Comments on Flexible Ramping Products Incorporating FMM and EIM
Draft Final Proposal

Department of Market Monitoring
December 31, 2014

The Department of Market Monitoring (DMM) appreciates the opportunity to provide comments on the Flexible Ramping Products Draft Final Proposal. While DMM is supportive of the Flexible Ramping Products as a more effective way of ensuring operational flexibility than the current flexible ramping constraint, there are too many unresolved issues with the current proposal to support it as the final market design. We recommend the ISO revise the proposal to address the unresolved issues and concerns raised by stakeholders before moving forward with the Flexible Ramping Product. More specific comments are presented below.

Day-Ahead FRP Product Not Well Defined for 5-Minute Flexibility

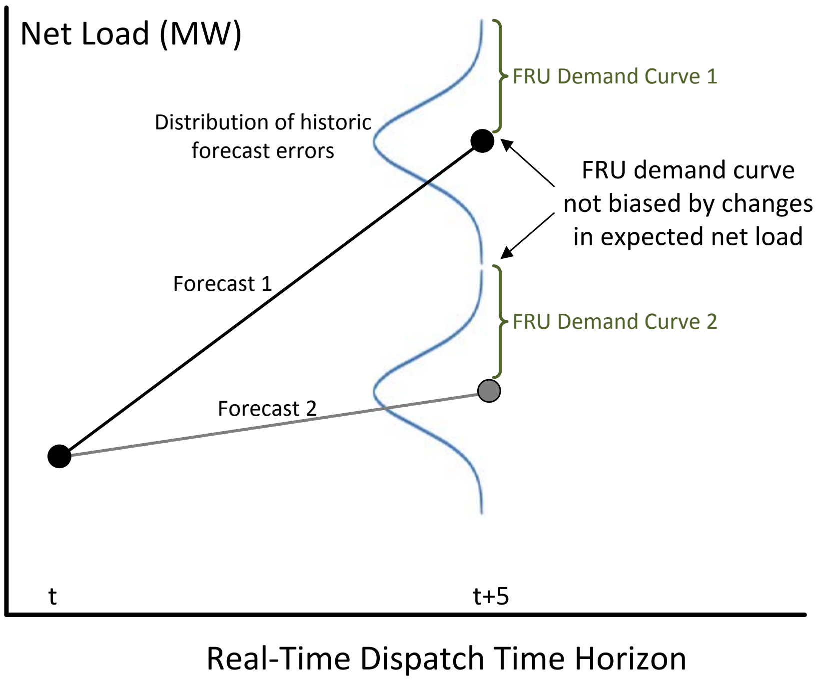
The Fifteen-Minute and Five-Minute market Flexible Ramping Product (FRP) designs use the ISO forecast of net load across a non-binding advisory interval time horizon to determine the FRP requirements/demand, prices, and awards.

The basis of the Day-Ahead FRP demand curves is fundamentally different than the basis of the Real-Time demand curves. This is because the Day-Ahead energy market does not clear generation against an ISO load forecast. Instead, the Day-Ahead energy market clears bid-in generation against bid-in load. As a result, the ISO proposes to create the Day-Ahead demand curves by using the historic net load ramp between hours to determine a distribution of net load changes in the Day-Ahead market. This appears closer to a modification of the Residual Unit Commitment process than the FRP design in the Real-Time markets.

The Real-Time FRP demand curves are based on the distribution of forecast errors in the Real-Time markets. The use of the forecast errors in Real-Time allows the ISO to construct demand curves in prior periods that are applicable to periods with different expected net loads. This is illustrated in Figure 1.[1] Forecast 1 is the load forecast for a warm day. The ISO will use the distribution of historic forecast errors from previous periods to construct the Real-Time FRU Demand Curve around this warm weather forecast. However, if the weather is cooler, the same distribution of historic forecast errors can be used to construct the FRU Demand Curve from Forecast 2.

[1] This implicitly assumes that the distribution of errors does not change as the level of net load changes i.e. $E(u|x) = 0$ and $Var(u|x) = \sigma^2$ where "u" is the error and "x" the net load.

Figure 1 - Using Forecast Errors Allows for Changes in Load Forecast Expectations



The Day-Ahead FRU demand curve uses neither the next hour's expected load forecast nor the distribution of forecast errors. The Day-Ahead FRU demand curve instead uses the historic net load ramp between hours (as described on Pg.14 of the proposal). Therefore, the ISO may not account for expected changes to the historic load when procuring Day-Ahead FRP.

Consider an example illustrated in Figure 2. Weather for the trade day is cooler than previous weeks. Market participants incorporate this into their Day-Ahead market bids and the IFM clears a lower net load for the subsequent hour, Forecast 2. However, the demand curve for Day-Ahead FRP is based on previous days' higher net load changes. Therefore, the Day-Ahead FRP demand curve will value the procurement of sufficient ramp to achieve the high end of a ramp distribution that is known to be erroneously high at the time the Day-Ahead market is run.

In this example, the upward flexible ramping capacity procured in the Day-Ahead market for the cool day could therefore be greater than the capacity that would have been procured had the weather continued to be warm. This would occur even though the likelihood of a large upward ramp decreases with the cooler weather.[2] The demand for FRP will increase as forecast 2 decreases. A similar problem will occur when net loads are higher than previous periods. In this case FRP will be systematically under procured during periods where the likelihood of larger ramps may be higher.

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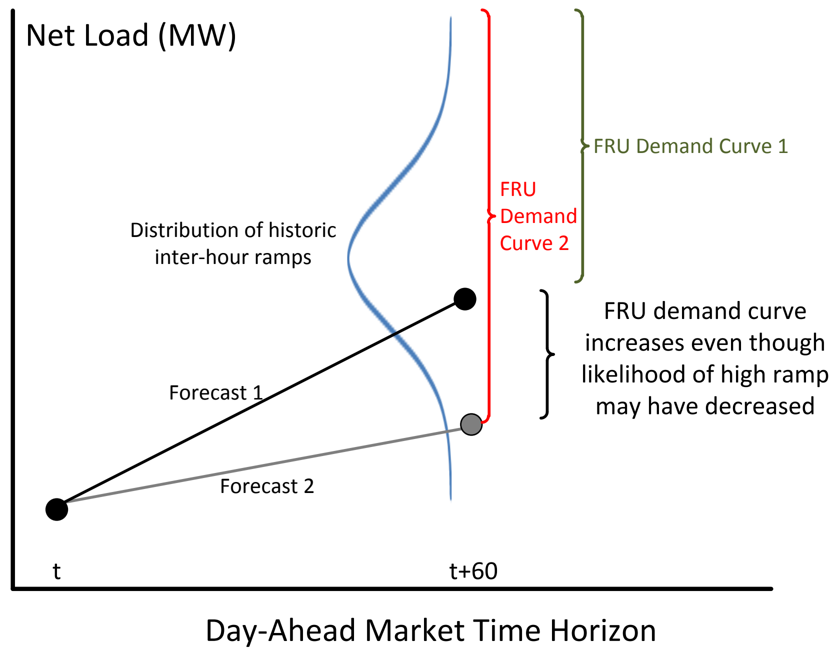
[2] This assumes DMM is correctly interpreting how the ISO intends to create the FRP Day-Ahead demand curve. The ISO has only provided examples for the Real-Time curves.

Figure 2 - Using Historic Inter-Hour Ramp Does Not Allow for Changes in Load Forecast Expectations



It is also unclear how an hourly award would increase 5-minute flexibility. The proposal does not address potential complications that may arise from averaging 5-minute ramp capability over hourly periods. As an example, consider two 10 MW resources. Assume one is a long-start resource with a 1 MW/minute ramp rate and the other is a short-start resource a 5MW/minute ramp rate. Both would be able to provide the same 10 MWs of Day-Ahead FRP. However, the resource with the higher ramp rate provides substantially more 5-minute flexibility. Committing the slow long-start resource in the Day-Ahead market to contribute to meeting what the Day-Ahead market models as an hourly flexible ramping need would be inefficient when the actual operational requirement is more flexibility over shorter time intervals.

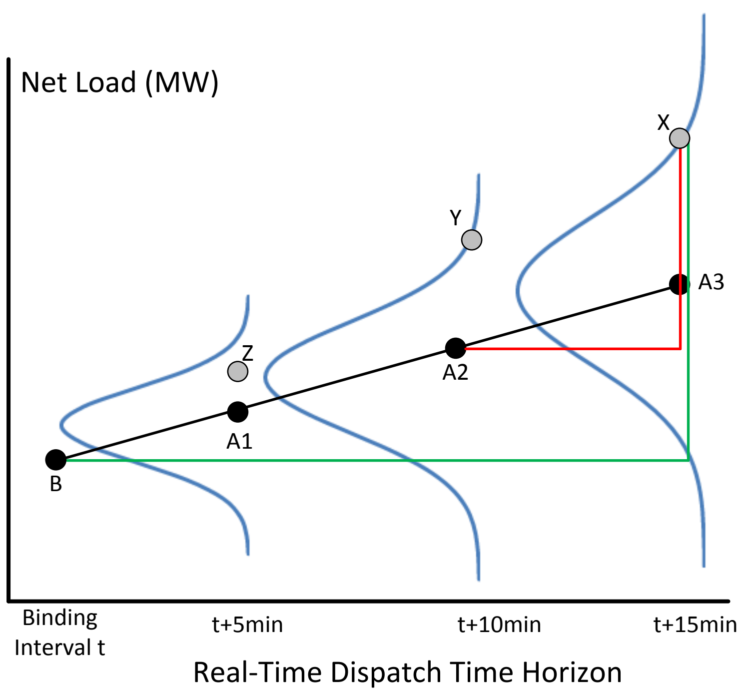
It is not clear what the Day-Ahead FRP, as proposed, would be procuring, how it actually relates to the Real-Time FRP awards, and how it would increase 5-minute flexibility. Procuring no additional flexibility in the Day-Ahead market is problematic. On the other hand, creating Day-Ahead constraints that do not reflect the Real-Time operational requirements could be even more problematic. Therefore, DMM recommends the ISO propose substantial revisions to the Day-Ahead product. However, this may not be feasible within the timeframe required to implement the improvements to the Real-Time Flexible Ramping product in the fall of 2015. As a result, the ISO should consider proceeding with the Real-Time FRP and starting a separate Stakeholder Initiative to develop a product for best procuring flexible ramping capacity needs in the Day-Ahead market.

Issues with Real-Time FRP Modeling in Advisory Intervals

The ISO does not clearly specify what it will model in the advisory intervals in the Real-Time markets. The proposal shows the demand curves in the advisory interval being constructed from errors between the forecast made during the market run for the binding interval, and the actual net load when the advisory interval is realized in a future market interval.

As an example see Figure 3. The forecast of net load for advisory interval A3 is made during the market run that creates binding awards in interval B. The demand curve for FRP used in A3 is based on the historic errors between this forecast and the net load when A3 is binding. By accounting for errors further out than 5-minutes, capacity can be procured to avoid potential power balance violations not just in t+5, but also in t+10 and t+15 etc. In this way the FRP would not avoid potential power balance violations in t+5 just to have them occur in a subsequent interval, as pointed out by the Market Surveillance Committee.

Figure 3- Forecast Net Load and Distribution of Errors in RTD Advisory Intervals



However, it is unclear if the entire uncertainty in the advisory intervals will be used for the advisory interval demand curves or just some incremental amount. If it is an incremental amount the ISO should explain how this amount would be determined and reconciled with the energy dispatch at the forecast level. If FRP is procured in the binding interval for the entire uncertainty of the advisory interval, then there is a mismatch between the advisory 5-minute capacity awards and the product defined by the demand curves. This would be because the product defined by the demand curves would be a greater than the 5-minute flexible ramp capacity product. This issue was raised by PG&E. Looking at Figure 3, this can be seen in advisory interval A3. Capacity procured in A2 to meet errors that drive net load up to "X" would be deliverable in 5-minutes. However "X" occurring could be conditional on "Y" occurring, which may be conditional on "Z" occurring. That is, fast 5-minute capacity would be procured to resolve 15-minutes of uncertainty. This can create issues where too much fast ramping capacity is held and not dispatched for energy in the binding intervals. The fact that capacity would only be procured if costs were less than or equal to the demand curve prices would not change the misalignment of product definitions between the demand curve and capacity award.

Below we describe a potential design option that would allow the flexible ramping products to have consistency between the definitions of the demand curves and capacity awards while also accounting for uncertainty greater than 5-minutes. The optimization could procure multiple flexible ramping products in the binding interval. Awards for 5-minute, 10-minute, 15-minute capacity etc. could all be procured and settled in the binding interval based on demand curves derived from the associated forecast errors. This would be a significant departure from the current Flexible Ramping Product design and require further discussion with stakeholders. Other issues with this design proposal that would need resolution include how these products would fit into the Fifteen-minute market and how to model the products in the advisory intervals.

Regional FRP Modeling Not Defined

During the stakeholder call and Market Surveillance Committee meeting the ISO indicated that the Flexible Ramping Products would be procured at the balancing authority area level and distributed regionally. It is unclear what this means, and the proposal does not define how the capacity would be distributed within a balancing authority area. The constraints and equations defining how the regional distribution or procurement will work are integral aspects of the overall Flexible Ramping Product Design. The policy is therefore incomplete in the absence of these constraint definitions. We oppose leaving the determination of this important aspect of the market design up to the discretion of the implementation team.

Clarify Determination of Penalty Price and Maximum Penalty Prices

The proposal states "The maximum penalty price for violating the minimum requirement is $247…" It is unclear if this means:

1. The maximum penalty price is $247, which is the penalty price on the minimum requirement; or
2. The penalty prices for all FRP demand curve segments will be calculated from the distribution of net load forecast errors, but the maximum penalty price for any

segment, including the minimum requirement segment, will be $247 so that FRP procurement will not displace ancillary service capacity.

It would be helpful if the ISO could clarify how the maximum $247 penalty price will be implemented. As indicated in previous comments, DMM believes the second interpretation would be the correct design.

It would also be helpful if the ISO provided a more realistic example of the construction of the Flex-Ramp Up and Down demand curves than that provided on page 16. This would help stakeholders better understand how the ISO intends to create the demand curves.

Allocation of FRP Procurement Costs to Hourly Intertie Schedules

As pointed out in comments submitted by Powerex, the allocation of FRP costs to hourly intertie schedules, even if economically bid into the Real-Time market, could result in these schedules being allocated costs despite reducing overall flexible ramping procurement costs. This could create incentives for interties to schedule in ways that reduce their exposure to FRP cost allocations but that are inconsistent with efficient market scheduling and that increase overall FRP costs (such as flattening their schedules during ramping periods). DMM does not agree that a system of credits and costs should be created as it will not be possible to know how much FRP up and FRP down costs were changed due to a specific schedule (the counterfactual cannot be known). The ISO should consider design options that limit the impact that FRP cost allocations have on creating adverse behavioral incentives.