Comments on the Revised Final Draft Proposal for Flexible Ramping Product Department of Market Monitoring September 4, 2012

I. Overview

The Department of Market Monitoring (DMM) appreciates the opportunity to review and comment on the ISO's Revised Draft Final Proposal for the Flexible Ramping Product (FRP) posted August 14, 2012. This most recent draft contains several non-trivial changes that appear to have the potent to increase the cost and effort it will take to implement a flexible ramping product. DMM has been supportive of the objective throughout this process. However, the most recent proposal changes combined with the many foreseeable changes to the ISO's resource mix and market structure leads us to recommend that the ISO consider providing additional analysis and details before moving forward.

Any complex market change with the potential to disrupt the operation of current markets should be reviewed holistically to ensure that it is the right-sized solution for a fixed and lasting problem. DMM generally supports the flexible ramping product market design and does believe that it may ultimately be a workable and elegant solution to increasing flexible capacity available in real-time. However, DMM is concerned that it may be a costly solution to build and a risky solution to implement, as the FRP market design impacts every major piece of the market. While an elegant approach, the proposal does add an additional layer of complexity to the market clearing and will have an impact on the other products procured. Given the projected procurement quantities, it is not clear that such a complex and interwoven solution is warranted in the short-term. The ISO's forecast of additional flexibility needs do not appear to be that large, and there are imminent changes that will affect the flexibility available in real-time and flexibility requirement.

DMM is also concerned about the current price volatility in the ISO's real-time market, and the fact that the flexible ramping constraint currently in place may not be providing the benefits initially hoped for. At a minimum, DMM notes that the ISO has not done significant empirical analysis of the impact that the flexible ramping constraint has actually had on real-time unit commitments and dispatches, and the resulting impacts on real-time price volatility and reliability. Therefore, before moving forward, DMM

asks the ISO to demonstrate that this is a necessary feature in the near-term and still the right solution in the foreseeable future.

The next section outlines DMM observations on potential risk of proceeding with the current proposal in the short-term. We then comment on individual details of the proposal, generally focusing on the most recent changes. The ISO has done a substantial amount of consideration, writing, and analysis on each aspect of the proposal, and we appreciate the opportunity to engage in a full discussion on the flexible ramping product that would not be possible without the thoughtful effort put forth by ISO staff.

II. Recommendation

The ISO should reconsider the timing of flexible ramping product market design

DMM is concerned that the flexible ramping product (FRP) market design has become an extremely specific solution to a problem that may significantly change in the near future due to new regulatory requirements and previously scheduled market changes.

1. FERC Order 764 will necessitate significant market changes in order to accommodate 15-minute scheduling. FERC notes that this will have an affect not only on variable energy resources (VERs), but also on flow-limited hydro resources, use-limited thermal resources, QF's, and energy storage resources. [1] To accommodate inter-hour schedules, the ISO will need additional flexibility on the system. However, the optimal product may not be a 5-minute ramping one. DMM recommends the ISO consider postponing any major, non-critical market redesigns until after the ISO has evaluated its market design path in response to Order 764. If, at that time, the ISO views that a 5-minute ramping product is the best solution, then DMM supports using the current FRP proposal as a starting point.

2. The most recent revision to the FRP proposal includes many changes to the proposal to date and is scheduled to be the final draft produced by the ISO before the final proposal is taken to the board. The recent revision includes significant changes from the prior draft in area such as: (1) the IFM and RUC processes, (2) FRP requirement methodology, (3) FRP procurement methodology, (4) FRP interaction with regulation, (5) FRP cost allocation, and finally, (6) PIRP rules. In the proposal, the ISO calculates a potential flexible ramping requirement of only about 250 MW, and in some hours less than 100 MW. Overall, the most recent changes added even more facets to what was already an extremely intricate proposal. The changes will only add to the risk of unintended consequences on the existing energy and ancillary service markets. In general, DMM feels that the additional layer of complexity on an already complex market is an undesirable path for the ISO to take unless absolutely necessary. In this case, the high risk and inevitable cost of the FRP proposal does not seem warranted given the size of the ISO's forecasted flexible ramping requirement.

[1] Page 74 of FERC Order 764.

3. The ISO has recently completed a stakeholder process to backstop flexible ramping capacity and is working with the CPUC to make flexibility an aspect of the resource adequacy (RA) program. Additionally in this process the ISO committed to providing a long-term forecast of flexibility needs to market participants. This may have the effect of increasing the amount of flexibility available to the ISO potentially as soon as 2013. It is possible that while the overall capacity amount available to the ISO will not change, that load-serving entities will favor procurement of more flexible resources, which may help negate the need for an explicit FRP in the near-future.

4. The ISO is scheduled to lower the bid price floor in 2013. This will provide additional incentives for resources to offer downward dispatch capacity. In particular, during the morning hours when the ISO forecasts they will have the highest flexible ramping down requirement, the negative bid price floor has the potential to considerably increase inherent downward ramping flexibility. PIRP resources in particular will see a decrease in the benefit of participating in PIRP. DMM found that at a $-150 bid price floor, certain VERs will be significantly worse-off under PIRP than under conventional settlement.[2] The additional downward flexibility may also help negate the need for an explicit FRP in the near-future.

Given these four points, DMM recommends the ISO consider the most appropriate timing for implementation of a flexible ramping product and whether the proposed solution best fits into anticipated changes in the real time market. We also recommend the ISO consider the following alternative interim solutions:

1. Fine-tune the existing flexible ramping constraint using methodology developed in the FRP stakeholder process. Currently, the constraint procures a fixed hourly amount of flexible ramping up in real-time. The ISO could initiate a process to refine both the hourly requirement and investigate the potential for implementing a day-ahead constraint and flexible ramping down constraint in certain hours.

2. Alternatively, the ISO could augment the spinning reserve ancillary service in order to make it better suited to providing real-time flexibility. Non-continent spinning reserve is effectively the same as the flexible ramping constraint, but is bid-based rather than administratively based. Non-contingent spinning resource is also procured in the day-ahead market, and shares the flexible ramping constraints disadvantages. Thus, this s not being recommended as a longer term solution, but instead being put forth as a way the ISO could create additional ramping for a lower amount of effort and potential unforeseen market impacts. DMM has currently only observed limited excess spinning reserves. However, the ISO can make minor changes in order to increase the amount of non-contingent spinning reserve that is available to the real-time energy market optimization. The ISO could move forward with Appendix C, which proposes to model ancillary services using the operational ramp rate. This would increase the chances that non-contingent spinning reserves procured in the day-ahead market would still be feasible in real-time and therefore reduce the need

[2] http://www.caiso.com/Documents/WhitePaper-PotentialImpacts_LowerBidPriceFloor_Contracts_DispatchFlexibility_PIRPResources.pdf

to procure additional contingent spinning reserves in the real-time pre-dispatch. We understand that a similar approach has been considered internally, but wanted to highlight here that there is a bid-based day-ahead / real-time alternative to the current proposal.

III. Comments on specific aspects of proposal

Summary

1. Integrated DA market: The integrated DA market (iDAM) is a significant change to the market and to the proposal itself, especially when viewed in the context of facilitating the procurement of a small amount of capacity under a new product. DMM asks the ISO to consider if the iDAM may deserve a separate stakeholder initiative to focus on its design. There will be many detailed issues, such as the impact of convergence bidding on the RUC requirement, market power mitigation, etc. that will need to be considered. DMM is concerned that stakeholders do not have enough time to discuss and digest the design changes given the ISO is scheduled to have only one final proposal draft remaining.

2. Real ramp requirement: DMM believes that moving from an unexpected ramp requirement to a real ramp requirement has a significant impact on (1) the purpose of the FRP and (2) the "exit" criterion for the FRP. DMM encourages ISO to clarify the intention of the FRP: i.e. whether it aims to solely provide operating needs due to an imperfect forecast, or whether it aims to primarily serve as an explicit pricing mechanism for ramping even under perfect forecast conditions.

3. Implicit demand curves: DMM notes that using a historical analysis to calculate implicit demand curves may be problematic due to the difficulty in analyzing the need for flexibility after the FRP is in place. If the historical analysis does not reflect inherent market characteristics without the impact of the FRP, the market may oscillate from procuring too much flexible ramping procurement to too little flexible ramping procurement.

4. Flexible ramping price and energy price interaction: DMM is concerned about the interaction between the flexible ramping price and energy price in RTD. The natural change in load in some circumstances will be captured in both the flexible ramping requirement and energy requirement, such that the flexible ramping price and energy price may both reflect any temporary constraints. RTD cannot commit units in the 5-minute market to cover the extra requirement, and thus the energy price can be impacted significantly by the flexible ramping shortage. DMM is concerned that the link between the energy price and flexible ramping price will shift costs from one market to the other without any visibility into whether there is a positive net effect.

5. PIRP decremental bidding: The intent of this initiative is to implement changes to make additional real-time flexibility available to the ISO and allowing PIRP to continue is counter to this goal. DMM is not supportive of the ISO proposal for allowing additional considerations to

PIRP resources. Allowing more incentives for VERs to participate in PIRP is inconsistent with integrating renewable energy resources into the market, is not technology neutral, and does not promote dispatch flexibility.

6. Cost Allocation: DMM supports the overall cost-allocation methodology and notes that the changes in the final draft proposal are significantly more aligned with the ISO cost-allocation guiding principles. There remains some uncertainty on whether the cost allocation follows the "incentivize behavior" guiding principle. DMM recommends the ISO consider whether both the initial allocation to market participant types and subsequent allocation to individual market participants could be adjusted to improve efficient market outcome incentives.

The following sections provide a more detailed discussion of these issues.

1. The Integrated day-ahead market deserves a separate stakeholder process

One of the most significant changes in the latest proposal is the integrated day-ahead market (iDAM), which combines the IFM and RUC into a single market application. This is a significant market design change in order to facilitate the estimated small FRP requirement. Considering that the flexible ramping requirement is small and day-ahead procurement is less useful in real-time, DMM questions how strong the link is between the FRP and day-ahead market and asks if perhaps it does not need such a significant market design change to support.

As DMM has noted in prior comments, the day-ahead procurement of flexible ramping may be problematic.[3] Real-time schedules are often significantly different than day-ahead schedules, and therefore the availability of day-ahead flexible ramping award is uncertain in real-time. It is one of the reasons that the ISO initially proposed to set a lower target in day-ahead (at an amount representing 60% of the confidence interval of the random variable) vs. a higher target in real-time (at an amount representing 95% of the confidence interval of the random variable).

The integrated day-ahead market is sufficiently complex that it deserves a separate stakeholder initiative to focus on its design. There will be many detailed issues, such as the impact of convergence bids on the RUC requirement, market power mitigation, and so on. So far the ISO proposal does not contain technical details for the integrated day-ahead market proposal, and there is one iteration of stakeholder meetings left. DMM is concerned that given this timeline that there is not sufficient time to work through the important design issues and for stakeholders to digest the proposed design changes.

[3] *DMM Comments on FRP Final Draft Proposal*, page 3. http://www.caiso.com/Documents/DMM-Comments-FlexibleRampingProductDraftFinalProposal.pdf

2. The reason for using real ramp need for flexible ramping requirement is ambiguous

The ISO proposes to use real 5-minute ramping need as the FRP requirement rather than the previously proposed unexpected ramping need. DMM believes that this change has a significant impact on the purpose of the FRP, the incentives to market participants, and the "exit" criterion for the FRP.

In general, market design attempts to solve an existing problem by motivating market participants to better respond to ISO reliability needs, and may sunset if eventually the underlying problem is solved in the future.

The real ramping up requirement is the difference between upper limit/lower limit at the next interval t+5 and net load value at binding interval t, and the portion of the natural net load incremental change between the next interval t+5 and binding interval 5 is always included in the ramping up requirement. Without the FRP, such natural load incremental change is already explicitly priced in the multi-interval energy dispatch, as real time RTD covers 12 or more 5-minutes intervals. The real ramping need counts such natural net load incremental change in the flexible ramping requirement again, and DMM believes such potential double counting of the same requirement may have significant implications for market outcomes and the market design goal.

The operating need for flexible ramping comes from the inability of the ISO to perfectly forecast and schedule for the future, which in most intervals cause the upper and lower limits to be different from the net load forecast. Consider an ideal scenario: over time, the forecast of load and generating resources improves. Assume that eventually load can be perfectly forecasted well ahead of time, and all resources including renewable resources can be forecasted and scheduled perfectly. In this scenario, the need for flexible ramping is reduced or eliminated entirely. However, under this hypothetically perfect forecast condition, the real ramp option still yields a requirement for flexible ramping, at an amount equal to the natural net load incremental or decremental change between binding interval t and the next interval t+5.

If under the hypothetically perfect forecast condition, ISO still feels the flexible ramping is needed from the real ramping option, then the flexible ramping requirement may not be based entirely on the operating need, because even a perfect forecast still demands flexible ramping. Instead, ISO may view FRP as a price decoupling mechanism, to separate ramping value from energy value, and to create a market pricing signal to compensate those units providing ramping. If this is the goal, we ask the ISO to demonstrate explicitly that ramping is not priced in both prices- the FRP price and the multi-interval optimization energy price.

DMM encourages ISO to clarify the intention of the FRP; whether it aims to solely provide operating needs due to an imperfect forecast, or whether it aims to primarily serve as an explicit pricing mechanism for ramping energy even under perfect forecast conditions. DMM supports the concept of separating the values of ramping energy and non-ramping energy in the real-time market and notes that it may be easier to accomplish this under a 15-minute single real-time market construct (as suggested by

FERC Order 764) with the addition of a sub-15-minute ramping product to fill the gap between regulation and a 15-minute dispatchable energy product.

The "exit" criterion indicates under what conditions the FRP may not be needed and can retire. The real ramp requirement really does not have an "exit" criterion, meaning the product will always be needed and never retire. Even the perfect conditions where all market participants follow their schedules and ISO forecast is 100% accurate, the real ramp need will still exist due to natural interval changes in net load.

3. Implicit demand curves are difficult to calculate using a historical analysis

The ISO proposes to construct implicit demand curves for the flexible ramping requirement, based on a cost-benefit analysis. The explicit approach, which uses a multiple segment demand curve with different penalty prices, is no longer being proposed. In the implicit demand curve, the first segment uses a penalty price, from 0 MW to the minimum flexible ramping requirement; all other segments use a dynamically calculated price based on historical data analysis.

One concern on using a historical cost-benefit analysis is that once the FRP is deployed, it will have a direct impact on the real-time market performance. It is very difficult to estimate what the actual cost-benefit would be without the influence of the FRP on the market.

In fact, since December 2011, there has been a flexible ramping constraint in the market, which procures flexible ramping based on energy opportunity cost only. The flexible ramping constraint requirement is generally a fixed amount. Therefore, the probability and severity of a RTD ramp shortage has already been impacted by the flexible ramping constraint. Once FRP is deployed (flexible ramping constraint will retire then), the RTD market performance will have an additional disturbance. After some time, any historical analysis will have 3 distinct time segments:

(1) Pre December 2011: natural real-time market performance.

(2) December 2011 – Flexible ramping Constraint: real-time market performance, need to identify and isolate the effect of fixed amount of the requirement.

(3) FRP – ?: real-time market performance, need to identify and isolate the effect of FRP on varying amount of the requirement.

Conducting a pure historical analysis is very difficult, if not impossible. If the historical analysis does not reflect the inherited market characteristics without the FRP impact, it is possible that the market may oscillate from procuring too much flexible ramping to too little flexible ramping.

4. No visibility into the net effect of interaction between flexible ramping price and energy price

DMM remains concerned about the potential interaction between the flexible ramping price and energy price in RTD. This becomes a greater issue if the flexible ramping requirement turns out to be much higher than the conceived 250 MW range.

The FRP will be procured and settled at 5-minute RTD binding intervals. Since RTD is not capable of unit commitment, procuring flexible ramping capacity in RTD to meet the requirement may result in infeasibility if the prior advisory procurement from RTPD is different from actual needs in RTD, and RTD cannot find extra ramping to meet the requirement. In this circumstance RTD would re-dispatch available resources as a means to meet the requirement. However, in the end FRP and energy are competing for the same ramping capability in each 5-minute RTD interval. While we believe that procurement of FRP will reduce the frequency of extreme price spikes, we highlight that because it is competing with energy for the same ramping capability it will also likely increase the frequency of price increases up to the FRP cap. This is will happen in cases where the RTD interval would have otherwise been adequate without FRP however the FRP procurement (reserving ramp for the following interval) was inadequate. In this case FRP will be priced at its cap and the energy price will incorporate that value as well. The overall benefit of FRP in terms of reducing the cost of price spikes will depend on the relative frequencies of averted extreme prices and increased energy prices when FRP is short but energy is not.

One of the key factors for RTD pricing is the potential infeasibility of the flexible ramping requirement. As noted in our Q2 2012 report[4], DMM has observed that the flexible ramping constraint in each month has had about 1% of 15-minute intervals with procurement have a shortfall. In May, when hydro resources typically self-schedule and load is relatively lower, there was a flexible ramping constraint shortage in 6% of intervals. It is important to note that the requirement for the flexible ramping constraint is relatively low, and the flexible ramping constraint is procured at 15-minutes RTPD market, which has the ability to commit short-start resources. We would expect the FRP, which will be procured in RTD and will likely have a higher requirement, to be infeasible more often than we have observed with the flexible ramping constraint.

Overall, DMM is concerned that not only is there no operating experience or analysis possible today to analyze the impact of the FRP on the energy price, in the future due to the additional commitment and re-dispatch in real-time it will be nearly impossible to assess whether on net the FRP increased or decreased the over-all cost of ramping.

5. Allowing additional considerations to PIRP is counter goal of initiative

The current proposal allows PIRP resources that wish to participate in the flexible ramping down product the ability to do so and will only remove the 10-minute settlement interval from the monthly PIRP netting if the resource is dispatched down. Otherwise PIRP would continue to function as it is today and any future variable energy resource may participate in the markets as a PIRP resource. DMM does not support the ISO proposal for allowing additional considerations to PIRP resources on the grounds that PIRP is inconsistent with integrating renewable energy resources into the market, not technology neutral, and does not promote dispatch flexibility. The intent of this initiative is to implement changes to

[4] http://www.caiso.com/Documents/2012FirstQuarterReport-MarketIssues_Performance-May2012.pdf

make additional real-time flexibility available to the ISO and allowing PIRP to continue is counter to this goal.

6. Cost allocation may not comply with 'incentivize behavior' guiding principle

DMM is generally supportive of the cost allocation design, but notes that some aspects of the cost allocation design depart from the guiding principle to incentivize desired behavior from market participants. Both the initial division of flexible ramping costs between market participant types and the specific calculation used to measure resource deviation are potentially inconsistent with incentivizing efficient market behavior. DMM is aware that the ISO does plan on altering the cost allocation methodology in the final draft proposal and so rather than focus on specific recommended changes will only comment generally on the current methodology.

The ISO proposes to initially allocate flexible ramping costs into three buckets using a common movement metric. Then within each bucket the costs will be allocated to individual market participants. In order to be consistent with the 'incentivize behavior' guiding principle, it is important to allocate costs appropriately not simply within each bucket, but between the buckets themselves. If there is a situation where one group of resources is allocated the majority of the costs, but also has the least ability to change their behavior, this would indicate that the allocation is meaningfully departing from creating a cost allocation policy that incentivizes efficient market outcomes.

It appears that this may be the case under the current cost allocation. The ISO provides an analysis that shows they expect load to be allocated the majority of the costs. Both load and the interties at this time have the least ability to change their behavior. On the other hand, internal generation and self-schedules have the most ability to alter their behavior, but are projected to be allocated the least amount of FRP costs.

After the initial costs are allocated among market participant types, the ISO proposes to use changes in deviations rather than absolute deviations to allocate costs within the 'Supply' bucket. This methodology also departs from the incentivize behavior guiding principle. First, when resources initially deviate from their schedule they are allocated costs, but after this there is no incentive for them to move back toward their schedule as no further costs will be allocated to them. Second, there is actually a disincentive for them to move back down to their schedule because this would cause further costs to be allocated to the them. DMM feels this is a significant enough issue with using changes in deviations that the ISO should consider using absolute deviations instead.