RRI: The proposal reasonably balances the need to certify an entity's capability and financial stability while not imposing onerous requirements</p>   | <p>Market participants that are not yet certified scheduling coordinators that want to participate in convergence bidding will either need to become a certified scheduling coordinator or contract with a certified scheduling coordinator to submit bids on their behalf. Market participants that want to become a certified scheduling coordinator will follow the existing process with some modifications. For example, the receipt of dispatch instructions is not applicable to convergence bids and it is not necessary for convergence bidders to maintain twenty-four hours a day, seven days per week communications, beyond that of a primary and secondary phone contact.</p>   |

| Management Proposal  | Load Serving Entities, CPUC, Suppliers, Traders  | Management Response<br>(Completed by the ISO)  |
|--|--|--|
| <p>The ISO will continue to achieve an AC solution in the day-ahead market with the inclusion of convergence bids to the fullest extent possible. If necessary the ISO will enforce MW limit constraints at a location or set of locations to limit the amount of convergence bids at certain locations.</p>   | <p><b>Support</b><br/>Citigroup, Constellation, DC Energy, Dynegy, NRG, RRI, Shell Energy, WPTF</p> <p><b>Oppose</b><br/>PG&amp;E</p> <p>SCE: ISO must demonstrate to stakeholders that a nodal bidding design with AC Convergence is achievable before proposing a final design that is solely dependent upon nodal bidding</p>   | <p>In order to increase the likelihood of ensuring AC convergence under virtual bidding, Management will include the software capability of enforcing MW limit constraints on a location basis to limit the amount of unrealistic virtual bids on a particular location or set of locations. These limits will only be used when AC solution is not attainable. This MW limit will be done within the IFM before the day-ahead market clears. When a MW limit enforcement is needed, it will be applied to the total flow affected by both physical and convergence bids. Some market participants advocate that the ISO should have a contingency plan to implement LAP level convergence bidding if it is found through testing that an AC solution is not achievable with the inclusion of convergence bids. If Management identifies a technical show stopper in testing, the stakeholder process will be re-opened and the issue discussed with stakeholders to determine how to proceed. Depending on that nature of the technical problem it may or may not be the correct solution to revert to a LAP level implementation.</p>  |
| <p>In the event that virtual bidding by any particular participant or group of participants was found to be contributing to a sustained unwarranted divergence in prices in the integrated forward market and real time market, the ISO would have the authority to suspend or limit virtual bidding by individual market participants at specific nodes. Upon suspension the ISO would have 10 business days to file supporting documentation with the FERC. The suspension would remain in effect for 90 calendar days from the time the ISO submitted its initial filing at FERC unless FERC directs otherwise or the ISO determines the suspension is no longer necessary. After this 90 day period the suspension would</p> | <p><b>Support</b><br/>Constellation, DC Energy, NRG, PG&amp;E, RRI, SCE, Shell Energy</p> <p>Dynegy: ISO should also have the ability to reduce the suspension period from 90 days, if the exchange of information between the market participant and CAISO suggests that a lesser period of time is warranted</p> <p>WPTF: Reporting event to FERC should be confidential</p> | <p>The determination of whether a sustained divergence in prices in the integrated forward market and real-time market occurs would be based on a calculation of the deviation between average hourly prices in these markets during a rolling four week period, or other such period determined to be appropriate given the participant's bidding behavior under review. The ISO's determination of whether the participant's bidding behavior caused or significantly contributed to this price divergence would be based on simulations of the ISO's integrated forward market results without the virtual bids under review, when practicable, or other appropriate analytical methods as necessary. This approach provides the ISO with authority to quickly respond to any convergence bidding practices that are having the effect of undermining the physical validation provisions for sellers choice contracts, or allowing generators to profit from uninstruacted deviations; or, more generally, manipulating market prices or deterring price convergence. At the same time, ISO's authority to quickly protect against such scenarios is ultimately limited by FERC, which may act on an expedited basis to remove or modify any limitations placed by the ISO.</p> |

| Management Proposal   | Load Serving Entities, CPUC, Suppliers, Traders   | Management Response<br>(Completed by the ISO)   |
|---|---|---|
| <p>remain in effect only if approved by FERC.</p> <p>There are no changes proposed to the residual unit commitment process (RUC) as a result of convergence bidding</p> | <p><b>Support</b></p> <p>Constellation, DC Energy, Dynegy, NRG, RRI, Shell Energy</p> <p>WPTF: Given that the RA program mandates sufficient planning reserve capacity, all of which must participate in the RUC market at a \$0/MW price, the possibility of market participants using virtual supply to force non-zero RUC prices seems remote. Further the ISO has established a process to review start-up and minimum load bidding considering the need for mitigation.</p> <p><b>Oppose</b></p> <p>CPUC, PG&amp;E</p> <p>SCE: Believe a comprehensive redesign of RUC is needed, especially with the introduction of nodal virtual bidding. The ISO has simply assumed away any problems with RUC without reasonable analysis and without properly considering the impact nodal virtual bidding will have on RUC.</p> | <p>Some market participants believe that a comprehensive redesign of residual unit commitment (RUC) is needed, especially with the introduction of nodal virtual bidding could increase reliance on RUC. In January 2008, prior to MRTU start-up, the ISO performed tests and provided a report on RUC performance in response to stakeholder concerns about the design, performance and results from the residual unit commitment process seen in market simulation. At that time the ISO determined that that the results and performance of RUC were consistent with the FERC-approved RUC design and, most importantly, did not indicate any flaws in either the design or the implementation of RUC that suggest there could be unintended consequences that would jeopardize the successful performance of the new MRTU market structure.</p> <p>The ISO revisited this topic again in the context of convergence bidding and performed some additional tests to simulate the effect that large quantities of virtual supply and nodal virtual demand could have on RUC. The initial testing showed no anomalous or extreme RUC results in terms of quantities and costs of RUC capacity or RUC prices. Additional testing will be performed on RUC once the ISO has a system in place to submit virtual bids under market simulation conditions. This will occur during the implementation phase of convergence bidding.</p> <p>Management will address the need for market power mitigation in RUC in the stakeholder process that is currently addressing changing rules for start-up and minimum load bidding in the event that there is a decision to increase caps or frequency for start-up and minimum load bids.</p> <p>The simultaneous optimization of RUC and IFM was ranked high in the most recent round of the market initiatives roadmap process. Implementation analysis and planning for this market enhancement still need to be determined.</p> |

# **ATTACHMENT E**

## Key Dates in Convergence Bidding Stakeholder Process

| Date               | Event/Due Date   |
|--------------------|--|
| May 31, 2006       | Market Surveillance Committee ("MSC") hosts meeting that includes MSC presentation entitled "Convergence Bidding and Scheduling Requirements" and discussion on convergence bidding issues   |
| June 1, 2006       | ISO issues white paper entitled "Convergence Bidding Fundamentals" and MSC issues paper entitled "Convergence Bidding and the Enforcement of Day-Ahead Commitments in Electricity Markets" for discussion at June 13, 2006, tutorial and panel discussion  |
| June 13, 2006      | ISO holds convergence bidding tutorial and panel discussion that includes ISO presentation entitled "Convergence Bidding," MSC presentation entitled "Too Many Prices? Virtual Bidding, Scheduling Requirements and Strategic Behavior in Multi-Settlement Markets," presentations by stakeholders, and discussion on convergence bidding issues |
| July 17, 2006      | ISO issues paper entitled "Working White Paper on Design Criteria for Convergence Bidding" for discussion at July 18-19, 2006, stakeholder meeting   |
| July 18-19, 2006   | ISO hosts market initiatives stakeholder meeting that includes discussion on convergence bidding issues  |
| July 28, 2006      | Due date for written stakeholder comments on matters discussed at July 18-19, 2006, stakeholder meeting  |
| August 8, 2006     | MSC holds meeting that includes ISO presentation entitled "Convergence Bidding Design Framework" and discussion on convergence bidding issues  |
| August 14, 2006    | ISO issues paper entitled "Revised Working White Paper on Design Criteria for Convergence Bidding"   |
| August 17, 2006    | ISO hosts market initiatives stakeholder meeting that includes ISO presentation entitled "Convergence Bidding Design Framework" and discussion on convergence bidding issues   |
| September 6, 2006  | ISO hosts conference calls with representatives from the New York ISO and ISO New England to discuss their experiences with virtual bidding  |
| September 8, 2006  | ISO hosts conference call with representatives from PJM to discuss its experience with virtual bidding   |
| September 18, 2006 | MSC hosts meeting that includes ISO presentation entitled "Convergence Bidding Design: Focus on Three Elements" and discussion on convergence bidding issues   |
| October 24, 2006   | Department of Market Monitoring ("DMM") issues paper entitled "Convergence Bidding: Market Monitoring and  |

| Date              | Event/Due Date  |
|-------------------|---|
|                   | Mitigation Issues” for discussion on October 30, 2006, conference call  |
| October 26, 2006  | ISO issues revised “Working White Paper on Design Criteria for Convergence Bidding” for discussion on October 30, 2006, conference call   |
| October 30, 2006  | ISO hosts conference call that includes ISO presentation entitled “Convergence Bidding Core Elements of Design,” DMM presentation entitled “Comments and Recommendations on Convergence Bidding Design Options,” and discussion on convergence bidding issues |
| November 13, 2006 | MSC hosts meeting that includes ISO presentation entitled “Elements of Convergence Bidding Design: Credit and Cost Allocation Issues” and discussion on convergence bidding issues  |
| November 15, 2006 | Due date for written stakeholder comments on matters discussed on October 30, 2006, conference call   |
| May 31, 2007      | ISO issues papers entitled “Key Elements for the Conceptual Proposal for Convergence Bidding in the MRTU Markets” and “Review of Settlement Charges for Convergence Bidding Cost Allocation” for discussion at June 6, 2007, meeting                          |
| June 4, 2007      | ISO issues paper entitled “Comparison of Credit Requirements for Virtual Bidding” for discussion at June 6, 2007, meeting   |
| June 6, 2007      | ISO hosts joint MSC/stakeholder meeting that includes ISO presentation entitled “Conceptual Design for Convergence Bidding” and discussion on convergence bidding issues  |
| June 13, 2007     | Due date for written stakeholder comments on matters discussed at June 6, 2007, meeting   |
| June 22, 2007     | ISO issues paper entitled “Addendum to May 31 Paper: Key Issues Related to Credit Policy for Virtual Bids” for discussion on June 29, 2007, stakeholder conference call   |
| June 29, 2007     | ISO hosts stakeholder conference call that includes ISO presentation entitled “Convergence Bidding: Credit and Collateral Issues” and discussion on convergence bidding issues  |
| July 17, 2007     | ISO hosts stakeholder conference call that includes ISO presentation entitled “Convergence Bidding – Granularity of Virtual Bids” and discussion on convergence bidding issues  |
| August 7, 2007    | ISO issues paper entitled “Options for the Conceptual Design for Convergence Bidding” for discussion at August 10, 2007, meeting  |
| August 10, 2007   | ISO hosts joint MSC/stakeholder meeting that includes   |

| Date               | Event/Due Date  |
|--------------------|---|
|                    | MSC presentation entitled "Convergence Bidding Issues," DMM presentation entitled "Comments and Recommendations on Convergence Bidding Design Options," stakeholder presentations, and discussion on convergence bidding issues   |
| August 24, 2007    | Due date for written stakeholder comments on matters discussed at August 10, 2007, meeting  |
| September 12, 2007 | ISO hosts stakeholder meeting that includes ISO presentations entitled "Convergence Bidding Credit Policy" and "Status of Convergence Bidding Design," DMM presentation entitled "Recommendations on Convergence Bidding" and discussion on convergence bidding issues  |
| September 19, 2007 | Due date for written stakeholder comments on matters discussed at September 12, 2007, stakeholder meeting   |
| November 7, 2007   | ISO issues paper entitled "Update on the Design for Convergence Bidding" and DMM issues paper entitled "Convergence Bidding: Department of Market Monitoring Recommendations" for discussion at November 14, 2007, stakeholder meeting  |
| November 14, 2007  | ISO hosts stakeholder meeting that includes ISO presentations entitled "Update on the Design for Convergence Bidding," "Convergence Bidding Design – Proposed Credit Policy," "Convergence Bidding Design – Cost Allocation," and "Nodal Convergence Bidding and Seller's Choice," and discussion on convergence bidding issues |
| November 30, 2007  | Due date for written stakeholder comments on matters discussed at November 14, 2007, stakeholder meeting  |
| February 1, 2008   | ISO issues paper entitled "Straw Proposal for Convergence Bidding Cost Allocation" for discussion at February 8, 2008, meeting  |
| February 8, 2008   | ISO hosts joint MSC/stakeholder meeting that includes ISO presentation entitled "Cost Allocation for Convergence Bids" and discussion on convergence bidding issues   |
| February 29, 2008  | Due date for written stakeholder comments on matters discussed at February 8, 2008, meeting   |
| May 2, 2008        | ISO hosts stakeholder meeting that includes presentations by representatives from ISO New England regarding its experience with virtual bidding, and discussion on convergence bidding issues   |
| July 23, 2008      | ISO hosts stakeholder meeting that includes presentations by representatives from the Midwest ISO regarding its experience with virtual bidding, and  |

| Date             | Event/Due Date  |
|------------------|---|
|                  | discussion on convergence bidding issues  |
| October 9, 2008  | ISO issues paper entitled "Two Tier Real-Time Uplift" for discussion at October 16, 2008, stakeholder meeting   |
| October 10, 2008 | ISO issues white paper entitled "Convergence Bidding Resource IDs" for discussion at October 16, 2008, stakeholder meeting  |
| October 16, 2008 | ISO hosts stakeholder meeting that includes ISO presentations entitled "Policy Discussion: Virtual Bids at Ties & Hubs, and Information Release About Virtual Bids," "Two-Tier Real-Time Bid Cost Recovery," "Finalizing Convergence Bidding Policy Development," "MAP (Markets and Performance) Update," and "Resource IDs for Convergence Bidding," ISO issuance of draft "SIBR Business Rules for Market and Performance (MAP)," stakeholder presentations, and discussion on convergence bidding issues |
| October 31, 2008 | Due date for written stakeholder comments on matters discussed at October 16, 2008, stakeholder meeting   |
| June 24, 2008    | ISO hosts release planning workshop with stakeholders that includes discussion on implementation of convergence bidding   |
| July 2, 2009     | ISO issues paper entitled "Straw Proposal for the Design of Convergence Bidding" for discussion at July 9, 2009, stakeholder meeting  |
| July 9, 2009     | ISO hosts stakeholder meeting that includes ISO presentation entitled "Straw Proposal for Design of Convergence Bidding" and discussion on convergence bidding issues   |
| July 24, 2009    | DMM issues "Comments on Straw Proposal for the Design of Convergence Bidding"; due date for written stakeholder comments on matters discussed at July 9, 2009, stakeholder meeting  |
| August 13, 2009  | ISO hosts stakeholder conference call that includes ISO presentations entitled "Convergence Bidding SC Certification Requirements," "GMC Charges to Convergence Bids," and "Convergence Bidding – Allocation of IFM and RUC Tier 1 BCR Uplift," ISO issuance of examples of Integrated Forward Market ("IFM") Bid Cost Recovery ("BCR") and Residual Unit Commitment ("RUC") BCR allocation to convergence bidders, and discussion on convergence bidding issues  |
| August 18, 2009  | DMM releases paper entitled "Congestion Revenue Rights Settlement Rule" for discussion on August 27, 2009, stakeholder conference call  |
| August 19, 2009  | ISO hosts release planning workshop with stakeholders   |

| Date               | Event/Due Date  |
|--------------------|---|
|                    | that includes discussion on implementation of convergence bidding   |
| August 27, 2009    | ISO hosts stakeholder conference call that includes ISO presentations entitled "Options for Bid Volume Limits," "GMC for Convergence Bidding," and "Impact of Virtual Bidding on RUC," and discussion on convergence bidding issues   |
| September 2, 2009  | Due date for written stakeholder comments on matters discussed on August 27, 2009, stakeholder conference call  |
| September 3, 2009  | ISO begins series of biweekly meetings (scheduled to end by December 3, 2009) of Convergence Bidding Working Group to discuss technical issues associated with convergence bidding  |
| September 9, 2009  | ISO hosts stakeholder conference call that includes ISO presentation entitled "Convergence Bidding on the Interties" and discussion on convergence bidding issues   |
| September 14, 2009 | ISO issues paper entitled "Draft Final Proposal for the Design of Convergence Bidding" for discussion at the September 18, 2009, stakeholder meeting  |
| September 18, 2009 | ISO hosts joint MSC/stakeholder meeting that includes ISO presentations entitled "Draft Final Proposal for Design of Convergence Bidding," "Convergence Bidding on the Interties," and "Cost Allocation for Convergence Bids," DMM presentations entitled "CRR Settlement Rule Under Convergence Bidding" and "Local Market Power Mitigation Under Convergence Bidding," and discussion on convergence bidding issues |
| October 2, 2009    | ISO issues paper entitled "Addendum to the Draft Final Proposal for the Design of Convergence Bidding" and DMM issues paper entitled "Local Market Power Mitigation Options Under Convergence Bidding" for discussion at October 9, 2009, stakeholder meeting; due date for written stakeholder comments on matters discussed at September 18, 2009, meeting  |
| October 6, 2009    | DMM issues paper entitled "Illustrative Examples of Alternative Local Market Power Mitigation" for discussion at October 9, 2009, stakeholder meeting   |
| October 9, 2009    | ISO hosts stakeholder meeting that includes ISO presentation entitled "Addendum to Draft Final Proposal for Design of Convergence Bidding," DMM presentations entitled "Local Market Power Mitigation Under Convergence Bidding" and "CRR Settlement Rule Under Convergence Bidding," and discussion on convergence bidding issues  |

| <b>Date</b>      | <b>Event/Due Date</b>   |
|------------------|---|
| October 14, 2009 | Due date for written stakeholder comments on matters discussed at October 9, 2009, stakeholder meeting  |
| October 29, 2009 | Following review of convergence bidding design policy by ISO Board of Governors and opportunity for stakeholder comments regarding convergence bidding issues, Board of Governors authorizes ISO to make all filings necessary to implement convergence bidding design policy |

## CERTIFICATE OF SERVICE

I hereby certify that I have served the foregoing documents upon each of the entities listed in the documents as receiving service, 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 20<sup>th</sup> day of November, 2009.

/s/ Cayden Jenness  
Cayden Jenness