

Memorandum

To: ISO Board of Governors
From: Eric Hildebrandt, Director, Market Monitoring
Date: December 8, 2011
Re: **Market Monitoring Report**

This memorandum does not require Board action.

EXECUTIVE SUMMARY

This report provides comments by the Department of Market Monitoring (DMM) on market design changes being proposed by Management to facilitate integration of renewable resource via the Renewable Integration Market and Product Review – Phase I initiative. As noted in Management’s memo on this issue, three options aimed at providing additional downward dispatch flexibility to accommodate additional integration of renewable resources were examined in this initiative:

- **Lowering energy bid floor.** The first change is a lower energy bid price floor from - \$30/MW to -\$150/MW. This change is intended to provide incentive to generation resources to increase bids to reduce their generation levels below previously scheduled levels in the real-time imbalance market. By increasing the frequency of real-time prices lower than -\$30/MW, this change will also provide a greater incentive for resources to avoid over-generating above their scheduled levels. DMM supports this change, as Management’s final proposal was modified to reflect DMM’s recommendation on this issue. Specifically, DMM recommended that rather than adopting any of the much lower bid floors previously proposed by the ISO, the bid floor should be reduced to -\$150/MW for at least one year. After that time, DMM recommends that the ISO analyze market performance and only lower the bid floor further if this analysis indicates a further reduction would be beneficial.
- **Bid cost recovery modifications.** DMM also supports Management’s proposal to separate bid cost recovery calculations for the day-ahead and real-time markets to increase incentives for resources to submit bids to increase or reduce generation in the real-time imbalance market. Currently, each unit’s revenues and bid costs from the day-ahead and real-time markets are netted together for each day when performing bid cost recovery calculations. This netting of costs and revenues from these two markets can reduce the financial incentive for generators to participate in

the real-time market, as described later in this memo. However, as noted in Management's memo on this issue, under the ISO's current market rules there are a number of ways that a unit may create and increase real-time bid cost recovery payments by deviating from its dispatched operating level. The potential incentive to intentionally exploit this aspect of current market rules will be increased with the separation of bid cost recovery calculations for the day-ahead and real-time markets. DMM is working closely with the ISO and stakeholders to develop these rules to mitigate this potential gaming opportunity and assess their effectiveness. While these rules may necessarily be relatively complex and require thorough analysis, we are optimistic that effective mitigation measures can be developed and presented to the Board for approval in 2012.

- **Participating Intermittent Resource Program (PIRP).** Management is deferring the decision of whether to alter the PIRP program until 2012 due to concerns of stakeholders representing wind resource owners. DMM has supported elimination of the PIRP program as being most consistent with the goals of reducing over-supply conditions, increasing dispatch flexibility allocating costs based on cost-causation, and ultimately facilitating further integration of variable energy renewable resources. However, given DMM's understanding of various contractual arrangements with load-serving entities under which most existing and future wind resources will operate, we believe that the elimination or modifications to the PIRP program considered by the ISO may not have a major impact in terms of reducing over-supply conditions and increasing dispatch flexibility in the short run. Meanwhile, we believe that the reduction in the bid floor to $-\$150/\text{MWh}$ will provide a much more significant incentive to make wind resources more curtailable or dispatchable in the real-time market.

The remainder of this memo provides a more detailed discussion of this issue.

Lower Bid Price Floor

Management is proposing to lower the energy bid floor to $-\$150/\text{MWh}$ to provide incentive for additional downward ramping flexibility during periods of excessive generation. The magnitude and frequency of over-supply conditions is expected to increase as more renewable variable energy resources integrate onto the grid. DMM supports a lower bid floor to elicit more downward economic bids, especially in light of the mandated increase of renewable resources. Our comments regarding further lowering the bid price floor are directed at achieving the goal of increased dispatch flexibility without creating undue cost that could potentially undermine the overall effort.

As noted in Management's memo, the proposed $-\$150/\text{MWh}$ bid price floor is intended to be low enough so that when prices reach this level it will provide economic incentive for entities controlling wind resources to reduce their output in the real-time imbalance energy market.

The -\$150/MWh level being proposed is designed to cover the opportunity cost of most wind generation, which typically includes a fixed price per MWh produced under contract with a load serving entity, plus production tax credits and the value of renewable energy credits. However, based on discussions with market participants, it is DMM's understanding that there may be contractual and technical barriers that may prevent a significant portion of wind resources from actually reducing their output even when prices reach the -\$150/MWh floor.

DMM believes that more traditional non-intermittent generating resources represent the largest and most economic source of downward flexibility in the ISO system. Analysis by DMM suggests that these generating resources could provide most or all of the additional downward flexibility needed when over-generation conditions exist.¹ DMM believes the \$150/MWh bid floor proposed by Management – combined with bid cost recovery modification being proposed – is likely to be sufficient to incent a significant amount of this capacity to participate in the real-time market for decremental energy.

Meanwhile, DMM believes there are several risks associated with lowering the bid price floor beyond the minimum level needed to incent sufficient additional downward flexibility in real-time:

- Resources that are not able to fully respond to dispatch instructions to reduce generation may be charged the negative price for any output that is above their day-ahead schedule. This risk is the motivation for separating the day-ahead and real-time bid cost recovery calculations, as discussed later in this memo. Further lowering the bid price floor increases the risk of loss in the real-time market and, consequently, reduces the overall profitability of submitting upward and downward offers in the real-time market. DMM and some generators have expressed concerns that an extremely negative bid price floor may sufficiently decrease expected profit from participation in the real-time market such that generators would actually increase the degree to which they self-schedule generation in the real-time market rather than submitting economic bids. This would reduce the amount of downward capacity offered and be counter-productive to the goal of increasing dispatch flexibility to address over-supply conditions.
- Second, DMM has expressed concerns that the potential for more negative prices (resulting from a more negative bid floor) may increase incentives for some generators to engage in uncompetitive strategies. One such scenario involves units within uncompetitive “generation pockets” that may be able to exploit modeling inaccuracies, inconsistencies or transmission de-rates that allow more generation to be scheduled in the day-ahead market than can be allowed to flow in the real-time

¹ DMM whitepaper “Draft White Paper on Over-supply and Shortage of Downward Ramping Supply in Off Peak Hours” at <http://www.caiso.com/Documents/Over-supply%20and%20shortage%20of%20downward%20ramping%20supply%20in%20off%20peak%20hours>.

market. Under these conditions, a generator may be able to schedule excessive amounts of energy in the day-ahead market and then submit extremely low negatively priced bids for this energy in the real-time market. When congestion occurs in the real-time market, the supplier would be able to sell energy in the day-ahead market and then get paid to not provide this energy in real-time (by being charged an extremely negative price) for decremental energy. While such behavior has not been observed to date under the ISO's nodal market design, the incentive to pursue such practices will be greatly increased as the bid floor is reduced to -\$150/MW or lower. In the event such behavior is observed as the bid floor is lowered, the ISO may need to develop rules to mitigate market bids under this scenario. In DMM's view, this provides additional justification for maintaining the -\$150/MW bid price floor until an assessment of the potential risks and benefits of any further reductions can be assessed.

For these reasons, DMM has consistently recommended that the ISO initially lower the bid floor no lower than may be needed to incent sufficient additional downward flexibility and – after assessing the impact of this change – consider whether any further reductions are needed. After initially proposing a bid floor of -\$1,000/MW, the ISO ultimately adopted this general approach and proposed an initial bid floor of -\$150/MW.

Under Management's proposal, after one year under this lower bid floor, the ISO will conduct a study of the impact prior to lowering the bid price cap to -\$300/MW. Management's proposal indicates that if this study finds that "there are no significant unanticipated negative effects" of this -\$150/MW bid floor, then Management will propose to lower the bid floor to -\$300/MW. DMM believes that a more appropriate criteria for further reductions in the bid floor is whether a further reduction in the floor is likely to provide significant benefits. In other words, the bid floor should not be lowered to -\$300/MW simply because "no significant unanticipated negative effects" have been observed under a -\$150/MW cap, but should also be based on a determination that a further lowering of the cap is likely to provide significant additional benefits.

In addition, DMM recommends that if the bid is lowered beyond -\$150/MW, that ISO also assess what specific level of bid floor might most effectively balance the potential benefits with the risks of further reductions in the bid floor. As noted in Management's memo, the rationale provided for lowering the bid floor to -\$300/MWh is that this level is necessary to cover the opportunity cost of the significant amounts of solar generation that are scheduled to come online in the near future. DMM finds this justification is questionable for several reasons.

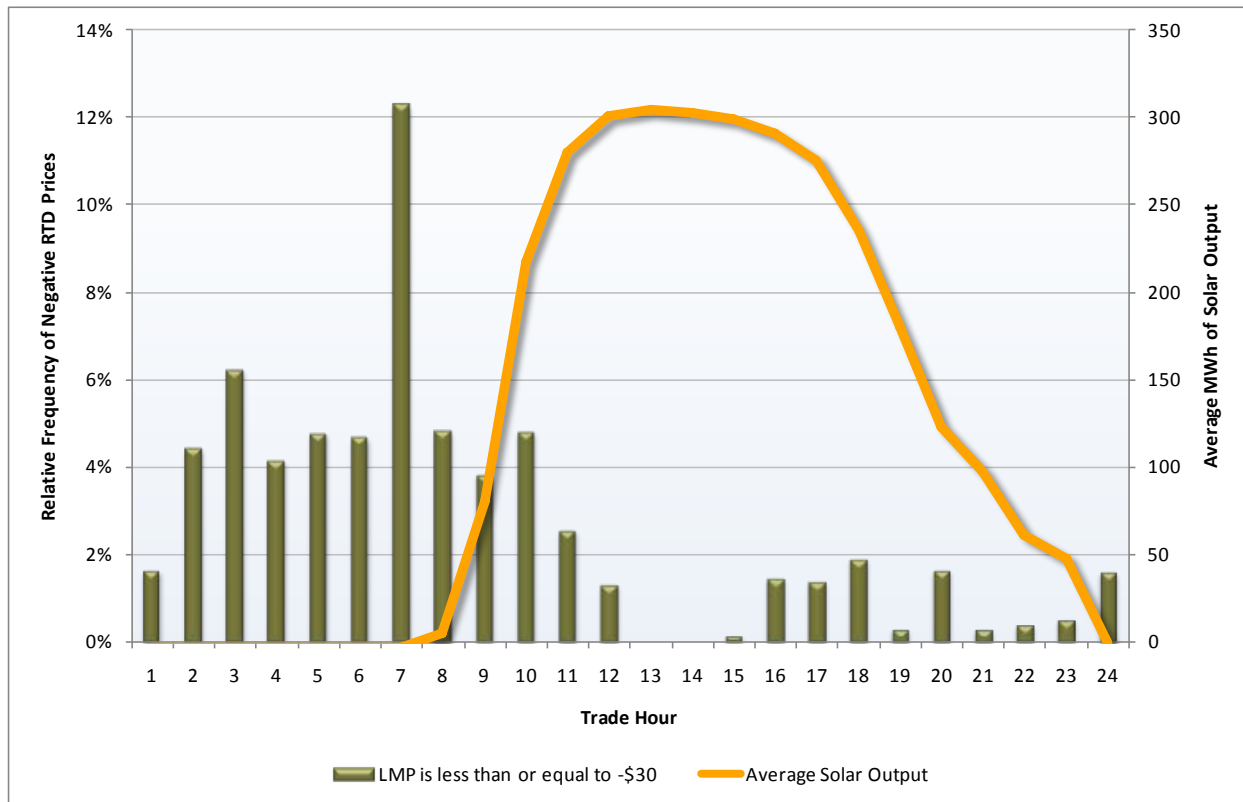
- First, the data cited in support of an opportunity cost of this -\$300/MWh for solar resources is extremely limited. The only specific data cited to support a potential opportunity cost as low as -\$300/MWh for solar resources is that a recent

Request for Offers issued for solar photovoltaic facilities had a cap of \$295/MWh.²

- More importantly, over-supply conditions and the need for additional downward dispatch flexibility primarily occur during off-peak hours when the sun is not shining and solar resources are not producing any energy. As shown in Figure 1, most intervals when more decremental energy bids are needed occur in hours 3 through 7 when there is no solar output.

Thus, DMM disagrees with the basis upon which the -\$300/MWh level for a potential future decrease in the floor has been justified by the ISO.

Figure 1: Correlation Between Negative Real-time Prices and Solar Output January through October 2011



² Revised Straw Proposal on Reforms to Energy Market and PIRP Rules and Procedures Renewable Integration: Market and Product Review Phase 1, February 17, 2011, p.17.

The written opinion of the Market Surveillance Committee (MSC) on this issue identifies a variety of specific factors that should be assessed after the -\$150/MW bid floor has been in place for one year to determine if any further reductions would be warranted.³ The type of analysis suggested by the MSC may also provide a better basis for determining the degree to which the bid floor might be lowered (i.e. above or below -\$300/MW) and may help identify other alternative market rule changes or measures that might be taken to remove barriers and incent any additional downward flexibility needed. Such analysis should also consider new products for downward ramping capability that currently under development by the ISO, but which may not have been implemented during the first year that the -\$150/MW bid floor was in effect.

Bid Cost Recovery Modifications

This change is designed to increase incentives for resources to submit bids to both increase and reduce generation in the real-time imbalance market. Under the ISO market design, most generating units are under resource adequacy contracts and therefore have a “must-offer” obligation that requires them to offer all available capacity in the real-time market. However, a unit owner can avoid participating in the real-time market for decremental energy by self-scheduling the unit at or above the level at which the units are scheduled in the day-ahead market. Meanwhile, a unit owner can avoid having any unscheduled capacity being dispatched for incremental energy by submitting relatively high energy bid prices for this capacity in the real-time market.

Currently, a unit’s revenues and bid costs from the day-ahead and real-time markets are all netted together when performing bid cost recovery calculations. This can reduce the incentive for a unit to participate in the real-time market under two scenarios:

- If a unit’s day-ahead market revenues exceed its accepted day-ahead bid costs, it is not eligible for day-ahead bid cost recovery payments. If the unit is then dispatched in the real-time market it may be eligible for bid cost recovery payments if its accepted real-time energy bid costs exceed its real-time revenues.⁴ However, since these potential real-time bid cost recovery payments are netted together with the unit’s total day-ahead revenues and bid costs, the unit may not receive any bid cost recovery payments for its participation in the real-time market. This may cause a unit to not earn any incremental revenues – or even incur an incremental loss – from its participation in the real-time market.

³ See Market Surveillance Committee. *Opinion on Integration: Market and Product Review, Phase 1. November 17, 2011.* http://www.caiso.com/Documents/MSC_Draft_Opinion_RenewableIntegrationMarket-ProductReviewPhase1DraftFinalProposal.pdf.

⁴ In the real-time market, a unit may frequently be eligible for bid cost recovery payments for energy dispatched by the ISO due to the volatility of real-time prices, unit ramping limitations and other unit constraints such as minimum operating times.

- If a unit is eligible for bid cost recovery based on its schedule in the day-ahead market, but then earns additional net revenues by participating in the real-time market, these additional revenues may simply reduce the unit's overall bid cost recovery payment, without providing any net gain in revenues for the unit. Again, this results from the fact that these additional net real-time revenues simply reduce or eliminate the unit's day-ahead bid cost recovery payment.

Under both these scenarios, a unit may receive limited benefits compared to the financial risks of participating in the real-time market. Separating bid cost recovery calculations for these two markets eliminates this potential disincentive.

However, under the ISO's current market rules there are several ways through which a unit may create and inflate real-time bid cost recovery payments by deviating from the level to which it is dispatched by the ISO in the real-time market. Although such operating behavior has not been highly problematic to date, the incentive to intentionally exploit this aspect of current market rules will be significantly increased with the separation of bid cost recovery calculations for the day-ahead and real-time markets. In many cases, the potential for this behavior is currently mitigated by the fact that any additional real-time bid cost recovery payments are largely or entirely cancelled out by a unit's net day-ahead revenues in the final daily bid cost recovery calculations. However, with the elimination of this netting, such behavior is much more likely to result in real-time bid cost recovery payments.

DMM has been closely involved in the process of identifying these potential market behavior issues, developing rules to mitigate such behavior and assessing their effectiveness. While potential settlement modifications have been developed that may be effective in mitigating the ability to inflate bid cost recovery payments for uneconomic energy bids through uninstructed deviations, such deviations can also be employed to receive additional minimum load compensation when a resource would otherwise be shut down. DMM believes this later issue is also extremely important to address, but notes that developing an effective way of mitigating this scenario may be somewhat more complex.

Given this complexity, additional time is needed to refine and assess these measures and vet them with stakeholders. Thus, DMM strongly supports continuing to addressing these issues in the first quarter of 2012, as indicated in Management's final proposal.

Participating Intermittent Resource Program

The renewable integration stakeholder process has also addressed potential changes to the participating intermittent resource program to provide further incentive to provide additional downward capacity offers. Resources in participating intermittent resource program currently receive some protection from extremely low process in the real-time imbalance market and, consequently, have not been encouraged to fully participate in that market and provide downward dispatch flexibility that would help the ISO manage over-supply

conditions. Management has elected to defer addressing alterations to the participating intermittent resource program to market initiatives in 2012.

Throughout the renewable integration process, DMM has supported elimination of the participating intermittent resource program as consistent with the goal of reducing over-supply conditions, increasing dispatch flexibility, eliminating disparity between incentives and benefits to different renewable technologies, and providing room for additional growth in installed variable energy renewable resources.

As noted in the MSC's opinion, there is good reason to expect that if participating intermittent resource program were ended completely, the resulting increase in costs would be reflected in higher contract prices for load serving entities contracting with these resources. However, DMM noted that's the participating intermittent resource program only benefits wind resources. This is because prices tend to be lower when the deviations of wind resources from their hour ahead forecast are higher, and vice versa. Conversely, solar output is much more predictable and deviations are less correlated with prices. Thus, DMM notes that in practice the participating intermittent resource program creates a financial subsidy for intermittent wind resources, but appears to provide little or no benefit for solar resources. In this way, the participating intermittent resource program may slightly favor investment in wind rather than solar resources in the overall mix of renewables procured to meet the state's renewable portfolio standards.

However, given DMM's understanding of various contractual, arrangements with load-serving entities under which most existing and future wind resources will operate, we believe that the elimination or modifications to the participating intermittent resource program considered by the ISO may not have a major impact in terms of reducing over-supply conditions and increasing dispatch flexibility in the short-run. Meanwhile, we believe that the reduction in the bid floor to -\$150/MWh will provide a much more significant incentive to make wind resources more curtailable or dispatchable in the real-time market.