California Independent
System Operator Corporation

August 28, 2012

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

Re: California Independent System Operator Corporation
Docket No. ER12-____- 000

Tariff Amendment and Request for Waiver of Sixty Day Notice Requirements

Dear Secretary Bose:

The California Independent System Operator Corporation ("ISO") respectfully submits for filing an amendment to the ISO tariff.[1] The purpose of this filing is to build upon and enhance the existing provisions of the ISO tariff that prevent exposure to excessive payments that can be caused by the exercise of market power.

The ISO requests waiver of the sixty-day notice requirement under section 35.11 of the Commission's regulations and requests an effective date of August 29, 2012. Waiver is appropriate and necessary to enable the ISO to eliminate immediately current incentives for market participants to engage in the identified bidding strategies that, if left unaddressed, may result in excessive payments.

I. EXECUTIVE SUMMARY

The ISO seeks to amend its tariff to address market power in two areas of the ISO market that, if left unchecked, can result in unjust and unreasonable payments to resources that exercise such market power. The ISO has, to date, observed only one market participant taking advantage of these opportunities to exercise market power, and available mitigation measures have limited excessive gains from this behavior.

[1] The ISO submits this filing pursuant to Section 205 of Federal Power Act,16 U.S.C. § 824d, and Sections 35.11 and 35.13 of the Commission's regulations, 18 C.F.R. §§ 35.11, 35.13 (2012).

However, the ISO has determined that additional mitigation authority is warranted to protect the market from noncompetitive behavior.

The ISO proposes to do this in two ways. First, the ISO proposes to expand the circumstances under which it is permitted to mitigate the amount of exceptional dispatch energy payments to include all exceptional dispatches that are needed to move a resource from its minimum physical operating level to its "minimum dispatchable level," at which the ISO is able to use the resource effectively to meet certain reliability criteria. This revision will prevent a resource from inflating the price that the ISO must pay for such dispatches through the exercise of market power.

Second, the ISO proposes to amend tariff provisions governing payment for residual imbalance energy. Residual imbalance energy is energy attributable to a resource ramping down from a real-time dispatch at the end of a previous hour or ramping up to a real-time dispatch at the beginning of an upcoming hour. The ISO created this category of energy for settlement purposes because ramping energy that occurs as a result of instructions issued by the ISO in a preceding or subsequent hour is settled differently than ramping energy that occurs within a given hour. The ISO settles ramping energy that occurs within the same hour in which the instruction is issued based on the locational marginal price ("LMP") and guarantees the resource's bid through the bid cost recovery process. Residual imbalance energy, however, is currently paid as bid. This payment structure creates an opportunity for the exercise of unilateral market power, through which resources can inflate payments for such energy to levels that far exceed their costs of producing that energy. The ISO proposes to pay the resources the LMP unless the LMP is lower than their bid, in which case the ISO will pay the resource the lesser of the resource's bid price or the default energy bid.

Both of these rule changes address situations in which a market participant's bidding behavior can create or contribute to the exercise of market power. Also, both of these changes eliminate the incentive for participants to bid and participate in the ISO markets in an effort to inflate payments through these two out-of-market mechanisms. The ISO seeks to provide incentives for parties to submit bids reflecting their true marginal cost of energy so that the ISO market can continue to create efficient and feasible dispatches and prices that reflect the true cost of serving load through the ISO system. The two rule changes further this goal, benefitting overall market efficiency.

The proposed changes will facilitate the efficient operation of the ISO's markets, while ensuring that all resources are compensated fairly. As discussed below, the impact on resources not engaged in the exercise of market power will be minimal and the proposed rules will ensure that resources recover their costs. Therefore, the Commission should accept the proposed rule changes and allow the ISO immediately to address these two areas of market power.

II. BACKGROUND

A. Exceptional Dispatch

Tariff section 34.9,[2] allows the ISO, for specified circumstances, to issue exceptional dispatch instructions – i.e., incremental or decremental dispatches outside of the order determined by the ISO's market optimization software. In addition, section 39.10 allows the ISO, under certain circumstances in which market power may exist, to mitigate the compensation that it would otherwise pay for generating units that receive exceptional dispatches.

Specifically section 39.10 permits the ISO to mitigate the price paid for an exceptional dispatch when the dispatch was made for any of three purposes: (1) to address reliability requirements related to non-competitive constraints, (2) to ramp resources with ancillary services awards or residual unit commitment capacity to a dispatch level that ensures their availability in real-time; and (3) to address environmental constraints in the Sacramento Delta region known as "Delta Dispatch." These mitigation measures consist of the following settlement rules: resources exceptionally dispatched for these reasons are paid the higher of their default energy bid or the locational marginal price at the resource's location, unless the resource's bid price is less than the default energy bid.[3] If the resource's bid price is less than its default energy bid, the resource is paid the higher of its bid price or locational marginal prices. This settlement rule protects against the exercise of market power by preventing a resource with potential market power that bids its energy at high prices from being paid an amount higher than the locational marginal price or the resource's (cost-based) default energy bid. If a resource is exceptionally dispatched for reasons not enumerated in section 39.10 of the tariff, the mitigation measures do not apply. As a result, that resource currently will be paid the higher of its bid price, its default energy bid, or the applicable locational marginal price.[4]

The exceptional dispatch mitigation rules have been revised since the commencement of the ISO's new market design in 2009. For the start of the ISO's LMP-based market, the Commission had granted the ISO authority to mitigate all exceptional dispatches for incremental energy for the first four months under its new market design, beginning April 1, 2009. After the first four months, the ISO was left with the authority to mitigate exceptional dispatches only if the exceptional dispatches were

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[2] Unless specified otherwise, section references are to sections of the ISO tariff.

[3] ISO Tariff § 11.5.6.7.2 and 11.5.6.7.3.

[4] Resources that are not resource adequacy resources will receive an automatic designation to receive an additional capacity payment for the month if the resource is exceptionally dispatched unless the scheduling coordinator on behalf of the resource has elected to receive supplemental revenues. *See* ISO Tariff §§ 39.10.3, 39.10.4 and 43.2.5.

to address reliability requirements for non-competitive transmission constraints or Delta Dispatch.[5]

While the Commission limited the original mitigation (after the first four months) to the two specified categories, it also left open the possibility that the ISO might "gather evidence to demonstrate the potential to exercise market power for specific instances of Exceptional Dispatch."[6] Although the Commission was at the time referring specifically to information gathered during the four-month transition period, it did not foreclose the possibility that such evidence would appear later.

In 2011, the ISO observed such evidence and took steps to address it through an amendment to expand the circumstances under which mitigation was permitted. As described in the ISO's filing in Docket No. ER11-3856, the ISO had observed a bidding strategy that resulted in certain resources being awarded in the day-ahead market ancillary services or residual unit commitment awards that would be infeasible in the real-time market because the resource would be operating in real-time at its minimum operating level, from which it would be unable to ramp up in time to meet its obligation. In effect, the ancillary services award or residual unit commitment obligation was "stranded" because the unit could not ramp in time to meet the obligation.[7] These units had pursued bidding strategies such that they were scheduled to operate at minimum load over the most critical morning and evening hours when market energy prices and reliability concerns are generally highest. The scheduling coordinators for these units submitted all of the energy above minimum load at bid prices well above competitive levels, up to the $1,000/MWh bid cap. In order to make any market-awarded ancillary services and residual unit capacity available, it was therefore necessary for the ISO to issue exceptional dispatches to these units.

Because of these events, the ISO filed a tariff amendment seeking to expand the circumstances under which it could mitigate exceptional dispatch compensation to include exceptional dispatches necessary to ramp resources with ancillary services awards and residual unit commitment capacity to a dispatch level that ensures their availability in real-time. The ISO demonstrated that the tariff amendment was needed to mitigate the exercise of market power. The Commission agreed and approved the amendment on August 19, 2011.[8] This additional mitigation authority is listed in Section 39.10 summarized above.

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[5] *Cal. Indep. Sys. Operator Corp.* 126 FERC ¶ 61,150 at P 71, *on reh'g* 129 FERC ¶ 61,144 (2009).

[6] *Id.* at P 74.

[7] Such awards are infeasible when the market dispatches a generating unit at minimum load and the unit's ramp rate is such that the unit is unable provide energy from the capacity award within the required time limits. Under such circumstances, the ISO may need to issue an exceptional dispatch to bring the generating unit up to its minimum dispatchable level. These concepts are discussed below and in Attachment C, the Testimony of Mark A. Rothleder (Exh. ISO-1).

[8] *See Cal. Indep. Sys. Operator Corp.*, 136 FERC ¶ 61,118 (2011).

Although this additional mitigation authority has provided important protection in the particular circumstance of a "stranded" ancillary services award or residual unit commitment capacity, the ISO has determined that the further mitigation measures are necessary in light of more recent evidence of market power.

B. Residual Imbalance Energy

Residual imbalance energy is energy attributable to ramping up to a dispatch at the beginning of an upcoming hour or ramping down from a dispatch, including an exceptional dispatch, in the previous hour. This category of energy was created for settlements purposes because ramping energy that occurs as a result of instructions issued by the ISO in a preceding or subsequent hour is settled differently than ramping energy that occurs within a given hour.[9] Like all real-time imbalance energy, residual imbalance energy is energy that occurs above or below the day-ahead scheduled energy. However, in any given five-minute dispatch interval, residual imbalance energy is distinct from other instructed imbalance energy and does not coincide with any energy that is actually due to an economic dispatch by the ISO in that interval. Put another way, this is additional energy that a unit ends up producing on the way up to or down from an ISO dispatch instruction.

Under the ISO's current settlement rules in Section 11.5.5, the ISO compensates scheduling coordinators for all energy classified as residual imbalance energy based on the resource's bid from which the resource is being ramped up to, or ramped down from, i.e., the reference hour bid. Therefore, where the dispatch causing the residual energy is an exceptional dispatch, and even when the ISO settles exceptional dispatch energy based on mitigated energy settlement, the associated residual imbalance energy is eligible to be paid as bid.

The classification of the inter-hour ramping energy as residual imbalance energy was adopted under the ISO's zonal real-time market, which preceded the ISO's current LMP-based energy market. When the ISO transitioned to its LMP-based market, the ISO incorporated the same energy category for this type of energy and adopted the same pricing.[10]

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[9] *See* Attachment E, Testimony of Bradford Cooper (Exh. ISO-3) at 8-9.

[10] Section 11.5.5 containing the residual imbalance energy provisions was accepted by the Commission on September 21, 2006. *Cal. Indep. Sys. Operator Corp.,* 116 FERC ¶ 61,274 (2006). Subsequently, in response to a compliance filing unrelated to the payment of residual imbalance energy, an intervenor challenged the ISO's exclusion of residual imbalance energy from the bid cost recovery process. The ISO explained that the exclusion was appropriate given that the ISO paid a resource based on its bid , which obviated the need for bid cost recovery. *Cal. Indep. Sys. Operator Corp*., 123 FERC § 61,285 (2008).

III. The Proposed Amendment Is Necessary to Address Opportunities for the Exercise of Market Power.

A. Mitigation Is Necessary to Eliminate the Potential Gains from the Exercise of Market Power in Connection with Exceptional Dispatch to Ramp Resources to Minimum Dispatchable Level.

The ISO has determined that an additional category of exceptional dispatch mitigation is now necessary because of the existence of market power in situations where a bidding strategy contributes to the need to exceptionally dispatch resources. The proposed amendment provides for mitigation of all exceptional dispatches that are necessary to dispatch a resource up to its minimum dispatchable level.

This additional category of mitigation is necessary as a result of the temporal market power for certain types of resources. These are primarily older resources that can increase output only slowly at lower operating levels, which renders them effectively unavailable to meet reliability requirements. When operating at or above a higher level – the minimum dispatchable level – these units can increase output more quickly and are usable for meeting both market and reliability requirements. A scheduling coordinator can utilize bidding strategies that result in resource commitment at minimum operating levels under circumstances where there is a reasonable expectation that the ISO will need to utilize exceptional dispatch to move the resource to its minimum dispatchable level. The scheduling coordinator can then bid in real-time at a price well in excess of its costs, up to the $1,000 bid cap. Once a resource is committed, the scheduling coordinator can take advantage of non-competitive market conditions unilaterally to drive the ISO to dispatch the resource at this excessively high bid price. If the ISO issues an exceptional dispatch to the unit, and the reason for the exceptional dispatch does not fit within one of the three existing mitigation categories, the ISO must pay the high bid prices.

The attached testimony of Mr. Mark A. Rothleder[11] and Dr. Jeffrey D. McDonald,[12] describes this process in more detail. As they explain, resources provide the ISO with an "operational ramp rate." The operational ramp rate is the MW/minute rate at which the unit can increase its energy output, if dispatched from a given operating range. The operational ramp rate is dynamic and can vary in stages over the unit's operating range. For example, a resource may be capable for ramping at a rate of 1.5 MW/minute when operating between 25 and 125 MW, and at a rate of 5 MW/minute when operating at 126 to 275 MW.[13] In this example, the minimum dispatchable level would be 126 MW.[14] For most units, minimum dispatchable level corresponds to the lower limit of the

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11 Attachment C.

12 Attachment D, Testimony of Jeffrey D. McDonald (Exh. ISO-2).

13 *See* Rothleder Testimony, Attachment C, at 8-9.

14 *Id.*

operating level at which the generating unit's ramp rate is at its highest level.[15] Resources may also have operating ranges above their physical minimum load in which they cannot actually operate and produce energy reliably. The ISO must ramp these units in the same direction (up or down) until they clear this range. The ISO must thus adjust for such forbidden operating regions in determining minimum dispatchable level.[16] For a very limited number of units, this minimum dispatchable level corresponds to a higher operating level which must be reached before units can provide regulation due to forbidden operating regions or other resource-specific operating constraints.[17] A number of large units have a much lower MW/minute rate when operating at minimum load than at minimum dispatchable level, such that they can provide nearly three times as much upward ramping capacity within 30 minutes when operating at this minimum dispatchable level rather than at their minimum physical operating level.[18]

Whether a resource is at its minimum dispatchable level may determine whether it is capable of responding to a particular reliability need. In this instance, the need is to have enough capacity on-line and operating at levels that provide enough capacity that could be ramped up within 30 or 60 minutes to protect against potential contingencies that could threaten reliability in a sub-region or at a system-wide level.

The ISO's full network model and market software take into account most transmission-related constraints in the ISO system. The full network model, however, does not account for all possible contingencies, such as load uncertainty, loss of excessive amounts of generation, and potential outages of the major interties and import limit constraints. For example, in the event of a major generation contingency or outage of the Pacific DC Intertie, the ISO must take actions to restore flows on thermal lines (including the Southern California Import Transmission) to regular ratings within 30 or 60 minutes.[19]

During the operating day, the ISO may issue exceptional dispatches to some units to ensure that they operate at their minimum dispatchable level above minimum operating levels (at which the units' ramp rates may be extremely low), so that the resources can ramp much more quickly to their maximum available capacity. These resources may have already received exceptional dispatches at minimum load or have day-ahead market schedules at minimum load. These resources are then positioned to

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[15] Under the proposed amendment, because some units may be needed to provide regulation, "minimum dispatch level" may also refer to the lower limit of the unit's regulating range if it is greater than the lower limit of the operating level at which the generating unit's ramp rate is at its highest level.

[16] Rothleder Testimony, Attachment C, at 5-7.

[17] *Id.* at 6-7.

[18] *Id.* at 9-10.

[19] *Id.* at 8, 12-16.

receive an exceptional dispatch in the real-time market to move them to their minimum dispatchable levels.[20]

Under certain system and market conditions, some specific resources, with minimum dispatchable levels that are higher than their minimum operating levels, have a relatively high probability of receiving an exceptional dispatch for additional real-time energy if they are operating at minimum operating levels during peak hours. As explained by Dr. McDonald, these circumstances provide the resources with significant temporal market power in the real-time market to force the ISO to pay non-competitive prices, up to $1,000 per MWh, to move the resource to its minimum dispatchable level. This market power may arise even when substantial capacity may be available in the day-ahead market to meet projected energy demand.[21]

The day-ahead market and exceptional dispatch process are designed to avoid committing excess capacity beyond that needed to meet anticipated energy and reliability requirements. The ISO must therefore dispatch energy to meet unanticipated requirements in real-time. Further, in real-time, if the ISO determines that it needs additional resources at minimum dispatchable levels, it must dispatch these resources to that level regardless of price. The bid price of the needed units at that time may be much higher than when the ISO committed them day-ahead, because units can raise their bid price in real-time after they receive the initial day-ahead exceptional dispatch or day-ahead market commitment.[22]

Thus, a resource may ensure that the ISO commits it in the day-ahead market by submitting a day-ahead bid or self-schedule designed to ensure commitment, but only at the minimum operating level during peak hours. In the real-time market, the unit may submit high bids in excess of competitive levels, up to the $1,000/MWh maximum, during peak hours when the ISO may need to have the unit's capacity available to protect against the various contingencies described above. If the ISO subsequently must dispatch the resource to its minimum dispatchable level, it will need to pay the resource the excessively high bid price unless mitigation is available under the current categories, which do not encompass all dispatches to minimum dispatchable level. Exceptional dispatches for capacity-based requirements can last eight or more hours over the peak load hours of the day.[23] These exceptional dispatches are not currently subject to mitigation.

As Dr. McDonald discusses, this bidding strategy is not just theoretical. The ISO has observed one market participant put it into practice. Over the last few months, total payments for these identified cases have amounted to approximately $2.8 million more than if the ISO had been able to mitigate the bids.[24] The potential use of this bidding

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20 *Id.* at 4-5. 8.

21 McDonald Testimony, Attachment D, at 6-8.

22 *Id.* at 8-11.

23 *Id.* at 11-15.

24 *Id.* at 17.

strategy by other market participants presents a significant risk that suppliers may impose far greater excessive and unjust costs on the market.

Dr. McDonald also discusses a variation on this bidding strategy that the ISO has observed. In this case, the resource takes advantage of the facts that exceptional dispatches to minimum dispatchable level last several hours and that participants are allowed to change their bid prices up to about 75 minutes before the trade hour. The resource can therefore increase its bid after receiving a real-time exceptional dispatch.[25] To date, the ISO has only observed this bidding behavior in connection with exceptional dispatches involving one market participant, and those dispatches were subject to mitigation under existing tariff provisions. Had the exceptional dispatches not been subject to mitigation, the ISO would have paid the resources significant excessive cost due to this absolute unilateral market power in the real-time market.[26]

B. Mitigation Is Necessary to Eliminate the Potential Gains from the Exercise of Market Power in Connection with Residual Imbalance Energy.

As part of an ongoing stakeholder process in which the ISO has been examining the impact of persistent uninstructed deviations on bid cost recovery payments, the ISO previously identified the potential to expand residual imbalance energy as a result of persistent uninstructed deviations from ISO dispatches.[27] Until more recently, however, the ISO had not observed a significant level of such payments, and continued its efforts to find a remedy through the stakeholder process. Earlier this summer, the ISO noted an increase in payments for residual imbalance payments associated with exceptional dispatches.[28] Mr. Cooper explains that for the past 14.5 months the cost of residual imbalance energy has generally ranged from $1 to $2 million per month, but this level began to increase to over $2 million in June and July of this year and has gone up markedly in the first half of August, with costs for that half month totaling almost $5 million.[29] The recently observed increase has not been due to persistent uninstructed deviations from ISO instructions, but instead has been caused primarily by an increase in exceptional dispatches and the residual imbalance energy payments incurred as a result of such dispatches. While the exceptional dispatches in many cases may have been settled based on a mitigated bid, under the current tariff requirements the residual imbalance energy was not. While the ISO has observed only a limited number of instances of this behavior, the cost of residual imbalance energy has increased significantly in the past two months. Therefore, the same market behavior described

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25 *Id.* at 16-17.

26 *Id.* at 17-18.

27 http://www.caiso.com/Documents/Addendum_BidCostRecoveryMitigationMeasuresDraftFinalProposal.pdf

28 *See* Cooper Testimony, Attachment E, at 12-13.

29 *Id.* at 13.

above, involving excessive real-time bid prices, contributed to the expansion of the cost of residual imbalance energy.

As described by Mr. Cooper, and as discussed in the stakeholder process, the current pricing structure also creates an incentive for a resource to inflate residual imbalance energy payments merely by persistently deviating from its dispatches.[30] This is possible regardless of whether the residual imbalance energy is as a result of an exceptional dispatch or a market dispatch. This incentive occurs because the ISO market ensures feasible dispatches and will re-dispatch a unit that is dispatched to ramp down, and that does not follow the dispatch down, from its current operating point, rather than from the lower operating point the unit would be at had it followed the dispatch.[31] This increases the amount of residual imbalance energy. In this manner, market participants can obtain significant market revenue in excess of their actual costs associated with residual imbalance energy.

Mr. Cooper testifies that the current pricing for residual imbalance energy creates the incentive for resources to submit real-time bids for energy that significantly exceed the resource's marginal cost for energy.[32] Dr. McDonald further testifies that he has observed the exercise of market power to inflate residual imbalance energy payments and that the potential gains of receiving expanded revenue based on uncompetitive bids can be significant enough to provide an incentive for more suppliers to exercise non-competitive bidding strategies.[33] In support of this conclusion, Dr. McDonald observes that $5.9 million of the excess gain from residual imbalance energy payments for June 1, 2012 through August 15, 2012 can be attributed to one participant's exercise of market power in connection with exceptional dispathces.[34]

IV. Description of Tariff Changes

A. Exceptional Dispatch Mitigation

To address the excessive payments for exceptional dispatch energy needed to ramp a resource up to minimum dispatchable level, the ISO proposes to amend section 39.10 of the ISO tariff to add a fourth category of exceptional dispatches for which the ISO mitigates payment, namely those exceptional dispatches issued to bring a generating unit to its minimum dispatchable level. The proposal also adds a definition of "Minimum Dispatchable Level" to Appendix A of the ISO Tariff, as follows: "The greater of (1) the lower limit of the fastest segment of a Generating Unit's Operational

30 *Id.* at 16-19.

31 *Id.* at 17-18.

32 *Id.* at 22-23.

33 McDonald Testimony, Attachment D, at 14-15, 28-30.

34 McDonald Testimony, Attachment D, at 31.

Ramp Rate, as adjusted for the Generating Unit's Forbidden Operating Regions, if any, and (2) if the resource is providing regulation, the lower limit of a Generating Unit's Regulating Range." As described above, this definition corresponds to the minimum level at which grid operators must ensure that units are operating in real-time, given their specific unit operating constraints, to ensure that they are capable of responding as needed to meet a variety of reliability contingencies that may not be met by dispatches issued by the ISO market software. These revisions remove the ability of a resource to gain market power rents when subject to exceptional dispatches to minimum dispatchable levels. They also eliminate the incentive for resources to submit day-ahead bids designed solely for the purpose of being committed, and thus increase the likelihood that the most competitive units will be available in the real-time market. As set forth in Mr. Rothleder's testimony, the definition is designed to capture the set of older resources that are not dispatchable at their minimum operating levels.[35]

This proposal ensures cost recovery and therefore is not punitive, nor will it discourage participation in ISO markets. Although resources subject to mitigation under the proposal cannot set the market price, they can earn the market price and will recover their costs if the default energy bid is higher than the market price, unless the resource voluntarily bids below its default energy bid, in which case the resource will be compensated at the higher of the market price or bid price.[36] These mitigated energy settlement rules have been in place since April 2, 2009, and have been found to be just and reasonable for the existing three categories where the Commission has found the potential for exercise of market power. The ISO submits that it has demonstrated that a fourth category of mitigation is required and, as in the case of the existing mitigated exceptional dispatch energy settlement, is just and reasonable.

B. Settlement of Residual Imbalance Energy

To eliminate the adverse incentives created by existing residual imbalance energy settlement, the ISO proposes to pay all residual imbalance energy in the same manner, regardless of its cause. This new settlement rule essentially caps the payment for incremental residual imbalance energy at the greater of the LMP for that interval or the resource's default energy bid (or bid price if it is lower than the default energy bid). The ISO will calculate payment as follows.

As it does today, the ISO will calculate the residual imbalance energy settlement amounts for each ten-minute settlement interval as the sum of the two applicable five-minute dispatch intervals. For each five-minute dispatch interval, the ISO will determine the residual imbalance energy settlement amount as the product of the MWhs of residual imbalance energy for that dispatch interval and the residual imbalance energy settlement price. In dispatch intervals in which the resource has incremental residual

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[35] Rothleder Testimony, Attachment C, at 6-7, 10-11.

[36] If the resource is dispatched to a level above the minimum dispatchable level, the resource will not be subject to mitigation unless one of the three categories of mitigation currently included in tariff section 39.10 applies.

imbalance energy,[37] the ISO will pay for the residual imbalance energy based on the LMP if the LMP is greater than the lesser of (1) the resource's default energy bid, or (2) the bid that led to the residual imbalance energy. Similarly, in dispatch intervals in which there is decremental residual imbalance energy,[38] the ISO will pay the resource based on the LMP if the LMP is less than the greater of (1) the resource's default energy bid, or (2) the bid that led to the residual imbalance energy. The ISO proposes specific changes to Section 11.5.5 to adopt this pricing rule.

Mr. Cooper explains that this new pricing rule provides for payment of residual imbalance energy for ramping associated with an exceptional dispatch at a price similar to the mitigated price paid for an exceptional dispatch. Mr. Cooper also explains that this new pricing rule provides an incentive for parties to bid closer to their marginal costs, as it only guarantees bid cost recovery to the resource's default energy bid (unless the resource voluntarily bids below that level), rather than the submitted bid if higher than the LMP. The default energy bid used for this calculation is the same default energy bid currently produced in consultation with an independent entity as defined in the current ISO tariff.[39]

The default energy bid is a good approximation of the resource's costs of producing energy as it is based on a resource's actual incremental costs. In addition to having an option for the default energy bid to be calculated daily based on daily natural gas prices, market participants have the right to negotiate default energy bids with an independent entity to reflect a resource's specific circumstances. Further, the ISO will calculate the bid that led to the residual imbalance energy from the relevant dispatch interval in which the resource was dispatched in the same manner that it calculates the bid today. To the extent that resources bid below their default energy bid, the price for incremental residual imbalance energy will be based on the lower reference hour bid price and not the default energy bid. Finally, the ISO will pay resources based on the LMP for the applicable five-minute dispatch interval if the LMP in that interval is higher than the minimum of the default energy bid or the reference hour bid. Mr. Cooper explains that this ensures that the resource is paid the value of the energy being provided in the specific dispatch interval determined through the ISO market.

Mr. Cooper reports the outcome of the ISO's analysis of the impact of this settlement modification on market participants. Mr. Cooper explains that the ISO compared the current residual imbalance energy payments to the payments for such energy that the ISO would have made to generators if the proposed modifications had been in place over the 14.5 month period from June 1, 2011 through August 15, 2012. Mr. Cooper reports that the proposed settlement changes would only substantially reduce residual imbalance energy payments for bids that are far in excess of a

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[37] There is incremental energy when the residual imbalance energy is incremental to the day-ahead schedule energy for the resource.

[38] There is decremental energy when the residual imbalance energy is below the day-ahead schedule energy for the resource.

[39] *See* ISO Tariff § 39.7.1.

generator's actual costs, while having minimal impact on other payments.[40] In particular, Mr. Cooper estimates that total residual imbalance energy payments for this 14.5 month period would have decreased by about $7.7 million had the ISO's proposed new pricing structure been in place, with about $6.3 million of this reduction occurring since June 2012.[41] Of this $6.3 million, Dr. McDonald testifies that approximately $5.9 million is attributable to the exercise of market power by a single market participant in connection with exceptional dispatches.[42] The remaining $400,000 can be attributed to excessive gains resulting from various resources ramping for a variety of reasons in hours with uncompetitively high prices, as Dr. McDonald further explains.[43] The proposed remedy thus is well targeted to address the existing problems recently observed in the ISO's market.

V. Effective Date and Waiver for Sixty Day Notice Requirements

Pursuant to Section 35.11 of the Commission's regulations, the ISO requests that the Commission waive the sixty-day notice requirements for the proposed amendment, accept it for filing, and permit it to become effective on August 29, 2012. Good cause exists for granting this waiver.

The proposed tariff amendment eliminates the potential for the expansion of the exercise of market power through the deployment of bidding strategies that unjustly inflate a resource's payments for both exceptional dispatches and residual imbalance energy. The ISO normally follows a stakeholder process to develop market rule changes. In this case, however, as demonstrated by the testimony provided herein, market participants can unilaterally expand such payments by engaging in the described anomalous market outcome. Therefore, it is necessary to immediately eliminate any incentive to engage in such activity. Moreover, as discussed by Mr. Cooper and Dr. McDonald, the proposed rule changes do not give rise to excessive mitigation and are well targeted to address the market behavior that the ISO has recently observed. The rule changes are, moreover, effective in eliminating the incentives for inflating real-time energy bids.

VI. Communications

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

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40 Cooper Testimony, Attachment E, at 12-14, 26-30.

41 *Id.* at 13-14, 29.

42 McDonald Testimony, Attachment D, at 31.

43 *Id.* at 31.

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VII. Service

The ISO has served copies of this transmittal letter, and all attachments, on the California Public Utilities Commission, the California Energy Commission, and all parties with effective Scheduling Coordinator Service Agreements under the ISO Tariff. In addition, the ISO is posting this transmittal letter and all attachments on the ISO Website.

VIII. Attachments

The following attachments, in addition to this transmittal letter, support the instant filing:

A. Clean version of the proposed tariff amendments.
B. Blacklined version of the proposed tariff amendments.
C. Testimony of Mark A. Rothleder (Exh. ISO-1).
D. Testimony of Jeffrey D. McDonald (Exh. ISO-2).
E. Testimony of Bradford Cooper (Exh. ISO-3).

IX. Conclusion

The ISO respectfully requests that the Commission accept the tariff amendment submitted today effective as of August 29, 2012. As discussed herein, the proposed amendment provides just and reasonable settlement of real-time energy and eliminates incentives for parties to exercise market power in an effort to unjustly inflate out-of-market payments.

Respectfully submitted,

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Attachment A – Clean Tariff

Exceptional Dispatch and Residual Imbalance Energy Mitigation Tariff Amendment

California Independent System Operator Corporation

Fifth Replacement FERC Electric Tariff

August 28, 2012

11.5.5 Settlement Amount For Residual Imbalance Energy

For each Settlement Interval, Residual Imbalance Energy settlement amounts shall be the sum of the two applicable five-minute Dispatch Interval Residual Imbalance Energy settlement amounts. The Residual Imbalance Energy settlement amount for each five-minute Dispatch Interval is calculated as the product of the MWhs of Residual Imbalance Energy for that Dispatch Interval and the RIE Settlement Price. The RIE Settlement Price will be determined as follows: in Dispatch Intervals in which there is incremental Residual Imbalance Energy, i.e., the Residual Imbalance Energy is incremental to the Day-Ahead Schedule Energy for the resource, the RIE Settlement Price is the greater of: 1) the Dispatch Interval LMP; or 2) the lesser of a) the resource's Default Energy Bid, or b) the Bid that led to the Residual Imbalance Energy from the relevant Dispatch Interval in which the resource was dispatched. In Dispatch Intervals in which there is decremental Residual Imbalance Energy, i.e., the Residual Imbalance Energy is below the Day-Ahead Schedule Energy for the resource, the RIE Settlement Price RIE Settlement Price is the lesser of: 1) the Dispatch Interval LMP; or 2) the greater of: a) the resource's Default Energy Bid, or b) the Bid that led to the Residual Imbalance Energy from the relevant Dispatch Interval in which the resource was dispatched. For MSS Operators the Settlement for Residual Imbalance Energy is conducted in the same manner, regardless of any MSS elections (net/gross Settlement, Load following or opt-in/opt-out of RUC).

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39.10 Mitigation of Exceptional Dispatches Of Resources

The CAISO shall apply Mitigation Measures to Exceptional Dispatches of resources when such resources are committed or dispatched under Exceptional Dispatch for purposes of: (1) addressing reliability requirements related to non-competitive Transmission Constraints; (2) ramping resources with Ancillary Services Awards or RUC Capacity to a dispatch level that ensures their availability in Real-Time; (3) ramping resources to their Minimum Dispatchable Level in Real-Time; and (4) addressing unit-specific environmental constraints not incorporated into the Full Network Model or the CAISO's market software that affect the dispatch of Generating Units in the Sacramento Delta and are commonly known as "Delta Dispatch".

* * * *

Appendix A

Master Definition Supplement

*** * * ***

Minimum Dispatchable Level

The greater of (1) the lower limit of the fastest segment of a Generating Unit's Operational Ramp Rate, as adjusted for the Generating Unit's Forbidden Operating Regions, if any, and (2) if the resource is providing regulation, the lower limit of a Generating Unit's Regulating Range.

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Attachment B – Marked Tariff

Exceptional Dispatch and Residual Imbalance Energy Mitigation Tariff Amendment

California Independent System Operator Corporation

Fifth Replacement FERC Electric Tariff

August 28, 2012

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39.10 Mitigation of Exceptional Dispatches Of Resources

The CAISO shall apply Mitigation Measures to Exceptional Dispatches of resources when such resources are committed or dispatched under Exceptional Dispatch for purposes of: (1) addressing reliability requirements related to non-competitive Transmission Constraints; (2) ramping resources with Ancillary Services Awards or RUC Capacity to a dispatch level that ensures their availability in Real-Time; (3) ramping resources to their Minimum Dispatchable Level in Real-Time; and (~~3~~4) addressing unit-specific environmental constraints not incorporated into the Full Network Model or the CAISO's market software that affect the dispatch of Generating Units in the Sacramento Delta and are commonly known as "Delta Dispatch".

* * * *

Appendix A

Master Definition Supplement

*** * * ***

Minimum Dispatchable Level

The greater of (1) the lower limit of the fastest segment of a Generating Unit's Operational Ramp Rate, as adjusted for the Generating Unit's Forbidden Operating Regions, if any, and (2) if the resource is providing regulation, the lower limit of a Generating Unit's Regulating Range.

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Attachment C

Testimony of Mark A. Rothleder (Exh. ISO-1)

Exceptional Dispatch and Residual Imbalance Energy Mitigation Tariff Amendment

California Independent System Operator Corporation

Fifth Replacement FERC Electric Tariff

August 28, 2012

Exhibit No. ISO-1

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

California Independent System Operator Corporation	**)** **)**	**Docket No. ER12-____-000**

DIRECT TESTIMONY OF
MARK A. ROTHLEDER
ON BEHALF OF THE
CALIFORNIA INDEPENDENT SYSTEM
OPERATOR CORPORATION

Q. Please state your name, title, and business address.

A. My name is Mark A. Rothleder. I am employed as Executive Director of Market Analysis and Program Development for the California Independent System Operator Corporation ("ISO"). My business address is 250 Outcropping Way, Folsom, CA 95630.

Q. Please describe your educational and professional background.

A. I have been employed at the ISO in various positions since July 1997. Prior to my current position, I was the Director of Market Analysis and Development for the California ISO. Before that, I was a Principal Market Developer for the ISO in the lead role in the implementation of market rules and software modifications related to the ISO's market redesign**.** I also played a lead role in designing many of the aspects of the ISO's revised market design, implemented on March 31, 2009. Since joining the ISO, I have worked extensively on implementing and integrating the market rules for California's

competitive energy and ancillary services markets and the rules for congestion management, real-time economic dispatch, and real-time market mitigation of the operations of the ISO balancing authority area. I have also held the position of Director of Market Operations.

Q. What are your duties and responsibilities at the ISO?

A. As Executive Director of Market Analysis and Program Development, I play a lead role in the design and implementation of ISO market rules and operating procedures, and the evaluation of the market's performance.

Q. What is the purpose of your testimony?

A. I provide an explanation of how the physical and operational characteristics of resources combined with the submission of certain bids results in the need for the exceptional dispatch of resources to their minimum dispatchable levels. I first provide an explanation of exceptional dispatch and the general reasons for needing to take such actions. I then explain under what conditions more specifically the ISO may be required to exceptionally dispatch resources to their minimum dispatchable minimum load. I further discuss how the ISO's market optimization software further uses bids to determine whether a resource is to be dispatched into certain ranges, and how it can fail to dispatch a resource into its minimum dispatchable levels based on the information it has within its time horizon. Finally, I discuss analysis of the fleet characteristics to

determine the proposed mitigation based on the resource's minimum dispatchable load.

I. Background on Exceptional Dispatches

Q. Please describe exceptional dispatches?

A. The ISO conducts day-ahead and real-time markets based on locational marginal pricing. The markets are designed to produce feasible schedules and dispatches for the fleet of generation resources within the ISO system. These day-ahead and real-time market dispatches and schedules account for almost all of the energy needed to meet system energy and reliability needs. However, there are certain circumstances and conditions that the ISO market systems cannot capture, making it necessary for the ISO to dispatch some additional resources outside its markets processes to ensure that the ISO operates its system reliably and consistent with NERC reliability criteria. Since these additional dispatches are determined by ISO system operators rather than the automated market software, these are sometimes referred to as "manual" or "out-of-market" dispatches. The ISO tariff defines them as exceptional dispatches.

Q. Please describe the reason for issuing exceptional dispatches?

A. ISO operators may issue exceptional dispatches to address a variety of reliability issues that exist but that the market software does not address in

any given time interval. Exceptional dispatches are the key tool that ISO operators have to ensure that the ISO operates the system reliably, and they address issues that cannot be addressed through the ISO market systems. For example, there are several transmission-related issues that the ISO must manage using exceptional dispatch. One situation is where the ISO operator anticipates congestion could occur on a specific transmission constraint and there is reason to believe, perhaps based on recent history, that the market software will not be able to manage that congestion effectively. In such circumstances, the ISO must utilize exceptional dispatch to ensure resources are available to address such reliability issues in advance.

Another situation is where an observed contingency (such as generating unit outage or transmission de-rate) results in power flow exceeding the post-contingency limits of a transmission element. Reliability criteria generally specify duration (often 30 minutes) during which flow can exceed the limit but after which the flow must be restored to levels below the post-contingency limit. The automated real-time market process can dispatch resources to achieve this once such a contingency occurs and is reflected in the real-time market software. However, as I will explain, it may be necessary to supplement these automated real-time energy dispatches through exceptional dispatch to ensure that resources are at their “minimum dispatchable level,” where they are capable of supplying the necessary increase in energy production

based on their operational ramp rate to recovery within 30 minutes. The operational ramp rate is used to model the rate at which a resource must be ramped through operational ranges. In addition a forbidden operating range may exist through which the resource cannot be operated in a stable fashion, but which could be ramped through but not dispatched in, which I describe further below.

Q. Are all exceptional dispatches issued in the real-time market?

A. No. There are two main types of exceptional dispatches. First, specific units may receive an exceptional dispatch to start up and run at their minimum operating level. I will refer to these as exceptional dispatches for unit commitment. Secondly, the iSO may issue exceptional dispatches to instruct a resource to operate at or above a specific level that is above their minimum operating level in real-time. The ISO can issue such exceptional dispatches to units that it committed through the day-ahead market or through exceptional dispatch unit commitments. These are the specific focus of my testimony and I will refer to these as exceptional dispatches for real-time energy.

II. <u>Need For Exceptional Dispatches For Real-Time Energy</u>.

Q. What is the minimum dispatchable level of a generating unit that you mentioned previously?

A. As the ISO is using the term, this is the operational level of a resource at which the resource is capable of readily responding to dispatch instructions to produce additional energy at the resource's maximum ramp rate or, in some cases, is capable of providing regulation. Many of the generating units in the ISO fleet, particularly the older gas-fired units, have a variety of different operating constraints and ramping capabilities at different operating levels. Almost all resources have a specific minimum level at which the resource can operate and be synchronized to the grid. This is referred to as the resource's physical minimum operating level, minimum load, or sometimes "PMin." I will use the term minimum load for the purposes of my testimony, and by that I mean the physical minimum load registered by the resource in the ISO's master file containing the physical characteristics of its fleet. However, not all generators are able to increase their output quickly or flexibly when operating at this minimum load. Some generating resources have ranges above their minimum load within which they can only ramp up very slowly until the resource is producing at a higher level. Resources may also have operating ranges above their physical minimum load in which they cannot actually operate and produce energy reliably. These units must be ramped in the same direction (up or down) until they clear this range. As I stated above, the ISO refers to this as a unit's forbidden operating region. Lastly, there are times where a resource that provides regulation can only be on Automatic Generation Control if the resource is above some minimum level of

operation above its minimum load. This is referred to as the lower limit of a unit's regulating range. Therefore, the minimum dispatchable level reflects the level the resource is capable of ramping at its highest ramp rate, after adjustment for any forbidden operating region, or the minimum regulation level of a unit, which is often significantly higher than the unit's physical minimum load.

Q. How do these operating constraints impact the ISO operations?

A. The ISO aims to dispatch resources in a manner that respects the physical characteristics of a resource to the best of its ability. In balancing its system and meeting load, the ISO market software and grid operators must consider the operational capabilities of a resource in any given time interval. In order to do so, the ISO requires that all resources register their physical characteristics and operational constraints in the ISO master file. This is the data repository of resource characteristics used by the the ISO for purposes of modeling characteristics of the ISO fleet. These constraints include the resource's physical minimum load, ramp rates at different operating levels, forbidden operating regions and operating ranges in which they can provide regulation. The ISO software is designed to issue schedules and dispatches that are feasible given these constraints. ISO grid operators also take these constraints into consideration when determining if an exceptional dispatch is necessary and, if so, to what level a unit should be positioned through exceptional

dispatch. As I previously noted, the ISO often issues exceptional dispatches to position a unit at its minimum dispatchable level.

Q. You previously stated that the ISO sometimes uses exceptional dispatch to ensure sufficient ramping capability to respond to a contingency. How is this related to the resource's minimum dispatchable level?

A. If the ISO identifies a resource is needed to provide relatively fast ramping capability to meet a reliability issue not modeled in the ISO market software (*e.g.*, to respond to a 30-minute contingency or to manage other potential system conditions within a 30 to 60 minute period), the ISO may need to ensure that the unit is operating at a level of output at which it can quickly respond to such conditions by issuing an exceptional dispatch to its minimum dispatch level. Doing so increases the amount of available ramping capability that the ISO can rely on to provide additional energy within 30 to 60 minutes in response to a contingency.

Q. Can you provide an example?

A. For example, a 275 MW resource may have a physical minimum operating level of 25 MW and be capable of ramping at 1.5 MW/minute when operating between 25 MW and 125 MW. Thus, when operating at its physical minimum the unit could ramp up 45 MW in 30 minutes. When operating at 125 MW the unit is capable of ramping at 5 MW/minute. At

this level, the unit could ramp up 150 MW in 30 minutes. In this example, the unit's minimum dispatchable level would be 125 MW. When operating at this level, the unit could provide an additional 150 MW of capacity over a 30-minute period in the event of a contingency – more than three times the amount of capacity available when operating at its physical minimum operating level.

Q. How many resources have this difference in ramp rate and what is the typical difference?

A. There are about 36 resources within the ISO balancing authority area that have a significantly higher ramping capability at the point of their fastest ramp rate relative to their ramping capacity at their minimum load level (i.e. which can provide at least 50 percent more capacity within 30 minutes when operating at this higher level). However, most of these units have rarely or never had to be issued an exceptional dispatch to ensure that they operate above their physical minimum load to increase their ramping capability. For example, so far in 2012 just ten resources account for about 95 percent of exceptional dispatch energy dispatched out-of-sequence (i.e. with a bid price greater than the market clearing LMP) to position units at their minimum dispatchable levels. For these resources, operating at a point on their operating range where the lower ramp rate is effective represents a significant reduction in

ramping capability available to meet reliability criteria. When operating at their minimum load, these units can ramp up an average of 64 MW in 30 minutes. However, when operating at their minimum dispatchable levels these resources can ramp up an average of about 164 MW in 30 minutes – or nearly three times as much additional capacity as they can provide when operating at minimum load.

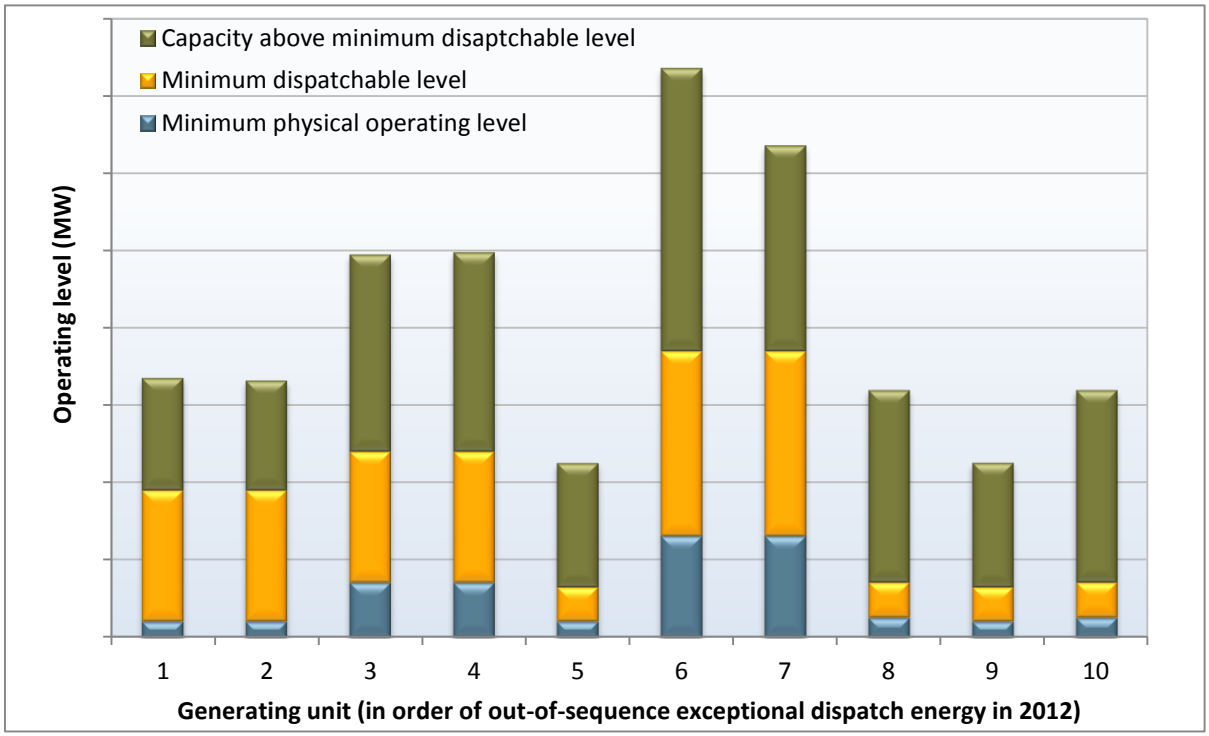
Q. How does the ISO propose to define the minimum dispatchable level of each unit?

A. The ISO proposes to define minimum dispatchable level as the greater of (1) the lower limit of the fastest segment of a Generating Unit's Operational Ramp Rate, after adjustment for the Generating Unit's Forbidden Operating Regions, if any, and (3) the lower limit of a Generating Unit's Regulating Range. In all cases a resource was exceptionally dispatched to minimum dispatchable level in 2012**,** the minimum dispatchable level of units coincides with the point at which the units reach their regulating range, if providing regulation, or their maximum effective ramp rate after consideration of the ramp rate through the forbidden operating range. Thus, this definition provides a very accurate and objective way of defining each unit's minimum dispatchable level based on information already submitted by generators to the ISO's master file.

Q. How do these minimum dispatchable levels compare with the minimum and maximum physical operating levels of various units? Can this be a significant amount of energy?

A. This can vary significantly by unit. Figure 1 shows the minimum dispatchable levels in relation to the minimum and maximum physical operating levels of the ten units that account for 95 percent of the out-of-sequence exceptional dispatch energy occurring up to each unit's minimum disputable level in 2012. As shown in Figure 1, some of these units have relatively high minimum dispatchable levels while others are relatively low. As described in the testimony of Dr. Jeff McDonald, units with relatively high minimum dispatchable levels have tended to be exceptionally dispatched out-of-sequence more as the result of bidding strategies designed to force ISO operators to issue such exceptional dispatches to these units in the real time market. As explained by Dr. McDonald, the higher the unit's minimum dispatchable level, the greater the potential payments at very high bid prices for exceptional dispatches needed to ensure the unit is positioned at this level for reliability.

Figure 1. Units accounting for most out-of-sequence exceptional dispatch energy to minimal disputable levels



Q. Can you describe in more detail why the ISO market software may not dispatch a resource as needed to its minimum dispatchable level?

A. The main reason for this is that the security constrained economic dispatch conducted through the ISO markets may not observe the need for additional energy in the relevant solution time horizon. The real-time security constrained economic dispatch looks ahead as far as 12 5-minutes intervals (60 minutes). In order for the secured economic dispatch solution to dispatch the resource above its physical minimum operating level, the optimization must determine that the marginal cost of the resource's energy above this level is economic for meeting the

expected energy imbalance and congestion conditions that exist at the resource's location within this 60 minutes horizon. The market software will consider the anticipated conditions and model some transmission contingency conditions. The secured economic dispatch considers also submitted bid prices to identify the need to dispatch specific resources up in the market time horizon based, economically. If the security constrained economic dispatch solution is moving the resource to minimum dispatchable levels based on the system conditions the market software is capable of observing, there is no need to take manual action via exceptional dispatch to position the resource to its minimum dispatchable level. However there are changing system conditions that are occurring beyond those observed within market solution horizon. If the market system does not anticipate a condition or does not project the need to dispatch a specific resource above its minimum load level based on submitted bids and the projected economic conditions of the system, then the resource will remain dispatched at this minimum operating level. Because of these scenarios, ISO operators must continuously evaluate whether manual intervention is necessary to position the resource at a level that the resource would be capable of responding to the events the market software is not able to observe, project or assess. If operators determine manual intervention is necessary to maintain reliable operations, ISO operators will issue an exceptional dispatch to position

some specific resources at a point where they have a minimum dispatchable level.

Q. Can you provide an example of this situation?

A. Yes. Assume a resource has a physical minimum load of 25 MW but has a ramp rate of 1.5 MW/min for an operating range up to 125 MW and 5 MW/min between 125 MW and 150 MW. In this example the resource would require 66 minutes to ramp to a level where the higher ramp rate to be realized. If the security constrained economic dispatch time horizon only looks out 60 minutes, there is no way for system conditions beyond 60 minutes in the future to drive the resource up to the high ramping level. If conditions within the sixty minute security constrained economic dispatch time are such that the projected price of real-time energy is less than the resource's energy bid, the resource will not be dispatched up. Conditions that may require additional energy from the unit may not arise within the security constrained economic dispatch time horizon fast enough to be accommodated by the ramps of the resources available in that time frame. In such cases, the slow ramp rate of the resource may prohibit the resource from being responsive to these conditions, even if the price of energy was high. Therefore, some manual intervention by operators is necessary to position the resource to its higher ramping level in advance of conditions that may require such ramping capability actually arise.

Q. Are there other modeling limitations that prevent the optimization from dispatching a resource to its minimum dispatchable level?

A. Yes. Currently the only contingencies modeled by the ISO software are transmission contingencies that shift flows to parallel transmission. The software does not model contingencies that change the balance between supply and demand by removing a generator that is producing energy, or transmission contingencies that eliminate imports or exports of energy. Since contingencies that disturb the system level balance of supply and demand cannot be modeled at this time, the market solution is not able to respond by dispatching a resource up to a faster ramping range in anticipation of such a contingency. Examples of the types of contingencies that the software cannot model include a generator tripping and the loss of a major intertie such as the Pacific DC intertie or the loss of generation or transmission elements that lower the limit to Southern California Import Transmission (SCIT) nomogram. For instance, the SCIT nomogram is a multi-faceted nomogram that is a function of East-of-River Flows, total generation inertia in Southern California, and total imports into Southern California. Some limiting dimensions of the SCIT nomogram are based on supply contingencies or import line contingencies. As a result, such contingencies cannot be explicitly modeled. Enforcing the SCIT nomogram within the market software is also difficult due to the fact that East-of-River flows are not within the ISO and only a portion of the

SCIT flows are into the ISO. Some of the SCIT flows are in to Los Angeles Department of Water and Power. The ISO is exploring methods to incorporate contingencies that would allow changes to supply and demand to be modeled as a part of the contingency event. However, until all contingencies can be incorporated in the ISO market solution, the ISO must continue to at times to rely on exceptional dispatch to position the resource in a range that is able to respond to such contingency events. Being able to model all contingencies would improve the ability for the market solution to position the resource in anticipation of all types of contingencies.

Q. Do the energy bid prices submitted by resources between their minimum load and minimum dispatchable level impact the need to utilize exceptional dispatch to position the resource?

A. Yes. Both the day-ahead and real-time market software dispatches resources in economic merit order based on their bid prices to meet the projected demand for real-time energy. If a unit's energy bids are equal to or below the locational marginal prices of energy, the resource will be economically dispatched up to meet by the market software. However, if the energy bid costs are significantly in excess of relevant locational marginal prices, there is little chance that the resource will be dispatched up to its minimum dispatachable level. Therefore, the higher the cost of energy bids submitted between minimum load and minimum dispatchable

level, the more likely it will remain dispatched at minimum load through the market software, increasing the need for the ISO to rely on exceptional dispatches to position resources to be able to response to all required contingency conditions. As explained in the testimony of Dr. McDonald, some generators may seek to exploit this market limitation by placing relatively high energy bids in the day-ahead and real-time markets during peak periods, so that units are scheduled at minimum load during these hours by the market software and must then be exceptionally dispatched up to their minimum dispatchable levels by the ISO to meet various reliability needs.

Q. Would introduction of a new regional or 30-minute ramping service address the need to exceptionally dispatch resources to minimum dispatchable levels?

A. The introduction of a locational or temporal ramping service may improve the ability for the security constrained economic dispatch and unit commitment routines to position the resource to meet the unexpected operational ramping needs. However, high priced energy bids submitted between minimum load and dispatchable minimum load would still undermine the ability of the software optimization from positioning the resource at a level that supports the higher ramping capability. If the optimization could overcome the high cost of energy to achieve the higher ramping capability, the resource could still receive unreasonably high bid

costs (through bid cost recovery) in order for the resource to meet the ramping needs of the system. As described in the testimony of Dr. McDonald, the ability to extract uncompetitive compensation for energy bids between minimum load and dispatchable minimum load constitutes temporal market power that should be mitigated.

Q. Thank you. I have no further questions.

DECLARATION OF WITNESS

I, Mark A. Rothleder, declare under penalty of perjury that the statements contained in the foregoing Testimony of Market A. Rothleder on behalf of the California Independent System Operator Corporation in this proceeding are true and correct to the best of my knowledge, information, and belief.

Executed on this 28th day of August, 2012.

/s/ Mark A. Rothleder
Mark A. Rotheleder

Attachment D

Testimony of Jeffrey D. McDonald (Exh. ISO-2)

Exceptional Dispatch and Residual Imbalance Energy Mitigation Tariff Amendment

California Independent System Operator Corporation

Fifth Replacement FERC Electric Tariff

August 28, 2012

Exhibit No. ISO-2

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

California Independent System Operator Corporation	**)** **)**	**Docket No. ER12-____-000**

DIRECT TESTIMONY OF
JEFFREY D. MCDONALD
ON BEHALF OF THE
CALIFORNIA INDEPENDENT SYSTEM
OPERATOR CORPORATION

Q. Please state your name, title, and business address.

A. My name is Jeffrey D. McDonald. I am employed as Manager, Market Analysis and Mitigation for the Department of Market Monitoring (DMM) of the California Independent System Operator Corporation (ISO). My business address is 250 Outcropping Way, Folsom, CA 95630.

Q. Please describe your educational and professional background.

A. I have three degrees in applied economics: a Bachelor of Science from the University of California, Davis (1990), a Master of Science from the University of Massachusetts, Amherst (1992), and a Doctorate of Philosophy from the University of California, Davis (2002). I began working at the ISO in June, 2000, as a market analyst in the DMM. From December 2005 through January 2010, I was the Manager of Market Monitoring and Reporting in DMM. I have been Manager of Market Analysis and Mitigation in DMM since February 2010. During this time I

served several functions ranging from monitoring and reporting on market outcomes, designing and performing analysis of specific market issues, investigating market participant behavior, and contributing to market design enhancement efforts.

Q. What are your duties and responsibilities at the ISO?

A. I manage a team of five market analysts in the Market Analysis and Mitigation group within DMM. My primary functions in this role are to monitor for and investigate instances of potential market manipulation and to contribute to the ISO's broader market design initiatives.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to explain an existing persistent opportunity to exercise market power in the ISO's real-time market through exceptional dispatch and residual imbalance energy. Since April of this year I have observed bidding and scheduling by one particular scheduling coordinator in the ISO market in a manner designed to create market power in the real-time market and profit from this through excessive payments for exceptional dispatch and residual imbalance energy. Excessive gains from this behavior have been abated in the majority of these instances to date through existing mitigation measures. However, there is a significant risk that increasing excessive costs can occur under existing market rules going forward. The mitigation measures

for exceptional dispatch and settlement rule changes for residual imbalance energy proposed by the ISO mitigate this risk.

I address three topics in my testimony. First, I provide background on the ISO's process for issuing and settling exceptional dispatches. Second, I explain how the ISO's need to issue exceptional dispatches in the real-time market can give rise to temporal market power and allow the resource to earn excessive uncompetitive profits, which results in excessive costs for load serving entities. Finally, I discuss how the ISO's residual imbalance energy settlement provides similar opportunity to exercise market power.

I. Background on Exceptional Dispatch

Q. What are exceptional dispatches?

A. As described in more detail in the testimony of Mr. Rothleder, there are a number of reliability issues that may not be sufficiently addressed by the ISO market software under some system or market conditions. Under the ISO Tariff, ISO Grid Operators may use exceptional dispatches to dispatch resources directly to meet these reliability issues when they are observed or anticipated. Units may receive an exceptional dispatch to start up and run at their minimum load. In the real-time market, units may also receive an exceptional dispatch to operate at or above a specific level that is above their minimum load in real-time. My testimony focuses on

this latter type of exceptional dispatch, which I will refer to as exceptional dispatches for real-time energy.

Under certain circumstances, the ISO will issue an exceptional dispatch for real-time energy to a resource in order to position it at its minimum dispatchable level; that is, to the point on its power curve where the resource is able to ramp at a faster rate. This may be necessary because, as described in the testimony of Mr. Rothleder, certain reliability criteria require that many resources be dispatched up via exceptional dispatch to levels at which they can provide more upward ramping capacity in the event of a contingency.

Q. How does the ISO compensate resources that receive exceptional dispatches for real-time energy?

A. Ordinarily, the ISO pays resources that receive exceptional dispatches at the higher of (a) the market clearing price (locational marginal price, or LMP) for energy, or (b) the price at which the scheduling coordinator bid the energy.

Q. You said "ordinarily." What other rules apply?

A. In certain circumstances in which the Commission has found that the potential for the exercise of market power exists, the ISO mitigates the payment by eliminating the "as-bid" option unless the bid price is below the default energy bid. That is, if the mitigated exceptional dispatch

settlement applies, the ISO generally pays the higher of (1) the market clearing price for energy or (2) the unit's default energy bid. If the bid price is less than the default energy bid, however, the ISO pays the higher of (1) the market clearing price for energy, or (2) the unit's bid price. The default energy bid is the bid that is used in the ISO's automated local market power mitigation process and is a proxy for a competitive bid price. In many instances this is approximately equal to each unit's marginal operating cost, plus a 10 percent adder. The default energy bid is discussed in more detail in the testimony of Mr. Cooper.

Q. Under what circumstances are exceptional dispatches subject to mitigation?

A. Under the ISO tariff, the ISO mitigates exceptional dispatch for real-time energy when issued for one of three purposes: (1) addressing reliability requirements related to non-competitive transmission constraints; (2) ramping resources with day-ahead ancillary services awards or residual unit commitment availability awards to a dispatch level that ensures they can provide in real-time the quantities procured in the day-ahead; and (3) addressing certain unit-specific environmental constraints that affect the dispatch of generating units in the Sacramento Delta.

Q. How frequently are exceptional dispatches mitigated?

A. There have been roughly 1.3 million MWh of energy from exceptional dispatch for the 12 month period August 1, 2011, through July 31, 2012. Historically, energy from exceptional dispatch has represented less than half of one percent of total system energy annually. About 28 percent of this exceptional dispatch energy was subject to mitigation under existing authority. Approximately 33 percent of energy from exceptional dispatch has been from exceptional dispatch to minimum dispatchable level, with approximately 50 percent of that energy subject to mitigation.

II. Temporal Market Power in Exceptional Dispatch

Q. What is market power in the context of the provision of electric generation?

A. Market power exists when a market participant (or participants collectively) has the ability to significantly influence the price it receives for a period of time.

Q. Please describe how market power arises in the context of exceptional dispatch.

A. There are three general factors that may limit competition and create market power when the ISO must use exceptional dispatch.

First, there is a limited set of resources that – often because of their location – are able to provide relief to reliability concerns for which the ISO

issues exceptional dispatches. Generally, there are an even more limited number of suppliers controlling those resources. This limits competition in the supply of services required to resolve the reliability issues. The more granular (or local) the reliability issue is, the more limited is the set of resources and suppliers that can address it. The limited options for the ISO also limit competition and provides opportunity for the exercise of market power. This is local market power.

Second, in the real-time market, the set of resources that can relieve a reliability issue is further restricted by the operational status of the resources that can resolve the reliability issues. The ISO often cannot dispatch off-line resources for this purpose. Because of longer start-up times for many of the gas-fired resources, the ISO must make most unit commitment decisions in the day-ahead market or shortly thereafter. This process defines what resources will be available to the real-time market and consequently also identifies resources that will not be available.

Moreover, if there is a time limit in which to resolve the reliability issue (for example, managing flow to a level at or below the operating limit within 30 minutes in the event of a contingency), the ISO may only be able to meet this criteria if resources are at their minimum dispatchable level where sufficient ramping energy is available. Thus, to resolve a reliability issue through exceptional dispatch, the ISO must rely on the more limited set of resources that are on-line and, in some instances, operating at minimum dispatchable level. Again, the limited resource options for the

ISO in such circumstances means limited competition and provides opportunity for the exercise of market power. This is referred to as temporal market power.

Third, once a resource has received an exceptional dispatch, the generator knows that it has perfect unilateral market power. The resource has received a dispatch instruction, outside of the normal economic dispatch mechanism, to operate at a specific output level regardless of market price. ISO bidding rules allow the resource to change its bid price up to approximately 75 minutes before the applicable trade hour. Upon receiving an exceptional dispatch, a resource can increase its bid for subsequent hours dramatically and still be confident that it will be paid its bid price for the energy. The combination of the information that the resource is being exceptionally dispatched, the as-bid settlement of exceptional dispatch energy, and the ability to change bid prices for subsequent hours creates perfect market power.

Thus, in practice, resources that receive an exceptional dispatch from ISO grid operators effectively have unilateral market power in most circumstances. Moreover, as described later in my testimony, scheduling coordinators can bid or schedule particular resources in a manner that, under certain operational circumstances, significantly increases the probability that they will receive an exceptional dispatch for real-time energy. In such situations, a resource owner can essentially directly impact the likelihood that they have unilateral market power.

Q. Why doesn't the day-ahead process address temporal market power?

A. The day-ahead market ensures that sufficient capacity will be available to meet bid-in load and respect modeled reliability constraints through the Integrated Forward Market and that there exists sufficient capacity to meet forecast load via the subsequent Residual Unit Commitment process. The set of resources that are online as a result of this day-ahead process are those needed to meet forecast load and modeled reliability criteria. The day-ahead process does not commit additional resources for purposes of providing an additional margin beyond those anticipated needs. Furthermore, the day-ahead process does not ensure that online resources are at their minimum dispatchable levels, that is, where they can provide the energy at their faster ramp rate when necessary to respond to a contingency within the time period that required under the reliability criteria. Nor does the day-ahead process ensure a sufficiently diverse ownership or control of the resources to provide competition in real-time among the set of resources that might be available to meet these criteria. Mr. Rothleder's testimony provides more detail on modeling reliability criteria in the day-ahead market.

In real-time the ISO must rely on the online set of resources to provide both the energy required to meet load as well as energy and capacity required to respond to changed conditions or contingencies in

accordance with reliability criteria. Given that the day-ahead process commits resources to meet modeled reliability needs, it is reasonable to expect that much of the online capacity that is effective in meeting the reliability needs identified day-ahead is usually needed to do so. Further, the day-ahead market commits and dispatches resources to meet modeled criteria and does so in a way that minimizes cost. Although the resulting unit commitment may provide online capacity available to meet changes in system conditions or modeled reliability criteria, it will not guarantee sufficient supply of capacity to meet non-modeled reliability criteria and uncertainties. These non-modeled reliability criteria and uncertainties are assessed by the ISO after the day-ahead market is run and deficiencies are addressed through exceptional dispatch for resource commitment.

This day-ahead exceptional dispatch process is intended to commit only sufficient capacity to meet the non-modeled reliability criteria and uncertainties – there is not an additional supply margin for individual criteria built into this process. This often results in a limited supply to meet these non-modeled reliability criteria in real-time, and is less likely to have sufficient margin ensure a competitive market to meet specific reliability criteria (and, in some cases, system requirements). Further, this limited supply may also have a composition of ownership or control that is sufficiently concentrated, further limiting the competitiveness of supply and creating the potential to exercise market power. Committing sufficient

resources in the day-ahead process to provide a margin of supply for specific reliability criteria that ensures a competitive market in real-time would result in excessive cost and may not even be possible for criteria with very limited supply.

Q. Please describe how a resource can exercise market power under exceptional dispatch in the real-time market.

A. A scheduling coordinator can enhance the probability that it can exercise market power in the real-time by structuring the offer prices for a resource in the day-ahead market such that (1) the resource appears economic to commit in the day-ahead market due to very low energy bid prices in off-peak hours, and (2) the resource is not dispatched in the day-ahead market for energy above minimum load during peak hours when market power could be exercised through exceptional dispatch in the real-time market. This ensures that the resource will be committed online by the day-ahead market and be positioned in real-time to influence the need for and capitalize on exceptional dispatch.

The resource employing this strategy will displace other resources that may have had more competitive costs but were not selected by the day-ahead market because of the strategic bidding. Another feature of this strategy is the resulting low day-ahead dispatch level during hours where exceptional dispatch is most likely to occur. Economic withholding in the day-ahead market during these hours ensures the resource will be

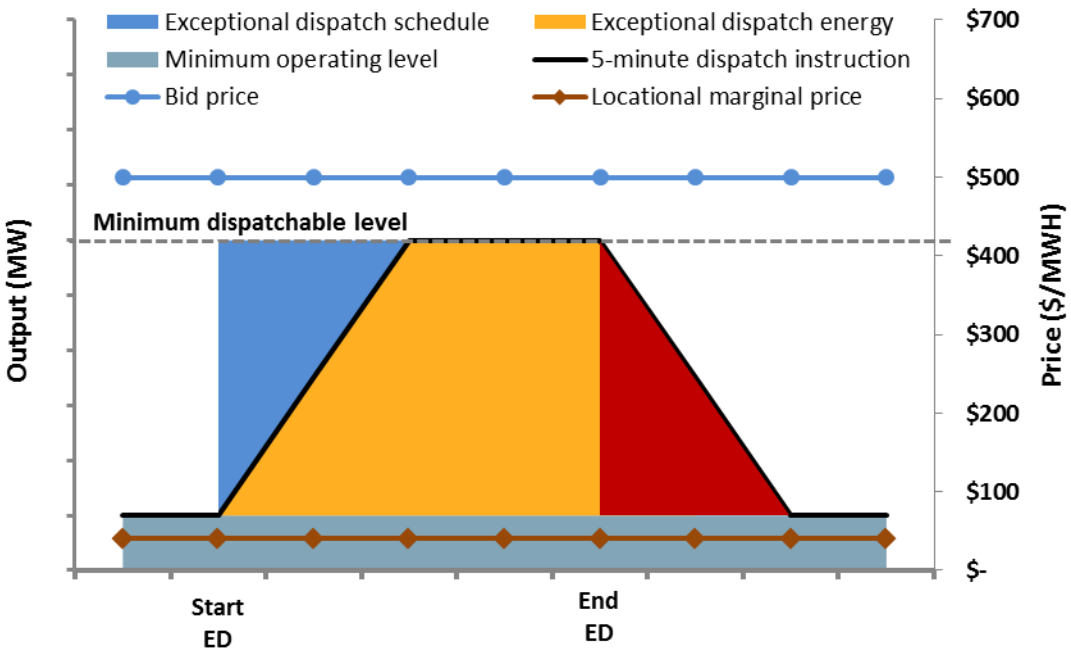
scheduled to operate at its minimum load during hours when it is likely to be needed to meet various reliability issues that must be addressed through exceptional dispatch.

After being committed in the day-ahead market, the generator can then ensure that it does not receive a real-time market dispatch for energy above minimum load during these peak hours by economically withholding, *e.g.*, by submitting bid prices well in excess of competitive levels or variable operating cost. Under the compensation rules I previously discussed, if the resource is needed to meet reliability criteria and consequently receives an exceptional dispatch it may be paid this high bid price and receive a very high premium for the resulting energy. Temporal market power exists in this circumstance where strategic bidding in the day-ahead market displaced resources that were truly lower-cost and would have bid competitively in the real-time market rather than economically withhold their energy.

Figure 1 below provides an example of exceptional dispatch, the resulting energy, and the case where the resource economically withholds going into the real-time market. I refer to this as the *ex ante* withholding strategy. In this example, the resource begins the period operating at its minimum load because it is uneconomical at the high bid prices submitted. The resource then receives an exceptional dispatch up to its minimum dispatchable level represented by the grey dashed line. The resource begins ramping upward to meet the exceptional dispatch instruction,

maintains output at that level (as shown by the black solid line), and begins ramping back down to minimum load at the end of the exceptional dispatch. The resource has a standing bid price of $500 for all energy across this period (blue line).

Figure 1. *Ex ante* withholding strategy in real-time market



The energy resulting from the exceptional dispatch that may be settled at the high bid price is represented by the yellow area under the 5-minute dispatch instruction (black line) from the time the exceptional dispatch was issued until it is terminated. To put the potential gains into context, assume this exceptional dispatch lasted for eight hours, the minimum dispatchable level is 100 MW, and the minimum load is 20 MW. In this case, the revenue on the energy resulting from the exceptional dispatch paid at a $500/MWh bid price is calculated by adding the revenue

from the ramp up period (the first four hours of the exceptional dispatch) to the revenue from the four hours where output was steady at the exceptional dispatch target. Revenue for the first four hours is calculated as $500/MWh * [0.5 * (100 MW – 20 MW) * 4 hours] = $500/MWh * 160 MWh = $80,000. Revenue for the last four hours is calculated as $500/MWh * [(100 MW – 20 MW) * 4 hours] = $500/MWh * 320 MWh = $160,000. The total revenue for the eight hour exceptional dispatch is $240,000 and represents considerable excess gain compared to the revenue calculated at a representative competitive price of $40/MWh, which is about $19,000 (using the same method of calculation).

The generator faces a potential economic tradeoff in executing this approach. By increasing offers in the real-time market, the resource risks being uneconomic and foregoing in-market revenue across all hours where the strategy is employed. The generator must weigh this against the gain from receiving an exceptional dispatch for potentially fewer hours but on very high-priced bids resulting in excessive gains.

One factor that can affect this calculation is that exceptional dispatch can be relatively predictable across days and exceptional dispatches can last eight hours or more. For example, the set of resources that have been exceptionally dispatched since June 1, 2012, received at least two exceptional dispatches per week (on average). This increased in the first half of August, where this set of resources received at least three exceptional dispatches per week (on average). The duration

of these exceptional dispatch events averaged approximately 10 hours. Thus, the predictability, duration, and high settlement price creates an incentive to employ this strategy instead of bidding competitively in the real-time market and relying on congestion or higher-cost resources to set a LMP that provides infra-marginal rents. Though the actual practice of such a strategy has been limited to one scheduling coordinator and in most cases their bids are subject to mitigation, leaving this opportunity unchecked could result in other scheduling coordinators engaging in this behavior and excessive market costs.

Q. Does *ex ante* economic withholding increase the opportunity to exercise market power through exceptional dispatch?

A. Yes. The high-priced bids submitted as part of the *ex ante* economic withholding strategy are sufficiently above market clearing prices that the resource will not be dispatched above its minimum load through the market. This ensures that the resource will be operating at its lower ramp rate in real-time. Generators can physically withhold ramping energy by submitting high priced bids that are reasonably known to be persistently uneconomic and result in market dispatch to output levels where the physical attributes of the resource dictate a lower ramp rate. By employing such a strategy, a generation owner can dramatically increase the likelihood that its resource will receive an exceptional dispatch to

minimum dispatchable level and consequently the opportunity to exercise market power on that exceptional dispatch.

Q. Are there other ways to exercise market power in exceptional dispatch?

A. Yes. As I noted, the ISO allows resources to change real-time market bids up to about 75 minutes before the trade hour. Therefore, in addition to increasing bid prices in the real-time market in anticipation of an exception dispatch, resources can increase their bid price after they receive an exceptional dispatch, up to as much as the bid cap price of $1,000/MWh. Because the resource will receive the higher of the LMP and its bid price for energy from exceptional dispatch, the combination of flexible bidding rules and real-time notification of exceptional dispatch creates market power for that resource. Once it receives an exceptional dispatch it is no longer competing with any other suppliers to provide that energy and it is able to increase its offer price after notification of the dispatch well above competitive levels.

The higher bid price can be effective beginning the third hour of the exceptional dispatch and extend through the end of the exceptional dispatch. For example, if an exceptional dispatch lasts for eight hours, the resource can increase its bid price such that it can be paid the higher bid price for up to six of those hours. I refer to this as the *ex-post* strategy.

As I discussed above, infrequent but excessive gains can provide sufficient incentive to employ a consistent strategy of economic withholding in lieu of offering competitive bids and receiving infra-marginal gains from in-market dispatch. This incentive not only distorts the individual's participation but also has an indirect impact on the efficiency of the imbalance energy market due to the withheld capacity.

Q. Have you observed instances of the exercise of market power through exceptional dispatch?

A. Yes. I have observed these strategies employed beginning in April 2012, and more aggressively beginning in May 2012, however only one market participant has been employing this strategy and the vast majority of attempts were unsuccessful due either to lack of need to support reliability criteria at the time or existing mitigation measures. While I did not observe any successful attempts in April or May, I have observed six instances where resources were able to successfully exercise market power in exceptional dispatch through economic withholding as I described above from June 1, 2012, through August 15, 2012. These six instances resulted in roughly $2.8 million in excessive gains through exceptional dispatch energy.

I have also observed four instances where the market participant attempted to employ the *ex post* strategy in which it increased its bid price significantly after receiving notification that its resource was being

exceptionally dispatched. In each of these instances, the exceptional dispatch was made for reasons that are covered under existing mitigation authority, so there were no excess gains directly attributable to the high-priced bids and exceptional dispatch energy. If mitigation did not apply, the excess gains on these four instances would have been roughly $3.1 million. While existing mitigation averted excessive gains on the exceptional dispatch energy in these instances, it did not impact excessive payment on the residual imbalance energy that resulted from the exceptional dispatch.

In total, an additional $6.1 million has been paid through residual imbalance energy to resources that have attempted to exercise temporal market power associated with exceptional dispatch during this time period. About $5.9 million of these payments are attributable to the exercise of market power. I discuss the issue of excessive residual imbalance energy payments associated with exceptional dispatch due to market power later in my testimony.

Q. What is the risk of future excessive cost resulting from these strategies?

A. As I noted previously, there are mitigation measures currently in place that are designed to prevent excessive gains from these strategies under specific circumstances. However, there are a number of other reliability requirements for which the ISO may exceptionally dispatch resources

where mitigation does not apply. The potential gains from exercising these strategies create sufficient incentive for at least one scheduling coordinator to favor economic withholding over competitive bidding. Leaving this opportunity unchecked can result in excessive associated cost should other scheduling coordinators employ these strategies on a frequent basis and their exceptional dispatches to minimum dispatchable level are not covered by existing mitigation measures.

Q. Is there another cost attributable to exceptional dispatches issues to resources that are economically withholding?

A. Yes. There is another direct cost attributable to exceptional dispatches issued to resources that are economically withholding. When a resource's exceptional dispatch terminates, the resource continues to produce energy above its minimum load as it ramps down. As discussed in the testimony of Mr. Cooper, this is settled as residual imbalance energy. Resources that are ramping down from a dispatch can receive their bid price for this energy. Resources that ramp more slowly in the range above their minimum load, as is the case with resources that have a minimum dispatchable level, produce more energy at this higher bid price as they ramp down from an exceptional dispatch over a longer period of time. The risk associated with the exceptional dispatch strategies extends to excessive gains from residual imbalance energy as well.

Q. How does the ISO propose to mitigate temporal market power in exceptional dispatch?

A. The ISO proposes in this proceeding to expand the categories of exceptional dispatches subject to mitigation to include exceptional dispatch instructions for the purposes of bring a resource up to its minimum dispatchable level. As with other exceptional dispatch mitigation, if the ISO exceptionally dispatches the resource to its minimum dispatchable, the ISO will pay for the energy resulting from these exceptional dispatches will be paid the greater of (1) the LMP at that location, or (2) the resource's default energy bid, unless the bid price is lower, in which case the ISO will pay the resource its default energy bid. When the bid price is lower than the resource's default energy bid, the exceptional dispatches will be pad the greater of (1) the LMP at that location or (2) the resource's bid price. This change will not alter bids during the course of running the market, but will be applied later during the settlement process as is the case for all mitigation of exceptional dispatch today.

Q. Will this reduce the incentive for economical withholding in order to increase higher exceptional dispatch revenue?

A. Yes. As I described above, the potential to exercise temporal market power through exceptional dispatch creates an incentive to economically withhold energy from the real-time market in many or all hours of

operation. The exercise of temporal market power not only can result in excessive payments on exceptional dispatch energy, but also can distort the competitiveness of the imbalance market resulting in higher prices there. The proposed expansion of mitigation rules eliminates the possibility of excessive payments on exceptional dispatch Energy, which mitigates the incentive to economically withhold energy from the imbalance market for this purpose.

Q. Does the proposal provide adequate compensation for the exceptional dispatch energy received?

A. Yes. As in the case of other mitigated exceptional dispatches, the proposed approach will provide the resource with payment that is not less than its variable operating cost (through the default energy bid) or, if the resource voluntarily submits a bid that is below the default energy bid, the resource's bid price. If the resource's LMP is higher than its default energy bid (or bid price as applicable), the resource is paid the LMP and receives infra-marginal rents. In addition, LMP premiums resulting from relative scarcity (at the local and system levels) will be paid on exceptional dispatch energy through the LMP when those factors result in an LMP greater than the resource's default energy bid or bid price, as applicable.

Q. Does the proposed mitigation limit potential market revenue from energy beyond the exceptional dispatch to the minimum dispatchable level?

A. No. The mitigation will take place during the settlement process after the market has run and will apply only to the amount paid for the exceptional dispatch energy. The resource's market bids will not be altered during the running of the market as a result of this process. As such, any in-market dispatch beyond the exceptional dispatch will consider the market bid from that resource. This preserves the resource's ability to set price based on its submitted bid in the imbalance energy market.

Q. Are there additional benefits to the proposed approach?

A. Yes. The proposed approach can be implemented in the settlement process that takes place after the market has run and, therefore, does not require alteration of the bid validation interface or the market optimization software. This allows for a more expedited implementation.

III. Residual Imbalance Energy

Q. What is residual imbalance energy and how is it settled?

A. Residual imbalance energy is energy attributable to ramping down from a dispatch, including an exceptional dispatch, in the real-time at the end of a previous hour or ramping up to a dispatch at the beginning of an upcoming hour. Residual imbalance energy recognizes that a resource may be

ramping up or down in one hour as the result of a bid dispatched in an adjacent hour, and that the resource can have different bid prices in these hours. Residual imbalance energy settles the resources energy at this dispatched bid price during these ramping periods, irrespective of the LMP in these ramping periods. Residual imbalance energy is not included in the bid cost recovery calculation. More detail on the residual imbalance energy calculation and settlement is included in the testimony of Mr. Cooper.

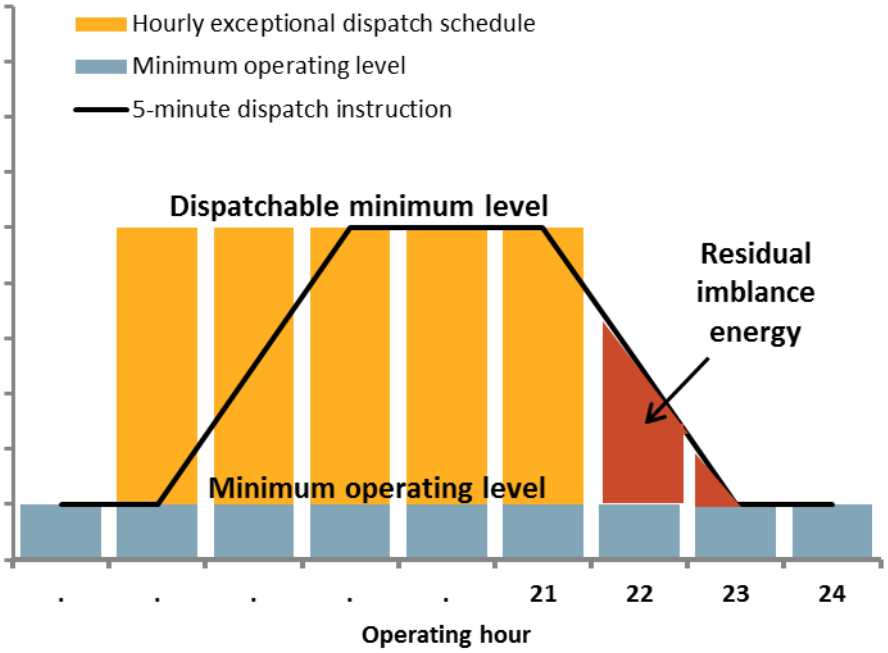
Q. How can scheduling coordinators inflate residual imbalance energy payments through the exercise of market power for exceptional dispatch energy?

A. Scheduling coordinators can inflate residual imbalance energy payments by an extension of the strategies for exercising market power though exceptional dispatch, which I previously outlined. The high-priced energy bids that created the excess gains through the exceptional dispatch strategy are also used to settle residual imbalance energy as the resource ramps down from the exceptional dispatch. The residual imbalance energy is a direct result of the exceptional dispatch (which moved the resource up to its minimum dispatchable level) and the fact that the resource is extremely uneconomic on submitted high-priced bids and will be dispatched down to its minimum load once the exceptional dispatch is complete. Like exceptional dispatch energy, this residual imbalance

energy is a result of out-of-market actions and is not competing on price with other supplier's offers. The residual imbalance energy is unmitigated and the schedule coordinator can choose (in either the *ex ante* or *ex post* strategies) the price paid to the residual imbalance energy. Further, the extent to which the schedule coordinator can impact the likelihood of receiving an exceptional dispatch (and exercise market power) extends to control over the likelihood of having residual imbalance energy settled on the high-priced bids effective during the exceptional dispatch.

Figure 2 illustrates how the residual imbalance energy results from an exceptional dispatch. The exceptional dispatch is represented by the yellow bars. The black line shows the rate at which the resource ramps up from its minimum load to the exceptional dispatch instruction. The resource is instructed to begin ramping down slightly prior to the end of the exceptional dispatch (hour ending 21). The energy produced during the ramp back down to the resource's economic dispatch in hours subsequent to the end of the exceptional dispatch is categorized as residual imbalance energy (as shown by the red area in Figure 2). Since the resource has submitted high-priced bids, its economic dispatch after the exceptional dispatch will be at minimum load.

Figure 2. Residual imbalance energy resulting from exceptional dispatch



In this example, the resource has a much lower ramp rate at output levels below its minimum dispatchable level and, therefore, can take considerable time to ramp down from its minimum dispatchable level to its minimum load. The residual imbalance energy represented by the red bars will be settled at the bid price effective for the exceptional dispatch that led to the ramp down to minimum load. The bid price effective for settlement is entirely determined by the schedule coordinator and can be as high as the energy bid price cap of $1,000/MWh.

Q. Are excessive gains from exercising market power in residual imbalance energy mitigated similarly to those associated with exceptional dispatch?

A. No. Mitigation is applied to exceptional dispatch payments (*i.e.*, resources are paid the higher of the LMP or their default energy bid). The bid for exceptional dispatch energy itself is not mitigated. Therefore, the original bid that was used when running the market during the hour when unit received an exceptional dispatch is also used in determining the price at which residual imbalance energy is settled. Under existing mitigation authority and settlement rules, mitigation for exceptional dispatch has no impact on excessive revenue that can result from exercising market power in residual imbalance energy.

Q. Are gains from residual imbalance energy netted against losses in other periods through the bid cost recovery process so that the gains from this energy might be reduced?

A. No. Bid cost and market revenue for residual imbalance energy are not considered in the bid cost recovery make-whole process. Therefore, the gains from strategies that target or leverage residual imbalance energy are not diminished by uneconomic dispatch in other periods. This further bolsters the incentive to bid and schedule for purposes of capturing gains from residual imbalance energy, increases the potential cost to the market from these gains, and further distorts the incentives for competitive bidding.

Q. Are there other means for exercising market power through residual imbalance energy?

A. Yes. For example, the ISO software allows generators to temporarily modify the minimum load of a resource in the event that physical operating limitations require a unit to operate at a different minimum level. Thus, a schedule coordinator could seek to increase the resource's minimum load upward such that the market software must dispatch the resource up to respect this new minimum. The schedule coordinator can submit high-priced bids for the last hour of the minimum load re-rate and into the next few hours. The energy produced as the resource is dispatched back down to its normal minimum load is classified as residual imbalance energy and settled in the same way as described in the exceptional dispatch example above.

Q. Are there other market impacts associated with exercising market power through residual imbalance energy?

A. Yes. So far I have focused on the direct impact of residual imbalance energy and exceptional dispatch on payments to generators, which are ultimately allocated to load serving entities. However, such bidding behavior can also have significant indirect impacts on efficiency in the day-ahead and real-time markets. The incentive to submit uncompetitive offers reduces the amount of energy available to the day-ahead and real-time markets at competitive prices in two ways. First, economic withholding reduces the amount of energy available to the market within the range of normal competitive prices. During periods when scheduling

coordinators economically withhold resources that would have been economic had they bid competitively, the ISO is forced to dispatch energy from higher-cost less efficient resources, thereby unnecessarily increasing price and cost to serve load.

For resources with very low ramp rates at their minimum load, this economic withholding can also have separate effect similar to physically withholding. The strategy of economic withholding I have previously described causes the market to dispatch resources at minimum load where they have very low ramp rates. This limits the amount of energy that is physically available to the real-time market if these resources are not dispatched up to their minimum dispatchable level through exceptional dispatch. The resulting reduction in available energy can force the market to dispatch energy from a higher-cost and less efficient resources thereby increasing price and cost to serve load. In more extreme cases in the real-time market, this physical reduction in available ramping energy can result in short periods of insufficiency and trigger administratively set market prices of $1,000/MWh or more.

Q. To what extent have you observed excessive gains in residual imbalance energy resulting from economic withholding?

A. I have observed the inflation of residual imbalance energy payments in cases where market power was exercised through exceptional dispatch in both the *ex ante* and *ex post* strategies (successfully or not). As

described earlier in my testimony, even if the ISO is able to mitigate payments when a generator exercises market power through exceptional dispatch, the generator may receive excessive payments for residual imbalance energy resulting from this exceptional dispatch. During the period June 2012 through August 15, 2012, total payments for residual imbalance energy to resources that bid over $500/MW and received exceptional dispatch were approximately $6.1 million, or about $5.9 million in excess of payments that would result if this energy had been paid based on the settlement provision being proposed by the ISO (*i.e.*, to pay this energy the higher of the market prices or the resource's default energy bid).

As indicated in the testimony of Mr. Cooper, the settlement modifications that the ISO is proposing would have reduced excess residual imbalance energy payments by a total of $6.3 million for all schedule coordinators between June 1 and August 15 of this year. Thus, the proposed changes would reduce residual energy imbalance payments by an additional $0.4 million beyond the $5.9 million attributable to the exercise of market power in exceptional dispatch. This additional $0.4 million is attributable to resources ramping for various other reasons in hours with uncompetively high-priced bids. For instance, this can occur as a result of ISO market dispatches, short-term changes in resource characteristics, uninstructed deviation, and other reasons not associated with exceptional dispatch. However, the ISO proposal eliminates the

potential for these excessive gains under all these circumstances including the exercise of market power in exceptional dispatch.

The potential gains from residual imbalance energy revenue on uncompetitive bids can be significant enough to provide an incentive for suppliers to exercise this strategy in lieu of competitive bidding. Further, as I have described above, currently suppliers can directly influence (through likelihood of dispatch and the price they are paid) the circumstances under which excessive gains are possible in residual imbalance energy. This has resulted in excessive costs to date, and poses significant risk of ongoing excessive costs even under circumstances where mitigation of the exceptional dispatch payments is available. More discussion of historical residual imbalance energy payments is included in the testimony of Mr. Cooper.

Q. Mr. Cooper notes that most of the reduction in residual energy imbalance payments that would result if the ISO had applied the proposed settlement change to past residual energy imbalance payments would result from payments to a single participant over the last few months. How does this related to your analysis?

A. Table 1 shows a more detailed breakdown of the total reduction in residual energy imbalance payments that would have occurred if the proposed settlement rules had been in effect over the last 14.5 months. As shown in Table 1, the proposed settlement rule would have mitigated about $7.1

million of the $7.7 million in excess residual energy payments over this 14.5 month period is attributable to a single scheduling coordinator (SC1). About $6.2 million of this $7.1 million was for one scheduling coordinator and occurred in the two and a half month period beginning June 2012, with $5.9 million of this resulting from exceptional dispatches. As shown in Table 1, this participant received a total of about $900 thousand in excess residual energy imbalance payments over the 12 month period from June 2011 through May 2012. Meanwhile, all other participants received only about $600 thousand in excess residual energy imbalance payments over this 14.5 month period, representing an average of only about $40 thousand per month. As previously noted, these other residual energy imbalance payments are attributable to resources ramping for various other reasons in hours with uncompetively high-priced bids.

Table 1. Residual energy imbalance payments in excess of payments that would result under modified settlement provisions being proposed

	June 2011 to May 2012	June 2012 to Aug 15, 2012	Total
SC1 (Exceptional dispatch)		$5.9	$5.9
SC1 (Other causes)	$ .9	$ .3	$1.2
Total for SC1	$ .9	$6.2	$7.1
All other SCs	$ .5	$ .1	$ .6
Total (all SCs)	$1.4	$6.3	$7.7

Q. What is the ISO's proposal for eliminating excessive gains in residual imbalance energy from the exercise of market power?

A. The ISO proposes to change the settlement rule for residual imbalance energy to prevent extremely high-priced uncompetitive bids from setting the basis for these payments. For positive residual imbalance energy, the payment price will first guarantee payment of the lesser of (1) the unit's default energy price, or (2) reference hour bid price. If this calculated price is lower than the LMP, the resource will receive the LMP for this energy. Mr. Cooper provides more detail on the proposed settlement rule for residual imbalance energy in his testimony.

Q. How does the ISO proposal mitigate the exercise of market power in residual imbalance energy?

A. Compensating for residual imbalance energy in the manner that the ISO proposes directly eliminates the incentive to submit uncompetitive bids by limiting the potential gains in residual imbalance energy that can result from doing so. If the schedule coordinator does submit high-priced uncompetitive bids, the residual imbalance energy will be settled on the higher of the LMP or the default energy bid. This eliminates the incentive to submit high-priced bids to receive excessive gains on residual imbalance energy.

Q. Thank you. I have no further questions.

DECLARATION OF WITNESS

I, Jeffrey D. McDonald, declare under penalty of perjury that the statements contained in the foregoing Testimony of Jeffrey D. McDonald on behalf of the California Independent System Operator Corporation in this proceeding are true and correct to the best of my knowledge, information, and belief.

Executed on this 28th day of August, 2012.

/s/ Jeffrey D. McDonald
Jeffrey D. McDonald

Attachment E

Testimony of Bradford Cooper (Exh. ISO-3)

Exceptional Dispatch and Residual Imbalance Energy Mitigation Tariff Amendment

California Independent System Operator Corporation

Fifth Replacement FERC Electric Tariff

August 28, 2012

Exhibit No. ISO-3

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

California Independent System Operator Corporation	**)**	**Docket No. ER12-____-000**

DIRECT TESTIMONY OF
BRADFORD COOPER
ON BEHALF OF THE
CALIFORNIA INDEPENDENT SYSTEM
OPERATOR CORPORATION

Q. Please state your name, title, and business address.

A. My name is Bradford Cooper. I am employed as Manager, Market Design and Regulatory Policy of the California Independent System Operator Corporation (ISO). My business address is 250 Outcropping Way, Folsom, CA 95630.

Q. Please describe your educational and professional background.

A. I have a master of business administration with concentrations in both finance and technology management from the University of California, Davis. I also have a bachelor of science in geology. I joined the ISO in 2002 as senior data quality auditor. From 2003 – 2005, I was compliance program development manager. In this capacity I managed development of rules, processes, and systems to adjust ISO market settlement amounts for deviations from energy schedules or for ancillary services' unavailability. This involved understanding the rules for the various energy settlement types in

the ISO market, including residual imbalance energy, which is the subject of this testimony. From 2005 until January 2012, I was lead market monitoring analyst in the ISO's Department of Market Monitoring. In this capacity, I monitored, analyzed, and reported on market activity and performance, recommended market design changes, and reviewed market design changes proposed by the ISO. Since January 2012 I have been the ISO's manager of market design and regulatory policy.

Q. What are your duties and responsibilities at the ISO?

A. I manage a team of five people responsible for developing ISO market design policy. We manage the ISO stakeholder processes that develop changes to the ISO market design and develop new market design features. This includes a current stakeholder initiative that is addressing various bid cost recovery issues and has also considered residual imbalance energy settlement.

Q. What is the purpose of your testimony?

My testimony describes two issues with the ISO's current method for paying residual imbalance energy, a type of real-time ramping energy categorized as such for settlement purposes. It also describes the method the ISO proposes to use to pay residual imbalance energy that will address these issues, the reasons this proposed method is just and reasonable, and the impact of this proposed change on market

participants. But first, my testimony provides background and an overview of the ISO markets to give context to my discussion of residual imbalance energy.

I. Background and Overview of the ISO Markets

Q. Please provide an overview of the ISO's day-ahead energy market.

A. The ISO operates a day-ahead and real-time market based on locational marginal pricing for energy and ancillary services. In the day-ahead market, the ISO conducts an integrated forward market based on bid-in demand and supply for energy, which results in feasible day-ahead schedules for generation resources. Day-ahead supply schedules are hourly schedules for energy at specific pricing nodes in the ISO system. Generating resources within the ISO can submit three-part bids to the ISO market that consist of a start-up cost, a minimum operating limit cost (normally referred to as minimum load cost), and an energy bid cost for energy above a resource's minimum operating level. This market design is intended to provide strong incentive for suppliers to submit bids that reflect the true marginal cost of energy from each resource. Start-up and minimum load costs are based on either a cost-based rate (known as proxy costs) or a monthly bid that that may be up to 200 percent of a resource's start-up and minimum load fuel costs (known as a registered bid). Energy bids can vary from hour to hour and are only limited by the maximum bid price of $1,000/MWh. Energy scheduled in the day-ahead

market for each trading hour is settled based on the hourly day-ahead locational marginal price (LMP). Each resource's day-ahead market schedule is financially binding, meaning that resources will be paid the day-ahead LMP for that hour regardless of actual performance in real-time. However, if resources generate below their day-ahead schedule in the real-time market they must pay back the real-time LMP for any portion of their day-ahead schedule not delivered in real-time. The second portion of the day-ahead market following the integrated forward market is the residual unit commitment process in which the ISO commits additional capacity that may be needed for reliability.

Q. Please describe the real-time energy market.

A. In real-time, the ISO conducts a five-minute market in which it dispatches units up or down based on submitted supply bids and the forecast for real-time demand. As a result of this real-time dispatch, resources may continue to generate at their day-ahead schedules, sell additional energy beyond their day-ahead schedule, or not produce as much as scheduled in the day-ahead market. Any additional energy produced in the real-time market is referred to as incremental energy. If a unit is dispatched below its day-ahead schedule this is referred to as decremental energy. All incremental or decremental energy is classified as imbalance energy. This imbalance energy is settled based on the real-time LMPs. Incremental imbalance energy results in a payment to the resource while

decremental imbalance energy results in a charge to the resource. In the real-time market, participants can submit different bid prices for each hour. These supply bids must be in the form of a monotonically increasing energy bid curve. The real-time dispatch process produces feasible dispatch instructions for resources. Whereas the day-ahead market is settled hourly, real-time energy is settled on a ten-minute basis based on the LMPs for the two five-minute dispatch intervals that make up the relevant ten-minute settlement interval. The ISO conducts a separate real-time process in the hour-ahead scheduling process for clearing intertie imports and exports, with those schedules being settled based on the hourly hour-ahead LMP.

Q. Is all real-time energy settled in the same way?

A. No. For every ten-minute settlement interval the ISO determines the amount of incremental or decremental energy that is instructed in the real-time market, which is referred to as instructed imbalance energy. The ISO also calculates the extent to which units deviated above or below this dispatch instruction by comparing the metered output of each resource to this dispatch instruction. This is referred to as positive or negative uninstructed imbalance energy. Currently, the ISO settles instructed and uninstructed imbalance energy in a similar manner because the ISO does not have any uninstructed deviations penalties. The ISO settles instructed imbalance energy at the average of the two real-time LMPs for the two

five-minute dispatch intervals in a 10-minute settlement interval, weighted by the amount of energy dispatched in each interval. It settles uninstructed imbalance energy at the simple average of the LMPs in the two dispatch intervals. Negative uninstructed imbalance energy is charged the LMP while positive uninstructed energy is paid the LMP.

Q. Please describe what you mean by feasible schedules and dispatches.

A. When clearing the ISO markets, the ISO market optimization considers and honors key physical characteristics of each generation resource. For example, both the day-ahead and real-time markets honor a resource's minimum run time. Therefore, in considering whether to schedule a resource, the ISO market optimization considers the minimum amount of time it must keep that resource on and the economics associated with that decision. Similarly, the ISO market will consider and honor a resource's ramp rates, or the speed at which it can ramp its output up or down. Consequently, in scheduling the fleet of resources within the ISO, the market is able to consider the ramp rates of each different unit at different operating levels and issue dispatches that are feasible given these ramping limitations. This ensures that the dispatches are operationally feasible and enables the ISO to use the market optimization solution in dispatching its system reliably to the extent possible. In order to ensure that all schedules and dispatches are feasible, the ISO market software

may dispatch a unit at an output level for which the resource's energy bid price is above the LMP. An important consideration is that the market software cannot model all circumstances relative to resource characteristics. Mr. Rothleder's testimony describes circumstances that the market software cannot model and that may require out-of-market actions by ISO operators.

Q. Please provide examples of conditions that may result in a situation in which the LMP does not cover a resource's submitted bid.

A. In scheduling resources, the ISO market will honor a resource's minimum run time. Consequently, it is possible that the optimization will find it economically optimal to schedule a resource for a given time period, even though the resource will have to be operating for a longer period once the resource is started. In many instances, resources also must ramp up or down at a given rate, which results in the resource producing energy at an output level for which its bid price may be greater than the LMP. One instance in which this can occur is when LMPs in the real-time market are not the same as the real-time market predicted in previous dispatch intervals.

To the extent the LMP is not sufficient to cover a resource's submitted energy bid, ISO settlement provisions ensure the resource recovers these costs, subject to the resource having a shortfall in overall revenue from the ISO market compared to its bid cost. These settlement

provisions, referred to as bid cost recovery, pay a resource any shortfall as calculated for the entire day and calculated for the day-ahead and real-time markets together. This process compares a resource's submitted energy, residual unit commitment, and ancillary services bid costs, plus its minimum load and start-up costs, to its energy revenue earned at the LMP plus any other ISO market revenue earned from ancillary services or from the residual unit commitment process.

In addition, in the real-time market, the ramping energy that occurs when a unit is ramping up or down from a real-time market bid dispatched in an adjacent hour is classified as residual imbalance energy and is paid the resource's bid, irrespective of the LMP.

II. Residual Imbalance Energy

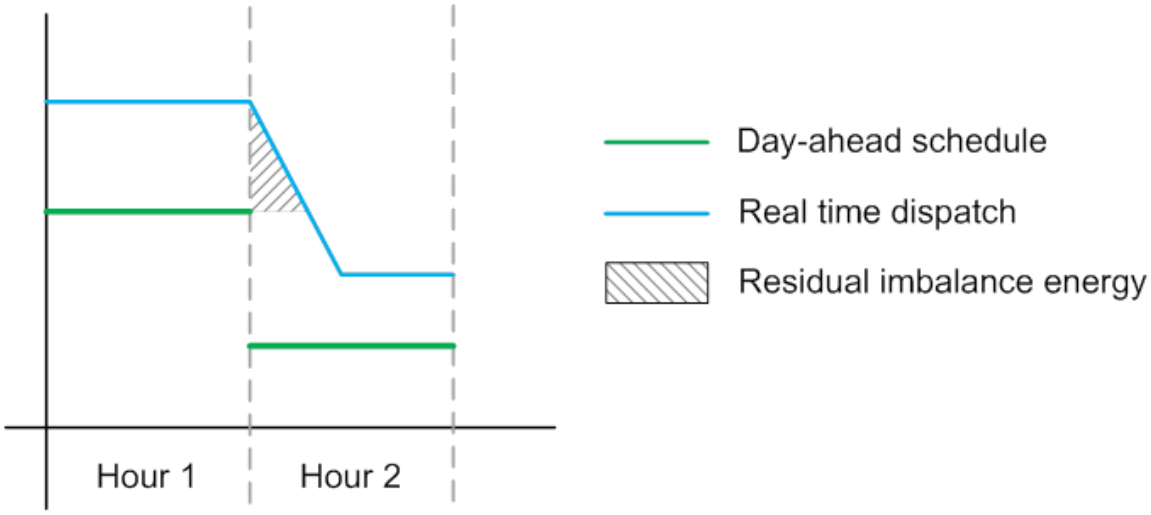
A. Residual Imbalance Energy Description, Settlement, and Settlement Trends

Q. Please describe residual imbalance energy.

A. As discussed above, residual imbalance energy is a category of real-time energy that is utilized for settlement purposes. Residual imbalance energy occurs when a unit is ramping down from a bid dispatched in the real-time market at the end of a previous hour or ramping up to a bid dispatched at the beginning of an upcoming hour. Residual imbalance energy is additional ramping energy beyond any ramping energy attributable to a change in the resource's day-ahead schedule from one

hour to the next. Figure 1 illustrates the portion of ramping energy that would be classified as residual imbalance energy for a unit that was already scheduled to ramp down due to the decrease in its hourly schedule from one hour to the next. Thus, residual imbalance energy is only the ramping energy attributable to real-time market energy dispatches and not to the hourly day-ahead schedule change.

Figure 1. Residual imbalance energy



Q. How is residual imbalance energy settled?

A. As provided in Section 11.5.4 of the ISO's current tariff, for each ten-minute settlement interval, the residual imbalance energy settlement amount is based on the product of the MWh of residual imbalance energy and the bid that led to the residual imbalance energy from the relevant dispatch interval in which the resource was dispatched. In other words,

residual imbalance energy is settled based on the bid in the adjacent hour corresponding to the dispatch level to or from which the resource is being ramped. This bid price is referred to as the reference hour bid. If there is no reference hour bid, residual imbalance energy is settled at the settlement interval's real-time LMP. Residual imbalance energy can be incremental or decremental to the day-ahead schedule. Residual imbalance energy is not subject to the bid cost recovery process, meaning that any other market revenues the resource earns are not used to offset the resource's residual imbalance energy payments. Therefore, even if a resource earns sufficient market revenues to cover its production costs for the day, the resource will still be paid at least the reference hour bid price for the intervals in which the resource's energy is classified as residual imbalance energy.

Q. Why is residual imbalance energy settled the way it is?

A. Residual imbalance energy was intended to recognize that resources can have different bid prices in adjacent hours, system conditions can change between hours, and resources have ramping limitations. Because the ISO real-time market software determines the optimal dispatch for the entire period from the next five-minute dispatch interval to one hour in the future, and recalculates this dispatch every five minutes, this dispatch may change as it considers bids from different hours. In addition, system conditions can change with each hour, particularly due to intertie schedule

changes. Because of this, a resource may be ramping up or down in one hour as the result of a bid dispatched in an adjacent hour, and the resource can have different bid prices in these hours. Residual imbalance energy was intended to settle the resource's energy at this dispatched bid price during these ramping periods, irrespective of the LMP in these ramping periods.

Q. Who pays for the cost of residual imbalance energy?

A. The costs for residual imbalance energy are included, among other settlement charges and credits, in an ISO market settlement category that is allocated pro rata to load and exports.

Q. Are there any concerns with the current tariff settlement rules for residual imbalance energy?

A. While residual imbalance energy payments have not been substantial over the past three years until very recently, there are two areas of concern that the settlement rules being proposed in this filing address. First, there is an inconsistency between the way in which the ISO settles exceptional dispatches and residual imbalance energy associated with the exceptional dispatch. Even though the exceptional dispatch settlement price may be mitigated, the residual imbalance energy is not settled at this mitigated price. The ISO settles the residual imbalance energy at the unmitigated reference hour bid, rather than at a mitigated price as with the exceptional

dispatch energy. This creates adverse incentives that can inappropriately inflate residual imbalance energy payments. Second, the ISO has observed that a resource can significantly increase residual imbalance energy payments by persistently deviating from its dispatch. Under this scenario, a resource could generate above the level of its dispatch as the ISO software is dispatching it down from its dispatch in the previous hour. In both of these cases, submission of bids well in excess of costs can inflate residual imbalance energy payments to unreasonable amounts.

Q. Have you observed any market behavior relating to these concerns with the current settlement rules for residual imbalance energy?

A. Under normal and expected market behavior, the rules seem to be working as expected and without issue. In the past, residual imbalance energy payments have been relatively minimal. However, current pricing of residual imbalance energy appears to be playing a role in encouraging or at least rewarding market behavior that has recently increased residual imbalance energy payments. Also, as I will describe below, the current pricing of residual imbalance energy has the potential to incent other behaviors that can inappropriately inflate residual imbalance energy payments.

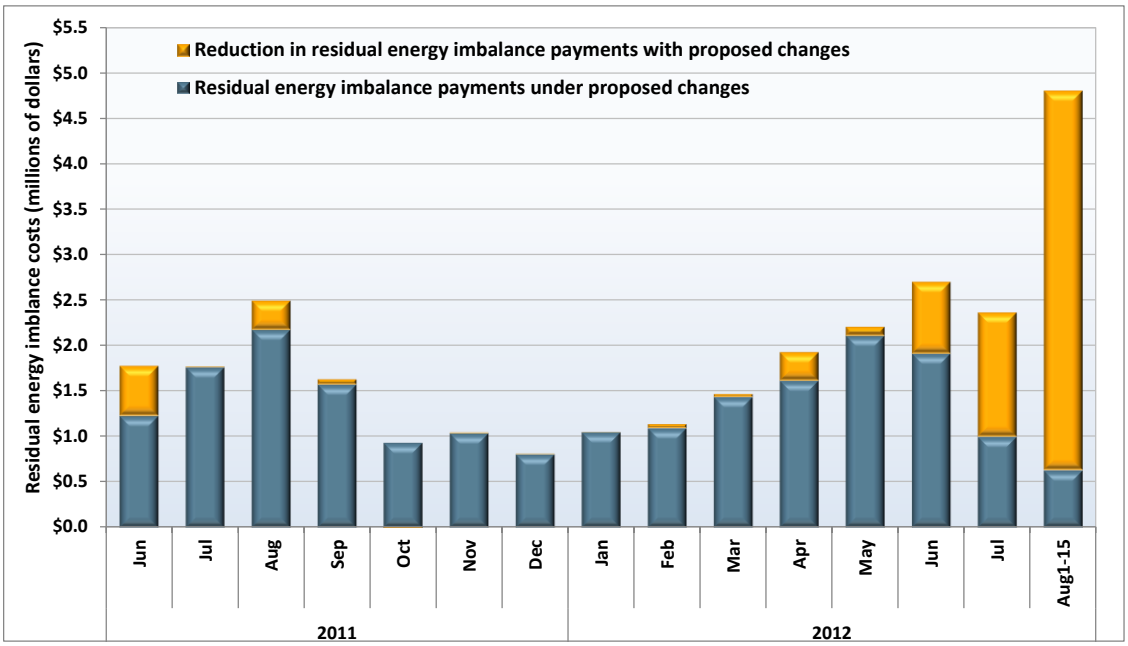
Figure 2 illustrates the trend in payments for residual imbalance energy by month from June 2011 to August 15, 2012. The bars in Figure 2 show the actual residual imbalance energy payments made by month

over this period. The upper (yellow) portion of the bars in Figure 2 show the amount by which the settlement rules proposed in this filing would reduce residual imbalance energy payments. The lower (blue) portion of the bars show the amount of residual imbalance energy payments the ISO would have made under the settlement revisions being proposed in this filing.

As shown in Figure 2, until the last few months, residual imbalance energy payments have been a relatively small part of overall real-time market settlement, generally in the range about $1 to $2 million per month, totaling about $35 million for this 14.5 month period. This represents only about six percent of total incremental real-time market energy costs over the same period. However, as shown in Figure 2, there has been a recent increase in these residual imbalance energy payments since June 2012, with these payments reaching almost $5 million in first half of August 2012. As shown by the upper (yellow) portion of the bars in Figure 2, the proposed settlement modification would have reduced residual imbalance energy payments over this 14.5 month period by about $7.7 million, with about $6.3 million of this reduction occurring since June 2012. Of this $7.7 million, about $7.1 million involves residual imbalance energy payments to one single participant. As described in the testimony of Dr. Jeffrey McDonald, this participant has engaged in bidding practices that have the effect of inflating residual imbalance energy payments through the

exercise of market power. I provide additional details of this analysis of the impacts of the proposed settlement later in my testimony.

Figure 2. Reduction in total payments for residual imbalance energy that would have occurred under proposed rule change (June 2011 – August 15, 2012)



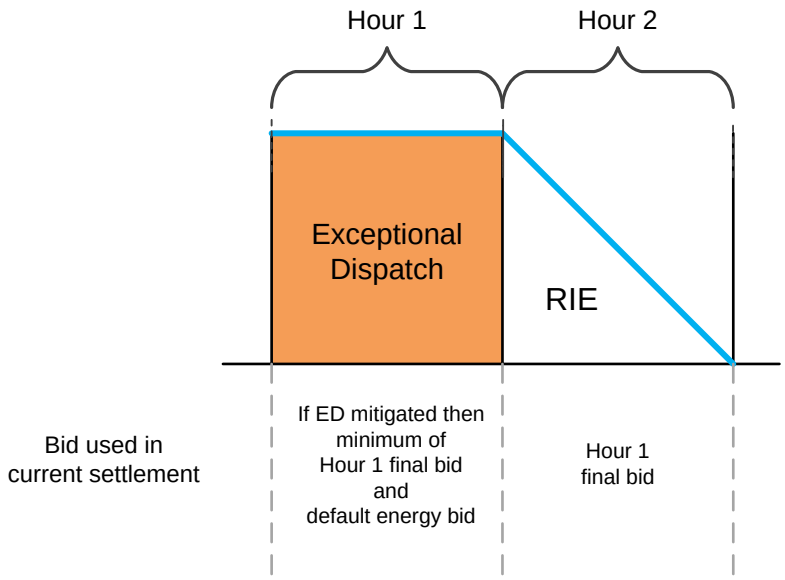
B. Issues related to the Settlement of Residual Imbalance Energy

Q. Please describe the issues associated with residual imbalance energy that precede or follow an exceptional dispatch.

A. As described by Dr. Jeffrey McDonald in Exhibit No. ISO-1, and as provided in section 39.10 of the current ISO tariff, the ISO may mitigate the settlement of certain types of exceptional dispatch under certain non-competitive conditions. When a resource is exceptionally dispatched by

the ISO, the resource can also incur ramping energy, moving up to or down from the exceptional dispatch. This ramping energy is classified as residual imbalance energy when the ramping energy crosses an hourly boundary. However, while the resource's payment for an exceptional dispatch may be mitigated, under the current rules, the corresponding residual imbalance energy is not settled based on this mitigated price. Figure 3 below demonstrates how this can occur

Figure 3. Settlement of residual imbalance energy ramping up to or down from an exceptional dispatch



The example in Figure 3 depicts two hours in any given operating day. The blue line is the ISO's real-time market dispatch resulting from issuing an exceptional dispatch in the real-time market for hour 1. The orange area in hour 1 is exceptional dispatch energy. The rest of the area

under the blue line consisting of the resource's energy ramping down from the exceptional dispatch in hour 1 is residual imbalance energy. The diagram also shows the energy bid used for energy settlement for the two hours. If the exceptional dispatch payment is subject to mitigation, the bid price used in the calculation of the resource's payment for hour 1 may be mitigated to the resource's default energy bid. However, the residual imbalance energy for hour 2 is settled at the bid price for hour 1 without it undergoing the provisions for exceptional dispatch energy that would mitigate it to the default energy bid. It is merely settled at the reference hour bid consistent with Section 11.5.5 of the current tariff.

Q. Have you observed these inefficiencies?

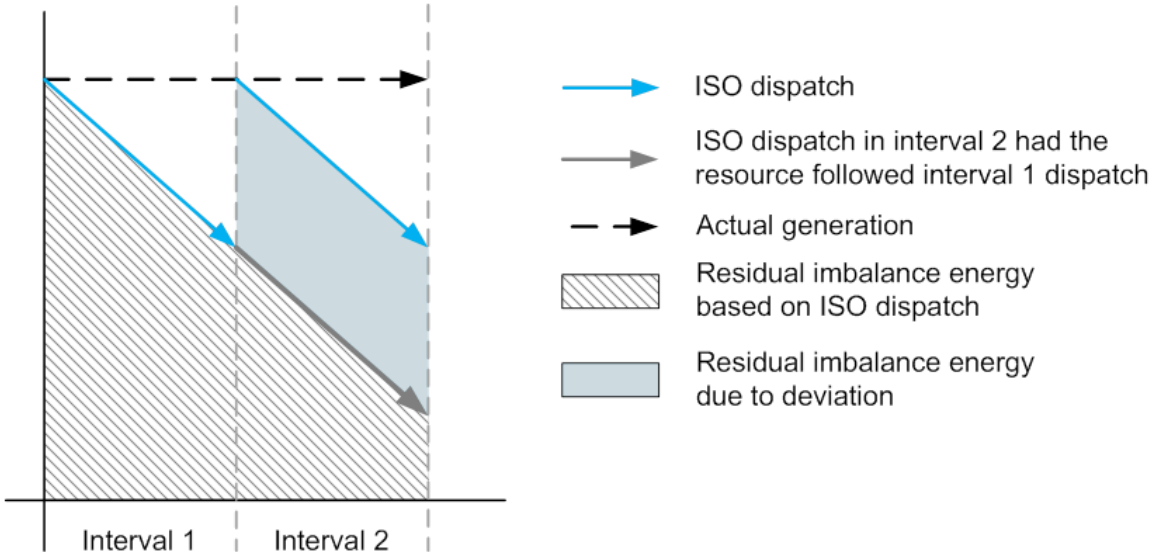
A. Dr. McDonald describes in greater detail the adverse market behavior that can exacerbate the market inefficiencies created by this market rule in Exhibit No. ISO-1 in this proceeding.

Q. Please describe the issues associated with residual imbalance energy and persistent deviations from dispatch.

A. Persistent deviations from ISO dispatch instructions can also inflate residual imbalance energy if a resource over-generates as it is being dispatched to ramp down from a bid that was dispatched in the preceding hour. Figure 4 provides an example of this over two real-time five-minute dispatch intervals. The solid blue line in Figure 4 shows the ISO's

dispatch instructions, while the dashed line shows the resource's actual output. The residual imbalance energy that occurs as a result of the ISO dispatch instructions is shown by both the cross-hatched area and the blue shaded area. The blue shaded area in Figure 4 shows the amount of residual imbalance energy inflated by the generating unit not following the ISO's dispatch to ramp down and instead maintaining its output level.

Figure 4. Inflation of residual imbalance energy resulting from persistent uninstructed deviations



In the first dispatch interval, interval 1, shown in the example illustrated in Figure 4, the ISO dispatches the resource down from a bid that was dispatched in the preceding hour. This results in the residual imbalance energy represented by the cross-hatched area in shown in Figure 4 for interval 1. Figure 4 also illustrates that instead the resource

does not follow the dispatch instruction and maintains its output level. If the resource followed the dispatch instruction in interval 1, Figure 4 shows that, in interval 2, the ISO would have continued to ramp it down at the ramping trajectory continuing from the dispatch instruction for interval 1. However, in interval 2, since the ISO market ensures feasible dispatch instructions, it again dispatches the resource to ramp down from the same output level from which it originally dispatched it in interval 1. Since all of the energy resulting from this dispatch in interval 2 is classified as residual imbalance energy, the amount of residual imbalance in interval 2 is increased relative to what it would have been had the resource followed the dispatch instructions. This increase amount is shown by the blue shaded area and is directly attributable to the amount the resource deviated from the dispatch instruction in interval 1 by over-generating. This residual imbalance energy inflated by the resource's over-generation will continue to increase in subsequent intervals if the resource continues to deviate from the ISO's dispatch instructions.

Q. Has this behavior been observed and if so, what has been its financial impact?

A. The ISO has observed that persistent deviations could inflate residual imbalance energy payments. However, as I describe in the next section of my testimony (C. Proposed Settlement Rule Change), the metric to determine the amount of residual imbalance energy attributable to

persistent deviation from dispatch would take some time to develop because of its complexity. Although preliminary analysis by the ISO indicates that residual imbalance energy resulting from over-generation has been limited, there is a very real potential that residual imbalance energy payments could be inflated by very high-priced bids and result in payments that are not just and reasonable. Consequently, it is appropriate to address this behavior irrespective of the extent to which it has already occurred.

C. Proposed Settlement Rule Change

Q. How does the ISO propose to address these issues?

A. These issues can be addressed by a settlement rule change that essentially caps residual imbalance energy payments at a resource's default energy bid price or the LMP. Under the proposed rule change, the ISO would settle all incremental energy, which is energy above the day-ahead scheduled energy, as follows. If the LMP in the five-minute dispatch interval in which the residual imbalance energy occurs is greater than the lesser of: (1) the resource's default energy bid price, or (2) its reference hour bid price, the ISO will settle the residual imbalance energy in that interval at the dispatch-interval LMP. If the dispatch-interval LMP is lower than the lesser of (1) the resource's default energy bid price, or (2) its reference hour bid price, the ISO will settle the residual imbalance energy in that interval at the lesser of (1) the resource's default energy bid

price, or (2) its reference hour bid price. Similarly, for any given five-minute dispatch interval, the ISO will settle a resource's decremental residual imbalance energy (*i.e.*, that is below its day-ahead scheduled energy) at the lesser of (1) the dispatch-interval LMP, or (2) the greater of (a) the resource's default energy bid price or (b) its reference hour bid price. The ISO is not currently proposing to change the bid cost recovery provisions relevant to residual imbalance energy.

Q. Please describe how the default energy bid would be defined.

A. The default energy bid would be the same bid that the resource must establish with the ISO under section 39.7 of its tariff. The exact same default energy bid would be used for this purpose. I describe that process here for the sake of completeness in explaining the ISO's proposal, but my explanation should not suggest any changes to the current methodology.

A resource may select one of three options for calculating its default energy bid: (1) variable cost based, (2) locational marginal price based, and (3) negotiated.

The first option is to base the default energy bid on the resource's variable costs. These are determined by considering the resource's incremental fuel costs and standard variable operations and maintenance costs that are specified in the ISO tariff for different generation technologies. Ten percent is added to these costs to determine the

default energy bid. The default energy bid under this option consists of different bid prices at different ranges of MW output based on heat rate information that the resource submits. These are calculated daily for natural gas-fired resources to account for varying natural gas prices. An additional amount is added to a resource's default energy bid under this option if a resource's bids are frequently mitigated under the ISO's market power mitigation procedures.

The second option uses the LMPs at the resource's location as the basis for the default energy bid. The default energy bid is established at the 25th percentile of the LMPs in hours when the resource was scheduled or dispatched by the ISO market over the past 3 months.

The third option is to negotiate the default energy bid. This option is intended for resources for which a resource's actual costs cannot be accurately reflected under the variable cost option. Examples of such costs are opportunity costs or the costs for non-standard operations. The default energy bids established under this option can either be set for each month or can be formulaic in which the default energy bid can vary by day as the inputs to the formula vary.

Q. Describe the reference hour bid.

A. The reference hour bid would be the same bid the ISO uses to settle imbalance energy today. Again there would be no change in that methodology.

Q. Please describe the rationale behind the change.

A. This change equitably addresses the two residual imbalance energy payment issues I previously described: (1) the payment for an exceptional dispatch may be mitigated while the residual imbalance energy for ramping up to or down from the exceptional dispatch is not, and (2) the potential to inflate residual imbalance energy by persistently over-generating. At the same time, it provides for just and reasonable settlement of residual imbalance energy.

This change will settle residual imbalance energy using a similar methodology to that used to determine the price paid for a mitigated exceptional dispatch. This methodology is described more fully by Dr. McDonald in Exhibit No. ISO-1 and in section 39.10 of the current ISO tariff. Exceptional dispatches price mitigation can be summarized as paying the greater of (1) the locational marginal price, or (2) the lesser of (a) the resource's default energy bid or (b) its submitted energy bid. It is just and reasonable that the ramping associated with a mitigated exceptional dispatch be paid on a similar basis to the exceptional dispatch itself.

This change addresses the potential to inflate residual energy payments by persistently over-generating because it will eliminate the profitability of this activity. Likewise, it will also remove the incentive to submit energy bids that exceed a resource's marginal cost in the hope of

inflating residual imbalance energy payments at this bid price by persistently over-generating. As part of the ongoing *Bid Cost Recovery Mitigation Measures* stakeholder initiative addressing various bid cost recovery issues, we considered the use of a metric which would identify resources that are inflating residual imbalance energy payments by persistently over-generating, and would claw back these payments.[1] However, this metric could not be implemented for some time and there is the current potential for the adverse behavior to occur. Also, use of this metric would put resources at risk of losing the entire residual imbalance energy payment for what might be inadvertent or unavoidable deviations.

This change to residual imbalance energy payment addresses the two residual imbalance energy issues described in my testimony, while providing just and reasonable payment for positive residual imbalance energy by guaranteeing that a resource is paid its production costs. In addition, this change would also pay the resource the locational marginal price if it is higher than the resource's production cost. It is appropriate to pay the locational marginal price if it is higher than the resource's default energy bid since this reflects the value of the energy produced. The current residual imbalance energy settlement provisions pay the resource's bid price irrespective of the locational marginal price.

As described above, the change to residual energy payment also applies to decremental residual imbalance energy. As negative residual

[1] http://www.caiso.com/Documents/Addendum_BidCostRecoveryMitigationMeasuresDraftFinalProposal.pdf

imbalance energy represents a charge to the resource, as opposed to a payment for positive residual imbalance energy, the changes proposed represent a symmetrical settlement treatment for positive and negative residual imbalance energy.

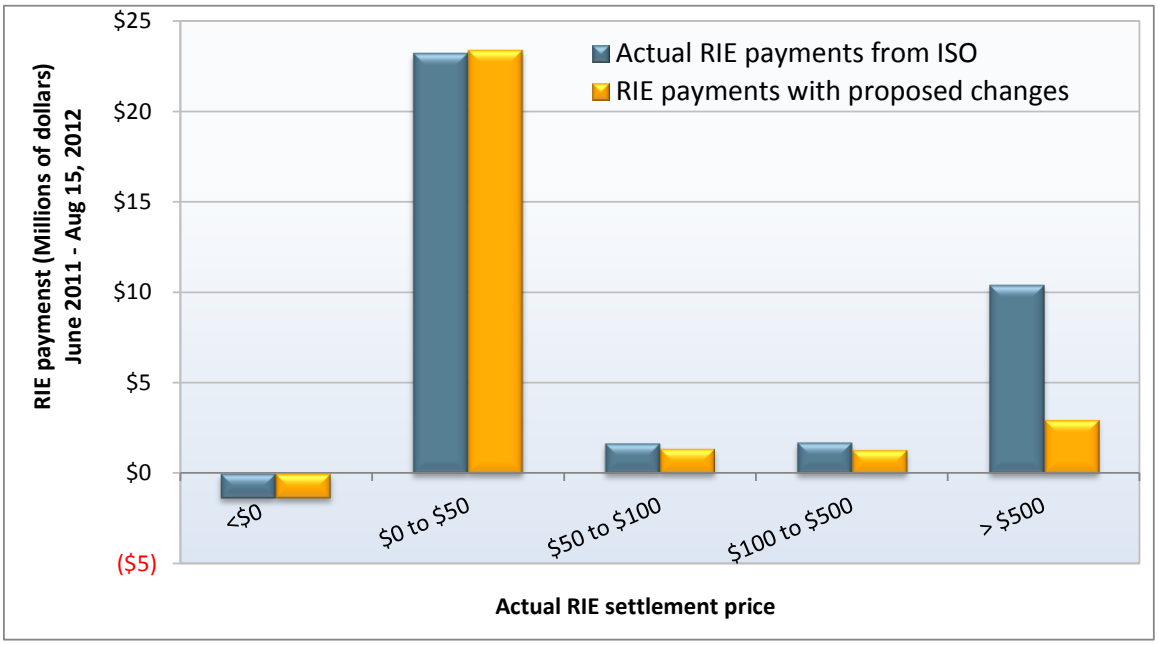
Q. What impact will this change to residual imbalance energy settlement have on payments to resources?

A. We have analyzed the impact of this settlement modification by estimating the change in residual imbalance energy payments to resources that would have occurred if the proposed modifications had been in place over the 14.5 month period from June 1, 2011 through August 15, 2012. This analysis shows that the proposed settlement changes would reduce residual imbalance energy payments for bids that are far in excess of a resource's actual costs, while having minimal impact on other payments. Results of this analysis are summarized in Table 1 and Figure 5. These results are categorized by different price levels at which this energy was actually settled in order to show how the impact of this settlement change is effectively targeted at reducing payments of bids far in excess of a resource's actual costs, and has a *de minimus* impact in other situations.

Table 1. Reduction in payments for incremental residual imbalance energy under proposed rule change based on actual RIE payments from June 2011 – August 15, 2012

Actual RIE settlement price	Actual RIE payments from ISO	RIE payments with proposed changes	Change in payments from ISO
<$0	($1,367,322)	($1,364,752)	$2,570
$0 to $50	$23,214,394	$23,405,622	$191,228
$50 to $100	$1,672,529	$1,385,212	($287,317)
$100 to $500	$1,722,036	$1,316,516	($405,520)
> $500	$10,421,442	$2,981,433	($7,440,009)
Total	$35,663,079	$27,724,031	($7,939,048)

Figure 5. Change in payments for incremental residual imbalance energy under proposed rule change based on actual RIE payments from June 2011 – August 15, 2012



Q. Can you explain these results in more detail? What do the negative values for residual imbalance energy payments settled at prices less than $0/MW in the first row of Table 1 represent?

A. Positive residual imbalance energy provided by dispatchable generating units that submit bids to the real-time market is settled based on the resource's bid price. However, residual imbalance energy for non-dispatchable resources without market bids is settled at the real-time price. The negative values for residual imbalance energy payments settled at prices less than $0 in Table 1 primarily represent residual imbalance energy from non-dispatchable resources (such as wind and other renewables) occurring in intervals with negative LMPs. This category also includes dispatchable resources that may sometimes submit negative bids in the real-time market. As shown in Table 1, payments for this category of residual imbalance energy would actually increase by a negligible amount under the proposed changes (*i.e.,* by $2,570 out of over $1.3 million).

Q. Why would the change in payments for residual imbalance energy be positive under the new settlement provisions for residual imbalance energy that is currently settled at prices above $0/MW up to $50/MW?

A. As shown in Table 1, this category accounts for over $23 million of the $35 million in residual imbalance energy payments (or about two-thirds) over this 14.5 month period. The positive numbers in the right hand column of Table 1 for this category represent an increase in residual imbalance energy

payments for residual imbalance energy in this price category over this period. This reflects the fact that under current rules residual imbalance energy in this price range was generally settled at levels below the LMPs or default energy bids that would be used to limit residual imbalance energy payments under the proposed changes to settlement rules. Under the proposed changes, energy currently settled at a price less than $50/MW would in some cases be paid a slightly higher price when the market LMP exceeds the resource's market bid or default energy bid. Thus, total payments for this category of residual imbalance energy increase by just under 1 percent (or about $191 thousand out of over $22 million in payments).

Q. Under what situation would residual energy payments decrease under the proposed changes?

A. Negative numbers in the rightmost column of Table 1 indicate a decrease to residual imbalance energy payments. As shown in Table 1 and Figure 5, these payments would only have decreased under the proposed settlement rules for residual imbalance energy that was settled at prices above $50/MW. Total RIE payments would have decreased by about $7.9 million over this 14.5 month period, with about $7.4 million of this decrease (94 percent) resulting from lower payments for energy that was settled based on bid prices in excess of $500/MWh. Thus, the proposed settlement changes would

reduce payments for bids far in excess of marginal costs, while having minimal impact on other residual imbalance energy payments.

Q. How would the proposed settlement changes affect charges to resources for negative residual imbalance energy?

A. The proposed changes would have a negligible impact on these charges. As shown in Table 2, over the last 14.5 months these charges would have decreased by only about $225,000 out of over $7.6 million (or a decrease of about 0.3 percent). Again, almost all of these decreased charges would be associated with energy bids in excess of $500/MWh.

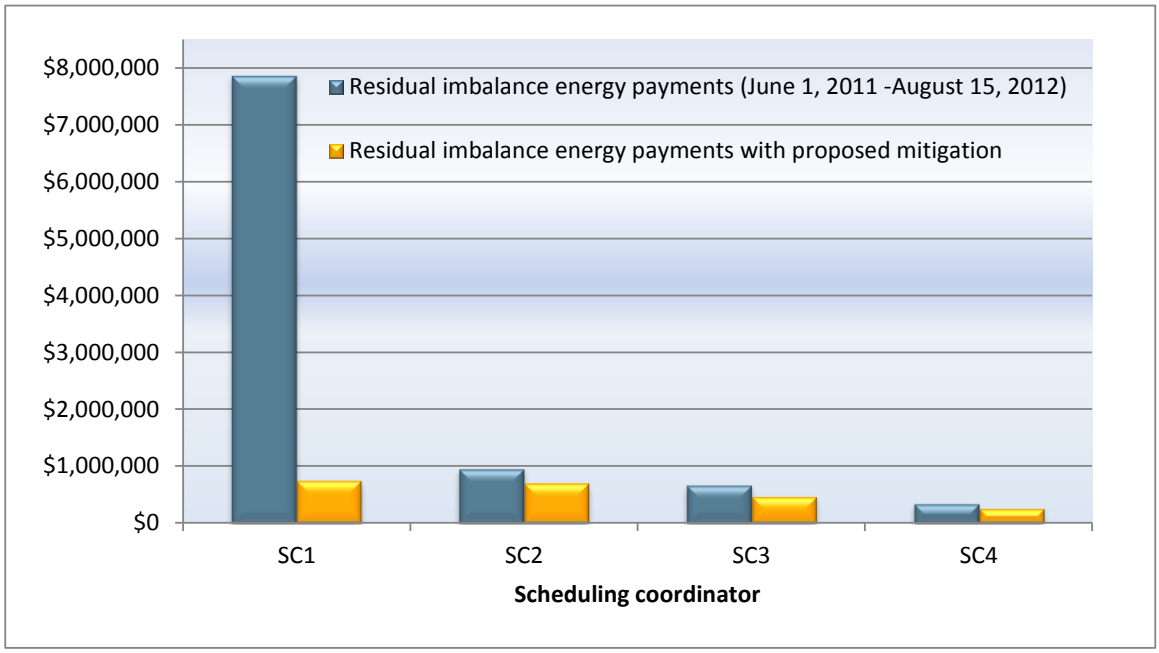
Table 2. Change in charges for decremental residual imbalance energy under proposed rule change based on actual residual imbalance energy charges from June 2011 – August 15, 2012

Actual RIE settlement price	Actual RIE charges to resources	RIE charges with proposed changes	Change in charges to resources
<$0	($269,012)	($158,361)	$110,651
$0 to $50	$6,056,475	$6,009,268	($47,207)
$50 to $100	$333,117	$326,847	($6,270)
$100 to $500	$364,992	$359,578	($5,414)
> $500	$1,167,504	$890,225	($277,279)
Total	$7,653,076	$7,427,557	($225,519)

Q. How would total residual imbalance energy payments to different participants decrease under the proposed changes?

A. If the proposed modifications had been in place over the 14.5 month period from June 1, 2011 through August 15, 2012, total residual imbalance energy payments to generators would have decreased by about $7.7 million. This consists of the total difference in payments for incremental residual imbalance energy amounting to $7.9 million as presented in table 1, net of the $225,519 total decreased charges for decremental residual imbalance energy. Over $7.1 million of this reduction would be incurred by a single participant. Residual imbalance energy payment to all other participants would have been about $600,000 lower. Figure 6 compares actual residual imbalance energy payments made over this 14.5 month period with payments that would result under the proposed settlement changes for the four scheduling coordinators that would have receive the largest reduction. As shown in Figure 6, these other three scheduling coordinators all received under $1 million in residual energy payments over this 14.5 month period and would have a relatively small reduction in total payments under the proposed settlement rules.

Figure 6. Reduction in payments for residual imbalance energy that would have resulted if proposed rule changes were in effect



Q. Why is the ISO asking to implement this settlement rule change immediately, rather than going through the stakeholder process?

A. We developed these settlement modifications as part of efforts associated with the ongoing *Bid Cost Recovery Mitigation Measures* stakeholder initiative. We have concluded that these modifications represent a very effective, equitable, transparent and simple modification to existing settlement rules to mitigate the potential for unreasonably high payments for residual imbalance energy. We planned to propose these settlement modifications in the next iteration of this stakeholder process. However, the recent dramatic increase in the residual imbalance energy payments significantly in excess of market prices and reasonable bid costs precludes this option. This increase is depicted previously in Figure 2 of my testimony, which compares actual

residual imbalance energy payments since the second quarter of 2011 to payments that would have been made if the proposed settlement changes were in effect. As shown in Figure 2, the difference between actual residual imbalance energy payments and payments under the proposed settlement changes started to become significant in the April of 2012 and has grown dramatically in the last couple months. In the third quarter of this year, residual imbalance energy payments were more than three times the level that would result under the proposed rule changes. As described in the testimony of Dr. McDonald, this increase has been driven by the combination of increased exceptional dispatches and higher bid costs for this exceptional dispatch energy substantially in excess of actual cost and market LMPs. Thus, the ISO believes it would be inappropriate to delay implementation of the proposed changes.

Q. Thank you. I have no further questions.

DECLARATION OF WITNESS

I, Bradford Cooper, declare under penalty of perjury that the statements contained in the foregoing Testimony of Bradford Cooper on behalf of the California Independent System Operator Corporation in this proceeding are true and correct to the best of my knowledge, information, and belief.

Executed on this 28th day of August, 2012.

/s/ Bradford Cooper
Bradford Cooper