UNITED STATES OF AMERICA BEFORE THE FEDERAL ENERGY REGULATORY COMMISSION

Updated Market Power Analysis for the Northwest Region of Idaho Power Company	**Docket No. ER10-2126-005**

COMMENTS OF THE DEPARTMENT OF MARKET MONITORING FOR THE CALIFORNIA INDEPENDENT SYSTEM OPERATOR CORPORATION

The Department of Market Monitoring (DMM) for the California Independent System Operator (CAISO) files comments in the above-captioned proceeding. In this proceeding, Idaho Power Company (Idaho Power) submits an updated market power analysis for the relevant geographic markets in the Northwest region, which includes CAISO's Energy Imbalance Market (EIM). This updated market power analysis is submitted to satisfy Commission requirements for triennial review of previously granted market-based rate power sales authorizations. From this analysis, Idaho Power concludes that it either passes the market power screens for each of the relevant markets or has submitted delivered price test (DPT) analyses and supporting evidence to rebut the presumption of market power.

As the independent market monitor for the CAISO, DMM supports the continuation of Idaho Power's authority to sell at market-based rates in EIM for the following reasons: (1) the EIM is structurally competitive during almost all intervals; (2) the Idaho Power Balancing Authority Area (BAA) has not been subject to any frequently binding transmission constraints; and (3) potential structural market power that may exist in some intervals would be mitigated by the CAISO's real-time bid mitigation procedures.

I. The EIM Market is Structurally Competitive

DMM has performed a series of analyses of the structural competitiveness of the EIM. One of DMM's most recent reports focuses on the structural competitiveness of the Idaho Power BAA in EIM.[1] This report is included as Attachment A to these comments. The DMM Idaho Power Report assesses structural competitiveness by comparing the total demand for imbalance energy within the Idaho Power balancing area to the total supply from non-Idaho Power sources that could compete to meet this demand through the EIM. During intervals when the amount of incrementally available competitive supply exceeds the total demand for imbalance energy within the Idaho Power balancing area, Idaho Power is not *pivotal* since total demand can be met by other competitive supply. The analysis in the DMM Idaho Power Report shows that Idaho Power is not pivotal, and the EIM market in the Idaho Power balancing area is structurally competitive during almost all intervals due to the large amount of competitive supply that could be transferred into the Idaho Power balancing area through the EIM.[2] During most intervals, the potential amount of competitive supply is several times the total demand for imbalance energy in the Idaho Power balancing area.[3]

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[1] *Structural Competitiveness of the Energy Imbalance Market: Idaho Power Balancing Area,* Revised – August 20, 2019, (the "DMM Idaho Power Report"). The DMM Idaho Power Report can also be found at: http://www.caiso.com/Documents/Structuralanalysisofmarketpower-IdahoPowerCompany-REVISED-Aug202019.pdf

[2] DMM Idaho Power Report, p.11.

[3] DMM Idaho Power Report, p.13.

II. Congestion on EIM Transfer Constraints into the Idaho Power Balancing Area Has Been Very Infrequent

The DMM Idaho Power Report also provides analysis of historical congestion and price separation in the EIM, similar to the analysis in Idaho Power's filing. The DMM Idaho Power report also shows that the frequency of intervals when the Idaho Power balancing area has been separated from the CAISO system by binding EIM scheduling constraints has been very infrequent.[4] This analysis of historical congestion of EIM transfer scheduling constraints further supports the conclusion that the Idaho Power balancing area is generally structurally competitive.

III. CAISO's Current Market Rules Effectively Mitigate Market Power in the EIM

During the relatively small number of intervals when Idaho Power may be pivotal and competitive supply from the rest of the EIM may be limited by congestion, this potential structural market power is mitigated by the CAISO's real-time bid mitigation procedures.

In prior orders, the Commission has specifically noted the concern raised by some parties about the potential for *under-mitigation* to occur when EIM transfer constraints were congested (or binding) in the market runs, but were not binding in the prior market runs used to trigger bid mitigation. This concern was based on prior annual and quarterly reports by DMM, in which DMM has highlighted this issue. Since DMM identified this concern, DMM continued to monitor this issue and worked with the ISO to develop software enhancements to effectively address the issue of potential under-mitigation in the real-time market. As a result of this effort, enhancements to address

[4] DMM Idaho Power Report, page 14.

the issue of under-mitigation in the ISO's real-time energy market were implemented in the 15-minute market in fall 2016 and in the 5-minute software in spring 2017.

Analysis by DMM indicates these enhancements have greatly improved the effectiveness of the CAISO's real-time market power migration procedures.[5] As indicated in the DMM Idaho Power Report, potential under-mitigation in the 15-minute market occurring during the small portion of intervals when EIM transfer constraints have been binding occurred in only 2 percent of congested intervals for Idaho Power between April 4, 2018 and April 3, 2019. In the 5-minute market, potential under-mitigation during intervals when EIM transfer constraints have been binding occurred in only 7 percent of congested intervals for Idaho Power.

The high degree of accuracy to CAISO's real-time market power mitigation procedures minimizes the risk of potential under-mitigation during the relatively small portion of intervals when EIM transfer constraints are binding. This level of accuracy ensures the effectiveness of automated mitigation procedures and mitigates concern that an EIM entity would have the opportunity to exercise market power through economic withholding.

IV. Conclusion

Since the addition of NV Energy to the EIM in December 2015, all EIM BAAs have been structurally competitive during almost all intervals. DMM's recent analysis of the Idaho Power balancing area further supports that this specific area of the EIM has been structurally competitive during almost all intervals. The structural competitiveness effectively mitigates the potential for both physical and economic withholding in the

[5] DMM Idaho Power Report, p.15.

Idaho Power balancing area. During the very small portion of intervals when Idaho Power may be pivotal and competitive supply into the Idaho Power BAA may be limited by binding EIM transfer constraints, this potential structural market power is mitigated by the CAISO's highly accurate real-time bid mitigation procedures. The high degree of accuracy of the automated mitigation procedures mitigates concern that an EIM entity would have the opportunity to exercise market power through economic withholding.

Therefore, DMM supports the continuation of Idaho Power's market-based rate authority in EIM, subject to the market power mitigation provisions of the CAISO tariff.

Respectfully submitted,

/s/ Eric Hildebrandt

Eric Hildebrandt, Ph.D.
Director, Market Monitoring

Adam Swadley
Lead Market Monitoring Analyst

California Independent System Operator Corporation
250 Outcropping Way
Folsom, CA 95630
Tel: 916-608-7123
ehildebrandt@caiso.com

Independent Market Monitor for the California Independent System Operator

Dated: August 20, 2019

CERTIFICATE OF SERVICE

I hereby certify that I have served the foregoing document upon the parties listed on the official service lists in the above-referenced proceedings, in accordance with the requirements of Rule 2010 of the Commission's Rules of Practice and Procedure (18 C.F.R. § 385.2010).

Dated at Folsom, California this 20th day of August, 2019.

/s/ Anna Pascuzzo
Anna Pascuzzo

ATTACHMENT A

Structural competitiveness of the energy imbalance market:

Idaho Power Balancing Area

California Independent System Operator Corporation

California ISO

Structural competitiveness of the energy imbalance market:

Idaho Power Balancing Area

REVISED – August 20, 2019

Department of Market Monitoring

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1 Introduction

This report provides an analysis of structural market power in the energy imbalance market (EIM) within the Idaho Power Company (IPCO) balancing authority area (BAA) using data from the 12 month period April 4, 2018 to April 3, 2019. The report assesses the competitiveness of the IPCO area based on the amount of competitive supply that may be transferred into the IPCO area in the EIM from the broader ISO/EIM footprint, compared to the amount of imbalance demand that is served by the EIM in the IPCO BAA[1].

Results of this analysis show that the EIM in the IPCO area is structurally competitive in almost all intervals and has not been subject to any frequently binding transmission constraints. Furthermore, during the very limited intervals when the IPCO area may be structurally non-competitive, the CAISO's market power mitigation processes provide highly effective mitigation of the potential to exercise market power.

The analysis of the accuracy of CAISO's automated market power mitigation procedures in this report reflects a minor correction in the analysis of mitigation accuracy provided in DMM's June 26, 2019 report on the structural competitiveness of the energy imbalance market in the IPCO area.[2] This correction results in a small increase in the percentage of under-predicted congestion displayed in Tables 6 and 7 of this report.[3]

1.1 Energy imbalance market

In the California ISO area, the majority of demand is met by supply procured or scheduled in the day ahead market. The CAISO's real time markets serve primarily to adjust and optimize unit commitments and dispatches in response to changes in system and market conditions and information.

In the EIM, however, almost all system load is served by resources identified in the base schedules of the EIM entities in each BAA. These base schedules are not determined by the automated market systems of the ISO and are not settled by the ISO or paid the EIM prices. The EIM is a real time market which starts from the base schedules for these BAAs and then adjusts and optimizes to best meet the imbalance needs of the aggregate EIM area.

In all EIM areas, only a small portion of total energy produced and consumed is settled by the ISO and paid based on EIM prices. Generating resources that receive or pay the EIM price are scheduled by the EIM entity. The only generation settled on EIM prices is the incremental amount scheduled in the EIM relative to each resource's base schedule. If market power is exercised in EIM, it is exercised on those

[1] The report uses a method to assess structural market power in the EIM similar to that used in DMM's June 2017 analysis of the BAAs of the Berkshire Hathaway Entities (BHE) and the April 2018 analysis of the Arizona Public Service (APS) BAA.

[2] Original report: *Structural Competitiveness of the Energy Imbalance Market: Idaho Power Balancing Area*, June 26, 2019. http://www.caiso.com/Documents/Structuralanalysisofmarketpower-IPCO.pdf

[3] For the IPCO area over the period April 4, 2018 – April 3, 2019, the percentage of 15-minute intervals with under-predicted congestion was unchanged at 2 percent. The percentage of 5-minute intervals with under-predicted congestion increased from 5 percent to 7 percent.

EIM imbalance quantities. Any measure of competition or market power should be centered on those quantities as the measures of supply and demand.

For a seller to have structural market power in the EIM, some kind of barrier must limit supply from new or outside (third-party) entities. The limited nature of electric transmission can create potential market power in some regions. Any area that can be isolated by limited transmission can be subject to high prices and the effects of uncompetitive behavior if a single seller controls enough generation in the area behind the constraint.

Transfers in the 15-minute and 5-minute EIM processes allow competitively priced sources of power to flow between BAAs, providing access to the BAA for competitive resources from outside areas. The limits of the transfers cap the amount of competitive supply that can be supplied from outside the BAA. In the EIM's 15 minute market and 5 minute market, competitive supply available to meet incremental demand is the transfer capacity that is incremental to the quantity of transfers occurring the prior market. If the imbalance demand in a given market is greater than the incrementally available import transfer capability, some supply from within the BAA is necessary to meet imbalance demand.

A market is not structurally competitive if a single producer can determine market outcomes. In a structurally competitive market, demand could be met without supply from that single producer. If demand cannot be met without that key producer, that producer is said to be *pivotal*. They can effectively dictate the market price. A *pivotal supplier* test compares demand to competitive supply in order to determine if the key supplier is pivotal. Competitive supply used in the pivotal supplier test consists of supply that can reach the market but is not controlled by the key supplier.

In most EIM areas, the additional imbalance needs that cannot be met by transfers from other areas would have to be met by the EIM entity's generation. In an interval where the imbalance demand is greater than the incremental transfer limits, the EIM entity could theoretically set prices up to the $1,000/MWh bid cap, knowing that they are pivotal and at least one of their resources would need to be dispatched to meet imbalance energy demand. In such intervals, the EIM entity could determine market outcomes and set market prices at extremely high levels in the absence of any special market power mitigation provisions.

1.2 Demand for imbalance energy

The relevant demand for each portion of the CAISO's multi settlement markets involves the sum of *changes* between two market solutions. In the CAISO, the 15-minute market demand is equal to (1) the sum of all generation in the 15-minute market *minus* (2) the sum of all generation in the day-ahead market. This represents the incremental energy dispatched by the 15-minute market. Using the changes to generation to quantify imbalance energy demand accurately captures the quantity of imbalance energy dispatched by the market. Using the load forecast in each market can underestimate or overestimate the actual market demand due to possible changes in self schedules, renewable output, resource outages, and other factors.

In the EIM, entities do not participate in the day-ahead market, but instead submit base schedules that are treated very much like day-ahead market schedules in the CAISO. For each EIM BAA, the quantity demanded in the 15-minute EIM market is equal to changes made by the market between base schedules and the final 15-minute schedules.

Analyzing market power in the EIM requires measuring supply and demand in the EIM. Exercising market power involves changing prices, so for this analysis we are able to leave out the changes to generation in the EIM BAAs that cannot have any impact on price. Since only changes made by the market software can set price, non-participating resources and self-scheduled resources that have no bids in the market do not need to be counted when measuring demand for market power evaluation.

When a resource has a self-schedule and has economic bids above the self-schedule, any dispatch into the economic bid range will be part of the market demand. Below we present a mathematical representation of this approach, using the following variables:

$E_{15,A}$ 15-minute market demand in BAA A

$E_{5,A}$ 5-minute market demand in BAA A

$Dispatch_{15,A}$ Total 15-minute schedules within BAA A

$Dispatch_{5,A}$ Total 5-minute schedules within BAA A

$schedule_{B,A}$ total base schedule for BAA A

$schedule_{I,A}$ total IFM schedule for BAA A

$gen_{h,p}$ output from economically bid participating resources p for market h

For a given EIM BAA A, 15-minute demand is:

$$E_{15,A} = \sum Dispatch_{15,A} - \sum schedule_{B,A}$$

This demand includes changes to generation schedules as well as net energy transfers out of each BAA through the EIM since transfers into and out of each BAA can be adjusted by the EIM dispatch as part of the 15-minute EIM. Mathematically, the two pieces of demand can be broken down to:

$$Dispatch_{15,A} = \sum_{p.np \in A} (gen_{15,p}) + in\ transfers_{15,A} + out\ \ transfers_{15,A}$$

$$Schedule_{B,A} = \sum_{p.np \in A} (gen_{B,p}) + in\ transfers_{B,A} + out\ \ transfers_{B,A}$$

The CAISO differs from EIM BAAs because we consider the day-ahead schedule instead of the base schedule as the starting point. Because 15-minute intertie transactions into and out of the ISO can be adjusted by the real time market, these transactions area also included in the analysis as imports and exports:

$$E_{15,ISO} = \sum Dispatch_{15,ISO} - \sum schedule_{I,ISO}$$

$$Dispatch_{15,ISO} = \sum_{p \in ISO} (gen_p) + in\ transfers_{15,ISO} + out\ transfers_{15,ISO} + imports_{15,ISO} + exports_{15,ISO}$$

$$Schedule_{I.ISO} = \sum_{p \in ISO} (gen_p) + imports_{I,ISO} + exports_{I,ISO}$$

Total demand for the 15-minute EIM is the sum of the EIM demand in the ISO and in each of the other BAAs participating in EIM:

$$E_{15} = E_{15,ISO} + \sum_{A \in EIM} E_{15,A}$$

In the 5-minute market, imbalance demand is the difference between 5-minute dispatches and 15-minute dispatches. For the 5-minute market, all EIM BAAs and the ISO have the same formulation.

$$E_{5,A} = \sum Dispatch_{5,A} - \sum Dispacth_{15,A}$$

$$Dispatch_{5,A} = \sum_{p.np \in A} (gen_{5,p}) + in\ transfers_{5,A} + out\ transfers_{5,A}$$

$$E_5 = E_{5,ISO} + \sum_{A \in EIM} E_{5,A}$$

2 Supply and demand in the energy imbalance market

For this report, DMM compiled the data described above for the IPCO BAA in the 12 month period from April 4, 2018 through April 3, 2019. This period represents IPCO's first full year of participation in the EIM.

2.1 Demand for imbalance energy

Figures 1 and 3 show the distribution of the demand for imbalance energy in the 15-minute and 5-minute markets in the IPCO BAA for this 12 month period (in MW). Figure 2 and Figure 4 highlight the distribution of imbalance energy demand in the 15-minute and 5-minute markets over this period as a percentage of total load in the IPCO BAA. Table 1 and Table 2 provide summary statistics for these data.

As seen in Figures 1 and 3, demand for imbalance energy in the IPCO BAA on a 15-minute and 5-minute basis are roughly normally distributed. Imbalance demand in the 15-minute market averaged 5 MW per interval with a median value of 1 MW (see Table 1). The close values for the average and median suggest a symmetric distribution. Base schedules were exceeded by 15-minute schedules (indicating a net positive imbalance demand) in approximately half of the intervals.

As shown in Table 1, the demand for imbalance energy was positive during about 53 percent of 15-minute intervals. During intervals with positive imbalance demand in the 15-minute market, the average imbalance demand was about 56 MW. Demand for imbalance energy was positive in 47 percent of intervals in the 5-minute market. During intervals with positive imbalance demand in the 5-minute market, the average imbalance demand was about 38 MW. Table 2 shows that the median imbalance demand in both the 15-minute market was about 2.4 percent of total demand while the median imbalance demand in the 5-minute market was about 1.6 percent in absolute value of total demand.

Table 1. Imbalance demand (MW)

Market	average	median	Intervals demand positive	Average positive demand	Percentiles 90th	95th	97th
15 minute	5	1	53%	56	91	120	142
5 minute	-8	-3	47%	38	56	81	99

Table 2: Imbalance demand as share of total load (absolute value)

Market	Median	90th	95th	97th
15 minute	2.4%	6.8%	8.6%	10.0%
5 minute	1.6%	5.3%	7.1%	8.5%

Figure 1. Demand for imbalance energy for the IPCO BAA (15-minute market, April 4, 2018 to April 3, 2019)

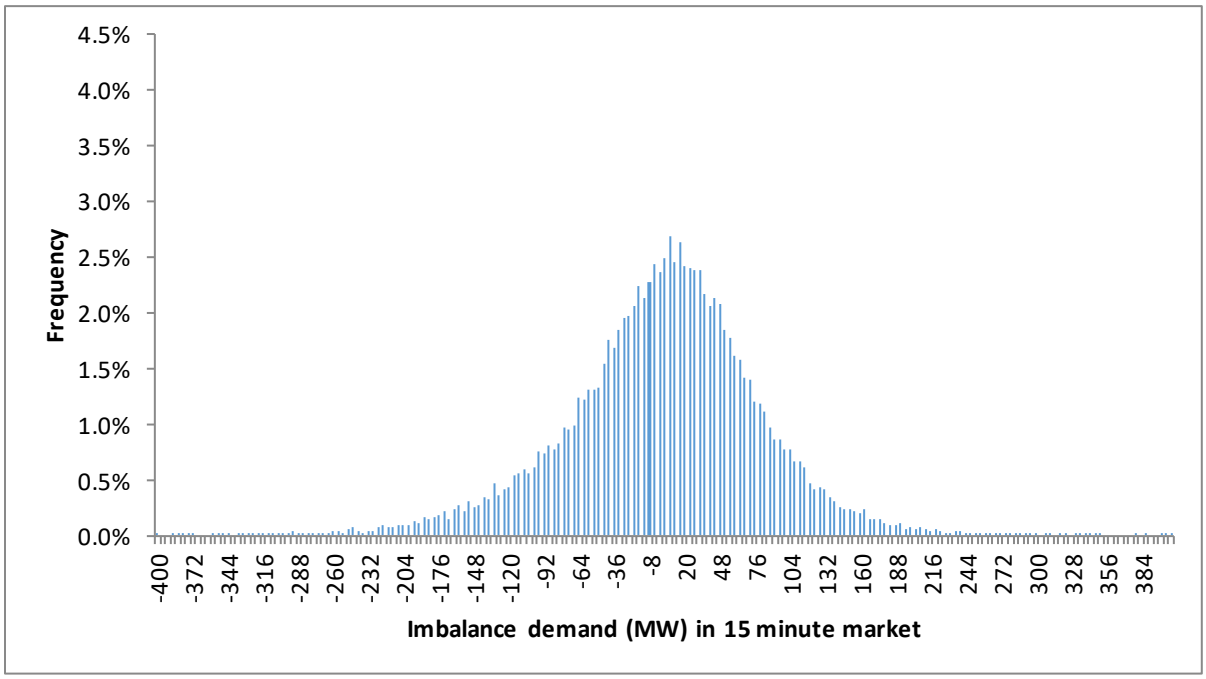


Figure 2. Imbalance energy demand compared to total load for the IPCO BAA (15-minute market, April 4, 2018 to April 3, 2019)

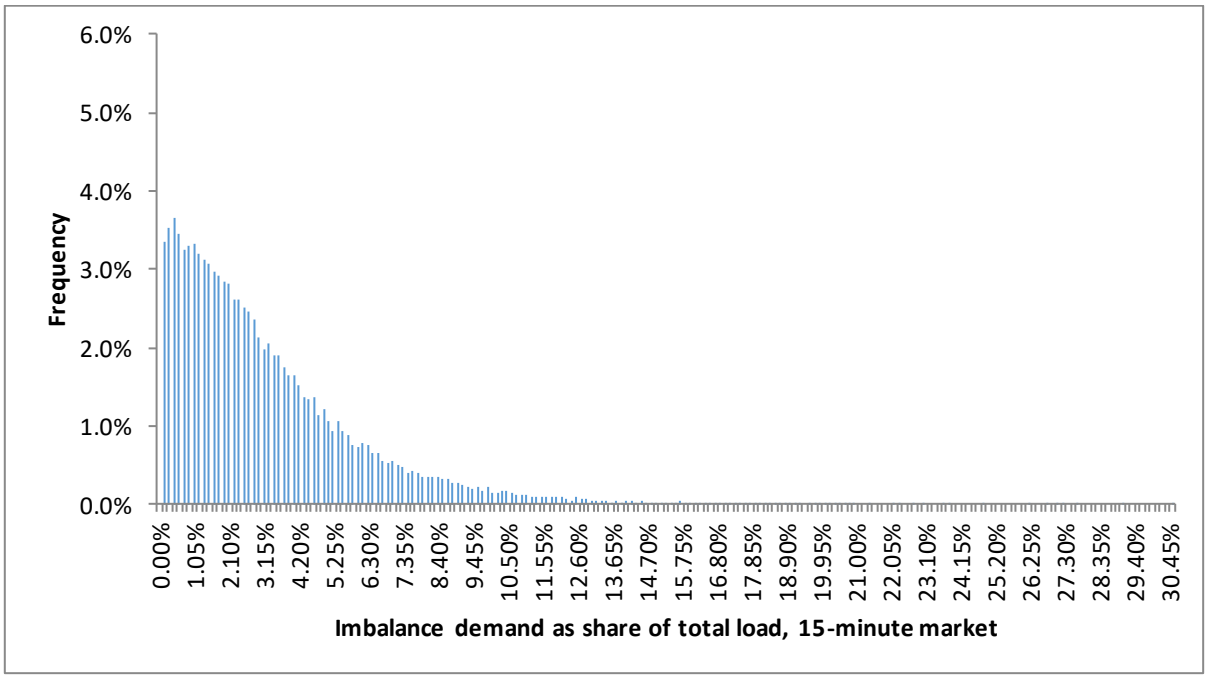


Figure 3. Demand for imbalance energy for the IPCO BAA (5-minute market, April 4, 2018 to April 3, 2019)

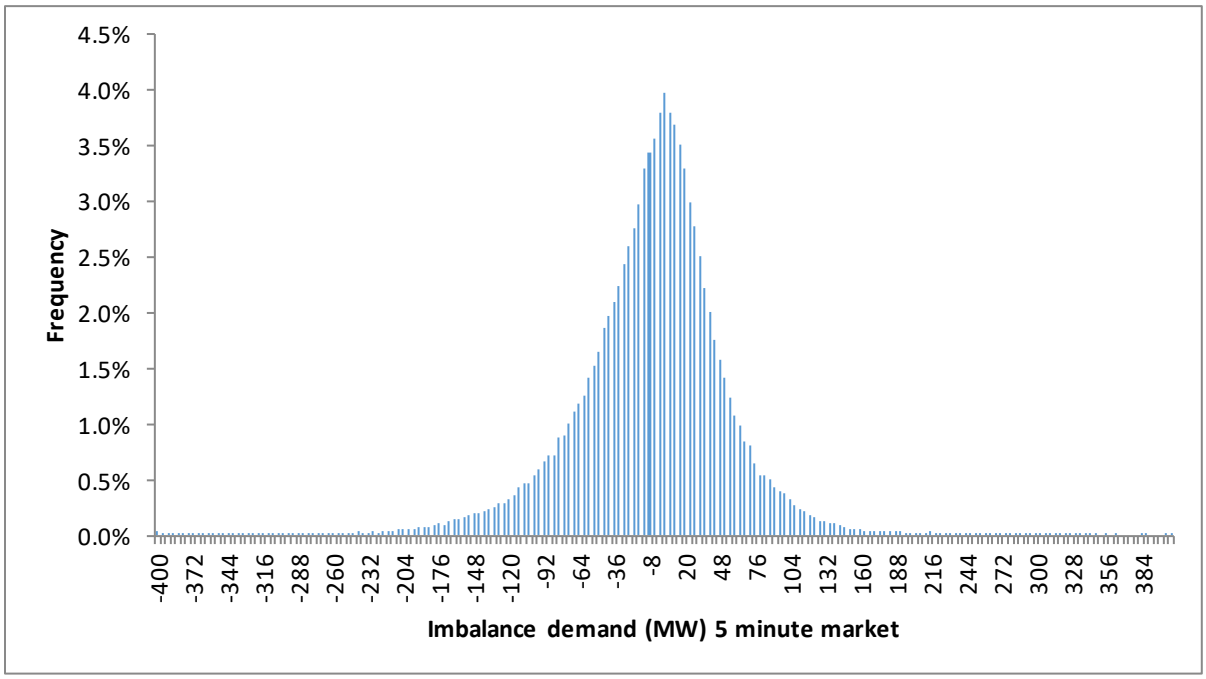
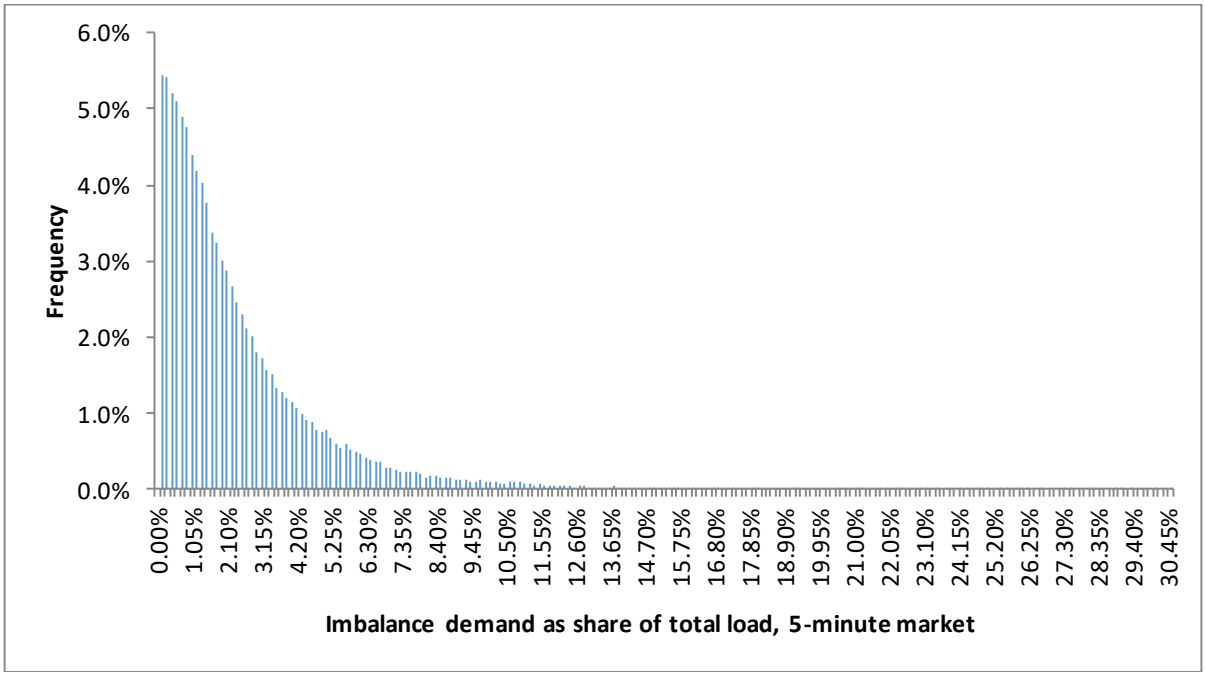


Figure 4. Imbalance energy demand compared to total load for the IPCO BAA (5-minute market, April 4, 2018 to April 3, 2019)



2.2 Competitive supply of imbalance energy

The competitive supply available to meet EIM internal demand consists of supply that is not controlled by the generation arm of the EIM entity for that BAA or one of its affiliates. In EIM areas, all or most of the available competitive supply is from outside the EIM BAA in the form of EIM transfers. EIM transfer limits are determined in the import and export directions for both the 15-minute and 5-minute markets.

To determine additional competitive supply available in each market to meet imbalance demand in that market, this analysis considers the portion of each market's EIM transfer limit that is incremental to the transfers occurring in the prior market. Specifically, we consider the portion of each market's import transfer limit that is incremental to the prior market's scheduled imports as the competitive supply available to serve imbalance demand.[4] This approach appropriately accounts for base transfers, and allows for direct comparison of imbalance demand in a given market to the ability to increase import transfers over the level of the prior market to meet imbalance demand.

As shown in Table 3, during more than 95 percent of intervals, total incremental transfer capacity into IPCO from any combination of other EIM BAAs was about 1.7 times the 97th percentile of IPCO's imbalance demand in the 15-minute market. Results for the 5-minute market suggest slightly tighter conditions on average, however the combined incremental transfer capacity into IPCO still exceeds the 97th percentile of imbalance demand by approximately 1.2 times during 95 percent of intervals. The analysis of total incremental import transfer capability demonstrates that considerable amounts of transfers have consistently been available relative to imbalance demand.

Table 3. Competitive supply from EIM into IPCO (MW)

	Percentiles: 15 minute market				
Source	5th	10th	25th	median	90th
Total	255	351	563	875	1,797
NEVP	12	65	189	278	591
PACE	0	25	138	402	1,241
PACW	0	0	13	127	261

	Percentiles: 5 minute market				
Source	5th	10th	25th	median	90th
Total	117	217	431	750	1,689
NEVP	0	5	235	262	568
PACE	0	0	83	335	1,197
PACW	0	0	0	41	210

[4] Supply that may be transferred into a BAA in the 15-minute EIM is the difference between the 15-minute transfer limit less any transmission needed between EIM areas for base schedules. Supply that may be transferred into a BAA in the 5-minute EIM is the difference between the 5-minute transfer limit less any transmission needed between EIM areas for final 15-minute EIM schedules.

3 Structural market competitiveness

3.1 Pivotal supplier test

The pivotal supplier test for structural market power in EIM asks this question: could imbalance demand within the EIM BAA have been met by transfers from other unaffiliated BAAs, without using generation controlled by the EIM entity or its affiliates? If so, then the EIM entity was not pivotal in that interval and could not have successfully raised prices at that time. In a structurally competitive market the exercise of market power would be difficult and opportunities to do so would be rare.

To perform this test, the imbalance demand in IPCO is compared to additional competitive supply that could be transferred into the IPCO BAA from the CAISO area and other EIM BAAs that are not affiliated with IPCO.

The pivotal supplier test can be performed for individual intervals using historical data by calculating how often competitive supply was able to meet imbalance demand in the IPCO BAA. When the level of competitive supply is below imbalance demand, IPCO would be pivotal. Table 4 shows results of this analysis for each of the 12 months examined in this report. The frequency of intervals where imbalance demand is greater than supply is typically low. However, the results from December 2018 show a somewhat higher percent of intervals with imbalance demand exceeding competitive supply. This difference appears to be driven in large part by a period of reduced incremental import transfer availability rather than an increase in imbalance demand.

Table 4. Frequency that IPCO is pivotal in IPCO EIM BAA

	Share of intervals with imbalance demand greater than incremental transfer capacity	
	15-minute market	5-minute market
Apr-18	0.9%	0.7%
May-18	0.4%	0.8%
Jun-18	0.0%	0.1%
Jul-18	0.0%	0.0%
Aug-18	0.3%	0.8%
Sep-18	0.5%	0.7%
Oct-18	0.3%	2.1%
Nov-18	1.5%	2.0%
Dec-18	3.9%	7.8%
Jan-19	0.3%	0.5%
Feb-19	0.1%	0.6%
Mar-19	0.0%	0.1%
Apr-19	0.0%	0.0%

The structural competitiveness of the IPCO BAA in the EIM can also be summarized based on statistical values of supply and demand. Figure 5 and Figure 6 provide a comparison between average incremental import transfer capacity, representing competitive supply, and the 95th and 99th percentile of imbalance demand.[5]

Figure 5 shows a comparison of average available supply to the 95th percentile and the 99th percentile of demand for the 15-minute market. In the 15-minute market, average competitive supply exceeded both the 95th and 99th percentile of imbalance demand during each month of the study period. In most months, average competitive supply is at least five times as large as the 95th percentile of imbalance demand. In the closest months, average available supply is about twice the volume of the 99th percentile of imbalance demand.

These results show that supply and demand conditions in the 15-minute market were competitive during more than 96 percent of the study period. Transfer capacity allowed resources from other parts of EIM to compete with resources controlled by IPCO in nearly all intervals of the 15-minute market.

Fundamental supply and demand conditions in the 5-minute market are also competitive. Figure 6 shows that these conditions are tighter than in the 15-minute market, but that average competitive supply still meets the 95th and 99th percentile of demand in all months of the study period. Competitive supply exceeded imbalance demand in the vast majority of 5-minute intervals. In all months other than December 2018, in more than 97 percent of intervals the amount of incremental import transfer capacity from the EIM exceeded total imbalance demand in the IPCO area. In December 2018, incremental import transfer capacity from the EIM exceeded total imbalance demand in the IPCO area in more than 92 percent of intervals.

[5] If we use the average demand over some period of time to compare to average transfer capacity, we will include the negative intervals and may provide an underestimate of the size of the market. Therefore, instead of comparing average competitive supply to average demand, we compare average competitive supply to imbalance demand during intervals with particularly tight supply conditions.

Figure 5: IPCO imbalance demand and competitive supply (15-minute market)

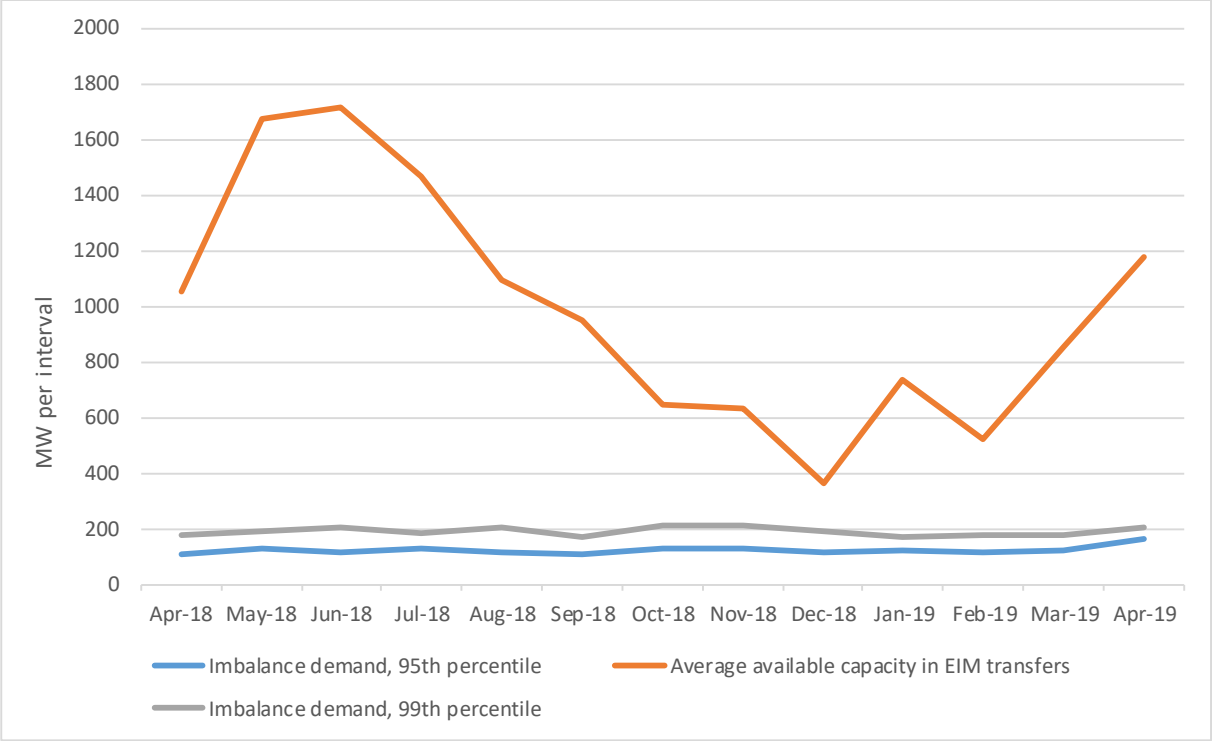
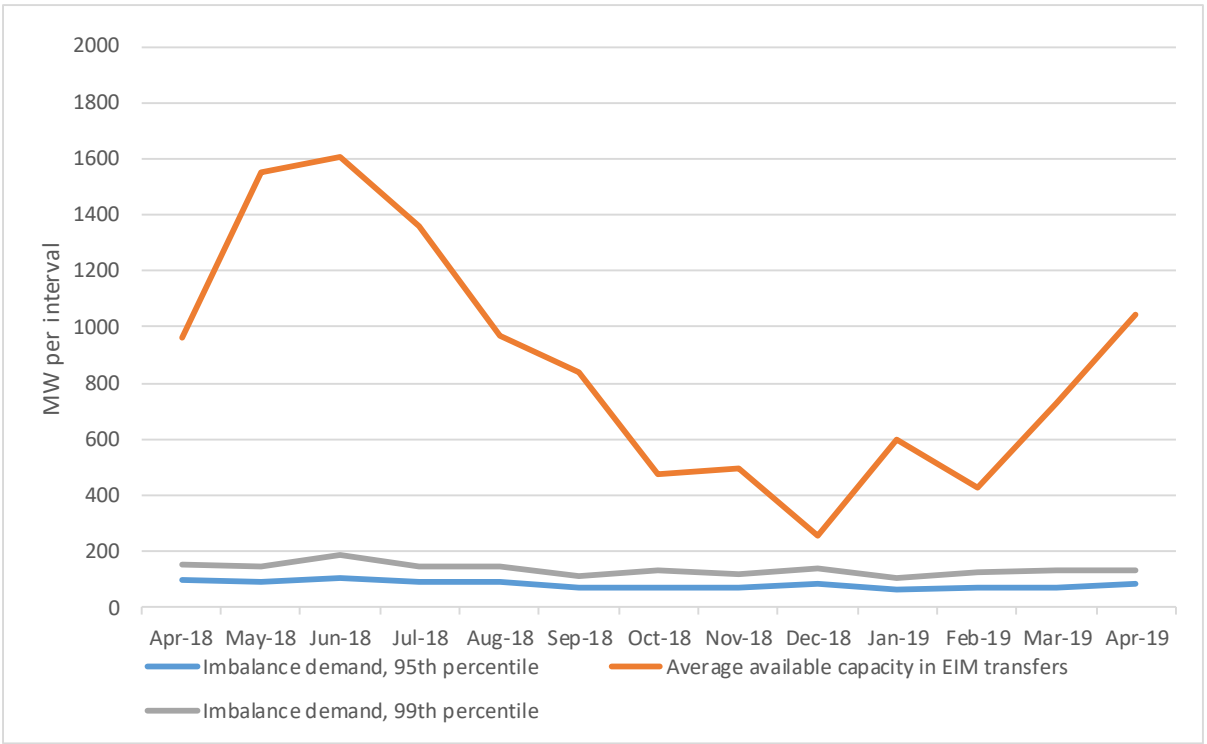


Figure 6: IPCO imbalance demand and competitive supply (5-minute market)



3.2 Market separation due to congestion

Another indicator that is often used to assess the structural competitiveness of a market (or a potential sub-market within a larger market) is the frequency with which an area is separated by congestion from other markets or a larger market. In an LMP market, such congestion results in *price separation,* which reflects higher LMPs within a congested area due to the positive congestion component of LMPs in that area.

Table 5 shows the portion of intervals that the IPCO BAA was separated by congestion from the rest of the EIM, such that prices within the IPCO BAA were higher due to congestion on EIM transfer constraints between the IPCO BAA and CAISO.[6] Although price separation implies relatively higher prices compared to other EIM BAAs, intervals with congestion on the transfer constraints in to an EIM BAA are precisely the intervals in which CAISO's local market power mitigation procedures are designed to be triggered. Therefore, given the high degree of accuracy in the prediction of congestion for local market power mitigation, nearly all intervals with price separation in the IPCO BAA will still have a competitive price set either by the cost-based default energy bid of a mitigated resource or the CAISO system energy price.[7]

Figure 5 shows that the frequency of price separation due to congestion limiting transfers into the IPCO BAAs is quite low. Only 4.6 percent of intervals in the 15-minute market and 5.6 percent of intervals in the 5-minute market show price separation between IPCO and CAISO. These results, combined with highly accurate prediction of congestion in market power mitigation, imply that less than half of 1 percent of intervals in either the 15-minute or 5-minute market may have separated prices set by an unmitigated bid.[8]

Table 5. Frequency of price separation (April 4, 2018 to April 3, 2019)

	Share of intervals exhibiting price separation	
	15-minute market	5-minute market
IPCO	4.6%	5.6%

[6] In the EIM, price separation can also occur due to the greenhouse gas (GHG) component of LMPs and congestion on constraints within each EIM BAA. Therefore, this analysis is based only on price separation due to congestion on transfer constraints between EIM areas. Additionally, price separations of less than one cent are not considered as intervals with price separation in this analysis. Such instances are typically the result of modeling parameters that add fractional amounts less than one cent to the objective functions associated with some individual ETSRs in order to ensure an optimal transfer solution.

[7] When mitigation is triggered, bids are limited by the higher of the unit's cost-based default energy bid or the competitive LMP for the resource's node (which is usually about equal to the system marginal energy price for the CAISO system)

[8] See Table 6 below. Under-prediction of congestion into IPCO in the 5-minute market occurred in 7 percent of intervals, and only 5.6 percent of intervals had price separation in IPCO in the 5-minute market. This implies that 7 percent of 5.6 percent of total intervals (.07*.056 = .0039 = 0.39%) were unmitigated and potentially had prices set by an unmitigated bid. The values are even smaller in the 15-minute market, which has even more accurate prediction of congestion and lower frequency of price separation.

3.3 Energy bid mitigation

During the relatively small portion of intervals when IPCO may be pivotal and competitive supply from the CAISO and broader EIM into the IPCO BAA may be limited by congestion (as shown in Table 5), this potential structural market power is mitigated by the CAISO's real-time market power mitigation procedures. These bid mitigation procedures are triggered when congestion is projected in the real-time market. When bid mitigation is triggered, bids of all supply within a BAA that is separated from the ISO are automatically subject to bid limits based on each resource's marginal cost and competitive system prices in the CAISO area. Thus, even when price separation occurs, effective market power mitigation ensures that the resulting price is still typically competitive.

The CAISO implemented enhancements to its real-time bid mitigation procedures in the 15-minute market in Q3 2016 and in the 5-minute market in Q2 2017. DMM analysis shows that with these enhancements, CAISO's market power mitigation processes have a high degree of accuracy of congestion estimation for all EIM transfer constraints. This reduces the possibilities of missed mitigation to a very low level for each of the EIM BAAs in both the 15-minute and 5-minute market over the period of this analysis, as shown in Table 6 and Table 7.

Table 6: Accuracy of congestion prediction by region on EIM transfers, 15-minute market April 4, 2018 – April 3, 2019

	Accurately predicted	Predicted but resolved	Under predicted
PACE	95%	3%	2%
PACW	93%	5%	3%
PGE	92%	5%	3%
BCHA	90%	7%	3%
PSEI	90%	6%	4%
IPCO	92%	6%	2%
NEVP	95%	2%	3%
AZPS	94%	4%	2%

Table 7: Accuracy of congestion prediction by region on EIM transfers, 5-minute market April 4, 2018 – April 3, 2019

	Accurately predicted	Predicted but resolved	Under predicted
PACE	66%	30%	5%
PACW	65%	24%	10%
PGE	63%	27%	10%
BCHA	58%	36%	6%
PSEI	59%	33%	8%
IPCO	66%	27%	7%
NEVP	55%	42%	4%
AZPS	60%	37%	3%

4 Conclusion

This report provides analysis by DMM evaluating the potential for market power in existing EIM areas. This analysis indicates that the IPCO BAA is structurally competitive during almost all intervals in the EIM due to the amount of competitive supply in each market that could be transferred into IPCO from the rest of the EIM. The report also shows that CAISO's real-time market power mitigation procedures provide assurance that any potential market power on the IPCO BAA is effectively mitigated when the IPCO area is separated by congestion from the CAISO and other EIM areas.