Memorandum

To: ISO Board of Governors

From: Eric Hildebrandt, Director, Market Monitoring

Date: December 7, 2016

Re: **Department of Market Monitoring update**

This memorandum does not require Board action.

EXECUTIVE SUMMARY

This memo provides an update on recent actions, analysis and recommendations by the Department of Market Monitoring aimed at gaining approval from the Federal Energy Regulatory Commission to allow market based rate authority for entities participating in the energy imbalance market. The memo also provides an update on energy imbalance market performance.

FERC has denied market based rate authority for sales in the energy imbalance market by most participants based on concerns about structural market power and the effectiveness of the ISO's market power mitigation provisions in the energy imbalance market. The Commission's concerns about market power in the energy imbalance market are heightened by the lack of the type of *must offer* requirement that exists in the CAISO and other organized markets. FERC has required that market bids submitted by participants without market based rate authority not exceed each unit's cost-based *default energy bids* which are calculated by the ISO for use in local market power mitigation.

DMM has taken steps to ensure strong market power mitigation in the energy imbalance market, but DMM supports additional bidding flexibility when competitive conditions exist. DMM believes this additional bidding flexibility will ultimately increase market efficiency and competitiveness by encouraging maximum participation in the energy imbalance market. Consequently, DMM is taking numerous steps to address issues cited by FERC in orders denying market based rate authority for entities participating in the energy imbalance market.

- DMM has submitted analysis to FERC showing that the frequency of potential structural market power in the PacifiCorp and NV Energy areas had dramatically reduced with the additional transfer capacity that became available when NV Energy joined the energy imbalance market. This structural competitiveness effectively

mitigates the potential for the exercise of market power through both economic and physical withholding during most intervals.

- DMM has recommended that the ISO implement enhancements to the ISO's automated market power mitigation process and outage reporting procedures to address concerns expressed by FERC about the potential for economic and physical withholding in the energy imbalance market. The ISO has indicated these enhancements may be implemented in early 2017.
- DMM is working with entities seeking market based rate authority in the energy imbalance market to help facilitate analysis needed to gain approval for market based rate authority from FERC. As part of this effort, DMM is seeking to ensure that the data needed for such analysis is available to market participants. DMM believes this may require provision of some data that are not currently publicly available for use in market power analysis.

Background

Within each balancing area in the energy imbalance market, a single supplier – the incumbent investor owned utility – controls virtually all the supply participating in the energy imbalance market. However, energy imbalance market balancing areas can be highly competitive as long as sufficient supply from the broader ISO system can be transferred into an area through the energy imbalance market. When the energy imbalance market began operation, the extent to which sufficient transfer capacity would exist to ensure competitive conditions in different energy imbalance market areas was uncertain. However, since the addition of NV Energy in 2015, each of these balancing areas has been structurally competitive during almost all intervals due to the availability of competitively priced supply that is can be transferred into each area through the energy imbalance market.

In FERC's November 19, 2015 order, the Commission found that the market power analyses submitted by PacifiCorp and NV Energy (referred to collectively as Berkshire Sellers) failed to demonstrate a lack of market power in the energy imbalance market. The Commission therefore required that all market bids from Berkshire Sellers' units participating in the energy imbalance market be submitted at or below each unit's *default energy bid*. In August, the Commission issued an order imposing a similar bidding limitation on Arizona Public Service (APS) prior to its entry into the energy imbalance market in 2016.

Default energy bids are cost-based bids calculated by the ISO which are used to limit market bids submitted by participants when local market power mitigation provisions are triggered. Under these procedures, market bids submitted by participants are capped when congestion occurs on uncompetitive constraints. When bids are mitigated, they are capped at the higher of a competitive market price or the unit's default energy bid.

Default energy bids for resources participating in the energy imbalance market are calculated prior to each operating day. Because of the timing of when these bids are currently calculated, the ISO must use publically available prices for gas purchased in the next day gas market when calculating default energy bids for gas-fired units. Default energy bids include a 10 percent adder that covers potential differences in the price of gas purchased in the same day market rather than the next day market price that is used to calculate default energy bids.

DMM has performed analysis showing that default energy bids allow resources to bid up to levels reflecting actual gas costs in the real-time market under almost all cases. In addition, resources are currently allowed to request cost recovery from FERC for any energy costs incurred that are not recovered as a result of bidding limits on energy and commitment costs. In the energy imbalance market, entities can also refrain from offering additional capacity that may be used to support transfers out of the balancing area at prices below the resource's actual costs due to these bidding restrictions.

DMM believes that default energy bids are highly accurate and appropriate for use when local market power mitigation procedures are triggered. These procedures are only triggered when an area may be structurally uncompetitive due to congestion on transfer limits into that area in the energy imbalance market. However, when competitive conditions exist, DMM believes it is better to allow participants in the energy imbalance market to have the same bidding flexibility that is afforded other ISO market participants as a means of managing issues relating to gas costs, fuel availability, and special unit operating characteristics and limitations.

Similarly, default energy bids for hydro units are based on pre-agreed formulas to estimate potential opportunity costs for use when local market power mitigation provisions are triggered. However, the ISO market is designed to allow participants the flexibility to submit market bids in excess of these estimated costs to allow more efficient management of operational limits of hydro resources in the real-time market over the course of each operating day.

Rather than having entities manage these gas and hydro limitations by not offering these resources during some hours, DMM believes it is better to allow suppliers to manage these limitations based on market bids that are used when mitigation is not triggered. Therefore, DMM is taking numerous steps to address the issues cited by FERC in orders denying market based rate authority for entities participating in the energy imbalance market. The remaining sections of this memo highlight steps being taken by DMM and the ISO.

Structural market power

In July and December, DMM submitted its third and fourth reports to FERC on the structural market competitiveness in the PacifiCorp balancing authority areas.[1] Each of these reports have provided analysis showing that the frequency of potential structural market power in the PacifiCorp and NV Energy areas had dramatically reduced with the additional transfer capacity that became available when NV Energy joined the energy imbalance market. This structural competitiveness mitigates the potential for the exercise of market power through both economic and physical withholding during most intervals.

Table 1 provides a summary of analysis provided in DMM's most recent report on structural market power. As shown in Table 1, scheduling constraints limiting transfers into each of these areas from the ISO in the real-time market have been binding only about 1 to 3 percent of intervals. Thus, during almost all intervals the potential for the exercise of market power in these areas is mitigated by the availability of competitive supply from the ISO system.

Table 1. Summary of energy imbalance market transfers and congestion (January – October 2016)*

	Net exporter		Net importer		Import congestion from ISO*	
EIM area	Frequency	Average MW	Frequency	Average MW	15-minute	5-minute
California ISO	33%	378	67%	-343		
PacifiCorp East	80%	333	20%	-197	2%	2%
PacifiCorp West	55%	110	42%	-126	1%	3%
NV Energy	33%	154	67%	-286	2%	2%
Puget Sound Energy	46%	89	50%	-90	0%	1%
Arizona Public Service	70%	274	30%	-178	0	0

* Intervals when supply from ISO was limited due to congestion on EIM transfer constraints. Data for Puget Sound Energy and Arizona Public Service are only for October 2016.

[1] See *Report on Structural Competitiveness of Energy Imbalance Market*, Department of Market Monitoring, December 6, 2016 and *Report on Structural Competitiveness of Energy Imbalance Market*, Department of Market Monitoring, July 7, 2016. http://www.caiso.com/Documents/Jul8_2016_DepartmentMarketMonitoring_EIM_StructuralMarketPowerInformationalReport_ER14-1386.pdf.

In a June 2015 order, FERC required the ISO to submit such reports every six months for two years following the launch of the energy imbalance market. The Commission indicated that it would use the information in these reports to determine if any action is necessary to address structural market power in the energy imbalance market in the PacifiCorp balancing areas.

Moreover, the volume of transfers into each of these areas available through the energy imbalance market appears to significantly exceed the amount of the demand for imbalance energy from third party entities during most if not all intervals.[2] This also mitigates the potential exercise of market power since the major supplier in each area is usually a *net buyer* in the energy imbalance market when congestion into their balancing area occurs.

Enhanced market power mitigation procedures

During the limited number of intervals when competitive supply from ISO into the energy imbalance market is constrained by congestion on transfer constraints, the ISO's automated real-time market power mitigation procedures are designed to mitigate the potential exercise of market power though *economic withholding*.[3] When congestion is projected to occur on a constraint – and the supply of resources that can relieve this constraint is structurally uncompetitive – the ISO's automated bid mitigation procedures are triggered. However, under the ISO's current process, congestion sometimes occurs in the market run during intervals when congestion was not projected to occur in the preceding process used to determine if bid mitigation should be triggered. DMM's prior annual reports include analysis of this issue, which is referred to as *under-mitigation*.[4]

FERC cited the issue of potential under-mitigation as one of the concerns in its decision to deny market based rate authority to the Berkshire Sellers in the energy imbalance market. Since 2015, DMM has been working with the ISO to develop enhancements to automate market power mitigation procedures to ensure that bid mitigation is triggered in the real-time market when congestion occurs on structurally uncompetitive constraints.

The ISO implemented these enhancements in the 15-minute market in fall 2016 and has filed for approval to implement enhancements in the 5-minute market in 2017. DMM has reviewed the effectiveness of enhancements recently implemented in the 15-minute market and is recommending further modifications in how these enhancements are implemented. DMM will continue to monitor and report on the effectiveness of these enhancements in order to address the Commission's concerns about this issue in the energy imbalance market.

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[2] See *Report on Structural Competitiveness of Energy Imbalance Market*, Department of Market Monitoring, July 7, 2016, op.cit. pp 6-7.

[3] Economic withholding involves bidding a resource above its marginal cost so that market clearing prices are increased by either setting the prices at the resource's bid price or causing another higher priced bid to set price.

[4] For instance, see *2015 Annual Report on Market Issues and Performance*, Department of Market Monitoring, May 2016, Section 7.3: http://www.caiso.com/Documents/2015AnnualReportonMarketIssuesandPerformance.pdf and *2014 Annual Report on Market Issues and Performance*, Department of Market Monitoring, June 2015, Section 6.3: http://www.caiso.com/Documents/2014AnnualReport_MarketIssues_Performance.pdf.

Enhanced outage reporting

In FERC's November 2015 Order, the Commission also expressed concern about the potential for physical withholding in the energy imbalance market from the lack of a must-offer requirement. To enhance DMM's ability to monitor capacity not offered in the energy imbalance market, DMM has recommended that the ISO and energy imbalance market entities develop more descriptive categories that can be entered in the ISO's outage management system to indicate the reason for unit outages or de-rates.

DMM has specifically noted that in the energy imbalance market, some entities are using forced outages categorized as being for physical plant problems to limit the availability of some capacity for other reasons. DMM understands that in many cases, these reported forced outages are being used as a way of managing various other operational and market issues. For example, since bids in the energy imbalance market must be submitted at least 75 minutes prior to the start of each operating hour, entities may bid capacity into the market and then use outages to manage issues that may affect the availability of this capacity within each hour. These issues include management of capacity used for operating reserves and capacity that is unavailable due to transmission, fuel or operating limitations not reflected in the ISO market software.

DMM has recommended that the ISO clarify reasons for which it is acceptable to use the outage reporting system and then create new outage codes that clearly identify when capacity is made unavailable to the market software using the outage reporting system. The ISO is working to implement this recommendation.

Enforcement of internal constraints

In FERC's November 19, 2015, Order, the Commission also conditioned Berkshire Sellers' participation in the energy imbalance market on a requirement that these entities facilitate the ISO's enforcement of all internal transmission constraints in the PacifiCorp and NV Energy balancing authority areas. This requirement stems from the Commission's concern that if constraints are not enforced in the market software, then the ISO's local market power mitigation procedures cannot be triggered when these constraints become binding.

In the second quarter of 2016, DMM's review indicated that a significant number of constraints that had been incorporated in the network model were not being enforced. Consequently, DMM has requested that the ISO and EIM entities further review this issue and provide a report to FERC identifying constraints that are not modeled or enforced, along with an explanation of the reasons some constraints were not enforced. The ISO submitted a report on enforcement of constraints within the NV Energy area in November and has indicted it is working with PacifiCorp to file a similar report for that balancing area.[5]

[5] http://www.caiso.com/Documents/Nov10_2016_EIM_Enforcement_TransmissionConstraints_NVEnergy_ER15-2281_ER15-2282_ER15-2283.pdf

DMM's review indicates that one factor that may be contributing to the lack of congestion within the PacifiCorp area is that some scheduling limits associated with transmission contracts (between PacifiCorp and non-PacifiCorp entities owning transmission within the PacifiCorp balancing area) are not incorporated in the full network model. DMM has recommended that the ISO and energy imbalance market entities assess whether these transmission contract limits can be directly enforced by the energy imbalance market software. This could allow more efficient dispatch of different resources to meet scheduling limits and avoid the need for energy imbalance market participants to not offer or limit generation in the market in an effort to avoid exceeding scheduling limits.

Data requirements

DMM is working with entities seeking market based rate authority in the energy imbalance market to help facilitate analysis needed to gain approval for market based rate authority from FERC. As part of this effort, DMM is seeking to ensure that the data needed for such analysis is available to participants requesting market based rate authority in the energy imbalance market. DMM believes this may require provision of some data that are not currently publically available for use in market power analysis.

Recent energy imbalance market performance

In October the energy imbalance market expanded to include Puget Sound Energy (PSE) and Arizona Public Service (APS). Implementation of the energy imbalance market in these areas went well during the first month of operation.

Figures 1 and 2 show the average hourly prices used to settle loads in these areas for October.[6] Settlement prices in PSE were lower than the ISO and reflected PacifiCorp West prices (see Figure1). Settlement prices in APS largely reflected prices in the ISO during October (see Figure 2). Overall average prices over all hours in both these areas were about equal to daily bilateral market prices previously used in these areas to settle real-time imbalances.

[6] Hourly settlement prices represent a volume weighted average price of 15-minute and 5-minute prices.

Figure 1. Average prices in Puget Sound Energy (October 2016)

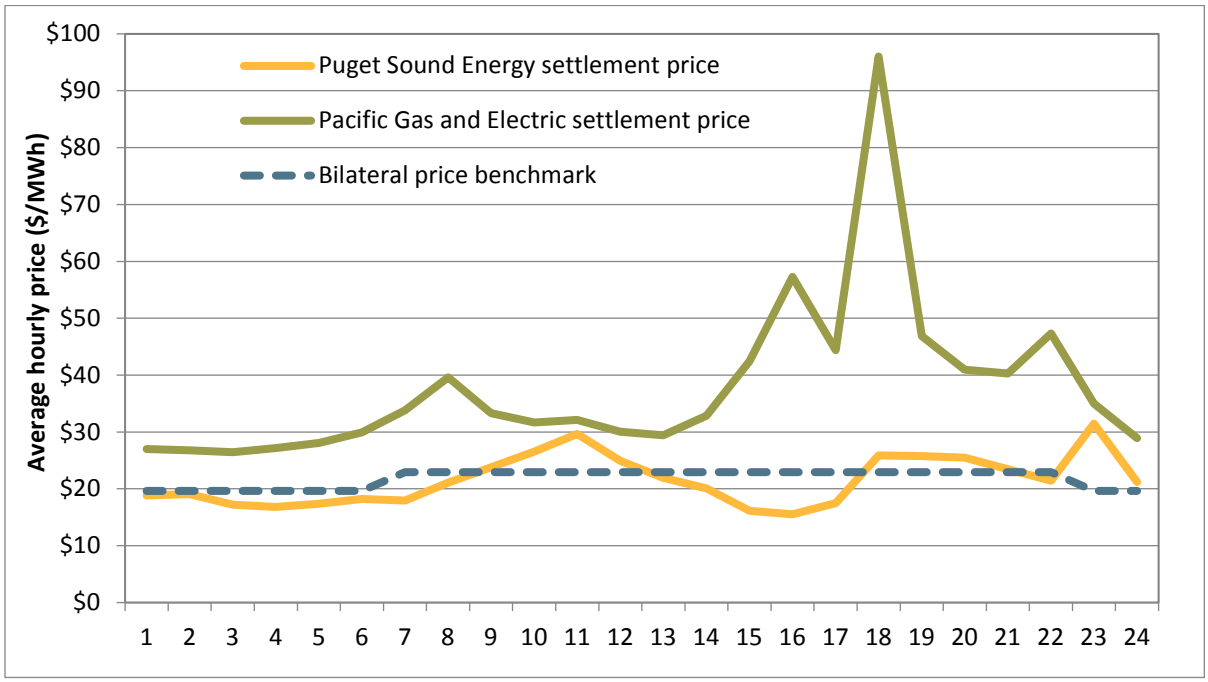
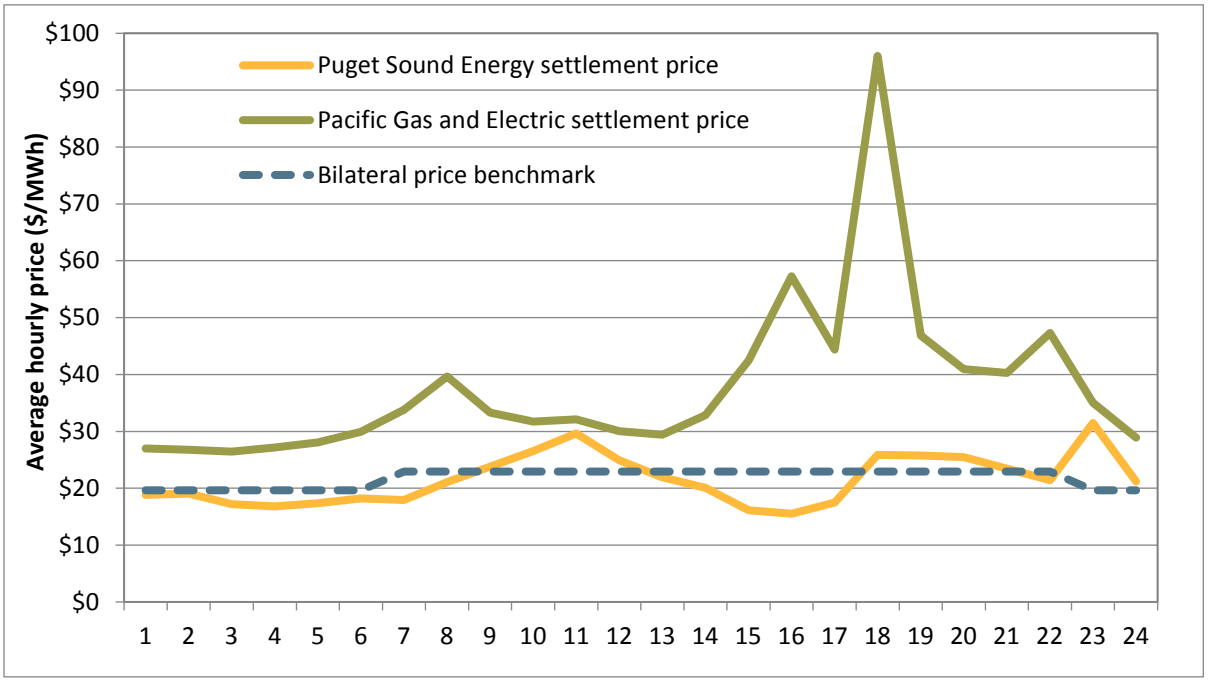


Figure 2. Average prices in Arizona Public Service (October 2016)



As shown in Figures 1 and 2, hourly prices in PSE and APS reflect the daily "duck curve" pattern that had become predominant in the ISO with the increase in solar energy, with the highest prices occurring in the morning and evening ramping hours. This hourly price pattern more closely reflects actual real-time system conditions than the day-ahead bilateral market prices previously used in these areas to settle real-time imbalances (see dotted blue lines in Figures 2 and 3). This reflects how the energy imbalance market can provide better price signals that more closely reflect actual system and market conditions over the day compared to day-ahead bilateral price indices previously used in these areas to settle real-time imbalances.

In November, the ISO implemented the new flexible ramping product in ISO's real-time market. DMM is currently reviewing the details of how this new feature has been implemented. DMM notes that beginning in November there has been a significant increase in the hours in which the flexible ramping capacity sufficiency test has not been met in the APS balancing area. Although this appears to have contributed to an increase in power balance constraint relaxations the APS area, the impacts of this are currently mitigated by the price discovery provisions that are in place during the first six months that a balancing area is participating in the energy imbalance market. DMM will provide additional analysis of this issue and the flexible ramping product in future quarterly reports.

Conclusions

DMM will continue to work with the ISO to address issues cited by FERC in orders denying market based rate authority for entities participating in the energy imbalance market. DMM will work to ensure that the energy imbalance market includes strong market power mitigation provisions, but supports additional bidding flexibility when competitive conditions exist. DMM believes this additional bidding flexibility will ultimately increase market efficiency and competitiveness by encouraging maximum participation in the energy imbalance market.

FERC's May 2016 Order on Berkshire Sellers' request for rehearing of its market-based filing also clarified that all new entities joining the energy imbalance market must obtain market based rate authority for sales in the energy imbalance market. In September, PSE was granted market based rate authority prior to joining the energy imbalance market in October.

DMM will work with other entities to understand the conditions under which FERC will grant market based rate authority to new participants in the energy imbalance market, and will support market based rate authority when it can be demonstrated that potential market power is effectively mitigated by the structure and mitigation rules of the energy imbalance market.