



protect against the adverse impacts observed prior to the suspension of intertie convergence bidding. The two options present timing and implementation costs tradeoffs that the ISO is currently asking stakeholders to consider. The first option offers an interim solution that allows for the reinstatement of intertie convergence bidding by the end of 2012, as well as a longer-term intertie pricing proposal modeled after the New York Independent System Operator Corporation (NYISO) approach to settling its interties. Under the first option, the longer-term solution could not be implemented sooner than spring 2014 as it requires that the ISO first implement the interim solution, which will require additional time and resources. On the other hand, the second option allows the ISO to concentrate its efforts towards resolving the remaining elements of its NYISO-style intertie pricing proposal. By allowing the ISO to focus its efforts to this single solution, the ISO can more readily implement this more robust solution by fall 2013. However, the second option does not contain a proposal for reinstating convergence bidding at the interties by the end of the year.

At this time the ISO believes the more favorable approach is to adopt the second option as it avoids the costs and time to develop and implement the interim solution, and enables the ISO and stakeholders to concentrate their efforts towards the solution that appears to be ultimately needed. However, the ISO stakeholder process to select between these two options is still pending and will complete in April. The ISO anticipates that this process will allow the ISO to seek approval of a proposal by its board of governors as early as May 16-17, 2012, and if approved by the board the ISO will file tariff language with the Commission shortly thereafter. The ISO recommends that the Commission allow this current process to complete before issuing a final decision on the outstanding issues in this proceeding.

## I. Comments

### A. The ISO's Removal of Intertie Convergence Bidding Pending Efforts to Develop Interim Market Adjustments is Just and Reasonable.

In its November 25, 2011 Order,<sup>2</sup> the Commission deferred ruling on whether the ISO's tariff amendment is just and reasonable. The Commission instead accepted and suspended the amendment and convened a technical conference to allow parties and the Commission to more fully examine data concerning the ISO's proposal and alternatives.<sup>3</sup> At the conference, the ISO and the ISO's Department of Market Monitoring (DMM) gave presentations that set forth extensive data and analysis about the market impacts experienced both before and after intertie convergence bidding was suspended.<sup>4</sup> In addition to the evidence set forth in the ISO's initial filing, those data demonstrate that a short-term removal of intertie convergence bidding is just and reasonable.

This outcome is just and reasonable because the data show that, during the period that intertie convergence bidding was in effect, virtual bidding produced significant market inefficiencies and costs. Specifically, it undermined the convergence of day-ahead and real-time prices in certain contexts, hindered the ability of the day-ahead market to drive efficient unit commitment, and produced uplift costs for load serving entities without any corresponding price convergence benefit. Although several proponents of intertie convergence bidding have identified *potential* benefits it may

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<sup>2</sup> *California Indep. Sys. Operator Corp.*, 137 FERC ¶ 61,157 (2011) ("November 25, 2011 Order").

<sup>3</sup> November 25, 2011 Order at PP 1, 38, 40; see also Supplemental Notice of Agenda and Discussion Topics for Staff Technical Conference (Dec. 16, 2011) ("Technical Conf. Notice"). On February 28, 2012, the Commission issued a Notice of Extension of Time granting all parties an extension of time to file initial comments until March 16, 2012, and reply comments on or before March 30, 2012.

<sup>4</sup> See February 2, 2012 Technical Conference Presentation of Mark Rothleder, Executive Director, Market Analysis & Development ("Rothleder Presentation"); February 2, 2012 Technical Conference Presentation of Eric Hildebrandt, Ph.D, Director, Department of Market Monitoring ("Hildebrandt Presentation"). Both presentations were filed in the record of this proceeding on February 2, 2012.

provide, the evidence shows those benefits, though theoretically available, have been either minimal or non-existent in practice.

**1. Under the Current Market Design, Intertie Convergence Bidding Interfered with Price Convergence and Undermined Efficient Unit Commitment.**

As the Commission has observed, a primary goal of convergence bidding is to promote convergence of day-ahead and real-time prices.<sup>5</sup> Such convergence, the Commission has explained, not only increases participation of physical resources in the day-ahead market, but also allows that market to drive efficient day-ahead unit commitment, thus reducing “reliance on RUC processes” and “reduc[ing] uplifts from inefficient unit commitments.”<sup>6</sup>

The data show that, due to the dual settlement structure of the ISO’s markets, intertie convergence bidding was not achieving either of these objectives and instead was generally undermining price convergence and impeding the ability of the day-ahead market to drive efficient unit commitment.

As Mr. Rothleder has explained in testimony and at the technical conference, these unintended negative impacts arose from the differing settlement timeframes for intertie and internal virtual bids. The ISO’s market design currently includes differing settlement rules for internal and intertie virtual bids that clear in the day-ahead market, with internal virtual bids settled at the real-time dispatch (RTD) market-clearing price while intertie virtual bids are settled at the market-clearing price established in the hour-

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<sup>5</sup> *California Indep. Sys. Operator Corp.*, 116 FERC ¶ 61,274, at P 450 (2006) ) (stating that convergence bidding reduces the price difference between the real-time and the day-ahead markets, thus reducing the incentive for buyers or sellers to forego bidding physical schedules in the day-ahead markets in expectation of better prices in the real-time markets). See also *California Indep. Sys. Operator Corp.*, 130 FERC ¶ 61,122, at P 30 (2010) (same).

<sup>6</sup> See *California Indep. Sys. Operator Corp.*, 112 FERC ¶ 61013, at P 175 (2005) (“If introduced in the CAISO’s market, convergence bidding could help reduce reliance on RUC processes, reduce uplifts from inefficient unit commitments, improve price convergence and reduce market power.”).

ahead scheduling process (HASP).<sup>7</sup> This means that, while intertie convergence bidding was in effect, virtual bidders faced different – and often opposite – price incentives depending on whether they were bidding internally or at the interties.

For example – and most relevant here – in hours when real-time dispatch prices tended to be higher than day-ahead market (DAM) prices and day-ahead market prices tended to be higher than HASP prices (*i.e.*,  $RTD\ price > DAM\ price > HASP\ price$ ), internal and intertie virtual bidders had opposite economic incentives. Internal virtual bidders had an economic incentive in such hours to submit demand bids in the day-ahead market because they would be paid the difference between the expected higher real-time price and the lower day-ahead price. Intertie virtual bidders, by contrast, had an economic incentive to submit supply bids in the day-ahead market because those bids would be paid the difference between the higher day-ahead market price and the lower HASP market price.<sup>8</sup> In this context, these opposite price incentives tended to prevent virtual bidding from achieving its objective of converging real-time and day-ahead prices because internal virtual demand bids that would otherwise tend to reduce or eliminate the spread between day-ahead and real-time prices typically were offset by intertie virtual supply bids that have the opposite effect.<sup>9</sup>

The phenomenon of intertie virtual supply bids that offset and counteract internal virtual demand bids was illustrated at the technical conference in a series of slides presented by Mr. Rothleder.<sup>10</sup> Slides 9 and 12 of the ISO's presentation deserve

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<sup>7</sup> See Direct Testimony of Mark A. Rothleder submitted at Attachment C to Transmittal letter for tariff amendment ("Rothleder Testimony") at 4-5; Rothleder Presentation at 2-4.

<sup>8</sup> Rothleder Testimony at 11-17, 34-35; Rothleder Presentation at 4.

<sup>9</sup> See Rothleder Testimony at 11-17, 34-35; Rothleder Presentation at 9, 12; Hildebrandt Presentation at 2-4.

<sup>10</sup> See Rothleder Presentation at 3-12, 16-17. It was also demonstrated in the ISO's initial filing. See Rothleder Testimony at 11-14.

particular mention because they show, in the aggregate, the strong tendency for internal and intertie bidding positions to offset each other.

The charts in those slides compare the net positions taken by virtual bidders at the interties and internally on a ten-day moving average basis during the roughly ten-month period in 2011 when intertie convergence bidding was in effect.<sup>11</sup> ISO Slide 9 shows the net virtual bid volumes for internal nodes and interties during the on-peak time period, and ISO slide 12 shows the same data for the off-peak time period. Both charts demonstrate that internal virtual bidding (shown in blue) tended to produce substantial volumes of net demand throughout this period, while intertie convergence bidding (shown in green) tended to produce substantial amounts of net supply. The charts further show that the two net virtual positions – interties and internals – tended to closely mirror and offset each other throughout this period, though the net intertie virtual supply position on average tended to be larger than the net internal virtual demand position. This offsetting pattern reflects the differing, and often opposing, economic incentives virtual bidders faced as a result of the different settlement rules for internal and intertie virtual bids.<sup>12</sup>

Slide 5 in the ISO presentation further illustrates how such offsetting virtual import schedules at the interties tended to counteract the price convergence impact of internal virtual bidding. As with ISO slides 9 and 12, the charts in ISO slide 5 provide this information for the ten-month period in 2011 when intertie convergence bidding was

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<sup>11</sup> The charts also show data for December 2011, the first month after intertie convergence bidding was suspended.

<sup>12</sup> Although these charts show data on a ten-day moving average basis, the hourly data also reflects this pattern. See Rothleder Testimony at 20-22. In his technical conference presentation, for example, Dr. Hildebrandt presented average hourly data illustrating this pattern for the two-month period before intertie convergence bidding was suspended. See Hildebrandt Presentation at 2-4. The total volume of hourly offsetting intertie and internal virtual bids is also shown (on a 30-day rolling cumulative basis) in Mr. Rothleder's presentation. See Rothleder Presentation at 16. The ISO has also made available to market participants the underlying data set forth in each of these charts from the technical workshops.

permitted.<sup>13</sup> The top chart in ISO slide 5 shows data for the on-peak time period, and the bottom chart shows data for the off-peak time period. The blue line on each chart shows, on a ten-day moving average basis, the difference between the day-ahead and real-time prices for this period.<sup>14</sup> The green area on each chart shows, on the same ten-day moving average basis, the total net volume of virtual bidding positions – including both intertie and internal bids – during the same period.

For both charts, the blue line is sometimes positive and sometimes negative, meaning that day-ahead prices were, on average, sometimes higher and sometimes lower than real-time prices. If virtual bidding were working as intended to converge day-ahead and real-time prices, one would expect the net virtual bidding positions (shown in green) to likewise move back and forth between net supply and net demand, thereby moderating or responding to the differences between day-ahead and real-time prices. More specifically, during periods when day-ahead prices were lower than real-time prices, the efficient – and price convergent – net virtual bidding position would have been net virtual demand. These charts show, however, that throughout the ten months when intertie convergence bidding was in effect, the ten-day moving average net virtual position across all intertie points and internal nodes was consistently net supply. As shown in ISO slides 9 and 12 discussed above, the internal nodes consistently averaged net demand during the same period, which means that the combined net supply positions were driven by offsetting virtual supply at the interties. This shows that, during periods when day-ahead prices were lower than real-time prices, offsetting virtual intertie supply positions tended to counteract the impact of internal virtual demand, thus preventing net internal virtual demand positions from achieving day-ahead to real-time

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<sup>13</sup> The charts also show data for December 2011, the first month after intertie convergence bidding was suspended.

<sup>14</sup> Prices are simple average of the three default load aggregation point (LAP) prices.

price convergence. As a result, day-ahead market unit commitment efficiencies expected from the implementation of convergence bidding were not achieved due to the virtual bidding activity on the interties.

This inefficient outcome, moreover, has stopped in the period after the Commission approved the suspension of intertie convergence bidding. As Dr. Hildebrandt demonstrated in his technical conference presentation, after a short adjustment period in December 2011, net virtual bidding positions in January 2012 became well aligned with hourly average price differences between the day-ahead and real-time markets.<sup>15</sup> In hours when day-ahead prices tended to exceed real-time prices, the ISO has generally experienced net virtual supply bids, and in hours when real-time prices tended to exceed day-ahead prices, the ISO has generally experienced net virtual demand. This pattern means that virtual bidding is now more consistently producing convergence between day-ahead and real-time prices. This improved efficiency is, moreover, the clear result of the elimination of intertie convergence bidding, which as shown both above and in Dr. Hildebrandt's presentation,<sup>16</sup> was undermining such convergence in periods when real-time prices exceeded day-ahead prices by generating offsetting virtual supply.

The suspension of intertie convergence bidding also has produced a similar improvement in efficient day-ahead unit commitment. When operating properly, convergence bidding promotes efficient unit commitment in the day-ahead market by driving the day-ahead price closer to the real-time price, thus removing an economic incentive for physical suppliers to withhold their resources from the day-ahead market.

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<sup>15</sup> Hildebrandt Presentation at 6. In slides 2-6 of his presentation, Dr. Hildebrandt presented a month-by-month comparison of the two months immediately before and after elimination of intertie convergence bidding.

<sup>16</sup> Hildebrandt Presentation at 2-4.

Because inertia convergence bidding tended to produce excessive virtual supply that interfered with day-ahead to real-time price convergence, it negatively impacted the amount of physical resources that cleared the day-ahead market, thus requiring more resources to be committed in the residual unit commitment (RUC) process.

Slide 6 of the ISO's presentation at the technical conference showed that for both on peak and off peak periods, the volume of resources called upon through the RUC process increased precipitously during the period when inertia convergence bidding was in effect and then quickly subsided to historical levels in December 2011, once inertia convergence bidding was suspended. This illustrates the negative impact inertia convergence bidding had on efficient unit commitment in the day-ahead market during the period it was in effect.

## **2. Inertia Convergence Bidding Produced Large Uplift Costs**

In addition, in the presence of these market inefficiencies, inertia convergence bidding caused uplift costs that must be paid by other market participants (principally load-serving entities) that had no means to avoid them. As Mr. Rothleder explained, these uplift costs were driven by the same dynamic as discussed above – the tendency of virtual bidders, both individually and collectively, to submit offsetting inertia and internal virtual bids for the same hour due to the differing price incentives for each bid.<sup>17</sup>

The amount of these uplift costs was substantial. The total uplift cost from such bids over the ten-month period when inertia convergence bidding was permitted was approximately \$58.6 million, with \$36.7 million caused by offsetting bids made by the same scheduling coordinator and \$21.9 million caused by independently offsetting bids submitted by different scheduling coordinators.<sup>18</sup> These costs cannot be justified as a

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<sup>17</sup> See Rothleder Testimony at 10-16.

<sup>18</sup> See Rothleder Testimony at 22 (presenting data through August 2011); Rothleder Presentation at 18 (updating data through November 2011). The heading on slide 18 of the Rothleder presentation refers to

price for achieving market efficiency. To the contrary, because these costs are specifically attributable to hourly virtual intertie and internal bids that offset, the bids produced no day-ahead to real-time price convergence, had no impact on the efficiency of day-ahead unit commitment, and did not provide any other market efficiency.<sup>19</sup>

It is, moreover, not reasonable to conclude, as some parties have suggested, that these uplift costs were not cause for concern because their magnitude went down over time. It is true that the monthly magnitude of these uplift costs was generally lower in the latter half of the ten-month period of intertie virtual bidding, due in part to operational and software improvements that reduced the opportunity for virtual bidders to profit from systematic price discrepancies. But even with those improvements, virtual bidders still found opportunities to profit from offsetting virtual internal and intertie bids, producing uplift costs that ranged between \$1.1 and \$3.5 million per month over the last five months that intertie convergence bidding was in effect, and totaled nearly \$12 million for the time period that intertie convergence bidding was in effect.<sup>20</sup> This outcome demonstrates that, absent a complete elimination of systematic price discrepancies between the real-time, day-ahead, and HASP markets, the potential for substantial uplift costs remains.

**3. The Potential Benefits of Intertie Convergence Bidding are Insufficient in Practice to Warrant reinstating it before its Inefficiencies and Costs can be addressed.**

At the technical conference and in protests, parties opposing the suspension of intertie convergence bidding identified several potential benefits that such bidding could produce. The ISO agrees that there can be potential benefits, which is why it continues

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\$36.8 million in uplift costs for “balanced” bids within the same scheduling coordinator. The rounded monthly data in the chart, however, totals to \$36.7 million.

<sup>19</sup> Rothleder Testimony at 14.

<sup>20</sup> See Rothleder Presentation at 18.

to work with stakeholders to find a way to reintroduce intertie convergence bidding. Those potential benefits, however, did not materialize during the period when intertie convergence bidding was in effect, and thus there appears to be no evidence that the suspension of convergence bidding at the interties has thwarted any of the benefits the ISO had hoped to obtain through its inclusion of this capability in the convergence bidding market design. Indeed, as DMM demonstrated in its workshop presentation, the market data show little or no evidence that, during the period it was in effect, intertie convergence bidding actually provided any of the main benefits its proponents have identified.<sup>21</sup>

As Dr. Hildebrandt observed, some stakeholders suggest that intertie convergence bidding can be used to hedge delivery risk at intertie scheduling points. To accomplish such a hedge, a party that is scheduling a physical import in the day-ahead market could also purchase an offsetting virtual export position to hedge against the potential risk of having to buy back the physical import in the HASP if the physical resource is unavailable. DMM has reviewed bidding data for ten-month period when intertie convergence bidding was permitted, and that data shows no evidence that such a bidding strategy was used.<sup>22</sup>

There is also little or no evidence that intertie convergence bidding was being used to facilitate the import of variable renewable energy resources, which is another potential benefit identified by some parties. As Dr. Hildebrandt explained, virtual intertie bidding could theoretically provide a way for an importer of a renewable resource to earn the day-ahead price for its resource while waiting until the HASP to bid its physical

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<sup>21</sup> See Hildebrandt Presentation at 7-12.

<sup>22</sup> Hildebrandt Presentation at 7; see also Memorandum from Eric Hildebrandt, Director of DMM, to ISO Board of Governors re: Market Monitoring Report, at 7 & fn.5 (Aug. 18, 2011) (“August 18 DMM Memorandum”). The August 18 DMM Memorandum is available on the ISO website at <http://www.caiso.com/Documents/110825DepartmentofMarketMonitoringUpdate.pdf>.

resource into the market. A party could accomplish this by submitting a virtual supply bid in the day-ahead market for an amount equal to the variable resource's expected supply and then waiting until the HASP market to physically schedule the resource. This would, at least in theory, allow the importer to receive the day-ahead price for its expected schedule while deferring the need to purchase transmission for the delivery of its resource to the intertie until shortly before or after HASP. DMM has examined bidding data for potential evidence of the use of such a bidding strategy and, based on that analysis, determined that such bidding "was minimal or non-existent" during the period when intertie convergence bidding was permitted.<sup>23</sup>

Moreover, data from the period after intertie convergence bidding was suspended do not support the contention made by some parties that its elimination could produce a large spike in implicit virtual bidding at the interties. As Dr. Hildebrandt observed, the volume of buy-backs of physical day-ahead schedules in HASP and the volume of HASP imports not delivered in real-time – potential indicators of implicit virtual bidding – remained low in the months since intertie convergence bidding was suspended.<sup>24</sup> This supports the conclusion that the ISO's existing rules to reverse the profits earned by implicit virtual bidding<sup>25</sup> are working as intended and intertie convergence bidding thus was not needed for this purpose.

Finally, the goal of achieving convergence between day-ahead and HASP prices is not, as some parties have suggested, a sufficient reason to reinstate intertie convergence bidding without additional market changes. Although intertie convergence bidding can potentially converge day-ahead and HASP prices, in doing so it has also

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<sup>23</sup> Hildebrandt Presentation at 8. *See also* August 18 DMM Memorandum at 7-8.

<sup>24</sup> Hildebrandt Presentation at 11-12.

<sup>25</sup> Those measures were found "just and reasonable" to "deter implicit virtual bidding." *California Indep. Sys. Operator Corp.*, 133 FERC ¶ 61,039, at PP 130-34 (2010).

tended to diverge day-ahead and RTD prices in the manner discussed above. Indeed, as long as there are periods when, due to other factors, the day-ahead price is expected to fall between a higher RTD price and a lower HASP price, the virtual bidding strategy that would tend to converge day-ahead and HASP prices – i.e., net bidding of virtual supply at the intertie – will tend to cause divergence of day-ahead and RTD prices. Because the physical market internal to the ISO is much larger than the HASP physical market, the goal of achieving convergence of day-ahead and RTD prices must take precedence over the goal of achieving convergence in prices between the day-ahead market and the HASP.

**4. Without Implementing Further Protective Measures, the Market Inefficiencies and Adverse Impacts Observed and Discussed above will continue to be at Risk of Occurring.**

As demonstrated above, the market inefficiency and uplift costs experienced when intertie convergence bidding was in effect were caused by a structural set of incentives for virtual bidders to submit virtual supply bids when the expected day-ahead price is higher than the expected HASP price but lower than the expected RTD price. Although the ISO has worked hard to eliminate such opportunities by making operational and software changes to reduce predictable disparities between these prices, such opportunities still potentially remain and have not been entirely eliminated. Indeed, as discussed above, even after the ISO adopted many of these adjustments in the fall of 2011, virtual bidders continued to engage in virtual supply bidding that offset internal demand and produced uplift costs.

Because such structural incentives continue to remain, it would not be just to reintroduce intertie convergence bidding without revising the market structure to reduce the risk of such inefficiencies and uplifts and without protections to mitigate any such risks that cannot be eliminated. The options discussed in the next section seek to create

such structural changes and protections while allowing intertie convergence bidding to be brought back within a reasonable time frame.

One other option, however, that certain parties have suggested would not provide sufficient protection given the strength of the underlying incentives that are at work. That option – simply prohibiting a single scheduling coordinator from submitting an offsetting internal and intertie virtual schedule – is insufficient because, even assuming the serious problems with enforcement could be overcome, it would do nothing to prevent the phenomenon of independently offsetting intertie and internal virtual schedules. As shown above, there would continue to be a strong incentive for such bidding as long as there remain any identifiable periods of time when the expected day-ahead price is between the expected real-time and HASP prices. The disparity between the maximum bid cap and the minimum price floor, moreover, creates an added incentive for intertie virtual bidders to continue unilaterally bidding offsetting virtual supply even when such opportunities become more difficult to predict because the potential gain from finding such opportunity is much larger than the potential loss incurred by bidding in the wrong direction. Because a ban on same SC offsetting bids would not prevent such inefficient bidding or the uplift costs it produces, other more protective options need to be considered.<sup>26</sup>

**B. The ISO is Currently Considering Two Viable Pricing Options that Will Enable the Reinstatement of Convergence Bidding at the Interties within a Reasonable Time.**

Through its stakeholder consultation process and informed by the discussions had during the February 2 Technical Conference, the ISO has developed and is considering two pricing options that will enable the reinstatement of convergence bidding

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<sup>26</sup> Simply prohibiting both offsetting same scheduling coordinator and independently offsetting bids also is not practical because there would be no practical way to distinguish the independent virtual bids that are prohibited from bids that are allowed. This approach would effectively mean that scheduling coordinators cannot engage in virtual intertie bidding.

at the interties while limiting further exposure to the inefficiencies discussed above. The two options avoid more extensive market redesigns and leverage off of the existing market structure to provide settlement solutions that would mitigate or eliminate the observed inefficient bidding pattern and reduce or eliminate the uplift costs incurred through the real-time imbalance energy offset (RTIEO) that are attributable to virtual bidding. The first option allows for the reinstatement of convergence bidding at the interties through an interim solution as early as the end of 2012, with the implementation of the more complete solution by spring of 2014. The second option does not include an interim solution, and instead proposes the continued suspension of intertie convergence bidding until fall of 2013, when the ISO can implement the more robust longer-term solution. Among other things, the two options present timing trade-offs the ISO is asking stakeholders to consider at this juncture of its pending stakeholder process. Essentially, the second option provides the ability to implement the more robust longer-term solution more quickly because the ISO would not be engaged in implementing an interim solution, while the first option allows for the reinstatement of intertie convergence bidding approximately nine months prior to the second option.

At this time the ISO believes the second option is the more appropriate course of action given that it allows the ISO to implement convergence bidding at the interties within a reasonable time under a pricing and settlement solution that better addresses the issues identified and discussed above. The second option also avoids the implementation costs associated with implementing the first option.

**1. Option 1: Interim Solution with Mitigation Measures by end of 2012 with Path towards Long-term Solution by end of 2014.**

This option tries to balance the competing interests of implementing convergence bidding at the interties as soon as possible provided that the adverse issues discussed above are addressed. Therefore, this option incorporates the minimal market rule

changes that would be required to allow for the reinstatement of convergence bidding at the interties.

**Interim Solution Implemented by the end of 2012:**

- a. All cleared intertie virtual bids would be priced at the real-time LMP when an intertie's scheduling constraints are not binding, i.e., the absolute value of the intertie constraints' shadow price is less than \$2. These intertie constraints consist of each intertie's transmission capacity (ITC) scheduling limit, as well as the branch group or market scheduling limit (MSL) flow-based limits. The real-time price would consist of the simple average of the five-minute RTD LMP for the applicable hour.
- b. All cleared intertie virtual bids would be priced at the HASP LMP (which would continue to be the simple average of the four fifteen minute LMPs at the interties produced through the real-time unit commitment (RTUC) process as it is today) when an intertie's scheduling constraints are binding with the absolute value of the intertie constraints' shadow price greater than \$2.
- c. The \$2 shadow price threshold for determining whether the virtual bids will be priced at the real-time LMP or the HASP LMP will change as follows: If the amount of overall RTIEO charges attributable to all virtual bids exceeds a total of \$3.5 million for a rolling 30-day period, the \$2 would increase for all interties based on a predetermined scale.
- d. All virtual intertie bids would be subject to a position limit of 2.5 percent of each intertie's capacity per scheduling coordinator.
- e. There would be no changes to pricing for physical resources in the HASP until a long-term solution is put in place.
- f. When the dual intertie constraints bind in the day-ahead market, the ISO will use different settlement LMPs for physical awards and virtual awards based on the shadow price of the respective constraint at which the physical and virtual bids participate.
- g. No bid cost recovery for virtual bids under this interim approach.

**Longer-term Solution Implemented Spring 2014:**

The ISO would then complete the stakeholder process to a long-term solution that uses the NYISO-style intertie pricing model as a basis for settling both intertie virtual bids and intertie physical resources.<sup>27</sup> The longer-term solution would contain the following attributes:

- a. Both cleared intertie physical and virtual bids are settled at the real-time LMP (simple average of the five minute LMPs for the applicable hour) unless there was any congestion in HASP due to the scheduling

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<sup>27</sup> The ISO provides a description of the NYISO-style intertie pricing in the Revised Straw Proposal attached in Attachment A.

constraints on an intertie (no threshold in this case), in which case transaction on that intertie are all settled at the HASP LMP.

- b. Deviations from HASP schedules by physical resources would be settled at the real-time LMP for the applicable hour.
- c. Eliminate the current HASP schedules decline charge threshold and penalty.
- d. Provision of hourly bid cost recovery physical and hourly intertie import resources.
- e. Requires resolution of:
  - i. Whether and under what conditions there would be bid cost recovery for exports and the effect on the supply of decremental energy at the interties.
  - ii. Potential rules to limit strategic bidding of offsetting physical imports and exports designed to artificially inflate bid cost recovery for physical imports or exports.
  - iii. Two tier bid-cost recovery for the real-time market.

Clearing and settling all cleared virtual bids based on the level of congestion on the interties as described above enables the ISO to continue to provide some of the benefits of intertie convergence bidding while also mitigating the adverse impacts of the bidding patterns and observed market inefficiencies that led to the initial suspension of convergence bidding on the interties. The settlement solution allows the scheduling coordinator to use virtual bids to provide a hedge for price risk when there is substantial congestion at the intertie, when the hedge is most important. During all other hours, when there is no or less congestion at the interties, there is little or no usefulness to the hedging option. In contrast, during such hours there would continue to be the potential for significant adverse impact to the RTIEO from practices that simply arbitrage the HASP and real-time prices, without contributing to their convergence. Therefore, in such hours when the interties are either not congested or minimally congested, such determination made on the basis of the shadow price levels, more cleared virtual bids will be settled at the real-time LMP. This nullifies the contributions to the RTIEO made by virtual bids. Moreover, this essentially liquidates the positions taken by the virtual bidders in the HASP, thereby diluting the incentive to engage in that behavior in the first

instance. All of this provides for a cap on the expansion of the RTIEO due to virtual bidding behavior.

The \$2 threshold proposed in the interim solution was selected based on the ISO's study of the intertie transfer capacity constraint shadow values for interties in 2011 in which it determined that for most interties, in most hours, the intertie transfer capacity constraint shadow price is zero. However, for those hours in which the shadow price was not zero, as shown in Table 3 of the Revised Straw Proposal provided in Attachment A, the average HASP intertie constraint shadow price is \$2 or less (using absolute values) only 2.28 percent of the time.<sup>28</sup> Because of the low instances of observed congestion in the past, in most instances the cleared intertie virtual bids will result in the automatic liquidation of the opposite sell/buy position in the HASP and settled at the real-time LMP. This reduces the potential adverse impact of virtual bids at the interties on the RTIEO significantly because fewer schedules will be settled at the real-time LMP.

This proposed settlement allows scheduling coordinators to fully hedge price risk in periods of substantial congestion while reducing the volume of virtual bids that settle in HASP and contribute to the RTIEO. But, during hours in which the interties are deemed congested, it does not entirely eliminate the opportunity to engage in the convergence bidding strategies that led to the ISO suspending convergence bidding at the interties. In hours when the HASP settlement rule applies (i.e., interties are determined to be congested), virtual bidders would still potentially be able to engage in the virtual bidding strategies that first gave rise the RTIEO uplift costs described above and in the ISO's initial Tariff Amendment in this proceeding. Therefore, it is reasonable and prudent to implement the two additional protective measures discussed above: 1)

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<sup>28</sup> There are almost 2,000 observations where the hourly average interties transfer capacity shadow price is greater than zero. Less than 50 observations had hourly average transfer capacity shadow prices plus or minus \$2.

position limits; and 2) the RTIEO \$3.5 million trigger price that would increase the \$2 shadow price used to determine whether the interties are congested and therefore whether virtual bids are settle at the HASP LMP or the real-time LMP.

The ISO proposes to set position limits at 2.5 percent of a line's intertie transfer capacity for each scheduling coordinator, which will allow sufficient hedging across most ties, while allowing the ISO to assess the effectiveness of the new convergence bidding design. This position limit would remain in place for at least one year after convergence bidding on the interties is reopened. Before lifting this limit, the ISO would examine the performance of convergence bids on the interties to determine if additional measures need be implemented to prevent gaming or if the position limits can be raised.

The RTIEO \$3.5 million threshold proposed above will provide a safety valve to protect load serving entities against the potential for incurring large RTIEO uplift costs caused by offsetting virtual bids. The \$3.5 million amount was selected based on the amount of uplift cost attributable to offsetting virtual bids made by different scheduling coordinators (also called "residual virtual bids") during the period when intertie convergence bidding was in effect. The \$3.5 million dollar amount reflects the highest 30 day rolling period cumulative amount of uplift that such bids produced during the time in which intertie convergence bidding was in effect. As demonstrated on slide 16 of Mr. Rothleder's presentation and Figure 3 of the ISO's revised straw proposal (attached), this \$3.5 million dollar amount occurred in April 2011. This threshold means that if the RTIEO charges attributable to either kind of offsetting virtual bids (i.e., by the same scheduling coordinator or across different scheduling coordinators) reaches \$3.5 million on a rolling 30 day period, the ISO would increase the range of the shadow prices used to determine if virtual bids are settled using the HASP LMP or the real-time LMP. Each time this \$3.5 million cumulative amount is reached over a rolling 30 day period, the ISO

will increase the intertie constraints' shadow price range in a scaled fashion as demonstrated Table 1 below:

**Table 1. ITC Shadow Price Increases when \$3.5M Threshold is Reached**

Trigger Hit	ITC Shadow Price <sup>29</sup>
Initial	\$2
First time	\$5
Second Time	\$15
Third Time	\$30
Fourth Time	\$55
Fifth Time	Convergence Bidding on the Interties Suspended

**2. Option 2: Longer Term NYISO-Style Pricing Implementable by Fall 2013.**

Under this option, the ISO would immediately proceed to developing further the longer-term solution based on the NYISO-style proposal described above, without first developing an interim measure. Under this approach, intertie convergence bidding would not be reinstated until the longer-term solution is implemented in the fall of 2013.

**3. Timing for finalizing the more Complete NYISO-Style Longer-term Solution under Either Option.**

As discussed above, at this juncture in its stakeholder process, the ISO has not fully resolved certain elements of the longer-term solution. The resolution of these issues for the longer-term solution will require additional time. If the first option is selected, the ISO anticipates it will seek approval for the interim solution from its board of governors in May 2012. Subsequently, it would continue developing the longer-term solution along the lines described above. Given the efforts required to implement the interim solution under the first option, the ISO would not, however, be able to immediately expend resources towards developing the longer-term solution. Under the first option, the ISO anticipates that a proposal for the longer-term solution could not be brought to its board of governors sooner than September 2012, depending on the additional details of the

<sup>29</sup> Prices expressed in absolute values.

final proposal. From a timing and completeness perspective, the second option is, therefore, preferred as it enables the ISO to develop a final proposal for the longer-term solution as early as July 2012, with a filing to follow at the Commission soon after and an expected implementation date of fall 2013.

#### **4. Resolution of Issues Related to the Enforcement of the Two Intertie Pricing Constraints**

Through parallel stakeholder processes, the ISO has also developed a proposal for resolving the issues associated with the enforcement of the dual constraints in the pricing run and scheduling run. If the ISO adopts the first option described above, the ISO anticipates it will seek approval of this proposal from its board of governors in May.<sup>30</sup> If the second option is adopted the ISO will review with its stakeholders any necessary amendments to this proposal in the context of the longer term solution.

As discussed in the ISO's original filing in this proceeding, under the current market design, the ISO enforces two constraints at scheduling points: (1) net physical schedules across each scheduling point, ignoring the accepted virtual schedules to ensure that the physical schedules are within the established scheduling limit for that scheduling point; and (2) physical and virtual imports net of physical and virtual exports must also be within established scheduling limits for that scheduling point.<sup>31</sup> With convergence bidding at the interties, the enforcement of the dual constraints can result in the clearing of physical imports at prices below the cleared bids and cleared physical export bids at LMPs that are higher than the submitted bid of the scheduled resource.<sup>32</sup>

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<sup>30</sup> Additional documentation for the Price Inconsistency Cause by Interties Constraints stakeholder initiative is available at <http://www.caiso.com/2b6d/2b6dbef62e710.html>.

<sup>31</sup> See Transmittal Letter at 12.

<sup>32</sup> The issues associated with this practice are more fully discussed in the ISO's initial filing.

Market participants have raised concerns regarding the negative impact this pricing inconsistency may have on their settlement outcome.

Prior to suspending convergence bidding at the interties, only the net virtual plus physical constraint was used in pricing intertie schedules. In its revised straw proposal, the ISO proposes to resolve this issue under convergence bidding at the interties by allowing the shadow prices of both constraints that are currently implemented to be factored into the settlement LMPs.<sup>33</sup> As described more fully in the attached Revised Straw Proposal, this will produce two different settlement LMPs for cleared physical and virtual bids under certain circumstances. Specifically, the virtual awards will not receive the same settlement LMP as the physical awards if the import or export physical constraint is binding. This poses no adverse outcome because even today where only one constraint is being priced, the two shadow prices of both constraints already affect the dispatches in the market optimization. In other words, even today physical and virtual bids are economically cleared according to different LMPs, but priced at the same settlement LMP. This option therefore, produces a better outcome where the physical and virtual bids are priced in a way that is consistent with how they are cleared, which makes this option the most transparent and mathematically correct approach to maintain price consistency.

This option does not require changes to the current market optimization.

However, it does require some changes to the ISO settlement system, OASIS reporting,

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<sup>33</sup> In prior straw proposals in the preceding stakeholder process, the ISO included two options that would result in consistent pricing: (A) different settlement LMPs for physical awards and virtual awards and (B) economic curtailment. In the draft final proposal for that initiative, the ISO removed option B from consideration given potential adverse market outcomes that arise because virtual export bids could clear against internal supply (at a higher price), but would be settled at the lower physical import price which could lead to day-ahead revenue adequacy issues. Some stakeholders did not support option A arguing it would result in different price for virtual and physical imports/exports. Several stakeholders further requested that the ISO retain the dual constraint and exports be provided bid cost recovery. Several stakeholders recommended no change to the current design as the impact was consistent with the frequency of this known issue during the convergence bidding design process.

and ISO business practice changes. Today, there is only one pricing node at the intertie constraint. In order to accommodate the two different settlement prices, the ISO will need to create an additional pricing node for the physical resources at the intertie constraints.

Parties raised a concern that under the ISO's proposal, market participants may be driven to change their behavior and implement a bidding strategy of submitting physical bids rather than virtual bids with the intent to liquidate their positions in HASP assuming a more advantageous LMP for physical awards. While this strategy would not be prohibited under the ISO proposal, it is not necessary to do so because it cannot generate sustainable revenue. The increased physical exports that would result would relieve the physical constraint congestion, rendering this strategy less profitable. In addition, the ISO would retain the HASP reversal settlement rule established concurrently with convergence bidding, which was put in place to eliminate any potential incentive for market participants to submit implicit virtual bids by reversing any monies paid due the difference between the day-ahead price and the HASP price for any MW quantity that is not e-tagged. Therefore, this rule to some extent alleviates the concern of using physical bids to conduct implicit virtual bidding because they are settled at different prices.

Many stakeholders also commented that the potential for different prices for physical imports/exports and virtual supply/demand at the interties would limit the ability for market participants to hedge day ahead positions. The ISO looked at this more closely and as illustrated in the example in Table 5 of the Revised Straw Proposal here attached, as long as the day-ahead price at which the virtual export clears is lower than the HASP price, the market participant is able to hedge a portion of the outage that is bought back in HASP.

As previously explained in its filing, the ISO does not believe that it is appropriate to reinstate convergence bidding at the interties and do nothing or simply provide bid cost recovery for exports at the times to address the adverse impact of the price inconsistency. Providing bid cost recovery to exports is not a solution because it has the indirect effect of settling virtual and physical bids at different net prices. The ISO believes at this time that it is preferable to settle at the two LMPs that could result from the two different constraints, but renders the pricing consistent with the resources bid.

## **II. Conclusion**

The ISO respectfully requests that the Commission allow the ISO to complete its stakeholder process to consider the proposals discussed herein that would permit the reinstatement of convergence bidding at the interties. This will allow additional time to vet any additional concerns and enable the ISO to fashion specific tariff language for the Commission's consideration in a timely manner. The Commission should not allow for reinstatement of convergence bidding without the changes considered herein, as it will again expose the market to significant market inefficiencies and costly consequences.

Dated: March 16, 2012

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**ATTACHMENT A**



**California ISO**  
Shaping a Renewed Future

## **Settlement of Interties in Real-Time**

### **Revised Straw Proposal**

**March 13, 2012**

**Settlement of Interties in Real-Time**

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## 1 Introduction

This revised straw proposal presents the ISO's proposed solution to three separate but interrelated issues:

- **Real-time imbalance energy offset:** High amounts of this settlement charge were being further increased by a convergence bidding strategy consisting of virtual bids at the interties offset by virtual bids at internal nodes.
- **Convergence bidding on interties:** The high amounts of the real-time imbalance energy offset and other related market inefficiencies prompted the ISO to propose to FERC that convergence bidding on the interties be temporarily suspended. FERC approved this request effective November 28, 2011.
- **Price inconsistencies caused by intertie constraints:** The design of pricing on the interties to facilitate convergence bidding caused a relatively limited amount of pricing anomalies in which physical imports and exports cleared at levels inconsistent with their bid price.

The ISO initially established two separate stakeholder initiatives in April 2011 to address the real-time imbalance energy offset costs and intertie price inconsistency issues. The "Redesign of the Real-Time Imbalance Energy Offset" initiative,<sup>1</sup> sought to address issues resulting from virtual demand at internal nodes offset by virtual supply schedules at the interties that were encouraged by the difference between the Hour-Ahead Scheduling Process (HASP) price for interties and the Real-Time Dispatch (RTD) price for internal generation and load. The "Price Inconsistency Caused by Intertie Constraints,"<sup>2</sup> initiative sought to address instances where physical imports and exports may clear inconsistent with their bid price. These initiatives have since been combined in the initiative that is the subject of this revised straw proposal.

Through this current initiative, the ISO is seeking solutions to intertie pricing and settlement that will reduce the pattern of offsetting virtual bids at the interties that gave rise to the suspension of convergence bidding at intertie locations, reduce the inflation of real-time imbalance energy offset charges, and resolve the price inconsistency caused by intertie constraints.

The ISO's objective is to identify solutions that will allow the return of convergence bidding on the interties. In the ISO's issue paper that it recently published as part of this initiative, the ISO proposed a solution to resolve the issues of intertie pricing and convergence bidding at the interties that it could implement relatively soon. Given stakeholder feedback, the ISO is now also proposing a more comprehensive solution that will take longer to implement. These options are as follows:

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<sup>1</sup> <http://www.caiso.com/informed/Pages/StakeholderProcesses/RealTimeImbalanceEnergyOffset2011.aspx>

<sup>2</sup> <http://www.caiso.com/informed/Pages/StakeholderProcesses/PriceInconsistencyCausedIntertieConstraints.aspx>

Option One

- Implement an interim solution, including intertie convergence bidding rule modifications, by the end of 2012 and reintroduce convergence bidding on the interties. The interim solution includes:
  - Settle convergence bids at an intertie's HASP LMP if an intertie is congested such that average hourly HASP congestion shadow price associated with the specific intertie is greater than \$2 in either the import or export direction. Otherwise, convergence bids will settle at the simple average of the RTD LMPs over the applicable hour at the intertie. (This approach is a variation of the ISO's original proposal to close out intertie convergence bids at the average of the RTD LMPs using the congestion and loss component of the HASP LMP. The ISO could implement the proposed interim sooner than the previously proposed or longer term approaches.)
  - The \$2 threshold for deeming the interties congested would increase if the amount of real-time imbalance energy offsets surpasses \$3.5 million on a 30-day rolling average and remain for at least 30 days.
  - When the dual intertie constraints bind in the day-ahead market, the ISO will use different settlement LMPs for physical awards and virtual awards (Option A) based on the shadow price of the respective constraint at which the physical and virtual bids participate.
  - Intertie convergence bids would be subject to a 2.5 percent position limit of each intertie's capacity (ATC) per scheduling coordinator (SC).
- The ISO would design a longer term solution using the NYISO intertie pricing model as a basis to resolve the real-time settlement of both intertie convergence bids and intertie physical resources.
- The longer term solution would be implemented in Spring 2014 (note that this is later than the implementation of the long term solution under option two, below).

Option Two

- The ISO would not pursue an interim solution and convergence bidding on the interties would remain suspended until the longer solution is implemented.
- The ISO would work with stakeholders to immediately start designing a longer term solution using the NYISO intertie pricing model as a basis for the real-time settlement of both intertie convergence bids and intertie physical resources.
- The longer term solution would be implemented starting Fall 2013.
- Convergence bidding on the interties would remain suspended until the longer term solution is in place.

Because the ISO has implemented (or will soon implement) mechanisms that have significantly reduced real-time imbalance energy offset charges, with exception of implementing a solution

to the dual constraints problem, the ISO is not proposing changes to the settlement of physical intertie resources as part of the interim solution.

## 2 Stakeholder Engagement

At the onset of the stakeholder process, the ISO engaged a stakeholder working group to assist in the formation of the initial straw proposal. Participants in the working group discussed unresolved issues outlined in the issue paper for this initiative. At the end of each session, the working group provided the ISO with resolutions reached during the working group as well as proposed next steps and tasks that were taken on by various members of the working group. The contributions of the working group have led to the proposals outlined in this revised straw proposal. In addition, the FERC technical conference regarding convergence bidding on the interties has further influenced this proposal.

The schedule for the stakeholder process is shown below.

Date	Action
November 8	Post Issue Paper
November 15	Working Group Meeting
November 29	Working Group Meeting
January 25	Working Group Meeting
February 10	Post straw proposal
February 17	Stakeholder meeting on straw proposal
February 24	Stakeholder comments on straw due
March 13	Post revised straw proposal
March 20	Stakeholder meeting on revised straw proposal
March 27	Stakeholder comments on revised straw due
April 12	Post draft final proposal
April 19	Stakeholder meeting on draft final proposal
April 26	Stakeholder comments due on draft final proposal
May 16-17	Board of Governors

### 3 Redesign of Real-Time Imbalance Energy Offset

The ISO has made several improvements to the accuracy of the ISO forecasts and in the consistency of procuring and dispatching resources to these forecasts in the HASP and RTD. These improvements have reduced the differences in energy prices between the HASP and RTD. This price difference between HASP and RTD, as well as the volumes of energy bought/sold in the HASP and RTD, are two components that drive the amount of the real-time imbalance energy offset charge. The price difference between HASP and RTD can arise from forecast error, operator biasing, insufficient ramping capability and the asymmetrical bid floor/cap. The ISO has addressed these items through improved operational practices and the implementation of the flexible ramping constraint. These efforts, along with reducing the volumes of energy transacted between HASP and RTD by eliminating convergence bidding at the interties, have resulted in a significant reduction in real-time imbalance energy offset costs. Lowering the bid floor pending implementation of separating bid cost recovery between the real-time market and day-ahead market should further reduce real-time imbalance energy offset charges in the future.

#### 3.1 Background

The real-time imbalance energy offset (CC 6477) is a neutrality account through which the ISO tracks the settlement dollar values for the following charge codes: real-time instructed imbalance energy (CC 6470), real-time uninstructed imbalance energy (CC 6475), real-time unaccounted for energy (CC 6474), and HASP energy, congestion and loss pre-dispatch (CC 6051), less the real-time congestion offset (CC 6774). The real-time imbalance energy offset is allocated to all scheduling coordinators (SCs) based upon a pro rata share of their measured demand (i.e., metered load and exports) excluding the demand quantity for the valid and balanced portion of self-schedules related to transmission ownership rights in real-time and net measured demand of load following metered subsystems (MSSs).<sup>3</sup> This may result in a payment or charge to SCs depending on the whether there is a surplus or deficit.

In 2009, the ISO conducted a stakeholder process to determine whether modifications to the current design of the allocation of the real-time imbalance energy offset were appropriate and necessary. At that time, no clear alternative could be identified because causal attribution to specific market activity was not clear. At the conclusion of the stakeholder process, the ISO did not change fundamentally the allocation to measured demand, but clarified that for SCs for MSS operators that have elected load following, the ISO will not assess any charges or make payments for the resulting non-zero differences recovered through the offset. The ISO, however, committed to, and has since continued to work on, operational enhancements that would assist in the convergence of the HASP and RTD prices. The ISO also committed to revisit

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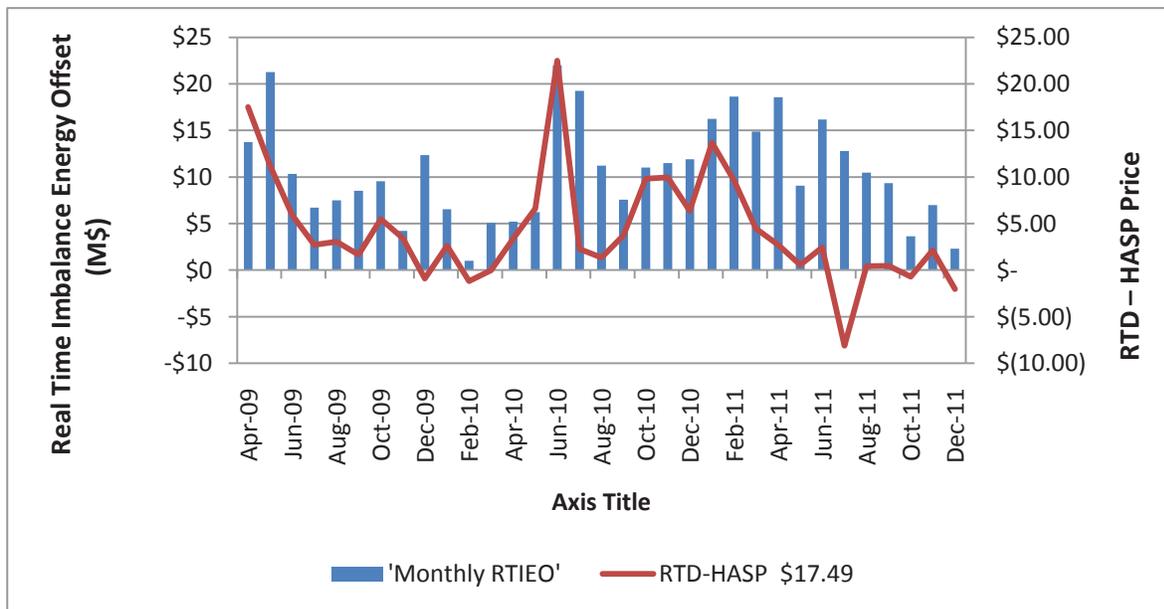
<sup>3</sup> Additional documentation can be found in the Settlements & Billing BPM Configuration Guide available at <https://bpm.caiso.com/bpm/bpm/version/000000000000085>

its prior conclusion if the dollar volume in the real-time imbalance energy offset account increased substantially.<sup>4</sup>

As Figure 1 illustrates, from April 2009 through December 2011 the average monthly real-time imbalance energy offset has been just over \$10.5M. The offset peaked in June/July 2010 at over \$20M and returned to levels consistent with the first half of 2010 in September 2010. Since February of 2011, when convergence bidding was introduced, through December of 2011, the monthly real-time imbalance energy offset averaged just over \$11.1M per month. The real-time imbalance energy offset peaked for this time period in April 2011, at which point the ISO commenced its stakeholder process to examine market design changes to address the issue. The stakeholder process resulted in the elimination of convergence bidding on the interties which was found to be exacerbating the real time imbalance energy offset charges. In the remaining months of 2011 after April, real-time imbalance energy offset amounts generally declined. After intertie convergence bidding was suspended in late-November 2011, the real-time imbalance energy offset amount reached a nearly two year low in December 2011.

Additionally, after the commencement of the ISO’s stakeholder process to address the real time imbalance energy offset charges, the volume of offsetting virtual bids dropped dramatically and HASP and RTD prices showed significantly improved convergence. However, the increased volume brought about by convergence bidding, even with improved HASP and RTD prices, still resulted in increased levels of real-time imbalance energy offset until intertie convergence bidding was suspended in late-November of 2011.

**Figure 1 – Monthly Real Time Imbalance Energy offset January 2010 through September 2011**



Since July 2010, the ISO has implemented several other market rules changes that impact the offset. First, as required by the ISO tariff, in April 2010, the energy bid cap was raised from \$500/MWh to \$750/MWh and in April of 2011, it was raised to \$1,000/MWh. Because certain

<sup>4</sup> Additional information on the first Real-Time Imbalance Energy Offset (2009) stakeholder process is available at <http://www.caiso.com/2406/2406e2a640420.html>

pricing parameters are tied to the energy bid cap, this has increased the level prices can reach in the real-time market when there are short-term imbalances in which the pricing parameters set the market clearing prices. The higher RTD prices impact the real-time imbalance energy offset charge when the ISO is constrained to procure additional energy in RTD at the higher prices. The offset is the mechanism for settling the additional imbalances for energy that are not already allocated to instructed and uninstructed deviations from resources' day-ahead schedules. Depending on the condition, the real-time imbalance energy offset can increase or decrease. However, because the bid floor remained unchanged at negative \$30.00 combined with the lower frequency of negative prices, the relative impact of potential reductions in the offset when negative prices caused by over-generation situations occur (*e.g.*, when the HASP price is greater than RTD) is not symmetric and does not balance the effect of the real-time offset when RTD prices are higher than the HASP price.

The recently introduced flexi-ramp constraint is currently helping reduce the amount of real-time imbalance energy offset charges by decreasing the frequency of price spikes in RTD. Additionally, ISO proposals in the Renewable Integration and Market Product Review: Phase 1 initiative and work on the flexi-ramp product should further reduce real-time imbalance energy offset charges.

Lastly, it is important to note that although these changes will reduce the amount of real-time imbalance energy offset charges, they will not eliminate them completely. Even with perfect procurement consistency between the HASP and RTD, real-time imbalance energy offset charges will exist because load is metered hourly and internal generation is metered on a 10 minute interval. This difference will create at least a small amount of real-time imbalance energy offset charges.

### **3.1.1 Consideration of Changes to the Allocation of Offset**

The offset is currently allocated to all SCs based upon a pro rata share of their measured demand (i.e., metered load and exports) excluding the demand quantity for the valid and balanced portion of self-schedules related to transmission ownership rights in real-time and net measured demand of load following metered subsystems. In 2009, the ISO conducted a stakeholder process to determine whether modifications to the current design of the allocation of the real-time imbalance energy offset were appropriate and necessary. At that time, no clear alternative could be identified because causal attribution to specific market activity was not clear. At the conclusion of the stakeholder process, the ISO did not fundamentally change the allocation to measured demand, but clarified that for SCs for MSS Operators that have elected load following, the ISO will not assess any charges or make payments for the resulting non-zero differences recovered through the offset.

As noted in Figure 1 above, real-time imbalance energy offset charges have been decreasing since June 2011. The ISO expects that improvements and modifications put in place, and those planned, will continue to significantly reduce these uplift costs. At this time, the ISO does not propose any modifications to the cost allocation for the real time imbalance energy offset charge. However, as part of the long term solution proposed in in Section 4.2, the ISO will reassess the allocation of these uplift costs to determine how virtual bids contribute to the uplift costs and if it reasonable and feasible to allocate uplift costs to virtual bids.

### 3.2 FERC Technical Conference on Convergence Bidding at the Interties

On February 2, 2012, FERC convened a technical conference to address convergence bidding on the interties. The ISO and the ISO's Department of Market Monitoring (DMM) presented information to support the need to at least temporarily suspend convergence bidding on the interties. While the real-time imbalance energy offset was used to demonstrate the magnitude of the problems the ISO identified, high real-time imbalance energy offset charges were not the primary reason the ISO suspended convergence bidding on the interties. The ISO was also concerned that intertie convergence bidding was, in certain hours, undermining and offsetting the ability of internal virtual demand bids to converge day ahead and real-time prices. At the technical conference, additional data was presented on expected vs. actual virtual bid behavior, volume of offsetting intertie virtual bids, and price convergence.<sup>5</sup>

### 3.3 The Working Group Process

The ISO engaged a stakeholder working group to assist in the formation of an initial straw proposal to address real-time imbalance energy offset issues that are the subject of this paper. The participants in the working group discussed the unresolved issues regarding the redesign of the real-time imbalance energy offset charge, including: 1) issues with the settlement of hour ahead import/exports versus settling such transactions on the same 5-minute real-time prices that internal resources are settled at; 2) issues associated with the non-performance in the real-time of intertie resources that are dispatched in the hour ahead scheduling process, and 3) potential changes to the allocation of the offset. One of the primary points made by working group participants was that any solutions the ISO proposed must be compatible with reintroducing convergence bidding back on the interties. Since the release of the ISO's issue paper for this initiative, the working group has convened three times.

The first working group meeting was held on November 15, 2011. Participants at this meeting formed two groups. One group chose to focus on the creation of a full hour-ahead market. The other group examined smaller, more incremental solutions. Both groups favored solutions to reduce real-time imbalance energy offset that would allow the reintroduction of convergence at the interties.

The second working group session, held on November 29, 2011, had all working group members in a single group. This working group session examined the advantages and disadvantages of various methodologies to reduce real-time imbalance energy offset amounts. The working group assessed the impacts of each of the identified options in terms of the impact to real-time imbalance energy offset costs, costs to implement, whether it would accommodate the reinstatement of convergence bidding at the interties, and the impact on market liquidity.<sup>6</sup> The working group illuminated the complexities of reducing real-time imbalance energy offset charges. For example, some working group members favored the development of a full hour-

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<sup>5</sup> The ISO's presentation materials for the FERC technical conference are available at [http://www.caiso.com/informed/Pages/StakeholderProcesses/IntertiePricing\\_Settlement.aspx](http://www.caiso.com/informed/Pages/StakeholderProcesses/IntertiePricing_Settlement.aspx)

<sup>6</sup> See the final slide of the ISO presentation at the FERC technical conference on convergence bidding on the interties. Available at [http://www.caiso.com/informed/Pages/StakeholderProcesses/IntertiePricing\\_Settlement.aspx](http://www.caiso.com/informed/Pages/StakeholderProcesses/IntertiePricing_Settlement.aspx)

ahead market because they felt it would address real-time imbalance energy offsets, allow convergence bidding back on the interties, and potentially solve other market inefficiencies. Meanwhile other working group members pointed out that this option was not practical, as it would be the most costly, challenging, and time consuming solution to implement.

At the end of the meeting there was no consensus amongst the working group regarding the best option. As a result, the participants requested the ISO to modify the original schedule to allow for additional opportunities to discuss the components of a straw proposal. All thirteen members of the working group affirmatively agreed to extend the original schedule and move approval of a final resolution from the March Board of Governors meeting to the May meeting.

The third meeting of the working group convened on January 25, 2012. The working group focused on addressing proposals brought by Powerex and Southern California Edison (SCE).

### **3.3.1 The Powerex Proposal**

Powerex provided a proposal that offered a three phased solution that Powerex asserts would ultimately lead to a timely reinstatement of convergence bidding at the interties.<sup>7</sup> Prior to the meeting, Powerex previewed their proposal with several other members of the working group. While many of these parties did not fully agree with all aspects of the Powerex proposal, many agreed that the proposal offered a reasonable starting point for further discussion.

The initial phase of the Powerex proposal includes five measures that Powerex asserts addresses the root causes of price divergence between the hour ahead scheduling process and real-time market. Powerex proposes increased assurance that energy will be available in real-time through items such as modifications to e-tagging timelines to avoid undelivered energy and mitigate price spikes in real-time. The measures Powerex proposes are:

- 1) Charging HASP awards that do not deliver the worse of HASP or RTD and charging IFM awards that do not deliver the worse of IFM or RTD
- 2) Enforce product definitions for firm and non-firm energy and requiring an e-tag by 3:00pm the day before real-time
- 3) Reduce price floor
- 4) Discontinue premature liquidation of internal convergence bids
- 5) Create a post HASP procurement mechanism (i.e. a post HASP procurement process)

Phase two would allow for the reinstatement of convergence bidding at the interties and consists of:

- 6) Reinstate intertie convergence bidding, ensuring all awards are consistent with bid prices

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<sup>7</sup> The Powerex proposal is available at [http://www.caiso.com/Documents/PowerexProposal\\_ConvergenceBiddingReinstatement.pdf](http://www.caiso.com/Documents/PowerexProposal_ConvergenceBiddingReinstatement.pdf).

- 7) Modify implementation of position limits to eliminate intertie-specific constraints on liquidity

The focus of the third phase of the Powerex proposal is promoting long term market efficiency and includes:

- 8) The creation of a post HASP RUC process
- 9) Additional measures to ensure proper use of firm energy

Powerex's proposal for HASP dispatches that fail to deliver in real-time is specifically addressed below in Section 4.2.1. Pursuing refinements to the e-tagging, as Powerex suggests, will not provide significant benefit at this time. In fact, modifying the ISO's current e-tagging practices would reduce flexibility, hurting liquidity. Lowering the bid floor should reduce the real-time imbalance energy offset, and, as noted above in Section 3.1, the ISO is lowering the bid floor as part of Renewable Integration and Market Product Review: Phase 1 initiative. The ISO has reviewed the Powerex proposal at great length. The ISO believes that several items improve the overall efficiency of the markets. Additionally, while a post-RUC process or expanding the use of Exceptional Dispatch may, in theory, ensure the ISO has sufficient resources for real-time dispatch, holding virtual bids through to the real-time market poses significant reliability and operational concerns for the ISO. The Powerex proposal would require significant changes to the current market design and business processes that should be considered in context of a longer-term solution. The ISO addresses other aspects of the Powerex proposal in Section 4 below.

### **3.3.2 The SCE Proposal**

SCE provided a proposal as part of the working group process that would settle imports scheduled in the hour ahead scheduling process at the real-time price and allow bid cost recovery for imports and exports based on the hour ahead scheduling process price. If the hour ahead scheduling process price is greater than zero, then bid cost recovery would be provided only for imports. If the hour ahead scheduling process price is less than zero, then bid cost recovery would be provided only for exports. When imports are congested, SCE proposes imports receive the hour-ahead advisory price and exports would be settled at the real-time price at the relevant proxy bus, computed as the time weighted average real-time price. This is similar to the NYISO approach described further down in this paper. While not prepared to dismiss SCE's proposal, working group members had numerous questions and were unable to settle on a consensus view of the merits of the proposal. The ISO addresses the SCE proposal in Section 4 below.

### **3.4 Settlement of Import/Exports based upon RTD**

In addition to the suggestion made by Powerex and SCE, the ISO has examined numerous other options to reduce real-time imbalance energy offset charges. Many of the options to resolve the real-time imbalance energy offset issues were also considered in the prior stakeholder initiatives. However, each of the options outlined had potential market inefficiencies or

reliability concerns. The ISO does not wish to reexamine the options, but believes it is appropriate for the stakeholder process to attempt to either a) find alternative options or b) solutions that address market inefficiency or reliability concerns of the proposed options. The proposals in 3.4.1 through 3.4.4 provide various options for reducing the real-time imbalance energy offset charges, they do not, without putting additional safeguards in place, provide sufficient protections for reintroducing convergence bidding on the interties. Additionally, some of these options may have other undesirable side-effects. As described in Section 4, the ISO believes the NYISO model for settling imports and exports provides the most useful starting point for developing a long-term solution for the ISO.

### **3.4.1 Pay as Bid**

This option is essentially the method for settling intertie transactions that existed in the ISO market prior to the new locational marginal price (LMP) market introduced in April 2009. Under this option, HASP timelines and bidding processes would remain unchanged; however, the HASP settlement for physical intertie transactions and liquidation of intertie virtual demand/supply would be eliminated. All intertie virtual demand/supply will be liquidated at the RTD price. The HASP process would determine indicative prices used to select which HASP intertie transactions that are accepted. Bids to export or reduce day-ahead imports would be accepted if the bid is below the indicative HASP price. Bids to export or reduce day-ahead imports would not be accepted if the bid is above the indicative HASP price. For incremental imports and reductions in day-ahead exports, the bids would be accepted if lower than the indicative price. The accepted physical transactions would be paid their bid price and difference between the bid price and the actual RTD price would be included as a credit/debit to the real-time imbalance energy offset. See Table 1 and 2 for example of the rule and impact to the offset.

As noted by several stakeholders, this would be a step backwards from the LMP market design. The previous concerns with bidding behavior that takes into consideration a market participant's expectation of real-time pricing versus bidding the resource's marginal cost could impact market efficiency. However, prior to the LMP market introduced in April 2009, the Pay as Bid process did operate without excessive undesirable side effects.

### **3.4.2 Pay as Bid or Better**

Under the pay as bid or better option, HASP timelines and bidding processes would remain unchanged; however, the HASP settlement for physical intertie transactions and liquidation of intertie virtual demand/supply would be eliminated. All intertie virtual demand/supply would be liquidated at the RTD price. The HASP process would determine indicative prices used to select the HASP intertie transactions that are accepted. Bids to export or reduce day-ahead imports would be accepted if the bid is below the indicative HASP price. Bids to export or reduce day-ahead imports would not be accepted if the bid is above the indicative HASP price. For incremental imports and reductions in day-ahead exports, the bids would be accepted if lower than the indicative price. The accepted physical exports would pay the lower of their bid price or actual RTD price. The accepted physical imports would receive the higher of their bid price or actual RTD price. The difference between the bid price and the actual RTD price would

be included as a charge to the real-time imbalance energy offset. See Table 1 and 2 for example of the rule and impact to the offset.

Tables 1 and 2 below show examples of pay as bid and bid or better would work under different relationships between HASP and real-time price. Table 1 shows pay as bid and bid or better when HASP price is less than the real-time price. Table 2 shows a similar example, except that HASP price is greater than real-time price.

**Table 1 - Pay as Bid and Bid or Better Settlement HASP Price < RTD Price**

HASP Price	\$ 60.00					
RTD Price	\$ 80.00					
	Bid	Award	As Bid	RTIEO	Bid or Better	RTIEO
Import A	\$ 40.00	Y	\$ 40.00	\$ (40.00)	\$ 80.00	\$ -
Import B	\$ 60.00	Y	\$ 60.00	\$ -	\$ 80.00	\$ -
Import C	\$ 80.00	N	N/A	N/A	N/A	N/A
Import D	\$ 100.00	N	N/A	N/A	N/A	N/A
Export A	\$ 100.00	Y	\$ 100.00	\$ (20.00)	\$ 80.00	\$ -
Export B	\$ 80.00	Y	\$ 80.00	\$ -	\$ 80.00	\$ -
Export C	\$ 60.00	Y	\$ 60.00	\$ 20.00	\$ 60.00	\$ 20.00
Export D	\$ 40.00	N	N/A	N/A	N/A	N/A

\* A negative real-time imbalance energy offset (RTIEO) amount is a credit to the offset, positive is a charge to the offset

**Table 2 – Pay as Bid and Bid or Better Settlement HASP Price > RTD Price**

HASP Price	\$ 80.00					
RTD Price	\$ 60.00					
	Bid	Award	As Bid	RTIEO	Bid or Better	RTIEO
Import A	\$ 40.00	Y	\$ 40.00	\$ (20.00)	\$ 60.00	\$ -
Import B	\$ 60.00	Y	\$ 60.00	\$ -	\$ 60.00	\$ -
Import C	\$ 80.00	Y	\$ 80.00	\$ 20.00	\$ 80.00	\$ 20.00
Import D	\$ 100.00	N	N/A	N/A	N/A	N/A
Export A	\$ 100.00	Y	\$ 100.00	\$ (40.00)	\$ 60.00	\$ -
Export B	\$ 80.00	Y	\$ 80.00	\$ (20.00)	\$ 60.00	\$ -
Export C	\$ 60.00	N	N/A	N/A	N/A	N/A
Export D	\$ 40.00	N	N/A	N/A	N/A	N/A

\* A negative RTIEO amount is a credit to the offset, positive is a charge to the offset

### 3.4.3 Comparison with NYISO Intertie Scheduling and Virtual Bidding

The New York ISO (NYISO) is the most relevant ISO/RTO for comparison with the ISO. Like the ISO, the NYISO is a large net importer of power and has an hour-ahead scheduling process

similar to the ISO. However, the NYISO does not allow virtual bids at the interties or at individual internal nodes.

The NYISO schedules imports and exports in an hour-ahead process that is very similar to the ISO's HASP process. The NYISO process/software tool is called RTC. RTC initializes and runs every 15 minutes, looking forward nine 15 minute intervals in time. In addition to scheduling imports, RTC is used to commit quick start units, primarily 10 minute and 30 minute gas turbines. While RTC runs four times an hour, only one of the four runs is currently used to schedule imports and exports. This run is referred to as RTC15 and initializes at the top of the hour and posts 15 minutes after the hour, with schedules for the hour beginning roughly 45 minutes after posting.

If there is no congestion on the external interfaces in the RTC evaluation, RTC will schedule imports and exports, but the price used for settlements will be the real-time price at the relevant proxy bus, computed as the time weighted average real-time price. However, imports scheduled in RTC receive a bid production cost guarantee that if the real-time price is lower than their offer price, they will be paid their offer price. This introduces a potential pay-as-bid element into the market design that is not ideal, but concluded to be necessary to ensure the availability of import supply. The NYISO, like the ISO, is typically a net importer, and is particularly likely to be a net importer during high load conditions when imports may be important for reliably meeting load.

There is no price assurance for exports scheduled in RTC. If the real-time price turns out to be higher than projected in RTC and higher than the price bid by the purchaser for the export, the export buyer has to pay the real-time price for power. The rationale for the absence of any price guarantee is that the scheduling of exports does not benefit New York power consumers and hence there is no basis for them to bear any uplift costs associated with exports. Neither generators nor exporters have volunteered to bear uplift costs to make exporters whole, so there is no price assurance for export transactions.

The exception to interchange prices being determined in real-time is if the interface is constrained in RTC such that the offer price of the marginal import is lower than the internal New York price (import constrained) or the bid price of the marginal export is higher than the internal New York price (export constrained). If a proxy bus is import constrained and the clearing price in RTC is lower than the real-time price, the import supplier is paid the RTC price, i.e. a price lower than the internal NYISO price. Conversely, if a proxy bus is export constrained the clearing price in RTC is higher than the real-time price, the export buyers pays the higher RTC price. Thus, congestion does not give rise to shortfalls and uplift but contributes to surpluses in the form of real-time congestion rents.

The NYISO does not allow virtual bids on the interties, but it should also be pointed out that the NYISO does not allow nodal virtual bidding at this time. All virtual supply and demand bids are cleared at zonal prices.<sup>8</sup> As a result, the market optimization for liquidating virtual supply and demand and determining internal zonal prices occur under the same timeframe. Since NYISO

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<sup>8</sup> A simple training presentation of Virtual Trading in NYISO can be found at [http://www.nyiso.com/public/services/market\\_training/online\\_resources/VirtualTrading/player.html](http://www.nyiso.com/public/services/market_training/online_resources/VirtualTrading/player.html).

does not allow virtual bids on the interties, they do not have a timing disconnect similar to the ISO under the current convergence bidding design.

The NYISO intertie settlement option was reviewed in the Real-Time Imbalance Energy Offset stakeholder process. Given the timeframe allowed and the added complexity that would have been needed to make the process complete for the interim solution the ISO concluded that the NYISO settlement option was not appropriate at that time. Since the ISO, through this initiative, is proposing a longer term solution which would provide additional time to consider the modifications that would be necessary to make the NYISO process applicable to the ISO, there is now more time and merit in examining this option as part of the stakeholder process.

Some stakeholders suggested that providing bid cost recovery for HASP exports would have less liquidity impact on intertie transactions than the bid or better option. The ISO will consider the merits of providing bid cost recovery for HASP import and exports as part of the longer term solution.

#### **3.4.4 Comparisons to the Ontario Model**

Similar to the NYISO model described above, the IESO Ontario prices the interties differently if there is congestion on the interties. If there is no congestion on the interties, intertie resources are dispatched based on hour-ahead prices, but settle at real-time prices. In order to manage this price risk, IESO Ontario offers an “intertie offer guarantee.” The intertie offer guarantee is similar to the ISO’s bid-cost recovery. If, over the course of an hour, the price differential between the hour-ahead pre-dispatch is such that an intertie resource is unable to fully recover bid, then intertie offer guarantee returns the resource to zero operating profits. It does not provide a guarantee of the expected profits from the hour-ahead pre-dispatch, but ensures that resource price risk is sufficiently mitigated.

However, if there is congestion on the interties, the IESO Ontario calculates the internal energy price and the external energy price. The difference between the internal price and the external price is called the “intertie congestion price” (ICP). The ICP is similar to the ISO’s marginal loss and marginal congestion components. IESO Ontario then settles the resources on congested interties at the real time price plus the ICP.

## **4 The ISO Proposal: Two Options**

Given the challenges associated with comprehensive market modifications needed to resolve all intertie pricing issues, the ISO is proposing two options to resolve the issues of intertie pricing and convergence bidding at the interties. The ISO has examined the requirements of each option and has determined that while both are feasible to implement, there are essential timing trade-offs. The options are as follows:

### **Option One**

1. The ISO would implement, by the end of 2012, an interim solution in which virtual bids are:
  - a. Priced at real-time LMP when an intertie’s scheduling constraints are not binding or the absolute value of the intertie constraints’ shadow price is less than \$2.

These intertie constraints consist of each intertie's ITC scheduling limit, as well as the branch group or MSL flow-based limits.

- b. Priced at the HASP LMP when an intertie's scheduling constraints are binding with the absolute value of the intertie constraints' shadow price greater than \$2.
  - c. Subject to a 2.5 percent position limit of each intertie's capacity (ATC) per scheduling coordinator (SC).
  - d. Subject to an increasing threshold for the value of the intertie constraints' shadow price to determine when intertie virtual bids are priced at the real-time LMP or the HASP LMP. Each time the amount of overall real-time imbalance energy offset charges due to offsetting virtual bids exceeds a total of \$3.5M for a rolling 30-day average, the threshold for the intertie scheduling constraint shadow price that determines if virtual bids settle at real-time LMP or HASP LMP would increase for all interties. The real-time LMP will be based on a simple average of the five minute LMPs for the applicable hour for at least 30 days.
  - e. There would be no changes to HASP pricing for physicals resources until a long term solution is put in place.
  - f. When the dual intertie constraints bind in the day-ahead market, the ISO will use different settlement LMPs for physical awards and virtual awards (Option A) based on the shadow price of the respective constraint at which the physical and virtual bids participate.
2. The ISO would continue this stakeholder process to design the details of a long term solution that uses the NYISO intertie pricing model as a basis for settling both intertie convergence bids and intertie physical resources. Once this longer term solution is implemented, the ISO proposes that intertie bids would be settled as follows:
- a. Both intertie physical resources and convergence bids would be settled using an approach modeled after the NYISO approach – at the average RTD LMP (simple average of the five minute LMPs for the applicable hour ) unless there was congestion in HASP due to the scheduling constraints on a tie, in which case they would settle at the HASP LMP.
  - b. The ISO would evaluate as part of developing the longer term solution whether and under what conditions physical intertie resources would be eligible for bid cost recovery to the extent the RTD price is inconsistent with their bid.
  - c. Physical resource deviations from HASP schedules would be settled at the RTD price.
  - d. The current HASP schedules decline charge threshold and penalty would be eliminated.
  - e. At a minimum, the longer term solution will also have to address:
    - i. Hourly bid-cost recovery for intertie resources

- ii. Bid Cost Recovery for exports and the effect on the supply of decremental energy at the interties
  - iii. Potential rules to limit strategic bidding of offsetting physical imports and exports designed to artificially inflate bid cost recovery for physical imports or exports.
  - iv. Two tier bid-cost recovery for the real-time market
3. Implementation of longer term solution would be Spring 2014.

#### Option Two

Option Two has many of the same components as option one. However, Option Two does not offer an interim solution to reintroduce intertie virtual bidding by the end of 2012. Thus, item one of Option One is not a part of Option Two. However, the trade-off would be the longer-term solution, which would include the reintroduction of intertie convergence bidding, would be implemented in the Fall of 2013, six months earlier than Option One. Not implementing a short-term solution would allow the ISO to focus resources on the permanent long-term solution and implement it sooner.

### 4.1 Option One Specific Items

This section details the ISO's proposal for items that are specific to the interim solution component of Option One, above.

#### 4.1.1 Settlement Methodology for Virtual Bids

One goal of this initiative is to provide an appropriate market structure under which convergence bidding on the interties can resume. To accomplish this goal, it is appropriate to modify how intertie convergence bids are settled in a way that provides some of the benefits of convergence bidding while also mitigating the adverse impacts of the bidding patterns and observed market inefficiencies that led to the suspension of convergence bidding on the interties. The ISO proposes to accomplish this by clearing virtual bids on the interties using a methodology that settles intertie convergence bids based on the level of congestion on the interties.

As noted above, since the suspension of convergence bidding in late 2012 and the implementation of other market enhancements, the Real-Time Imbalance Energy Offset has dropped significantly. Therefore, in order to allow SCs to use virtual bids to provide a hedge for price risk, when there is congestion on a given intertie such that the average HASP intertie transfer capacity constraint shadow price exceeds \$2, virtual bids will be automatically liquidated with the opposite sell/buy position at in the HASP and will settle at the HASP LMP.

The ISO has studied the intertie transfer capacity constraint shadow values for interties in 2011 and determined that for most interties, in most hours, the intertie transfer capacity constraint shadow price is zero. However, for those hours in which the shadow price was not zero, as shown in Table 3, the average HASP intertie constraint shadow price is \$2 or less (using

absolute values) only 2.28 percent of the time.<sup>9</sup> Therefore, because these are low frequency events for which the price differential between HASP and real-time is small, virtual bids will be automatically liquidated with the opposite sell/buy position in the HASP, but will settle at real-time LMP. This proposed settlement allows SCs to fully hedge congestion risk in periods of congestion while reducing the volume of virtual bids that settle in HASP and contribute to the Real-Time Imbalance Energy Offset. There will not be bid-cost recovery for convergence bids. Thus, there is no need to consider the bid cost recovery proposal offered in the SCE proposal.

Table 3: Percent of Intertie Transfer Capacity Shadow Prices Above a Given Price When Intertie Transfer Capacity Shadow Values are Greater than Zero

Hourly Average ITC Shadow Price <sup>10</sup>	Percent of Congested Hours Below	Hourly Average ITC Shadow Price <sup>11</sup>	Percent of Congested Hours Below
\$ 2.00	2.28%	\$ 55.00	76.29%
\$ 5.00	4.19%	\$ 60.00	81.74%
\$ 10.00	8.48%	\$ 65.00	86.03%
\$ 15.00	12.72%	\$ 70.00	88.26%
\$ 20.00	16.44%	\$ 75.00	90.96%
\$ 25.00	21.33%	\$ 80.00	92.45%
\$ 30.00	29.62%	\$ 85.00	93.25%
\$ 35.00	42.66%	\$ 90.00	93.53%
\$ 40.00	53.00%	\$ 95.00	94.04%
\$ 45.00	62.69%	\$100.00	94.32%
\$ 50.00	70.42%		

While this proposal reintroduces intertie convergence bidding, it does not fully eliminate the opportunity to engage in the convergence bidding strategies that led to the ISO suspending convergence bidding at the interties, particularly when there is congestion on an intertie in HASP. Therefore, it is reasonable and prudent to implement two additional protective measures: position limits and a Real-Time Imbalance Energy Offset trigger price that would change the intertie transfer capacity shadow price used to determine if virtual bids settle at HASP LMP or the RTD LMP.

**4.1.1.1 Position Limits**

Given the challenges and risks that have been demonstrated with convergence bidding on the interties, the ISO believes it is prudent to impose initial position limits on intertie convergence bids. As an initial starting point, the ISO proposes a limit of 2.5 percent of a line’s intertie transfer capacity for each SC. The use of 2.5 percent of a line’s intertie transfer capacity will allow sufficient hedging across most ties, while allowing the ISO to assess the effectiveness of the new convergence bidding design. This position limit would remain in place for at least one year after convergence bidding on the interties is reopened. Before lifting this limit, the ISO will

<sup>9</sup> There are almost 2,000 observations where the hourly average interties transfer capacity shadow price is greater than zero. Less than 50 observations had hourly average transfer capacity shadow prices plus or minus \$2.

<sup>10</sup> Prices expressed as an absolute value

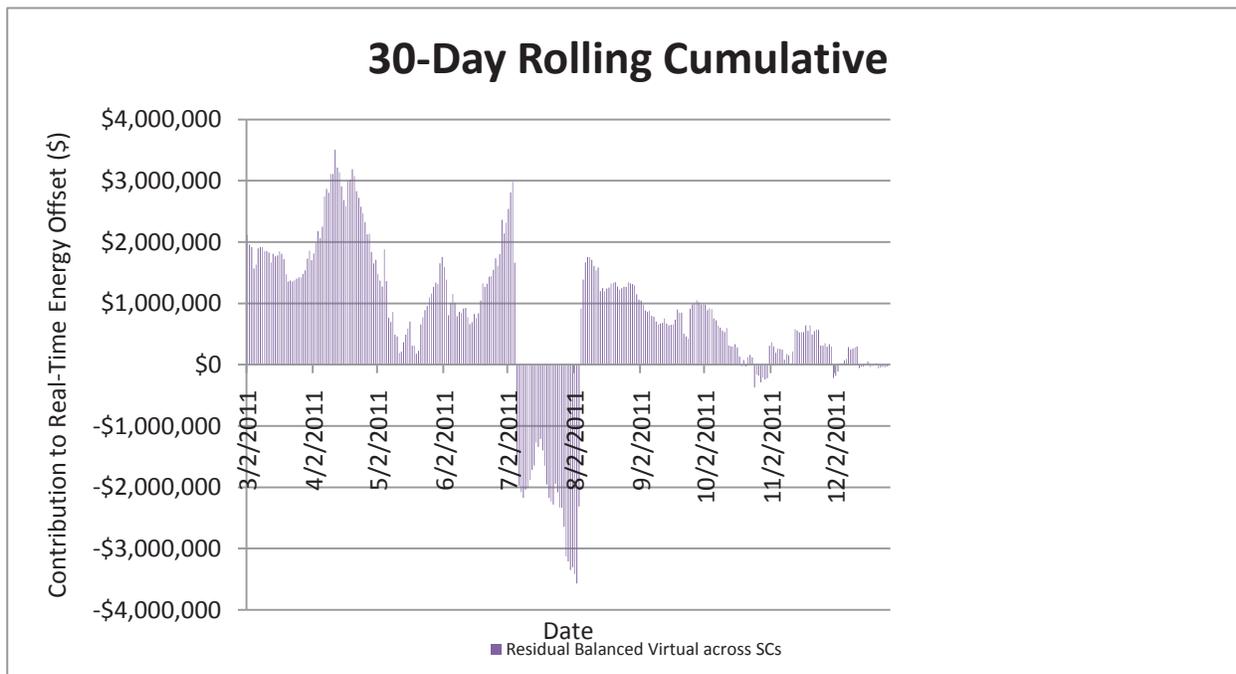
<sup>11</sup> Prices expressed as an absolute value

examine the performance of convergence bids on the interties to determine if additional measures need be implemented to prevent gaming or if the position limits can be raised. The ISO proposes that this be an interim solution and the need for position limits would be reexamined as part of the long term solution.

**4.1.1.2 Real-Time Imbalance Energy Offsets Trigger Value**

While real-time imbalance energy offset charges are a function of numerous factors, it is possible to isolate the portion of the real-time imbalance energy offset that is caused by virtual bids. Offsetting virtual bids created significant uplift between March 2011 and May 2011. Therefore, the ISO proposes putting a cap at the maximum uplift created by residual offsetting virtual bids, or \$3.5 million dollars as shown in Figure 3. If the real-time imbalance energy offset charges attributable to virtual bids reaches \$3.5 million on a rolling 30 day average, the ISO would increase the value of the intertie constraints’ (ITC, branch group or MSL limit) shadow price used to determine if a virtual bid is settled using the HASP LMP or the real-time LMP from \$2 to \$5. Each time this \$3.5M rolling average is reached, the ISO will increase the intertie constraints’ shadow price used to determine if a virtual bid is settled using the HASP LMP or the real-time LMP. See Table 4 for the scale.

**Figure 3: Real-Time Imbalance Energy Offsets Since Convergence Bidding Implemented (30-Day Rolling Average)**



**Table 4. ITC Shadow Price Increases when \$3.5M Threshold is Reached**

Trigger Hit	ITC Shadow Price <sup>12</sup>
Initial	\$2
First time	\$5
Second Time	\$15
Third Time	\$30
Fourth Time	\$55
Fifth Time	Convergence Bidding on the Interties Suspended

This means that fewer convergence bids will contribute to the Real-Time Imbalance Energy Offset. It also means that the convergence bids will be able to perfectly hedge congestion risk in fewer hours. However, such a mechanism creates the incentive to use convergence bids only as a hedge and should reduce the incentives to submitting offsetting virtual bids.

#### **4.1.2 No Changes to HASP Pricing for Physicals Resources**

Real-time imbalance energy offset charges due to dispatch of physical resources has steadily decreased over the last six months. This reduction is the result of improved consistency with procurement targets as well as the implementation of the Flexi-Ramp constraint. Once the ISO lowers the bid floor and implements the Flexi-ramp product, the ISO will have sufficient tools to mitigate the real-time imbalance energy offset charges attributable to the dispatch of physical resources. Therefore, as part of the interim solution, there appears to be no need to change the settlement and pricing for physical intertie resources (except as noted in section 4.2.3 below). However, as noted below, the ISO will consider settlement rule changes for physical resources as part of the longer term solution.

## **4.2 Items Relevant to Both Options**

As outlined above in the introduction to this section, the ISO is proposing to continue this stakeholder process to develop a longer term solution to the intertie pricing and settlements for both physical and virtual intertie resources. This longer-term approach would be pursued under either Option One or Option Two. The ISO proposes to use the NYISO model described above as the starting point for this longer term solution. At a minimum, the longer term solution will also have to address:

1. Hourly bid-cost recovery for intertie resources
2. Bid Cost Recovery for exports and the affect on the supply of decremental energy at the interties
3. Potential rules to limit strategic bidding of offsetting physical imports and exports designed to artificially inflate bid cost recovery for physical imports or exports.
4. Two tier bid-cost recovery for the real-time market

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<sup>12</sup> Prices expressed in absolute values.

Other issues have been vetted so far as part of this stakeholder initiative and should not require additional discussion but are integral parts of the long term solution. While the ISO hopes to resolve these issues as part of the current stakeholder initiative, implementation of these items will occur in conjunction with implementation of the longer term solution. These issues are discussed in greater detail in this section.

#### 4.2.1 Negative Deviations to HASP Imports/Exports

In stakeholder comments in the real-time imbalance energy offset initiative, Powerex identified a concern with the treatment of HASP deviations. An intertie resource that sells energy in HASP, but fails to deliver is not subject to imbalance charges at the RTD price. Instead, failure to deliver on HASP commitments results only in (a) non-payment of the HASP price (up to 10% of the participant’s total HASP respective supply and demand volume per month); or (b) a penalty equal to 50 percent of the HASP LMP for volumes beyond the first 10%.<sup>13</sup> As a non-performing HASP sale results in the ISO purchasing that energy from internal resources in the RTD, this revised straw proposal proposes as part of the long-term solution, that failure to deliver on HASP awards should be charged the RTD price, independent of the magnitude, frequency or reason for such failure. Intertie resources scheduled in the day-ahead market already pay the real-time price for energy that is not delivered in real-time. This rule change improves the consistency of treatment between the day-ahead market and HASP for intertie resources.

The ISO has reviewed the penalties imposed for failure to deliver on HASP schedules. Table 3 shows that these penalties have been insignificant for 2011. This data shows that very few undelivered imports or exports exceed the 10% margin.

**Table 3: Monthly Penalties for Failure to Deliver on HASP Commitments**

Month	Penalties
1/1/2011	\$25,861.87
2/1/2011	\$60,375.89
3/1/2011	\$16,872.14
4/1/2011	\$24,562.05
5/1/2011	\$13,721.57
6/1/2011	\$12,284.98
7/1/2011	\$94,221.41
8/1/2011	\$75,741.50

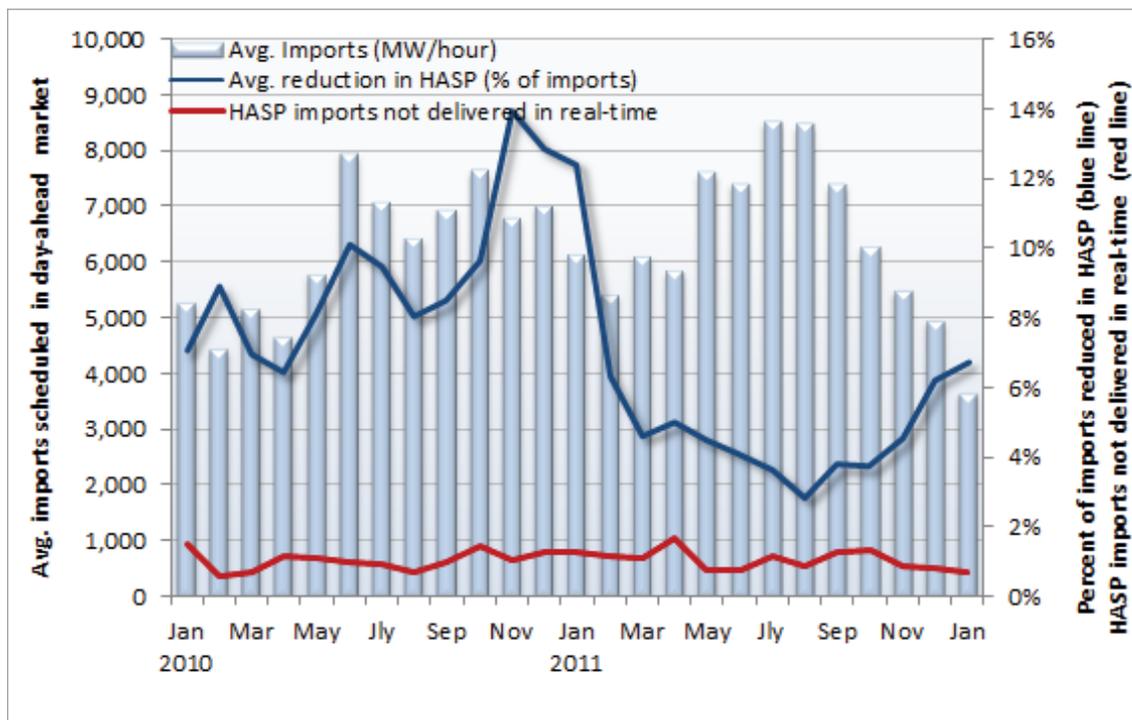
<sup>13</sup> See ISO Tariff, Section 11.31

**California ISO**

9/1/2011	\$32,545.35
10/1/2011	\$17,995.75
11/1/2011	\$8,478.53
12/1/2011	\$4,295.47
<b>Grand Total</b>	<b>\$386,956.51</b>

Though very few scheduling coordinators are triggering the penalty criteria (85 percent of the penalties have been assessed to six scheduling coordinators), it is still important to note that small declines of HASP dispatches can lead to significant effects on the real-time prices. As such, these deviations may significantly increase the real-time imbalance energy offset charges. Therefore, the ISO proposes to require all resources that fail to deliver on HASP commitments to buy back their deviations at the real-time price once the long term solution is put in place. The ISO believes this will create the proper incentives for resources dispatched in HASP to perform in such a way that will reduce divergence of HASP and real-time prices. The Powerex proposal, described above, suggests that the deviations be settled at the worse of the HASP or real-time price to create a stronger incentive to deliver. However, the ISO believes that settling deviations at the real-time price is more aligned with cost-causation principles. While some have asserted that such a requirement would negatively impact the liquidity of the market for imports, Figure 2 demonstrates that the quantity of imports that fail to deliver on final HASP schedules are typically small. However, until the longer term solution is implemented, the ISO will not eliminate the penalty charge for resources with undelivered volumes beyond the first 10%. Keeping this penalty acts as a deterrent for resources that might become continuous problem for failing to deliver on HASP commitments and provides reliability benefits by limiting undelivered HASP dispatches while the longer term solution is developed.

Figure 2: HASP Awards – Delivered versus Undelivered



#### 4.2.2 Issue with Convergence Bidding Liquidation and Settlement Timing

Another issue with the current market design for convergence bidding is the structural disconnect between the liquidation of virtual supply/demand and the establishment of real-time binding settlement LMPs for physical supply/demand. The current market design has three binding settlement LMPs for physical supply/demand (IFM, HASP for interties, RTD for internal generation/load), three binding settlement LMPs for virtual supply and demand (IFM and HASP for interties, and RTD for internal nodes), but only two liquidation market optimizations for virtual supply and demand (IFM and HASP).

Within the stakeholder process to find a longer term solution, the ISO will attempt to resolve this difference. Using the NYISO approach, with appropriate modifications to account for the addition of virtual bids, should resolve issue to a large extent.

#### 4.2.3 Price Inconsistency Caused by Intertie Constraints

In a stakeholder initiative run in parallel to the real-time imbalance energy offset initiative, the ISO has worked to resolve price inconsistency<sup>14</sup> issues that are caused by enforcing the two intertie constraints implemented with convergence bidding. Under the current design, the ISO enforces two constraints at scheduling points: (1) net physical schedules across each scheduling point, ignoring the accepted virtual schedules to ensure that the physical schedules are within the established scheduling limit for that scheduling point and (2) physical and virtual imports net of physical and virtual exports must also be within established scheduling limits for

<sup>14</sup> Additional documentation for the Price Inconsistency Cause by Interties Constraints stakeholder initiative is available at <http://www.caiso.com/2b6d/2b6dbef62e710.html>.

that scheduling point. Since convergence bidding was implemented, the ISO has seen cases where physical export bids are clearing the market at LMPs that are inconsistent (higher) than the submitted bid for the scheduled resource. Market participants have raised concerns regarding the negative impact this pricing inconsistency may have on their settlement outcome.

In the straw proposal for that previous initiative, the ISO included two options that would result in consistent pricing: (A) different settlement LMPs for physical awards and virtual awards and (B) economic curtailment. In the draft final proposal for that initiative, the ISO removed option B from consideration given potential adverse market outcomes. The potential adverse market outcomes arise because virtual export bids could clear against internal supply (at a higher price), but would be settled at the lower physical import price which could lead to day-ahead revenue adequacy issues. Stakeholders did not support option A because it would result in different price for virtuals and physical imports/exports. Several stakeholders requested that exports be provided bid cost recovery. Several stakeholders recommended no change to the current design as the impact was consistent with the frequency of this known issue during the convergence bidding design process.

#### **4.2.3.1 The ISO's Proposal (Option A)**

Prior to curtailing convergence bidding at the interties, only the net virtual plus physical constraint was used in pricing. In order to resolve the price inconsistency problem the ISO proposes to allow the shadow prices of both constraints that are currently implemented to be factored into the settlement LMPs. This will produce two different settlement LMPs for cleared physical and virtual bids. The virtual award will still be settled at LMP\*V, while the physical award will be settled at:

$$\text{LMP}^*P = x^*\text{SYS} - x^*\text{PVI} - x^*\text{PI} + x^*\text{PVE} + x^*\text{PE}$$

xPVI = import physical plus virtual constraint

xPI = import physical constraint

xPVE = export physical plus virtual constraint

xPE = export physical constraint

\* = Optimal solution

One outcome of this option is that the virtual awards do not receive the same settlement LMP as the physical awards if the import or export physical constraint is binding. However, this poses no adverse outcome because even today where only one constraint is being priced, the two shadow prices of both constraints already affect the dispatches in the market optimization. In other words, even today physical and virtual bids are economically cleared according to different LMPs, but priced at the same settlement LMP. Option A, therefore, produces a better outcome where the physical and virtual bids are priced in a way that is consistent with how they are cleared, which makes this option the most transparent and mathematically correct approach to maintain price consistency.

This option does not require changes to the current market optimization. However, it does require some settlement changes, OASIS reporting changes, and business practice changes.

Today, there is only one pricing node at the ITC priced at LMP\*V. In order to accommodate the two different settlement prices, the ISO needs to create an additional pricing node for the physical resources at LMP\*P at the ITC. For physical bids, the pricing node priced at LMP\*P must be specified, and for virtual bids, the pricing node at LMP\*V must be specified. Both LMP\*V and LMP\*P will be published in OASIS.

Parties raised a concern that Option A may drive market participants to change their behavior and implement a bidding strategy of submitting physical bids rather than virtual bids with the intent to liquidate their positions in HASP assuming a more advantageous LMP for physical awards. For example, if the physical constraint is binding in the import direction, physical export will receive a lower price than a virtual export, so the virtual export may opt to be physical and liquidate in the real-time market. While this strategy would not be prohibited, it cannot generate sustainable revenue, because the increased physical exports can relieve the physical constraint congestion, rendering this strategy less profitable. It is also possible that the strategy could create congestion in the export direction resulting in an adverse affect. In addition, the ISO implemented the HASP reversal settlement rule concurrently with convergence bidding. This rule was put in place to eliminate any potential incentive for market participants to submit implicit virtual bids by reversing any monies paid due the difference between the day-ahead price and the HASP price for any MW quantity that is not e-tagged. Therefore, this rule to some extent alleviates the concern of using physical bids to conduct implicit virtual bidding because they are settled at different prices.

Many stakeholders commented that the potential for different prices for physical imports/exports and virtual supply/demand at the interties would limit the ability for market participants to hedge day ahead positions. Table 5 illustrates the hedge of a physical import. Since the virtual export price is greater than the physical import, the physical import limit is binding in this example. As long as the day-ahead price at which the virtual export clears is lower than the HASP price the market participant is able to hedge a portion of the outage that is bought back in HASP.

**Table 4 – Hedge of Physical Import with Virtual Export**

	MW	DA	HASP	Revenue		MW	DA	HASP	Revenue
Physical Import	100	\$ 50.00		\$ 5,000.00	Physical Import	100	\$ 50.00		\$ 5,000.00
Virtual Export	20	\$ (55.00)	\$ 60.00	\$ 100.00	Virtual Export	20	\$ (65.00)	\$ 60.00	\$ (100.00)
HASP Outage	20		\$ (60.00)	\$(1,200.00)	HASP Outage	20		\$ (60.00)	\$(1,200.00)
Actual with Hedge	80		\$ 48.75	\$ 3,900.00	Actual with Hedge	80		\$ 46.25	\$ 3,700.00
Actual w/o Hedge	80		\$ 47.50	\$ 3,800.00	Actual w/o Hedge	80		\$ 47.50	\$ 3,800.00

Some market participants advocate that the ISO provide bid cost recovery to exports to remedy the inconsistencies that result from the existing approach for settling the two constraints. Bid cost recovery has the indirect effect of settling virtual and physical bids at different net prices; therefore, the ISO finds that it is preferable to settle at the two LMPs that could result from the two different constraints, but renders the pricing consistent with the resources bid.

## **5 Next Steps**

The ISO is will host a stakeholder meeting on March 20, 2012. Comments on this revised straw proposal are due on March 27, 2012. Stakeholders interested in participating in the working group should notify the ISO via email to [intertiepricing@caiso.com](mailto:intertiepricing@caiso.com) by written comments by March 16, 2012.

## CERTIFICATE OF SERVICE

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

Dated at Washington, D.C. this 16<sup>th</sup> day of March 2012

/s/ Anna Pascuzzo  
Anna Pascuzzo