March 26, 2015

The Honorable Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Re: California Independent System Operator Corporation
Docket No. ER15-402___
Informational Report – Performance of Energy Imbalance Market

Dear Secretary Bose:

The California Independent System Operator Corporation (CAISO) hereby submits its March report on the performance of the Energy Imbalance Market for February 13 – March 16, 2015.[1]

The Commission also directed the Department of Market Monitoring to submit independent assessments on the causes and solutions identified by CAISO. The CAISO intends to submit the independent assessment of the Department of Market Monitoring in about eight days.

On March 16, 2015, the Commission directed the CAISO to refine the monthly reports to "assist the Commission and the parties in determining the extent to which the price spikes continue to be caused by transitional issues, and the extent to which they may be triggered by lack of adequate supply in the EIM."[2] While the CAISO started to change its reporting procedures to comply with the Commission's directives shortly after the order was issued, the CAISO was not able to modify this report with those changes in time for this submission. Therefore, the CAISO is filing this report with the same type of information provided in prior reports. However, the CAISO will file in mid-April a

[1] The CAISO submits this report pursuant to *California Independent System Operator Corp.*, 149 FERC ¶ 61,194 (2014).

[2] *California Indep. Sys. Operator Corp. Inc.*, 150 FERC ¶ 61,191 (2015).

report that complies with the Commission's directives and covers the full month of March. Thereafter, the CAISO will continue filing such reports monthly consistent with the Commission's order to continue submitting reports on a 30 day interval until the 206 investigation is concluded or the Commission issues a directive, whichever is earlier.

Please contact the undersigned with any questions.

Respectfully submitted

By: *<u>/s/ Anna A. McKenna</u>*

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Energy Imbalance Market Pricing Waiver Report February 13 – March 16, 2015

March 26, 2015

ISO Market Quality and Renewable Integration

I. Introduction

On December 1, 2014, the Federal Energy Regulatory Commission (FERC) granted the California Independent System Operator Corporation's (CAISO) petition for limited waiver of the pricing parameters in sections 27.4.3.2 and 27.4.3.4 of its tariff for 90 days, as they pertain to the Energy Imbalance Market, effective November 14, 2014, as requested.[1] In addition, FERC directed CAISO to submit informational reports as further described herein. The CAISO will be submitting on a monthly basis the requested reports in Attachments A through E, including reports provided by the CAISO's Department of Market Monitoring and PacifiCorp. This report covers the CAISO's reporting requirements for the time period covering February 13 through March 16, 2015.

The Department of Market Monitoring will file its report within approximately eight days of March 26, 2015. The Commission directed the Department of Market Monitoring to submit independent assessments on the causes and solutions identified by CAISO. The Department of Market Monitoring requires some additional days to fully review and evaluate the CAISO's report and provide an independent assessment.

II. Background

On November 1, 2014, the CAISO fully activated the Energy Imbalance Market (EIM). The Energy Imbalance Market allows balancing authorities outside of the CAISO balancing authority area to voluntarily take part in the imbalance energy portion of the CAISO locational marginal price-based real-time market. PacifiCorp, the CAISO, and market participants participated in market simulations prior to the start of the Energy Imbalance Market on November 1, including parallel production from October 1 to November 1. However, shortly after go live the CAISO began observing challenges that led to artificially high prices in cases where the market application had to resort to the relaxation of transmission constraints or the power balance constraint in order to clear the market.

On November 13, 2014, the CAISO sought a 90-day waiver of the applicability of section 27.4.3.3 and the second sentence of section 27.4.3.4 of its tariff to permit CAISO to address, without suspending the Energy Imbalance Market, those circumstances which produced atypically high prices. Those two sections of the tariff provide that when there is a lack of economic bids to clear the fifteen-minute and five-minute markets, the CAISO's market application will price the shortages (and therefore set

[1] *California Indep. Sys. Operator Corp.*, 149 FERC ¶ 61,194 (2014) (December 1 Order).

locational marginal prices) according to the pricing parameters specified in those sections. Specifically, for the purpose of determining how a transmission constraint or system-energy balance constraint will affect the determination of prices in the market, the pricing parameter for the relaxation of the constraint is $1,000/MWh (the maximum energy bid price specified in tariff section 39.6.1.1).

The waiver addresses three sets of transitional conditions in the Energy Imbalance Market that together have caused the transmission and system energy-balance constraints described in tariff sections 27.4.3.2 and 27.4.3.4 to bind more frequently than expected in the weeks since the Energy Imbalance Market began operation on November 1, causing prices in these intervals to be set by the $1,000/MWh relaxation parameter. Because of these transitional conditions, the high prices are not always indicative of actual physical conditions on the system, and reflect challenges in providing timely and complete data to ensure system visibility under the new procedures, exacerbated by limitations on the resources available to PacifiCorp for use in the Energy Imbalance Market and several forced outages of large Energy Imbalance Market participating resources. The CAISO described[2] the transitional conditions that led to the waiver in its petition filed on November 13, 2014, as follows:

1) All possible operational conditions, including interactions between disturbance events and other conditions on the system, were not fully represented, simulated and tested during these earlier market simulations. It was not until actual operations that these circumstances were experienced and the resulting price excursions became apparent. In some cases data issues arise because of errors made in processing such information, and in such intervals the CAISO will have authority to correct prices. But it in some cases, the pricing excursions may be due to the need to adopt better practices generally and not because of an erroneous data processing issue.

2) Limitations on the resources available to PacifiCorp for use in the Energy Imbalance Market. Several resources had not yet received the necessary metering upgrades due to various outage schedule limitations, which has prevented PacifiCorp from making these resources available in the initial pool of resources participating in the Energy Imbalance Market. The CAISO is processing temporary metering exemptions in accordance with its requirements and participation by some additional resources has improved conditions, but other considerations remain. For instance, some resources are subject to multiple ownership rights and have contractual issues that must be resolved to enable their participation in the Energy Imbalance

[2] *See Petition For Limited Tariff Waiver And Request For Expedited Consideration*, California Independent System Operator Corp., filed November 13, 2014, FERC Docket No. ER15-402.

Market. Additionally, third-party resources in PacifiCorp's balancing authority areas have not yet begun participating in the Energy Imbalance Market, which further limits the pool of available resources.

3) The PacifiCorp East (PAC East) and PacifiCorp West (PAC West) balancing authority areas experienced several forced outages of large Energy Imbalance Market participating resources, which led to short term supply deficiencies in the market. While outages are not necessarily uncommon, these outages quickly exacerbated an already tight supply and contributed to price increases in the associated intervals. In addition, while PacifiCorp operations accounted for the outages by responding to system conditions, these actions have not always been communicated in a timely manner to the market. Without such information, the market results would not necessarily reflect physical conditions on PacifiCorp's system. The addition of more participating resources and enhanced operational procedures should mitigate the impact of such outages.

On December 1, 2014, FERC granted the CAISO its waiver request and also directed monthly reports to FERC on the progress of the issues that led to the need for the waiver. The CAISO provides its reports consistent with the order below and in the attachments to this report. On February 12, 2015, the Commission extended the term of this waiver to March 15, 2015, in its order issued in FERC Docket ER15-861 (*California Indep. Sys. Operator Corp.*, 150 FERC ¶ 61,086 (2015)). Consistent with that extension, the CAISO intends to file an additional report after March 16, 2015.

On March 16, 2015, the Commission again extended the waiver to 90 days after the date on which the Commission's order issued on March 16, 2015, in FERC Docket No. ER15-861 (150 FERC ¶ 61,191) is registered in the Federal Register (June 22, 2015). In the March 16, 2015, order the Commission also directed the CAISO to refine the monthly reports to "assist the Commission and the parties in determining the extent to which the price spikes continue to be caused by transitional issues, and the extent to which they may be triggered by lack of adequate supply in the EIM."[3] While the CAISO started to change its reporting procedures to comply with the Commission's directives, the CAISO was not able to modify its report with those changes in time for its submission of the March monthly report. Therefore, the CAISO files this report with the same type of information provided in prior reports. However, the CAISO will file in mid-April a report that complies with the Commission's directives and covers the full month of March. The CAISO will continue filing such reports monthly consistent with the

[3] *See* 150 FERC ¶ 61,191 at P 38.

Commission's order to continue submitting reports on a 30 day interval until the 206 investigation is concluded or the Commission issues a directive, whichever is earlier.

III. Reports

In the December 1 Order, the Commission directed the CAISO to file detailed informational reports on the performance of Energy Imbalance Market at 30-day intervals during the 90-day waiver period. Consistent with the order, this fourth report is filed approximately 30 days from the last report filed on February 19, 2015. The Commission stated that these reports should provide detailed supporting data demonstrating progress towards identifying and eliminating the problems giving rise to the waiver petition. Consistent with the December 1 order, the following reports are included in Attachments A through E as follows:

Attachment A: A quantitative and qualitative description of the market performance (covering both progress and remaining concerns) related to the issues that prompted the CAISO's waiver request that are within the CAISO's control. Includes a description of, and status update regarding, measures being taken or planned to be taken to identify and address the market performance problems related to the issues that prompted the CAISO's waiver request. Identifies any remaining deficiencies in CAISO and PacifiCorp processes, procedures, and tools and any additional market issues related to these pricing concerns that the CAISO considers necessary to sustain stable market operations, along with the CAISO's plan to address such issues.

Attachment B: A quantitative and qualitative description of the market performance (covering both progress and remaining concerns) related to the issues that prompted the CAISO's waiver request that are within PacifiCorp's control. This section includes a description of, and status update regarding, measures being taken or planned to be taken to identify and address the market performance problems related to the issues that prompted the CAISO's waiver request.

Attachment C: Independent assessments from the Department of Market Monitoring on the causes and solutions identified by the CAISO. For this first report, this will be submitted within seven days of the CAISO's first submission.

Attachment D: An exploration of impacts, if any, on non-EIM pricing nodes, including the Mona trading node. Report on whether EIM pricing is adversely impacting non-EIM pricing nodes. The extent to which non-EIM pricing nodes such as the Mona trading node are impacted by EIM pricing within the PacifiCorp Balancing Authority Areas. Identify any such impacts and describe any actions the CAISO is taking or plans to take to address such impacts.

Attachment E: Description of each relaxation event, and a summary of the magnitude and frequency of such events overall. Data on instances where the $1,000/MWh price would have occurred but for this waiver, including the time of the instance, the duration, the cause, and the affected node(s) and load aggregation points.

ATTACHMENT A

Quantitative and qualitative descriptions of market performance related to the issues that prompted the CAISO's waiver request - CAISO.

This attachment includes quantitative and qualitative information for three reporting requirements specified in the Commission's December 1 order. First, section 1 and section 2 provide a quantitative and qualitative description of the market performance (covering both progress and remaining concerns) related to the issues that prompted the CAISO's waiver request that are within the CAISO's control. Second, the tables in section 2 of this attachment provide a descriptions of, and status update regarding, measures being taken or planned to be taken to identify and address the market performance related to the issues that prompted the CAISO's waiver request. Finally, the tables in section 2 of this attachment also report on the measures taken and planned to address the market performance problems, which also identify any remaining deficiencies in processes, procedures, and tools and any additional market issues related to these pricing concerns that the CAISO considers necessary to sustain stable market operations, along with the CAISO's plan to address such issues.[4]

1. Analysis of Impact on Market Performance

In this section the CAISO provides a quantitative and qualitative analysis of the market performance impact of the issues that prompted the CAISO's request for a waiver.

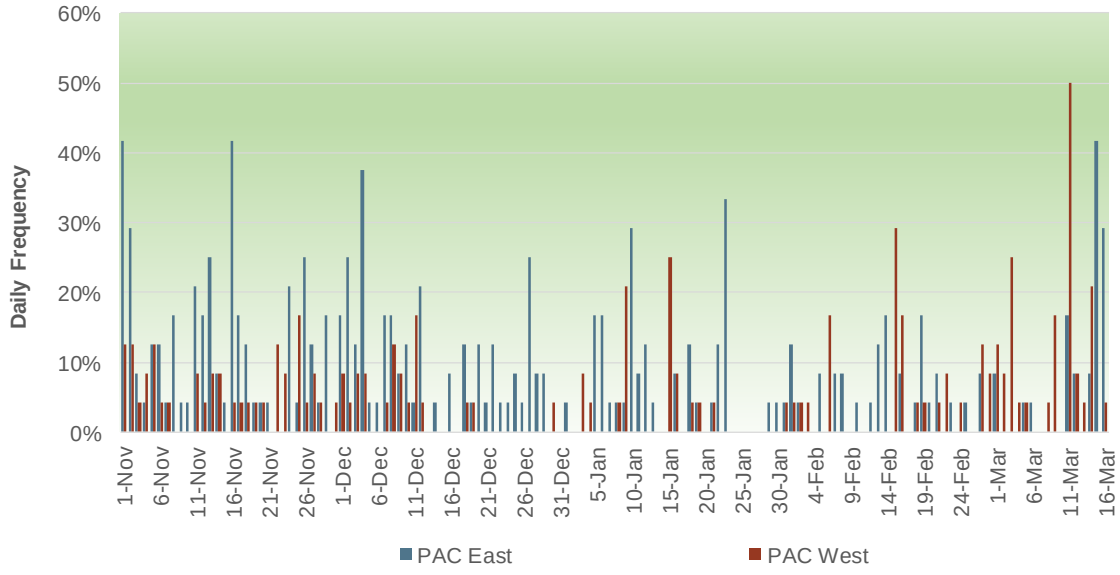
The Energy Imbalance Market is only a part of the real-time market and is not part of the day-ahead market. The CAISO uses the day-ahead market as a reference point for the real-time market. In lieu of the day-ahead market solution, for the Energy Imbalance Market the CAISO uses EIM balanced base schedules, which are used to model hourly Balancing Authority Area generation and load before the Energy Imbalance Market runs. The base schedule can be adjusted by seventy five minutes before the applicable hour, (T-75), fifty five minutes before (T-55) and forty minutes before (T-40). The last cycle at T-40 minute will determine the base schedules actually used for the Energy Imbalance Market. The base schedules also serve as a reference for imbalance energy settlements. When the EIM entity opts to use the ISO demand forecasts, the CAISO compares the base schedules –generation and net interchange- with hourly demand forecast and performs a balancing test by EIM Balancing Authority Area and if the EIM entity Balancing Authority Area imbalance is within 1 percent of the forecast, it passes the balancing test. The balancing test is important because it is the

[4] *December 1 Order* at P 25.

starting point from which the Energy Imbalance Market is run. Therefore, if the energy market starts with a significant imbalance, such that even the bid-in capacity is not enough to cover the imbalance, there is the potential for infeasibilities in the fifteen- and five-minute markets for either over- or under-supply. It is important to note that the base schedules are set at one level for the entire hour, while load actually varies within the hour.

Figure 1 shows the trend of balancing test failures for the period of November 1, 2014, though March 16, 2015 of operation of the Energy Imbalance Market by area, PAC West and East. There is a downward trend in the frequency of failures from a frequency of failures of 9.2 percent in November to 6.45 percent in December to 5 percent in January and February. The average amount of imbalance has been 166 MW and 148 MW in PAC East and West, respectively. The frequency of balancing test failures increased to a daily average of 8 percent for the period of March 1 through March 16. During this time, the average imbalance was 222 MW and 72 MW in PAC East and West, respectively. The increase in frequency of balancing test failure appears to be driven by two issues: 1) an error in the net schedule interchange for both PACE and PACW reported for the balancing test compared to the net schedule interchange supplied for the fifteen and five minute markets; and 2) incorrect disqualification of base schedules from certain multi-stage generating units. These issues did not appear to influence imbalance infeasibilities.

Figure 1: Frequency of balancing test failures in PAC West and East.



As specified in section 29.34(n) of the CAISO tariff and section 10.3.2.1 of the Business Practice Manual for the Energy Imbalance Market, if the EIM Entity balancing

authority area fails the sufficient ramp test, or is deemed to have failed the test because it failed the capacity (resource plan) test, CAISO will restrict additional EIM Transfer imports into that EIM Entity balancing authority area during the hour starting beyond the optimal solution for T-7.5 minutes. The CAISO will enforce the individual EIM Entity balancing authority area flexible ramp requirement in the isolated EIM Entity balancing authority area and will not include that balancing authority area to area group constraints. This sufficiency test applies to each PAC West and East area on an hourly basis. Figure 2 shows the trend of test failures for flexible ramping for the first two months of operation of the energy imbalance market. The frequency is obtained by dividing the number of hours failed by 24 hours of a day.[5] Figure 2 shows that there was a continued reduction in the frequency of failures of the sufficiency test over November and December, from an average of 20 percent to an average of 1.5 percent in the combined PAC West and East areas. In January, there was an increase in failures of the test, which trended down again in February. The downward trend continued in March in PAC East and PAC West, except for one day.

Figure 2: Frequency of flexible ramp sufficiency test failures in PAC West and East.

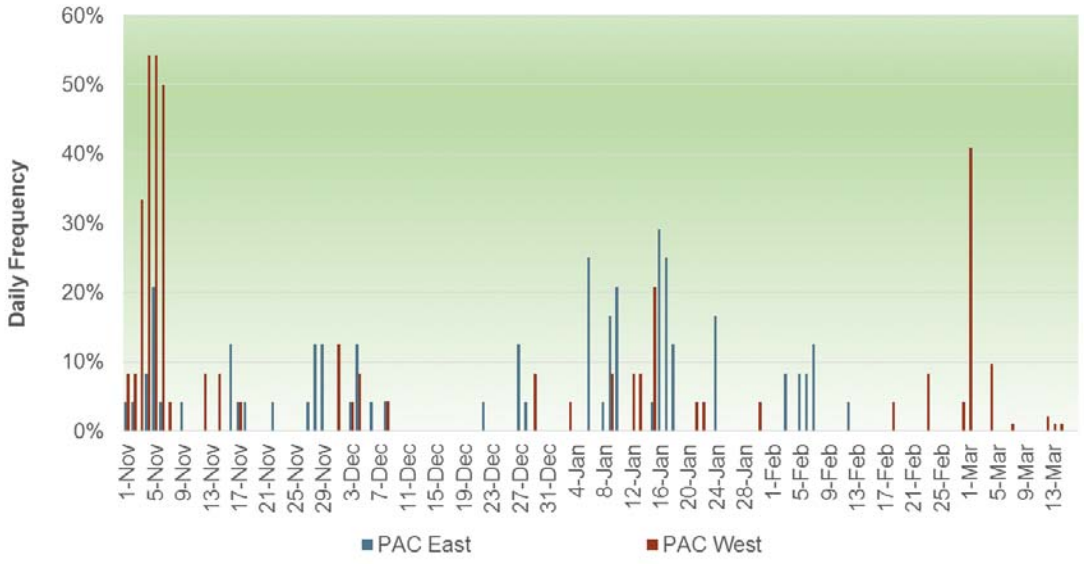
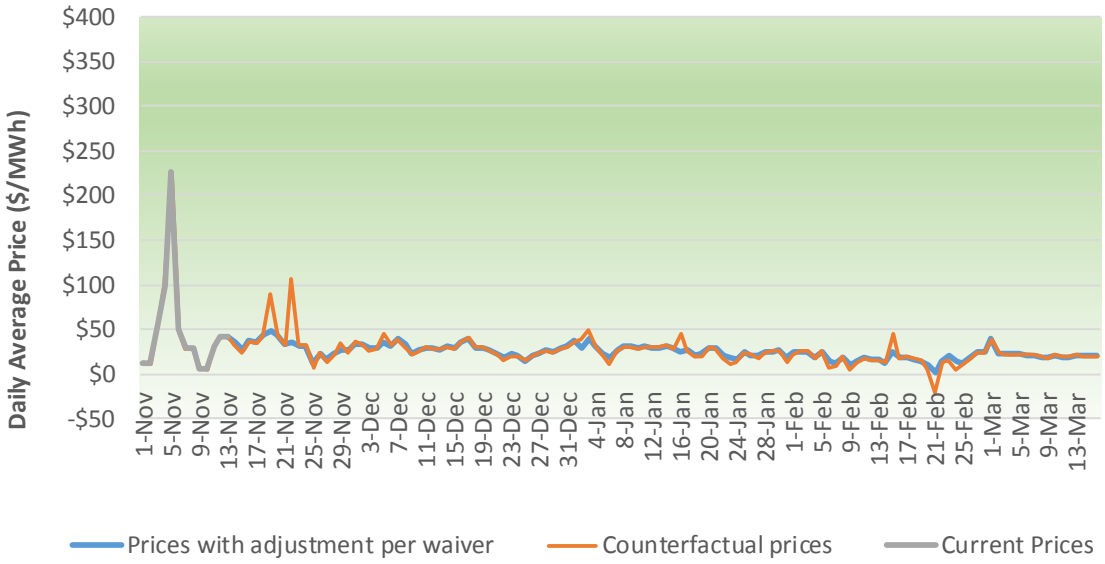


Figure 3 through Figure 6 provide daily average price trends in the Energy Imbalance Market organized by market and area. These trends include pricing for both the PAC West and PAC East external load aggregation points (ELAPs). The report focuses on the ELAP prices because these aggregate prices are representative of pricing in each area -- PAC West and PAC East-- and would reflect short-term imbalance shortage for

[5] During the term of the waiver, the procedure described in Section 10.3.2.1 of the Business Practice Manual is made ineffective under the pricing procedure under the waiver.

the aggregate area. These daily averages reflect all prices of the real-time market, including the price corrected through the price correction process and the price adjustments pursuant to the waiver associated with this report.[6] From November 14 through November 30 the CAISO implemented the price adjustments pursuant to the waiver retroactively and is making the relevant adjustments in settlement statements after the December 1 order was issued. After December 1, there are no retroactive adjustments since the logic of the price discovery feature implemented pursuant to the waiver is implemented through the market clearing solution process. These prices, like any other prices, are still subject to the price validation and correction process. Section 35.4 of the CAISO tariff already provides the CAISO authority to correct prices if it detects an invalid market solution or prices due to issues such as data input failure, occurrence of hardware or software failure, or a result that is inconsistent with the CAISO tariff.

Figure 3: Daily average of fifteen-minute market prices in PAC West.



[6] Note a separate waiver has been submitted requesting relief for period of November 1-November 13. These reports do not reflect any adjustments for this separate waiver request which has not yet ruled on as of the date of this report.

Figure 4: Daily average of fifteen-minute market prices in PAC East.

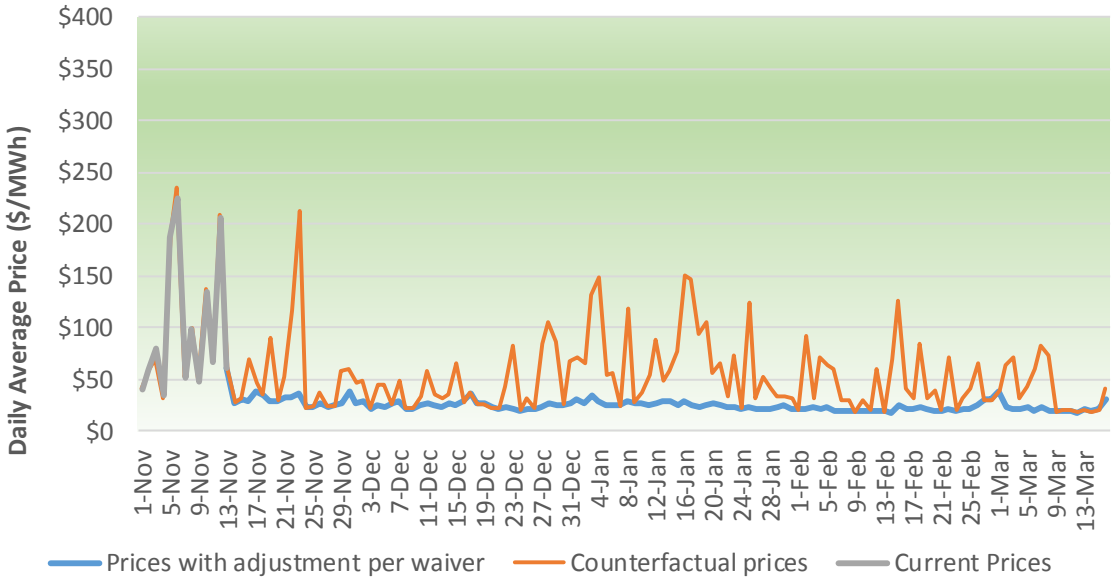


Figure 4 and Figure 5 each compare two trends for the same market and same area, PAC East and West respectively. The blue line illustrates daily average prices from November 14 on and represents the actual and final prices after any price corrections or price adjustments pursuant to the December 1 Waiver, which is the subject of this report. After November 14, even when there were power supply infeasibilities, per the December 1 Waiver, this trend reflects prices that are set based on the the marginal economic signal in the market and are not based on constraint relaxation pricing parameters. The price trends for November 1 through November 13 are represented in a different color than the the prices after Novemer 14 because those represent the final prices as of this date, after all price corrections have been made. The prices for the November 1-13 include prices based on the constraint relaxation pricing parameters.

The orange line was constructed to estimate the counterfactual case of what prices would have been if they were based on the constraint relaxation pricing parameters, pegged to the $1000/MWh bid cap. As of December 1, the CAISO adopted the waiver-based pricing in its systems, which means that the market systems produced prices consistent with the pricing mechanism under the waiver and not based on the constraint relaxation pricing parameters. Therefore, the CAISO had to find a way to reconstruct those cases, which it is referring to as the counterfactual case. In other words, the prices represented by the orange line represent the CAISO's estimate of what prices would have been absent the December 1 Waiver. These two lines compare

together prices under the December 1 Wavier to what they would have been without that waiver.

The orange line is more volatile and spiky because those prices are calculated based on the $1000/MWh any time there is an observed undersupply infeasibility. Whereas the blue line shows a more stable pricing trend reflecting dispatched economic bids. For the first 13 days of November, the lines in grey and orange track closely to each other but not exactly. The prices represented by the grey line are final as of now and include prices that even though there was infeasibility, for other reasons the prices were not based on the constraint relaxation pricing parameters. In contrast, in the counterfactual case, the CAISO estimated that any interval with infeasibility would produce a price based on the constraint relaxation pricing parameter.

In addition, the prices for the counterfactual case in Figure 4 and Figure 5 were constructed based on the following two factors. First, because the goal of this report is to quantify and explain the price changes associated with the the implementation of the Deccember 1 Waiver, these trends do not include the reconstruction of prices related to price corrections and flexible ramping constraint infeasibility for the following reasons:

i) Price corrections. If there was a price associated with a power balance infeasibility, but the interval was rendered to have an invalid price and was subject to price corrections for other reasons, the CAISO did not estimate the counterfactual price and instead the estimated and counterfactual price is equal to the final and current price. This is based on the premise that had the CAISO not experienced the issue that supported the price correction in the first place, the power balance infeasibility would not have triggered in the first instance. Therefore, the market price would have been based on the tariff-based rules that consider the submitted economic bid prices rather than the penalty prices specified in the tariff; and

ii) Flexible ramp sufficiency test. As specified in section 29.34(n) of the CAISO tariff and section 10.3.2.1 of the Business Practice Manual for the Energy Imbalance Market, if the EIM Entity balancing authority area fails the sufficient ramp test, or is deemed to have failed the test because it failed the capacity (resource plan) test, CAISO will restrict additional EIM Transfer imports into that EIM Entity balancing authority area during the hour starting at T beyond the optimal solution for T-7.5 minutes. For the duration of the restricted interval, the market clearing price in the affected EIM Entity balancing authority area will also be based the tariff-based rules that look at the last economic bid cleared in the applicable fifteen-minute or five-minute interval in the EIM Entity balancing authority area. This logic is outside the scope of the waiver of this report and consequently, with or without the waiver, the pricing mechanism will be in place. Therefore, the original price for market intervals that had power balance infeasibilities and that failed the

flexible ramp test would have remain unchanged absent the waiver as they will not be set by relaxation parameter prices pursuant to Section 10.3.2.1 of the BPM for the Energy Imbalance Market.

Second, the prices reflecting the tariff-based relaxation parameters were reconstructed for both under-supply and over-supply infeasibilitites. This means that when an instance of undersupply was reconstructed, the price was set to the bid cap plus/minus marginal loss component. Similarly, when an oversupply instance was reconstructed, the prices in the conterfactual case were set to the bid floor relaxation parameter plus/minus marginal loss prices.

During the term of these reports, in some intervals the market clearing process experienced what is referred to as "degenerate cases" during which the market may be able to clear at multiple pricing run solutions that are equally valid from an economic perspective. The CAISO has recently stakeholdered and the CAISO board of governors has approved a solution to this phenomena and intends to file a tariff amendment to implement this change.These upcoming market rule changes eliminate the multiplicity of pricing issue and produce one price that reflects the lack of congestion at the appropriate locations. During such cases, even if the market systems had observed an infeasibilty that would have led to the relaxation of a constraint and triggered the penalty pricing parameters, the pricing run could have landed at a price that was based on the marginal resource economic bid price, which could be different than the price had it been based on the $1000/MWh parameter. The CAISO observed many intervals in which this phenomena occurred, in particular in the five minute real-time dispatch. The CAISO does not correct for these cases and believes these to be optimal from the perspective of the energy market alone. But because of issues this may cause in associated markets such as the congestion revenue rights, the CAISO will be modifying it market rules prospectively to eliminate such occurances. [7]

The counterfactual case represented by the orange line cannot account for the degeneracy and simply represents what prices would have been for those intervals based on the tariff-based constraint relaxation pricing parameters because there was an infeasibility. This is has implications regarding the trends presented in the figures below. For the first 13 days, as discussed above, the CAISO has not yet modified posted prices based on the waiver-type pricing. The CAISO filed for an additional waiver to conduct this pricing adjustment and it is pending before the Commission in FERC Docket No. ER15-817. Without the waiver, the prices as posted would remain as they are. One would expect the counterfactual case represented by the orange line to be close to the

[7] Additional information regarding the stakeholder process and the resulting policy changes is available at: http://www.caiso.com/informed/Pages/StakeholderProcesses/PricingEnhancements.aspx. This will be the subject of an upcoming tariff amendment with the Commission.

posted prices represented by the blue line. This is the case for the fifteen minute markets. However, for the real-time dispatch, the lines diverge because in a number of the intervals posted prices appear to have not been determined based on the $1000/MWh parameter even if there was infeasibility. At this time, the CAISO believes that this was due to the fact that many of the affected intervals were subject to degeneracy. After November 13, however, whether or not there would have been degeneracy in the pricing run, is immaterial, because pricing under the December 1 waiver or degeneracy is based on the last economic bid price signal.

Figure 5: Daily average of five-minute market prices in PAC West.

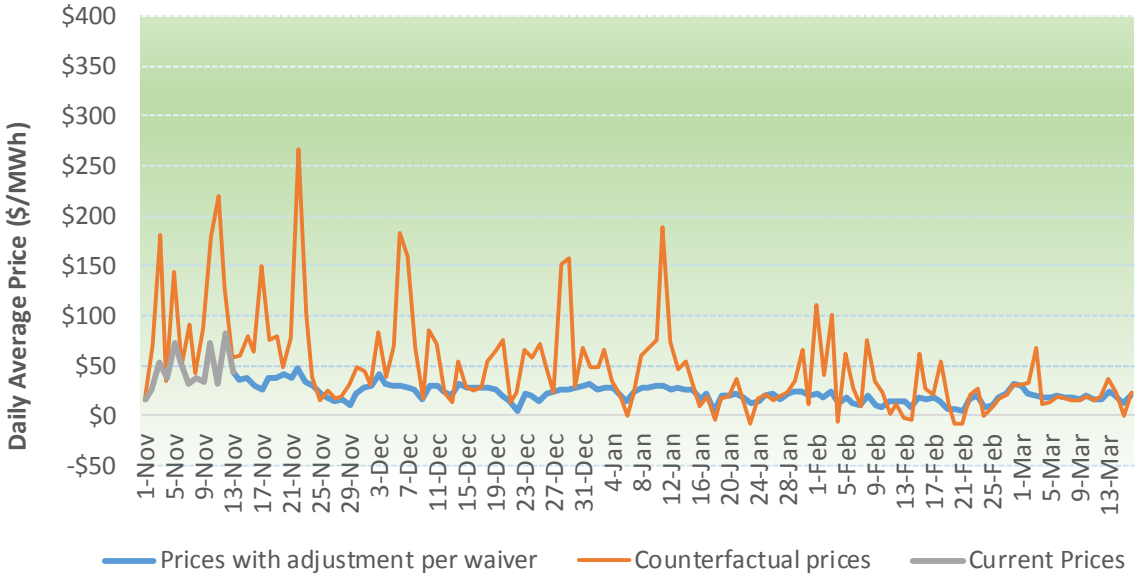
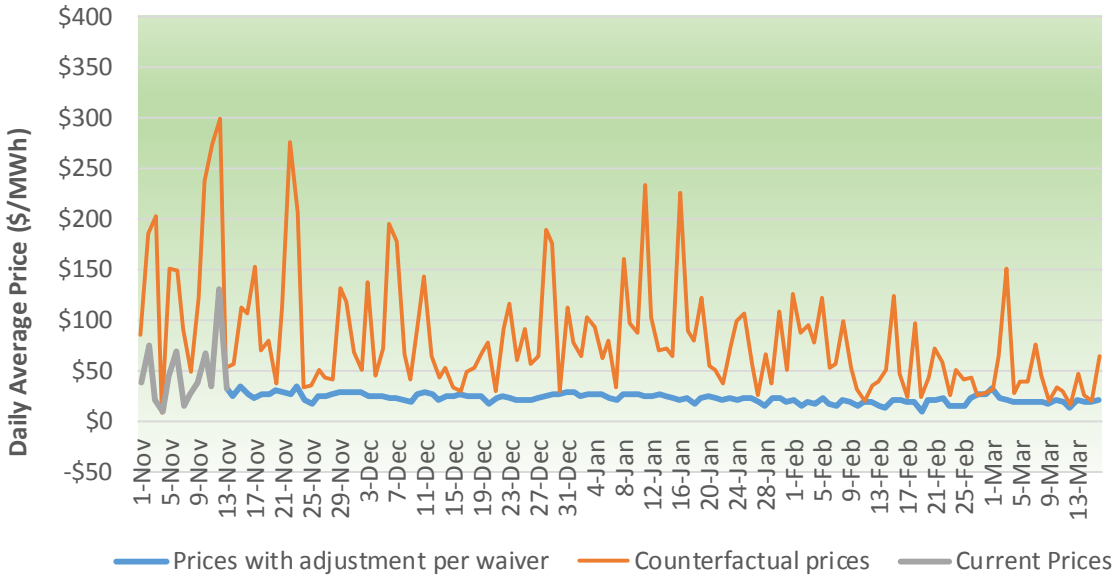


Figure 6: Daily average of five-minute market prices in PAC East.



Overall, PAC East tends to be more volatile and subject to more frequent price excursions than PAC West. This may be due to limited transfers into the PAC East area. In contrast, PAC West does not share such limitations which enable more transfers in and out of the CAISO balancing authority areas to PAC West.

In both PAC East and PAC West, the five-minute real-time dispatch is notably more volatile than the fifteen minute market. This is due to the fact that the fifteen minute market embodies more flexibility as it is further in time than the applicable intervals whereas the five minute real-time dispatch is closer to real-time. In the five minute dispatch, ramping capability is more limited. Figure 7 and Figure 8 provide bi-weekly averages of the prices as modified under the December 1 Waiver and are final as of now. These include price corrections and price adjustments pursuant to waiver of this report. These figures show that the average price for energy in both the PAC East and West have increased slight in March 2015, around $22/MWh in the fifteen minute market and around $19/MWh in the five minute market.

Figure 7: Bi-weekly average of fifteen-minute market prices in PAC West and East.

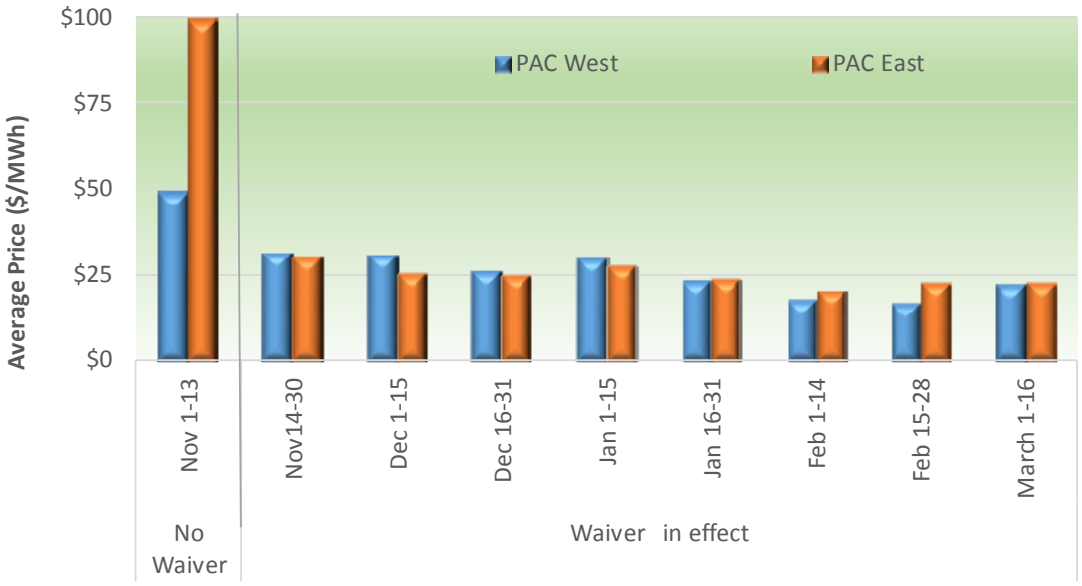


Figure 8: Bi-weekly average of five-minute market prices in PAC West and East.

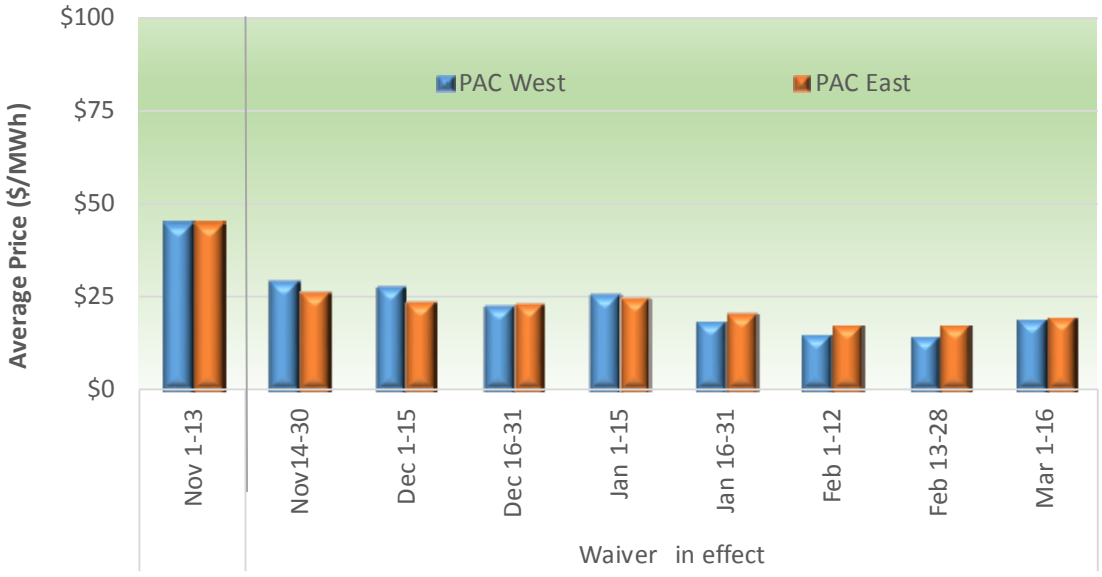


Figure 9 through Figure 12 show the frequency of price excursions for both the fifteen and five-minute market, organized by the reason for the power balance infeasibility. In any given market interval, more than one of the illustrated reason may have contributed to the price excursion because there are numerous elements that can impact the market outcome. For example, a given market interval may experience a

price excursion due to data alignment, manual dispatches and load changes. For the purpose this report, the CAISO has reviewed each affected market interval and has assigned the interval to a reason category that most afflicted the interval. The categories used in the figures in this section 1, include:

1. *Renewable deviations* for conditions in which wind or solar changes lead to the loss of capacity and for the need to increase generation from other resources.
2. *Load changes* refer to conditions where either the load forecast is adjusted or there is a change in the load bias.
3. *Import/Export changes* is for adjustments and updates to imports and exports as seen by the market.
4. *Resource outage* is for conditions in which an outage results in the loss of capacity available to the market, and for which the market needs to increase generation from other resources. Similar conditions apply for manual dispatches leading to a reduction of available capacity to the market.
5. *Manual dispatches* is for instances where the introduction of a manual dispatch may cause imbalances, such as max go to manual dispatch may limit the unit up to certain capacity, resulting in the loss of capacity for the market.
6. *Resource data alignment* is for any other condition not captured in the previous five categories. This group accounts for resource deviating from their dispatch, differences between base schedules and bids or dispatches, and changes between markets.
7. *Transfer/Congestion constraints* is for instances where the interplay of EIM transfer constraints or congestion in either PAC or CA balancing authority area may restrict the incremental generation of resources leading to infeasibilities.

Figure 9: Reasons for intervals with ELAP prices exceeding $500 in the fifteen-minute market in November. PAC West and PAC East combined.

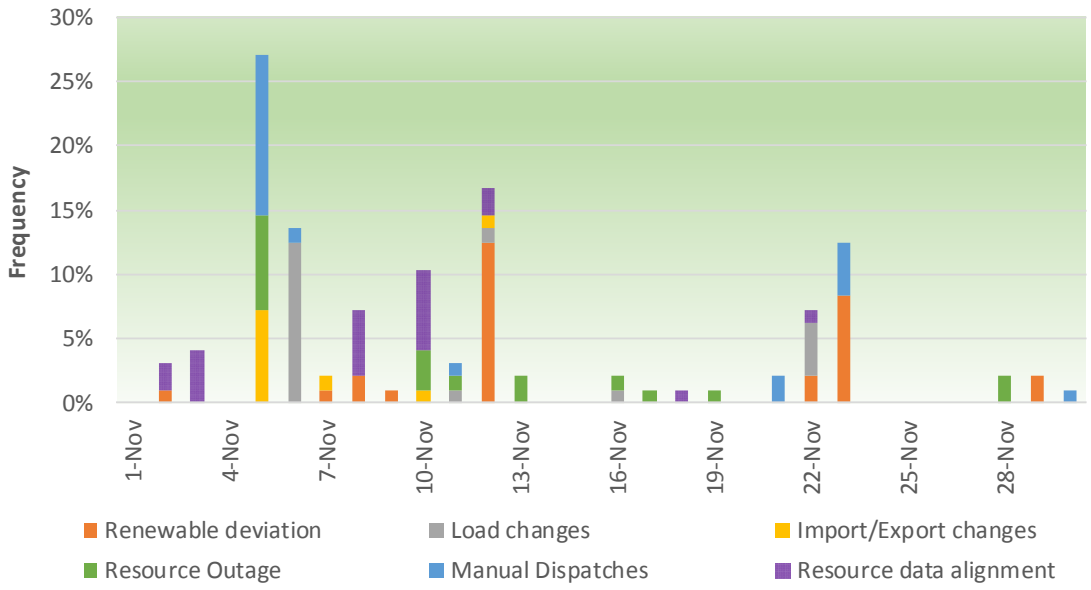
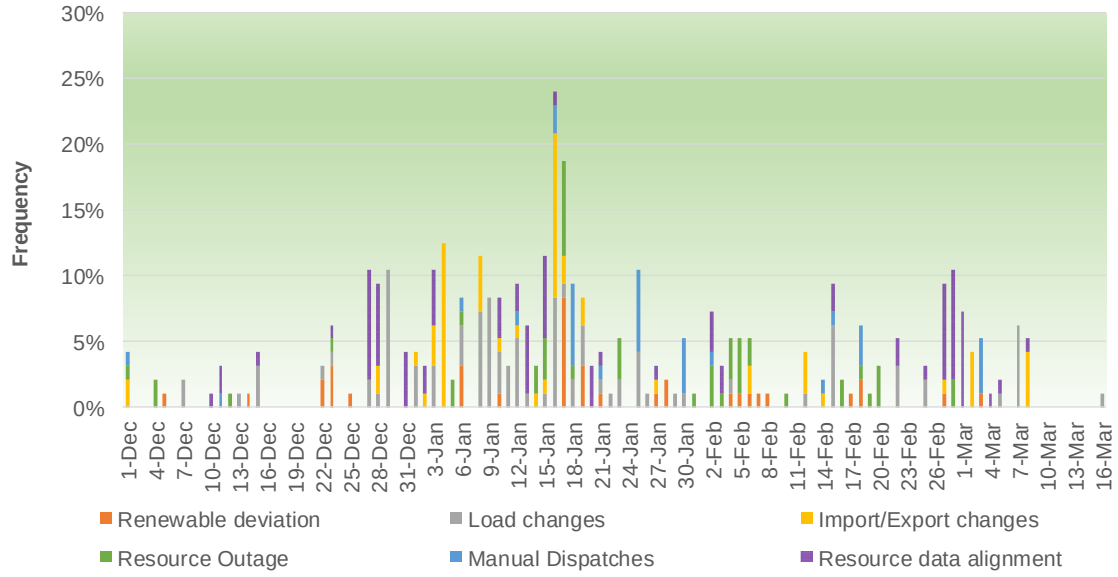


Figure 10: Reasons for intervals with undersupply infeasibility in the fifteen-minute market in December to March 16. PAC West and PAC East combined.



For the month of November, as previously reported in the December 15 report, the metrics represent all intervals where there were price excursions above $500/MWh

in either PAC West or PAC East, or both, whether or not there were power balance constraint infeasibilities. The sample was chosen as such, because the CAISO presumed that prices exceeding $500 were suspect and possibly in need of price corrections due to some form of an error, or they were due to the relaxation of a constraint and were based on the $1000/MWh pricing parameter. For the month of December and onwards, because the CAISO started employing the December 1 Waiver, prices simply were rarely above $500. Following that same approach would have yielded a very small set of intervals. Therefore, for the December time period it is more appropriate to report the frequency of issues that led to the request for a waiver based on the intervals in which there were power balance infeasibilities (undersupply conditions) as observed through the relaxation of a constraint (power balance or transmission). While these differences present a difference in the type of intervals from which the frequency data was drawn, the data for the two months is still instructive in terms of which of the types of issues that led to the need for the waiver were observed most frequently in each month. The CAISO further reports on the frequency and magnitude of power balance infeasibilities in greater detail in both months in Attachment E of this report in Figure 16 through Figure 23. Those later figures better represent the trends for magnitude of the infeasibilities observed in the markets overall.

Figure 11: Reasons for intervals with ELAP prices exceeding $500 in the five-minute market in November. PAC West and PAC East combined.

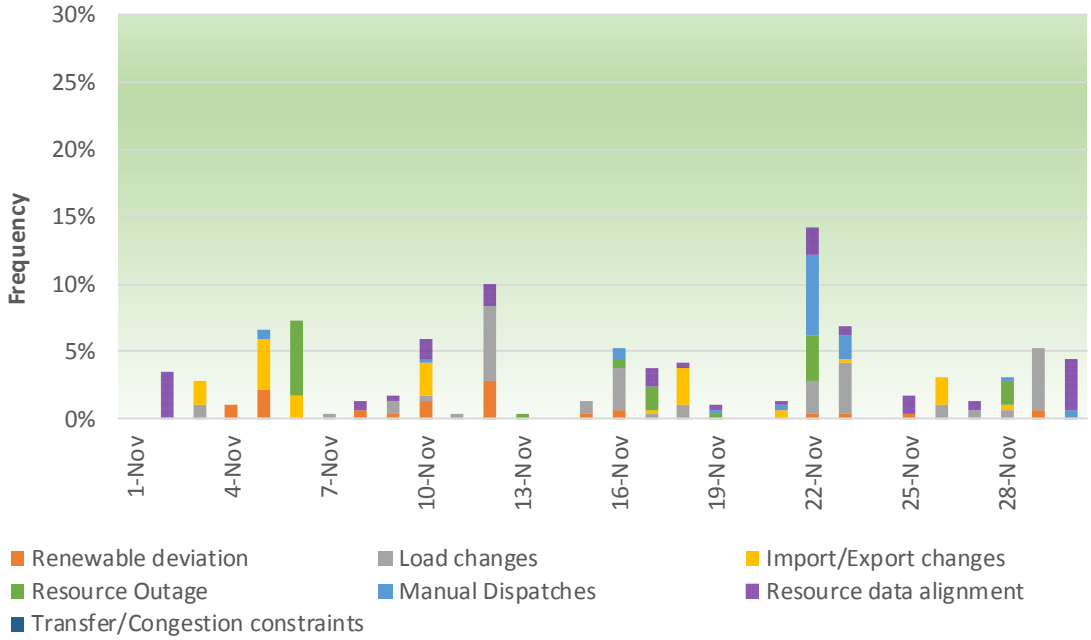
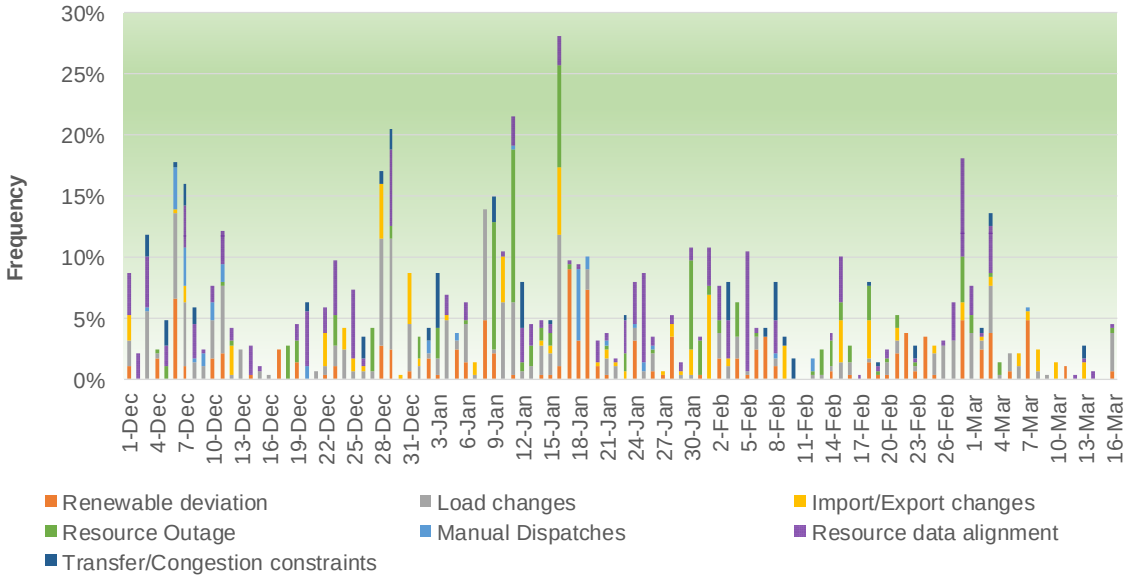


Figure 12: Reasons for intervals with undersupply infeasibility in the five-minute market in December 1 to March 16. PAC West and PAC East combined.



The categories used in Figure 9 through Figure 12 are related but not exactly the same as the broader descriptions provided in the tables in section 2 below. In some cases, the descriptions provided in the tables below will create conditions leading to the manifestation of power balance infeasibilities. For example, category 1 below includes the issue of timely manner of entering and cancelling outages. This issue also falls in the category of resource data alignment. The descriptions in the tables below link each issue to the relevant category of reasons above to more specifically define the categories of reasons that prompted the need for the December 1 Order tariff waiver.

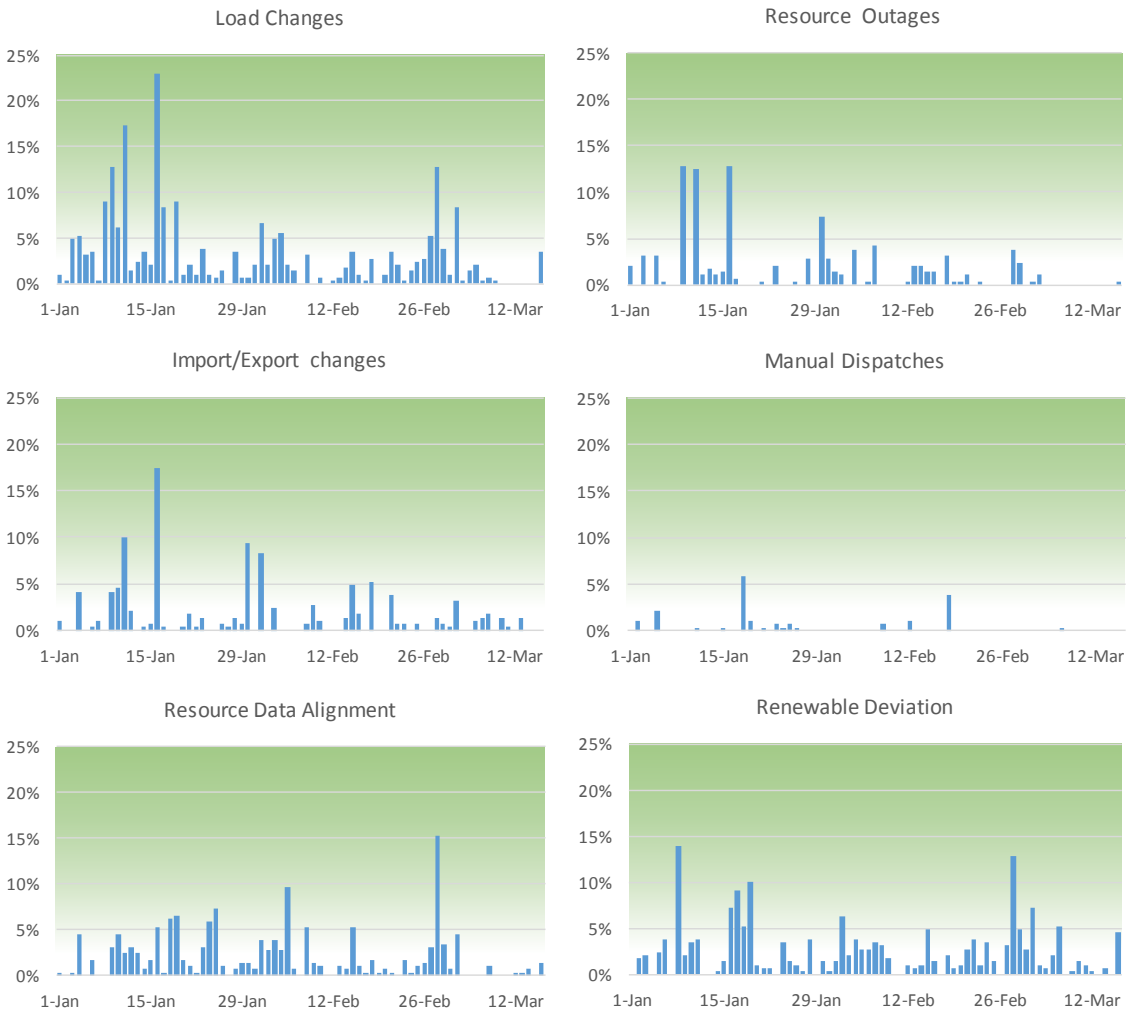
Also, as indicated above, this classification of reasons for power balance infeasibilities is a relative classification. The reasons described in this section are not mutually exclusive, and the ISO has identified that at times multiple factors lead to power infeasibilities; therefore, assigning only one reason to an infeasibility is relative and does not capture the nature of various factors interplaying. In some cases a single reason may be sufficient to drive an infeasibility but in others it is the combination of more than one condition that lead to the infeasibilities. To illustrate this concept, consider the following figure where the relative frequency of reasons leading to power infeasibility is provided for the period of January 1 to March 16, 2015. If there was a certain number of infeasibilities in a given day (in percent of the total number of intervals in FMM per day), this figure shows how frequently each reason was present in a day with power balance infeasibilities. The frequencies are not cumulative and are not

mutually exclusive; they rather show the frequency of each reason with respect to the total intervals in a day for intervals where a power balance infeasibility occurred.

Figure 13: Frequency of reasons leading to power balance infeasibilities in the fifteen-minute market. Both PAC West and PAC East combined.

Similarly, the reasons for power balance infeasibilities in the five-minute market are organized by groups in the following figure.

Figure 14: Frequency of reasons leading to power balance infeasibilities in the five-minute market. Both PAC West and PAC East combined



2. Issues prompting waiver, remedial actions taken, status and outstanding items

Category 1: Outages, derates/rerates management

Issue	Description	Remedial Action and Status	Frequency and Market Impact
1. Timely entering and cancelling of outages in the market	When resources experience full or partial forced outages, the market must be informed in a timely manner of the outage event and the corresponding measures taken to compensate for the lost megawatt capacity. Delay in informing the market application causes the market application to detect capacity shortages not covered by the unloaded capacity from participating resources. Under such conditions, prompt EIM Entity manual dispatch instructions are needed to increase the generation of available non-participating resources to create room for participating resources to be marginal and to economically set price. When the EIM Entity cancels an outage in a timely manner, it is also important to inform the market that the capacity is available and can be used to clear the Energy Imbalance Market, otherwise the market will perceive that there is capacity shortage to meet the load.	CAISO and PacifiCorp participated in several discussion sessions to clarify the process of entering or cancelling outages including maximum capacity derates, and minimum capacity re-rates. More emphasis was given to multi-stage generating resources due to the complexity of their multiple configurations and additional needed coordination between them. CAISO formalized a production system support plan for Outage Management System to respond quickly to questions or situations encountered by PacifiCorp operator when entering outage tickets. We observe downward trend of price excursions caused by incorrect outages or timing of outages due to resolving many issues related to processes, training, and software glitches. PacifiCorp's practices of managing	This issue may result in instances counted in Figure 910 and Figure 12 as Resource data alignment and Resource outages.

Issue	Description	Remedial Action and Status	Frequency and Market Impact
		their reserves in the EIM described in Attachment B allows the market to see the deployment of reserves more quickly and recognizes that load is actually covered by generation.	
2. Base schedule and Bid submission for resources undergoing outages	The timing in which the EIM Entity reports the outage is very important. If the outage occurred before T-75 (*i.e.*, seventy five minutes before the operating hour) and is expected to last during the operating hour T, then both the economic bid and base schedule submission should be adjusted to account for the outage. Otherwise, the assumptions and data used by the market application for the balance test and look-ahead fifteen-minute market are not consistent with real system conditions, which results in less capacity available to the Energy Imbalance Market than what was computed before the start of the operating hour, and high prices are imminent due to limited unloaded economic capacity that is offered in the market.	PacifiCorp has utilized the CAISO new displays to quickly identify discrepancies between base schedules and derated maximum capacity of resources. PacifiCorp has acted on these discrepancies and adjusted the base schedules accordingly. A decrease in discrepancy occurrences has been noted. Additional information related to re-rated minimum capacity has been added to existing displays to help PacifiCorp identify and fix discrepancies between base schedules and re-rated minimum capacity that caused many noted over-generation conditions in PACW. The CAISO enhanced situational awareness screens to report on un-qualified MWh when base schedules were submitted for the	This issue may result in instances counted in Figure 9 and Figure 12 as Resource data alignment and Resource outages.

Issue	Description	Remedial Action and Status	Frequency and Market Impact
		outaged resource to inform the EIM entity of inconsistencies between base schedules and outages earlier. The CAISO continues to monitor and analyze for timely responses to inform the market about any out-of-market manual actions that are taken or are planned to be taken by the EIM Entity.	
3. Outages of partial or full multi-stage generating resource configurations	Multi-stage generating resources have multiple configurations that must be carefully managed in the real-time market. The configuration characteristics are registered in the master file and are observed and honored by the market application. These include physical registered characteristics such as transition time, minimum up time, and minimum down time and minimum capacity (Pmin) and maximum capacity output (Pmax) megawatts (MWs) as well as any overlapping MW regions between configurations. If a configuration is out of service, a timely input of the outage is needed to inform the market that the corresponding economic bid or base schedule is not available and another configuration should be used. If the	The CAISO provided additional clarification and review of base schedules and coordination with resource parameters. Due to the complexity of multi-stage generating resource data modeling there, this constitutes the majority of outage/derates/re-rates issues causing price excursions. PacifiCorp's practices of managing their reserves in the EIM described in Attachment B allows the market to see the deployment of reserves more quickly and recognizes that load is actually covered by generation. The CAISO continues to monitor, analyze, and provide feedback to	This issue may result in instances counted in Figure 910 and Figure 12 as Resource data alignment and Resource outages

Issue	Description	Remedial Action and Status	Frequency and Market Impact
	information is not promptly entered or bids don't exist on other configurations then the market has no way to move the resource to other configurations and the whole MW of the plant is not accounted for in the market and price excursions will occur.	PacifiCorp for continuous improvements.	
4. Availability of Upward/Downward Capacity	Upward and downward capacity is needed to cover system uncertainty besides serving EIM transfers. Typical system uncertainties include: a. Load deviation during an hour b. Load forecast error c. Wind deviation d. Resource outage e. Net Schedule Interchange deviation	PacifiCorp has reviewed all their MSG parameters and modified transition times.	
5. T-75' balance test	T-75' balance test is the first balance test of the three balances tests ran. The accuracy of the base schedules submitted for the test impacts prices as well. For example, if the EIM entity under schedules at T-75', HASP would have EIM transfer import from the CAISO. This EIM transfer import could counter flow on Malin 500 such that the ISO could import more than the Malin 500 limit. Later, even if the EIM entity balances the schedules, it is still necessary to import from the CAISO causing over generation.	PacifiCorp is working on a process to improve T-75' balance test.	

Category 2: Manual Dispatch

Issue	Description	Remedial Action and Status	Frequency and Market Impact
1. Timely input of manual dispatch	Since many units are not participating in the market, manual dispatch and other out-of-market actions taken on these units must be recorded by the EIM Entity in the market to inform the market about the availability of these resources and their movements to respond to events like contingency or outages of other units. Without this timely information, the market can only assume that the participating resources will respond to these various events, which will result in depleting the flexible unloaded capacity of the participating resources and their capability to set economic prices causing price excursions.	The manual dispatch is entered directly in the market tool by the EIM Entity. PacifiCorp's practices of managing their reserves in the EIM described in Attachment B allows the market to see the deployment of reserves more quickly and recognizes that load is actually covered by generation.	This issue may result in instances counted in Figure 910 and Figure 12 as Resource data alignment and Manual Dispatches
2. Flexible ramping sufficiency test	The CAISO performs the flexible ramping sufficiency test on the base schedules, the last test being at 40 minutes before the start of each operating hour. When the EIM Entity fails the test based on the economic bid-in capacity that is being offered to the market, the market application will constrain PacifiCorp from increasing its import from CAISO to prevent the leaning concern. This means	The CAISO has discussed this issue with the PacifiCorp and has clarified the market impact. The CAISO is also collecting and analyzing both wind and load variability in PacifiCorp's two balancing areas. Several wind forecasting issues were addressed last month, but wind forecast deviations from base schedules continues to be among the main reasons for price excursions and infeasibilities. The CAISO is	This issue may reduce the flexibility of the market to absorb system condition changes and data updates and, consequently, leave the market more susceptible to price excursions by any of the reasons provided in Figure 910 and Figure 12

Issue	Description	Remedial Action and Status	Frequency and Market Impact
	that PacifiCorp enters the operating hour depending on its resources and any additional manual changes to available non-participating resources set points or purchases of interchanges within the hour. Any delay in performing the manual dispatches or the additional interchange purchases leaves the market exposed to price excursions due to insufficient bid-in flexible capacity.	in the process of assessing the flexible ramp requirement for PacifiCorp's two balancing areas based on the collected data for the actual real-time imbalance conditions. The CAISO is also revisiting and reviewing the flexible ramp constraint and associated credit accounting in the flexibility sufficiency test and towards satisfying the flexible ramp requirements in the market optimization.	

Category 3: Wind forecast accuracy

Issue	Description	Remedial Action and Status	Frequency and Market Impact
1. Accuracy of PacifiCorp wind resources forecast	The variable energy resource (VER) forecast, which is mainly wind forecast for the PacifiCorp balancing authority areas, is crucial because it sets the maximum economic megawatt range that the market is allowed to dispatch these resources. The accuracy of the short term VER forecast benefits immensely from the accurate telemetry of the output of the VER resources. The forecast of the wind resources was deviating significantly from the output of the resources even for the next 5-min forecast over a period of many days. This resulted in significant	PacifiCorp continues to utilize the new unit deviation display that CAISO added to the EIM Entity user interface. This display provides the grid operator information related to differences between any combination of telemetry, state estimation, base schedule, and cleared target operating points for all resources. This display is used by PacifiCorp to quickly identify which wind resource is deviating and the amount of deviation per resource and on aggregate basis	This issue may result in instances counted in Figure 9 and Figure 12 as Renewable deviation

Issue	Description	Remedial Action and Status	Frequency and Market Impact
	deviations in calculated energy imbalance and sometimes resulted in over-generation, or under-generation conditions compared to the hourly base schedule values of these wind resources for the corresponding operating hour. Lastly, in cases where wind resources are participating and being dispatched, the short-term forecast, which is a persistent forecast, may not be accounting for the dispatch instruction.	per balancing area. PacifiCorp has identified some areas of improvement related to its wind forecast quality and has worked diligently with its wind forecast service provider to fix those issues. However, there have been several reported volatile cases when the wind drops more than 150MW from its base schedules causing potential price excursions had the waiver is not currently in place.	

Category 4: Interchange schedule variation

Issue	Description	Remedial Action and Status	Frequency and Market Impact
1. Interchange information within the hour	Interchange information is essential part of meeting energy imbalance for each balancing authority area. Considering the forward look-ahead time horizon of the fifteen-minute market for almost two hours, and one hour for the five-minute real-time dispatch market, timely information about the interchange schedules is essential. The delay to inform the market application about these interchanges during resources outage times or steep load ramping conditions tightens the market conditions, leading to fake price excursions that sometimes	CAISO has re-emphasized the importance of informing the market application about any planned purchase or sale of interchanges before the balancing test or within the hour to respond to changing imbalance conditions. The CAISO also re-emphasized the need to submit planned interchange base schedules for multiple hours in the horizon to provide the short term unit commitment, which has a four and half hours look-ahead horizon,	This issue may result in instances counted in Figure 9 and Figure 12 as Import/Export changes

Issue	Description	Remedial Action and Status	Frequency and Market Impact
	show in the financially binding fifteen-min market interval which is calculated 37.5 minutes ahead of time before the T-20 minutes cut off time for the tags to be submitted and approved for any extra or within the hour interchanges.	with good projection of the forward hours to enable optimal market decisions related to multi-stage generating resources transitions from one configuration to another, and startup of fast start resources. In the first part of March, system issues affecting interchange schedules and balancing occurred. PacifiCorp is aware of these cases and is reviewing to avoid repeat of such issues.	

Category 5: Load forecast variation

Issue	Description	Remedial Action and Status	Frequency and Market Impact
1. Load forecast biasing	EIM Entity grid operators have the capability to bias the load forecast for reliability purposes to account for any non-modeled issues causing discrepancy between forecast load and actual load. The setting of the bias is somewhat subjective based on the grid operator's judgment of system operational and reliability needs. This biasing if not done in a coordinated fashion with market operations can create price excursions especially when there is limited flexible ramp capacity available to accommodate small marginal overshoot or undershoot of the bias values. Due to the limited pool of participating resources, the PacifiCorp grid operator will necessarily need to pay extra attention to the bias values to prevent unintended overshoot or undershoot.	The logic for the load bias to maintain reliability was extensively discussed, documented, and used during PacifiCorp grid operator training including the impact on prices as a situational awareness signal to indicate an issue in meeting load or balancing the system. There were several instances reported in January when excessive amount of load bias was used to dispatch more capacity when the system is out of CAISO will be implementing software functionality to limit erroneous excessive load bias, similar to the logic currently used for the CAISO operator bias of load. This feature corrects operator bias of load forecast that exceed available ramp.	This issue may result in instances counted in Figure 910 and Figure 12 as Load changes

Category 6: Resources not following dispatch

Issue	Description	Remedial Action and Status	Frequency and Market Impact
1. Resources not following dispatch signal	On occasions resources were not closely following the market dispatch signal. This was either because the plant was unavailable or an outage ticket was not entered on-time for the market to consider the outage, or because of some lag time when the plant was not set on automatic generator control to be dispatched directly from market signal. In any of these cases, the deviation from the market dispatch and the lack of the manual instructions to inform the market application when the resource cannot operate to the target operating point, resulted in market conditions that are not reflective of actual system conditions, causing price excursions. In some cases when the plant is dragging its response to the market signal, it was necessary for the EIM Entity to make direct phone calls to the plant to start moving up or down to the plant's designated market dispatch signal.	PacifiCorp continues to utilize the new unit deviation display that CAISO added to the EIM Entity user interface. This display is used by PacifiCorp to quickly identify which resource is deviating and the amount of deviation per resource and on aggregate basis per balancing area. When a resource was observed to be dragging its dispatch, a direct call to the plant was enough to expedite the response if the plant was available or resulted in submission of outage ticket or manual dispatch instruction if the plant had any temporary physical limitations. Unit deviations in January have maintained their levels in December but they are still present and among the reasons for price excursions, especially when they are combined with a manual dispatch that fixes the resource megawatts in the market but the resource is not following the dispatch.	This issue may result in instances counted Figure 9 and Figure 12 as Resource data alignment

Category 7: Network Model discrepancy

Issue	Description	Remedial Action and Status	Frequency and Market Impact
1. Industrial load base schedules	PacifiCorp has industrial load as part of the conforming load and market load forecast. This created a discrepancy whenever these industrial loads are operating or called upon to curtail. The market is not aware of these non-participating resources that exist in the PacifiCorp energy management system, but not in the market, creating the need to manually bias load to maintain consistency between market model and PacifiCorp's energy management system (EMS) model.	CAISO and PacifiCorp went through a series of meetings and identified these resources. An action plan was developed to add these non-participating resources to the network model used in the market application. PacifiCorp is diligently working on providing telemetry, and register these resource with CAISO so they can be treated as separate resources with the capability to submit base schedules reflecting their actual real-time operation. The issue has impacted the quality of load forecast and called for manual load biasing after resulting in some MW infeasibilities and potential price excursions had the waiver is not currently in effect.	This issue may result in instances counted in Figure 910 and Figure 12 as load changes and resource data alignment
2. Distributed energy resources modeling	Distributed energy resources are currently included in the market load forecast as conforming load. These resources have both load and generation components, which nets to positive or negative net injection at the load bus. When generating the market does not visibility of them and effectively considers more	CAISO and PacifiCorp went through series of meetings and identified the gross impact of these resources. Action plan was developed to add them to the market network model. The non-generation resource market model is used to model one of these	This issue may result in instances counted Figure 9 and Figure 12 as load changes and resource data alignment

Issue	Description	Remedial Action and Status	Frequency and Market Impact
	load than what the PacifiCorp's EMS is observing and price excursions occur because of the lack of base schedules for these resources.	resources, and others are coming with this coming month. Load biasing is being used in the meantime to compensate for the MW changes of these resources.	
3. Telemetry quality issues (net versus gross accounting)	The EIM Entity is sending telemetry values for all PacifiCorp registered resources in the master file. When the quality of the telemetry values is not good, the state estimator solution quality is negatively impacted, which in turn affects the quality of the market solution and the dispatch operating targets of these resources. During the first few weeks of operation the CAISO found that some resources have telemetry measurement that is net of its auxiliary loads and others have gross telemetry measurements that do not include the auxiliary load. In addition, certain wind resources and other small non-participating resources did not have telemetry. When these discrepancies are combined together they tend to impact the market solution and cause price excursions.	The CAISO and PacifiCorp identified all these resources and telemetry issues and permanent fixes were put in place.	This issue may result in instances counted in Figure 910 and Figure 12 resource data alignment

Category 8: Market model discrepancy

Issue	Description	Remedial Action and Status	Frequency and Market Impact
1. Energy during startup and shutdown	For multi-stage generating resources, the energy of these resources during the startup and shutdown periods when their output is below the PMin is accounted for in energy management system and automatic generation control (AGC). But the market does not account for this energy because it is below the PMin of the resource. This created discrepancy in the base schedule balance test, and the imbalance calculations between market and actual conditions as seen by AGC, which led to performing some load bias during the startup and shutdown of these resources subjecting the market to price excursions.	The CAISO is modeling the transition ramping for multi-stage generating resources and has scoped the requirements to add startup and shutdown profile to the 15-minute market since these features are already in the 5-min market. PacifiCorp is in the process of collecting data to define the startup and shutdown profiles for many of the resources with high PMin values.	This issue may result in instances counted in Figure 910 and Figure 12 as part of the resource data alignment
2. Inconsistent base schedule and bid submission	It is important that the base schedules, self-schedule, and economic price curve submission are consistent. If a resource is scheduled to be OFF at a particular hour, then it is expected that the submitted base schedule to be zero, it is not expected, however, for this resource to have a self-schedule at higher configuration for the same hour. Another bid submission inconsistency occurs when the resource's higher configuration bid ends or not submitted for a particular	This issue continues to exist. There were several reported cases where base schedule value is above the maximum economic bid range causing MW infeasibility. The CAISO has identified, and analyzed these instances and discussed them in detail with PacifiCorp. PacifiCorp has identified changes to its internal processes and interfaces to mitigate those inconsistencies in the automated	This issue may result in instances counted in Figure 10 and 12 as part of the resource data alignment

Issue	Description	Remedial Action and Status	Frequency and Market Impact
	hour forcing the resource to transition to lower configuration with lower PMax value than its submitted base schedule for that hour, which was used in the balance test calculation. These inconsistencies results in market supply shortages that cause price excursions.	bid submission.	

Category 9: EIM Transfer Limits

Issue	Description	Remedial Action and Status	Frequency and Market Impact
1. Static and dynamic transfer limit restrictions on California-Oregon Intertie (COI)	The Energy Imbalance Market is designed to have the EIM transfer capacity fully re-optimized in both the fifteen-minute and five-minute market. With respect to the COI, the added restriction of the dynamic five-minute limit which is an incremental limit around the fifteen-minute solution creates at times price excursions. The five-minute dynamic limit constrains the market application from re-optimizing the fifteen-minute EIM transfers decisions between PacifiCorp and CAISO beyond the amount allowed by the five-minute incremental dynamic limit, which can be restrictive especially during the on-peak hours.	PacifiCorp is engaged in ongoing discussions with the Bonneville Power Administration (BPA) to understand the nature and allocation of the dynamic transfer capability on COI. BPA is in the process of conducting a detailed dynamic transfer capability study, which is ongoing work. Any additional five-minute capability will help the five-minute market re-optimize the fifteen-minute decisions that are based on system conditions and information available at approximately 30 minutes prior to the five-minute market. The five-minute dynamic COI limits were recently increased for the off-peak hours but still very	This restriction on the 5-min dynamic limit on COI issue is counted in Figure 910 and Figure 12 as part of transfer/congestion constraints

Issue	Description	Remedial Action and Status	Frequency and Market Impact
		limited in the on-peak hours.	
2. Five-minute rate-of-change constraints	The rate-of-change constraints are five-minute flow limit constraints that limit the amount of five-minute movement of PAC West balancing authority area participating resources around the corresponding resources' fifteen-minute schedules due to their flow impact on certain paths and flowgates internal to BPA's balancing authority area. This restriction on the resources' five-minute movements or the corresponding rate-of-change constraint has created at times price excursions on the impacted resources when the corresponding path or flowgate five-minute limit constraint is binding.	PacifiCorp is engaged in discussions with BPA to understand the nature and basis behind the five-minute flowgate limits and possible change in the calculation of those limits. BPA is reviewing the five-minute limits which are based on historical movement of PacifiCorp West resources before EIM. BPA has also asked for more data points to perform a review of the current rate-of-change limits based on actual EIM market data. Any additional five-minute capability will help the five-minute market re-optimize the fifteen-minute market decisions that are based on system conditions and information available approximately 30 minutes prior to the five-minute market. The CAISO had provided BPA the requested data points and answered any relevant questions. CAISO is also engaged with both BPA and PacifiCorp to revise the implementation model for the rate of change constraint to reflect ramping 15-min schedule values.	

ATTACHMENT B

Quantitative and qualitative descriptions of market performance related to the issues that prompted the CAISO's waiver request – PacifiCorp

REPORT PROVIDED BY PACIFICORP

Issue	Description	Remedial Actions Taken During Waiver Period and Ongoing Activity
1. Increase Pool of EIM Participating Resources	PacifiCorp coordinated with the CAISO to increase the pool of owned and third-party resources available to participate in the EIM.	PacifiCorp has completed testing of the Swift 1&2 aggregation project and is planning on making these changes effective in the Master File by March 27, 2015. This will result in the Swift 1&2 units becoming a single aggregated PacifiCorp EIM Participating Resource and will add approximately 68 MWs of upper bid range capability. In addition, PacifiCorp continues to work with other transmission customers who may be interested in participating in the EIM with resources, including the recent filing of a construction agreement at FERC to enable resource metering upgrades, which would facilitate further steps towards participation of the resource in the EIM (FERC Docket No. ER15-711). At this time, PacifiCorp has not certified any third-party transmission customers for participation in the EIM, but is nevertheless hopeful that these efforts will result in additional EIM participation. PacifiCorp continues efforts to model certain of its industrial customer interruptible loads as participating resources. This is necessary because some of PacifiCorp's industrial customer loads have on-site generation and, as a result, this presents additional complexity for accurate forecasting and balancing. These changes are expected April 8, 2015, because they need to be aligned with changes to the ISO network model. Adding these elements as participating resources will provide improved operational visibility and will

Issue	Description	Remedial Actions Taken During Waiver Period and Ongoing Activity
		also add approximately 200 MW of flex capacity in its PACE Balancing Authority Area ("BAA"). PacifiCorp is also improving modeling of its jointly owned generating resources. Such improvements will further minimize imbalance issues and improve forecast accuracy. PacifiCorp has also made improvements to the bid configurations of PacifiCorp EIM Participating Resources in order to fully maximize the bid range available to the market. This includes recognizing start-up hours for CCGT plants, working to bid in all possible plant operating configurations and accounting for reserves to fully reflect the operational capability to respond to real-time market conditions. These modifications became effective in the Master File March 24, 2015. PacifiCorp has experienced challenges conveying information to the EIM models relating to PacifiCorp's contingency reserve management in its BAAs. As with other operational improvements identified and realized since EIM go live, PacifiCorp has been working in coordination with the ISO to improve the accuracy of how the EIM understands PacifiCorp's balancing authority operations by using the information communication tools available in the EIM, including outage cards, to ensure that the EIM is accurately understanding the real time system conditions and unit capacity available in PacifiCorp's BAAs. Leading to and through initial go-live, PacifiCorp designed the bid range of units to separate capacity associated with units holding contingency reserves from the bid range. This was based upon an assumption that contingency reserve obligation should be separately accounted for and that capacity associated with contingency reserves could not be made available. This had the unintentional consequence of overly restricting the capacity of these units when the market models assess potential infeasible market solutions

Issue	Description	Remedial Actions Taken During Waiver Period and Ongoing Activity
		and PacifiCorp's ability to make operational adjustments to units required by real time system conditions. The result of this approach was that the bid range and operational capacity of these units were essentially fixed for 75 minutes prior to the operating hour when EIM bids are due and during the operating hour (or approximately 135 minutes), even when system conditions changed. Without such restrictions (similar to PacifiCorp's pre-EIM operations), PacifiCorp would have been able to respond to real time system conditions, such as a precipitous drop on variable energy resource output, by making operational adjustments to its units, including deploying contingency reserves as needed and adjusting which units are carrying sufficient reserves to meet PacifiCorp's contingency reserve obligation. As explained above, an unintended consequence of PacifiCorp's initial bid range configuration design was reduced ability to make such changes without triggering additional market infeasibilities. To overcome this issue, in coordination with the ISO, PacifiCorp has implemented a solution which better approximates its actual contingency reserve management through the use of outage cards. The solution allows PacifiCorp to bid full unit capacity into the market and control the dispatch of contingency reserves with outage cards (as well as through PacifiCorp's EMS system). PacifiCorp continues to meet its contingency reserve obligation by holding sufficient contingency reserves on its units, but is able to convey adjustments that it makes to which units are carrying the reserves in real time also through outage cards. For example, when reserves are deployed or shifted to other units, the associated outage card can be adjusted for the amount of reserves being deployed or transferred to other units. This allows for a more transparent, efficient and timely market awareness of contingency reserve management and the ability to increase the amount of capacity available to the EIM, without affecting PacifiCorp's contingency

Issue	Description	Remedial Actions Taken During Waiver Period and Ongoing Activity
		reserve obligations. Use of outage cards ensures that PacifiCorp is able to represent actual operating conditions and offer the maximum possible capacity from its units to address market infeasibilities, but can also better approximate how PacifiCorp holds contingency reserves on its units during real time to meet its contingency reserve obligation and how PacifiCorp deploys reserves when necessary. This solution was deployed and working effective as of March 9, 2015, in the PACW BAA and implementation is still in progress in the PACE BAA, expected to be completed April 3, 2015.
2. Increase System Visibility and Situational Awareness	PacifiCorp developed and implemented additional tools and displays to provide its Grid Operations personnel with increased visibility and situational awareness regarding available regulation on a 5- and 15-minute basis.	PacifiCorp created and/or improved certain Grid Operations displays to monitor generator availability, capacity, and ramp capacity. PacifiCorp has finalized enhancements to its generator database (Pi) displays to provide Grid Operations with situational awareness when there is a deviation between the Dispatch Operating Target (DOT) and the actual dispatch. Since go-live, PacifiCorp has been participating in recurring discussions with the CAISO to evaluate the root cause of remaining infeasible schedules. PacifiCorp has made improvements to its systems that interface with the CAISO's BSAP and SIBR, as well as systems designed for bidding resources in the start-up and shutdown hours for multi-stage resources. PacifiCorp further narrowed the gap between the persistence forecast methods it uses for VER forecasting and the submission of those forecasts to the market. This ensures the market has a more current view of wind conditions and results in an improved market solution. Additionally, PacifiCorp has worked with CAISO to improve the load forecast during ramping hours. This has resulted in an even more accurate load

Issue	Description	Remedial Actions Taken During Waiver Period and Ongoing Activity
		forecast during these hours and improved the flex available to the market as less resource is needed to cover forecast error. For troubleshooting purposes, PacifiCorp continues to work with CAISO on tools and displays that can compare interchange deviations between EIM Entity submissions and confirmation of interchange data used by the Market Operator. PacifiCorp Grid Operations also continues to work with neighboring BAAs to improve visibility and tools.
3. Improve Training and Systems	PacifiCorp identified opportunities to provide additional training to personnel and improve systems with increased EIM operational experience.	PacifiCorp provided personnel with training on outage entry and required the provision of daily spreadsheets from PacifiCorp EIM Participating Resources that describe any operational issues and the resources' ambient conditions. PacifiCorp's Grid Operations provided its balancing agent real-time continued training on CAISO EIM tools during the first two weeks of February. Finally, PacifiCorp has worked with CAISO to improve load conforming errors. Software enhancements have been introduced that help protect against over-conforming that can exacerbate issues when capacity in the market is near its limit.
4. Improve Internal Processes and Tools	PacifiCorp improved its processes and tools to address identified market performance issues.	PacifiCorp's Grid Operations drafted and made available to operations personnel, "best practices" procedure documents to aid in personnel's implementation of critical EIM Entity tasks. PacifiCorp will continue to update these procedure documents in real-time as needed. PacifiCorp also developed a Desk Guide for the 24/7 Grid Operations desk and an EIM Division of Responsibilities document.

In addition to the operational updates provided above, PacifiCorp provides the following update relating to the implementation of emergency e-tags in PacifiCorp's BAAs. During the month of February 2015, there was a material decrease in emergency e-tags in PacifiCorp's BAAs. There were 10 emergency e-tags total during February 2015, which is an approximate 400% decrease from the average amount of emergency e-tags in November 2014-January 2015. The 10 e-tags implemented during February 2015 represent 984 MW across both BAAs (271 MW in PACW and 713 MW in PACE), or only 0.0175% of PACW BAA load and 0.021% of PACE BAA load during this period. This marked decrease is primarily due to not having a Colorado River Supply Project resupply issue at Vernal for all of February, which was the primary non-EIM related cause of emergency e-tags for prior months. Notably, emergency e-Tags for December 2014 (16 e-tags) and January 2015 (19 e-tags) were non-EIM related and were primarily due to an existing potential overload condition for the Vernal transmission lines which manifests during specific line outages in PacifiCorp's PACE BAA. The occurrence of outage event condition during December 2014 and January 2015 resulted in an influx of re-supply Western Area Power Administration ("WAPA") load e-Tags initiated by PacifiCorp's curtailment of existing WAPA load e-Tags.

ATTACHMENT C

Independent assessments from the Department of Market Monitoring on the causes and solutions identified by the CAISO.

This part of the report will be submitted to the Commission within eight days of March 26, 2015.

ATTACHMENT D:

This attachment provides an exploration of impacts, if any, on non-Energy Imbalance Market pricing nodes, including the Mona trading node.[8] This attachment identifies any such impacts and describes any actions the CAISO is taking or plans to take to address such impacts.

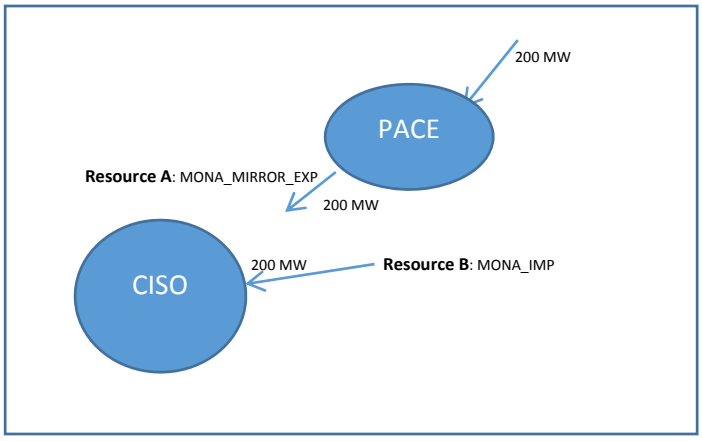
The implementation of the Full Network Model Expansion on October 15 increased the accuracy of the transmission grid modeling from neighboring balancing authority areas, and also allowed for better representation of unscheduled flow effects into the CAISO system. In addition, the implementation of the Energy imbalance Market on November 1, 2014, further enables the CAISO to co-optimize resources across the various areas of the Energy Imbalance Market. Both of these initiatives required that the CAISO also change the way in which the scheduling points are defined so that it can associate the scheduling points with external interties.

With regards to the CRAG and Mona scheduling points, the CAISO had to account for the fact that schedules can be submitted at the locations for purposes of CAISO only transactions or Energy Imbalance Market only transactions. The Crag location is the scheduling point for the Cascade intertie; the Mona location serves as a scheduling point for various southern interties, such as IPPUTAH and Adelanto interties. Prior to the implementation of the full network model, these two scheduling points were modeled with the standard radial link and were considered part of the CAISO balancing authority area. With the implementation of the full network model expansion, this definition changed and with the implementation of the Energy Imbalance Market, the prices at these locations changed notably as the CAISO began accounting for Energy Imbalance Market related congestion.

CRAG and Mona scheduling points are physically located inside PacifiCorp Balancing Authority Areas instead of the CAISO Balancing Authority Area. Mona is located inside PAC East, and CRAG is located inside PAC West. However, these locations continue to serve as scheduling points for imports and exports transacted with the CAISO balancing authority area. This situation requires special treatment for balancing and pricing calculations and leads to a special prices posted on OASIS. The pricing at these locations is based on the following rules to implement the special treatment of CAISO scheduling points CRAG/Mona Interchanges into the balance and price calculations of CAISO and PAC East/PAC West balancing authority areas.

[8] *See December 1 Order* at P 25.

Figure 15: Illustration of Mona Pricing



Assume that Resource A is Mona_Mirror_Exp, Resource B is Mona_IMP. Both of these resources are defined in Master file to have the same scheduling point and intertie definitions (ISO-PACE). The following rules apply:

Resource A,		
BAA	Balance	Price
CISO	**Don't** include MW	Not applicable
PACE	**Include** MW	**Resource LMP**= Price@SP
Resource B,		
CISO	**Include** MW	**Adj_Price@SP=** Price@SP – EIM_PACE – EIM_PACE_PACW – GHG + ∑ MONA ITCs **Resource LMP**= **Adj_**Price@SP SP-TIE Price shall use the **Adj_**Price@SP for the SP price calculations.
PACE	**Don't** include MW	Not applicable

The same above treatment shall be applied to CRAG scheduling point and mirror resource. The Figure above illustrates how an import at Mona scheduling point is mirrored by an export from the PACE balancing authority area with equal megawatt value. The reason for this mirroring is to allow the accounting for the import and associated offsetting export for each balancing authority area separately while the supporting resource(s) for the transaction is modeled at the physical location within PACE balancing authority area or as a separate import to PACE balancing authority area from another balancing authority area.

The table above illustrates that the pricing at Mona for CAISO balancing authority area is adjusted to not include effects of Energy Imbalance Market transfer constraints, GHG pricing, and other constraints pertaining to the EIM area.

The CAISO detected that the pricing at CRAG and Mona over the first few days of implementation were subject to a software defect that resulted in the CAISO pricing to include some of the LMP components pertaining to the mirror resource. The CAISO fixed this issue on November 5, 2014 and has not detected it since.

Currently, the prices at these scheduling points, as posted on OASIS, reflect all the congestion effects from either CAISO or PAC balancing authority areas. However, for CAISO imports and exports, the actual price used for settling the respective schedules at each of these locations as scheduling points for imports and export to and from CAISO balancing authority area, only accounts for the congestion arising from CAISO balancing authority area. The prices posted on OASIS do not reflect that, but the prices provided through the California Market Results Interface (CMRI) application and used for settlements for resources transacting at these scheduling points will reflect only the applicable CAISO balancing authority area congestion.

For example, consider the case of a sample market interval, November 26, hour ending 11 interval 4 for the fifteen-minute market. The shadow price of the IPPUTAH ITC is -$183.29, the Energy Imbalance Market transfer price for PAC East is $6.80 and the Energy Imbalance Market transfer for PAC East and PAC West is -$11.88. The system energy price is $35.38 and the greenhouse gas price is $0. The price posted on OASIS for the marginal congestion component at MONA_3_N501 is -$188.37. The congestion component posted on OASIS accounts for all the congestion associated with this location, both from the CAISO and PacifiCorp balancing authority areas. This published congestion component is thus calculated as -$183.29 (IPPUTAH ITC)-$11.88(PACW_PACE) +$6.80 (PACE) =-$188.37.

On the other hand, for intertie awards using the Mona point as a scheduling point to transact in the CAISO Balancing Authority Area, the prices posted in CMRI and used for settlements reflect accordingly only the congestion share of -$183.29 arising from IPPUTAH ITC. This price still adheres to the typical congestion calculation used prior to the implementation of the full network expansion and Energy Imbalance Market.

The current data structure used in the OASIS application only supports the display of one entry for the marginal congestion component, and given the nature of the congestion associated with these two scheduling points, either marginal congestion component combination will reflect partial information. Currently the display of the full congestion components -- CAISO and PAC -- does not apply to CAISO schedules. If the entry displayed only the CAISO congestion share, it will still be partial because it will be missing now the congestion portion associated with PAC. The CAISO is working on an enhanced OASIS display that will publish the congestion component breakdown. In this case there will be an entry for the congestion share associated with PAC of -$11.88+$6.80 and another entry with the congestion share associated with CAISO tie of

-$183.29. The CAISO expect that this display will be available in January 2015 and will provide the clarity and minimize the concerns about the pricing for these two locations.

The CAISO upgraded its OASIS to provide the more granular displays for the Mona and Crag locations on January 8, 2015. However, it is continuing to evaluate the performance of that display and continues to make changes to ensure the greater granularity is provided accurately. The CAISO has been also working towards posting the greater granularity of prices going back to October 15 and is expected to have this part completed by February 18.

While the CAISO has resolved the pricing displays, the CAISO identified other technical issues that might have rendered prices as posted on OASIS or CMRI incorrect. The CAISO posted a market issue bulletin to describe these issues and is investigating the financial impact of these errors.[9]

[9] The market issue bulletin is available at: http://www.caiso.com/Documents/TechnicalBulletin_PricingLogicforSchedulingPoint-TieCombination.pdf,

ATTACHMENT E

In this attachment, the CAISO reports on each relaxation event, and a summary of the magnitude and frequency of such events overall.[10] This report provides data on instances where the $1,000/MWh price would have occurred but for the Commission's December 1 Order waiver, including the time of the instance, the duration, the cause, and the affected node(s) and load aggregation points.

The relaxation events affect numerous market intervals as the CAISO real-time markets contain many fifteen and five minute intervals. The information is provided at summary level because the data is significant and detail specific reporting of such events would not be meaningful. The report focuses on the external load aggregation points (ELAP) prices because these aggregate prices are representative of pricing in each area -- West and East-- and would reflect short-term imbalance shortage for the aggregate area.

Figure 16 through Figure 23 provide summary information on the instances of power balance relaxation for undersupply (shortage) in the fifteen- and five-minute market in the PAC West and East area. Normally, when there are such infeasibilities, it is expected that prices will be based on the constraint relaxation pricing parameter, and prices will be near or at $1000/MWh. However, there are three cases where this would not occur and is reflected in the data supporting the figures in this report. First, as of December 1st consistent with the December 1 tariff waiver, the price is based on the last economic signal consistent with the pricing principles contained in the tariff. Second, as described in more detail in Attachment A, when the EIM Entity fails the flexible ramping sufficiency test prices are calculated using the same approach based on the last economic signal for the duration of the restricted interval. Therefore, it is important to keep in mind that in these intervals, even if the CAISO had not received the waiver, the CAISO would have implemented the procedure described in Section 10.3.2.1 of the Business Practice Manual, and prices would have still been based on the last economic bid cleared in the applicable fifteen-minute or five-minute interval in the EIM Entity balancing authority area as opposed to the $1000/MWh bid cap.[11] In the December 15, 2014 report the CAISO noted that there was a third case in which it had observed the power balance constraint was relaxed in the scheduling run, but prices did not reflect the $1000/MWh. The CAISO has since evaluated these cases more closely and as discussed in Attachment A, in some instances the market is in a degeneracy case, and

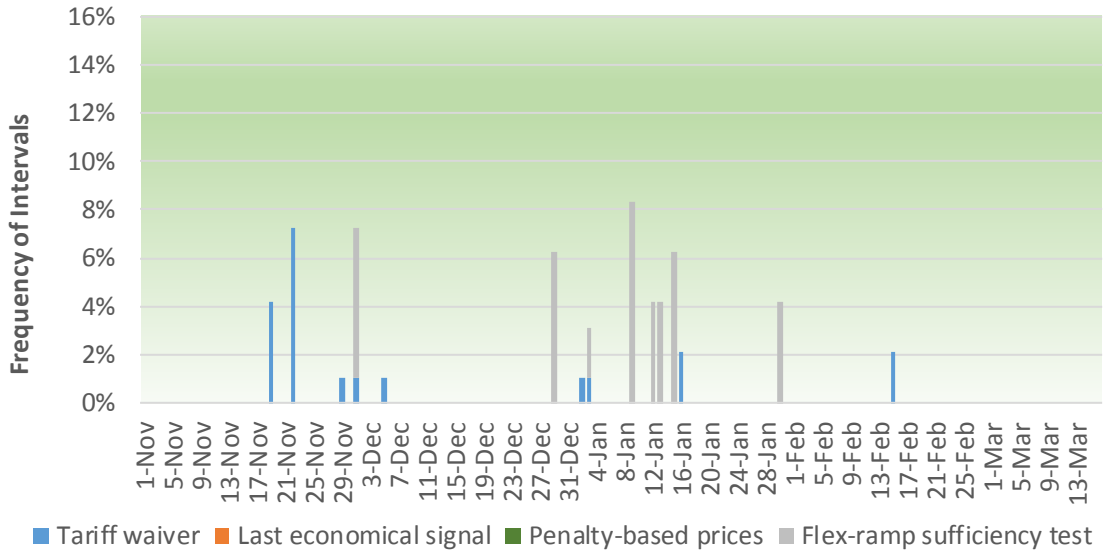
[10] *December 1 Order*, at P 26.

[11] The price discovery mechanism under the procedure described in Section 10.3.2.1 of the BPM for Energy Imbalance Market is, however, essentially the same price discovery procedure used under the December 1 Order waiver.

the market clears based on the last economic signal. The CAISO is continuing to investigate these intervals to ensure these events are not due to other abnormalities and are in fact due to degeneracy. As explained in Attachment A, after the implementation of the pricing procedure under the December 1 waiver there is no pricing based on the degenerate cases because the pricing procedure under the December 1 waiver governs over the pricing.

Figure 16 through Figure 23 exclude the intervals that were subject to price corrections because they were invalid. These figures show the frequency of infeasibilities organized by instances in which the prices were set based on 1) the last economic bid price signal as per the tariff waiver, referred to in the figures as "Tariff waiver," 2) the $1000/MWh penalty price parameter, referred to in the figures as "Penalty-based prices" 3) last economical signal from degeneracy referred as "Last economical signal" and 4) the last economic signal but because for those intervals the EIM entity failed the flexible ramping sufficient test, referred to as the "Flex-ramp sufficient test." Each figure of the frequency of infeasibilities is accompanied with a figure the magnitude of infeasibilities. The reported events are also aggregated on a daily basis and depicted with an infeasibility range shown by the vertical line in blue. The ends of the vertical blue lines represent the minimum and maximum values of power balance relaxation in each day. The average magnitude of the infeasibility is shown by the red marker on the blue vertical lines.

Figure 16: Frequency of under-supply infeasibility in PAC West. Fifteen-minute market.



For the period of November 1 through November 13, the data on the magnitude of infeasibility in the fifteen minute market was not preserved in the data system. This impedes the CAISO's ability to identify the cases with infeasibility and quantify their

magnitude. However, such instances were conservatively estimated by analyzing the cases where prices reached the relaxation-based levels of $1000/MWh.

Figure 17: Magnitude of undersupply infeasibility in PAC West. Fifteen-minute market.

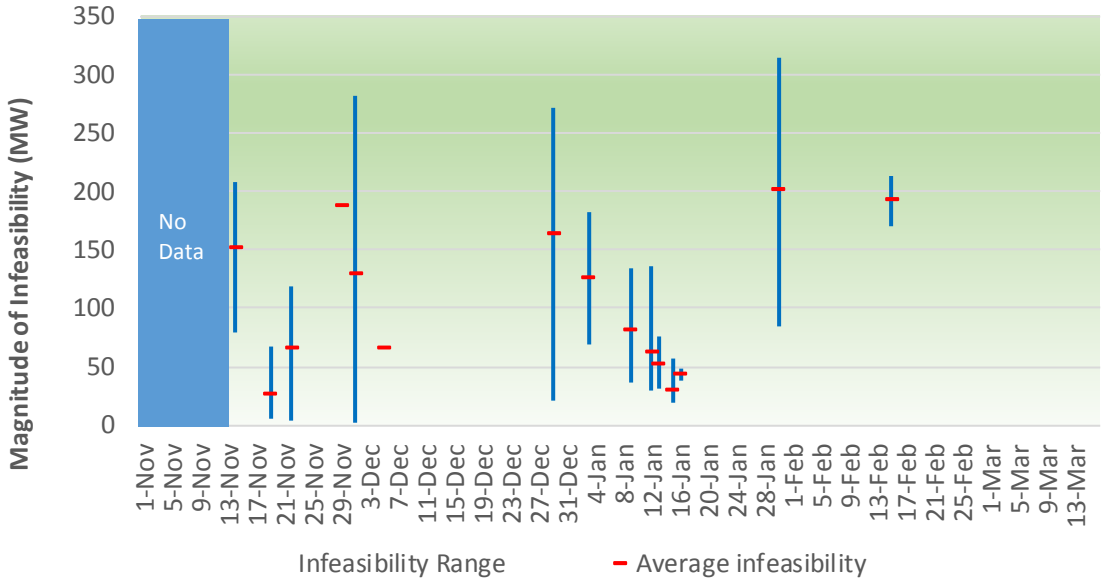


Figure 18: Frequency of undersupply infeasibility PAC East. Fifteen-minute market.

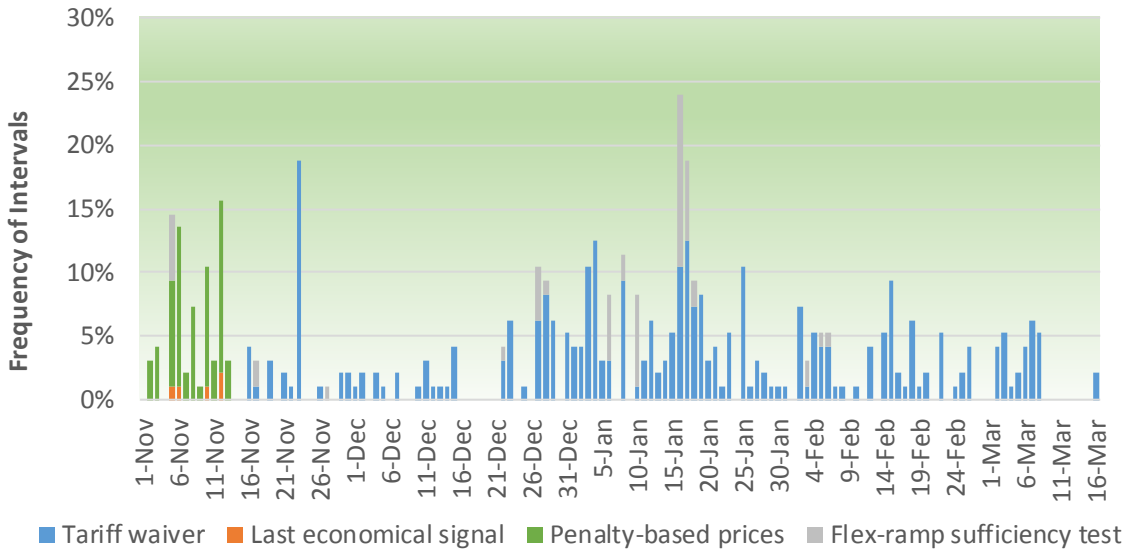


Figure 19: Magnitude of undersupply infeasibility PAC East. Fifteen-minute market.

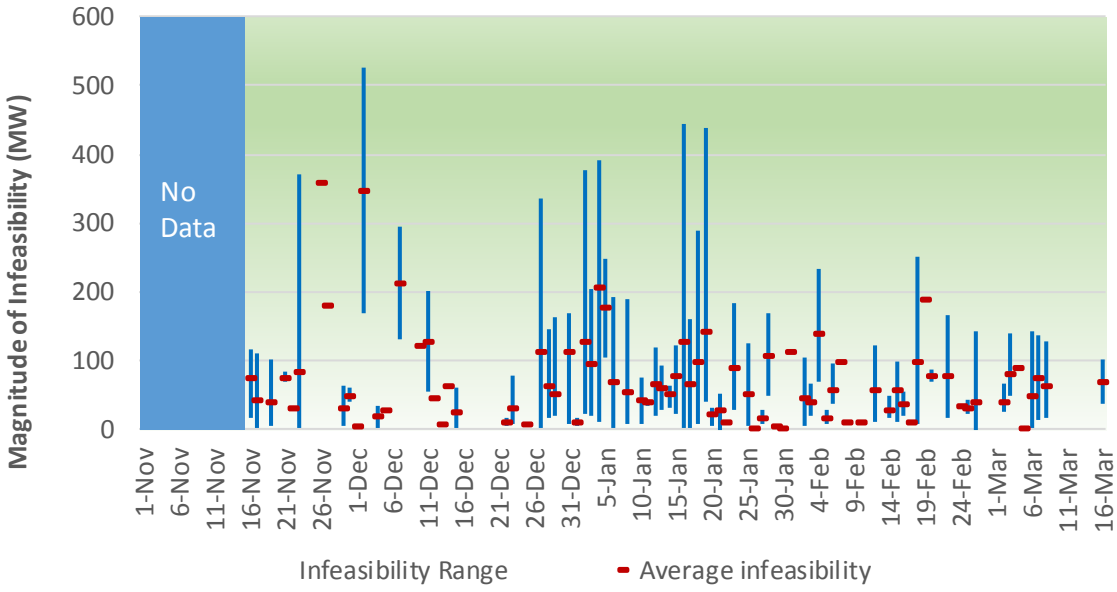


Figure 20: Frequency of undersupply infeasibility PAC West. Five-minute market.

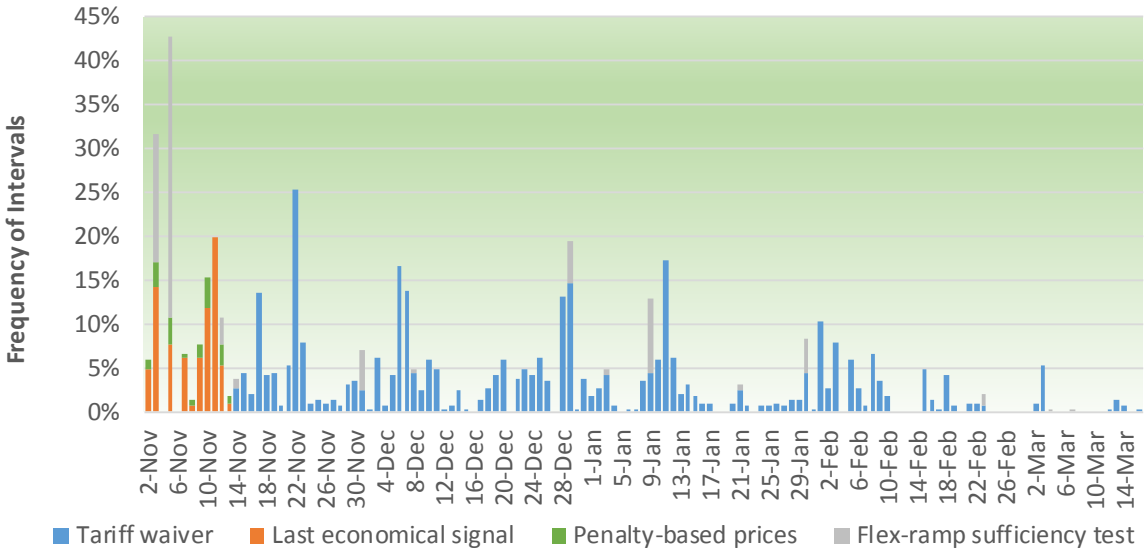


Figure 21: Magnitude of undersupply infeasibility PAC West. Five-minute market.

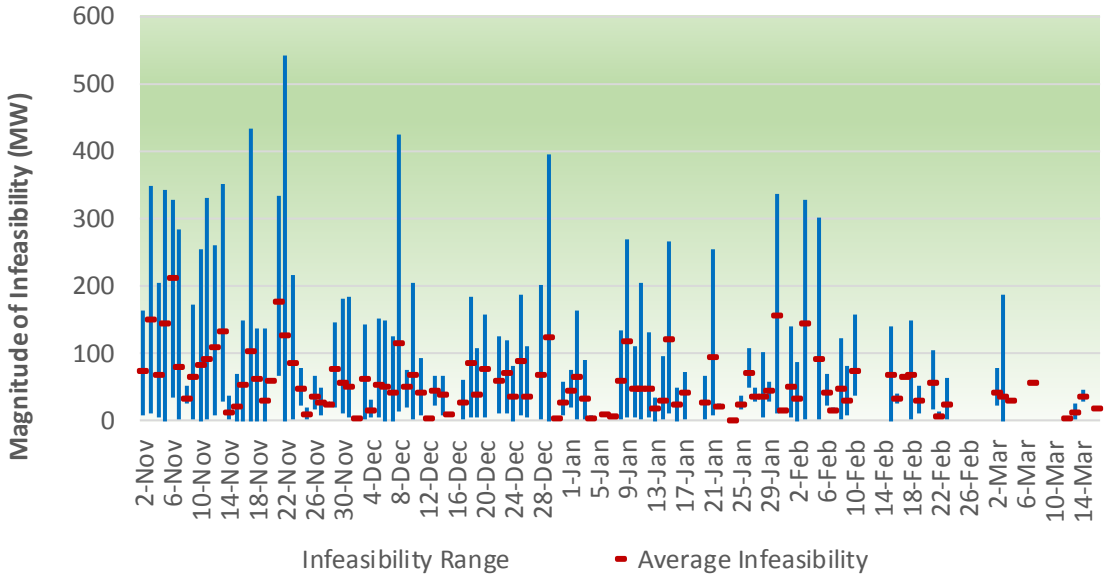


Figure 22: Frequency of undersupply infeasibility PAC East. Five-minute market.

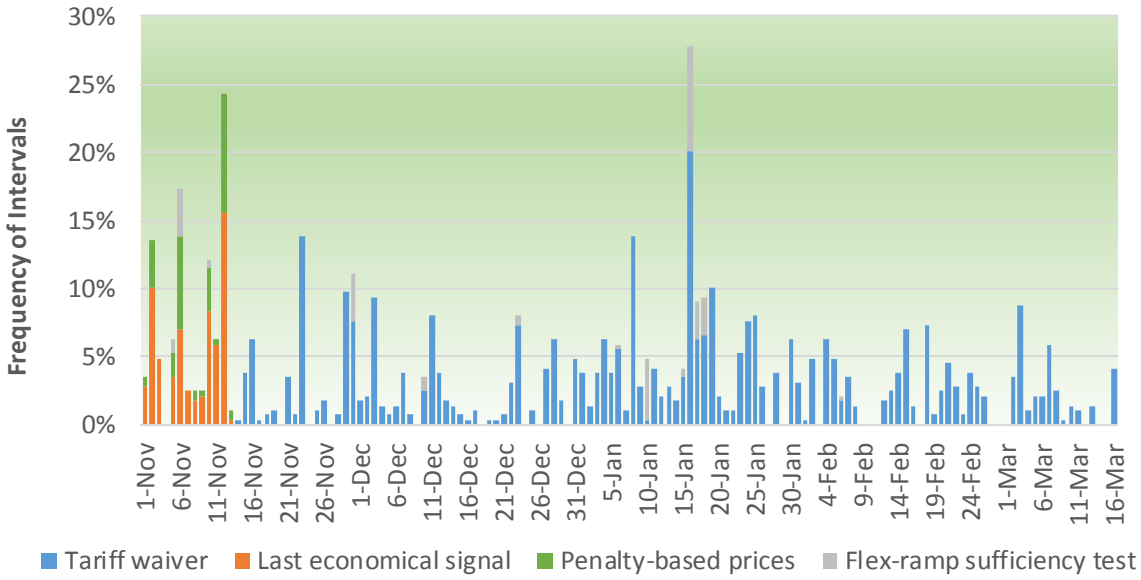


Figure 23: Magnitude of undersupply infeasibility PAC East. Five-minute market.

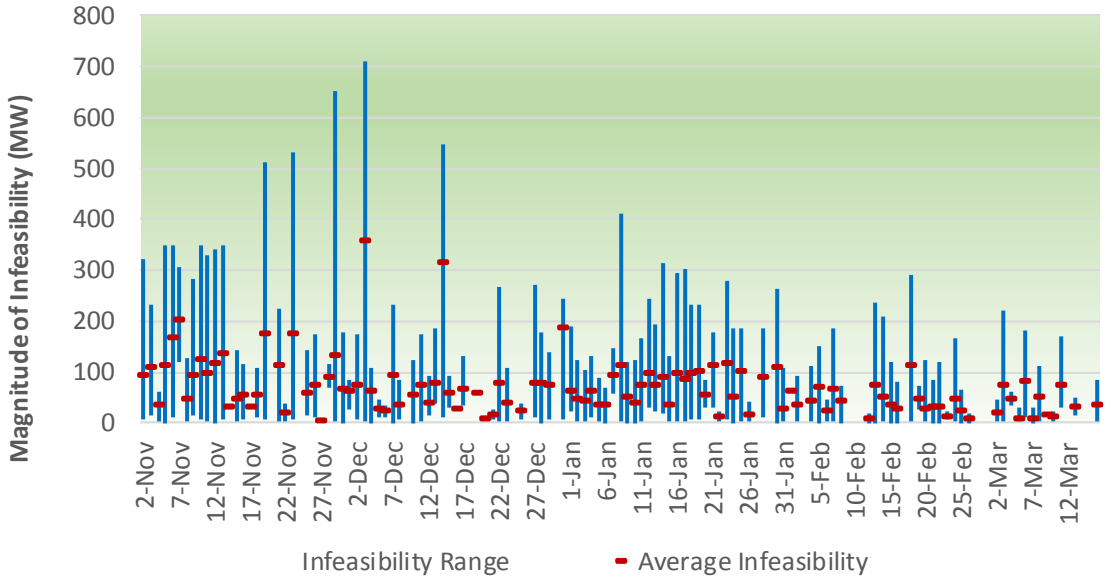


Figure 24 through Figure 27 show the hourly profile of the undersupply infeasibilities for both PAC West and East by market. This profile is provided to identify any patterns during the day where infeasibilities may be more prone to occur, such as the pull-up periods of load, for the period of January 1 through February 12. This operational data, however, shows no marked pattern of the frequency of infeasibilities with the time of day. This may be an indication that the drivers of infeasibilities are not system condition related.

Figure 24: Hourly undersupply infeasibilities for PAC West. Fifteen-minute market.

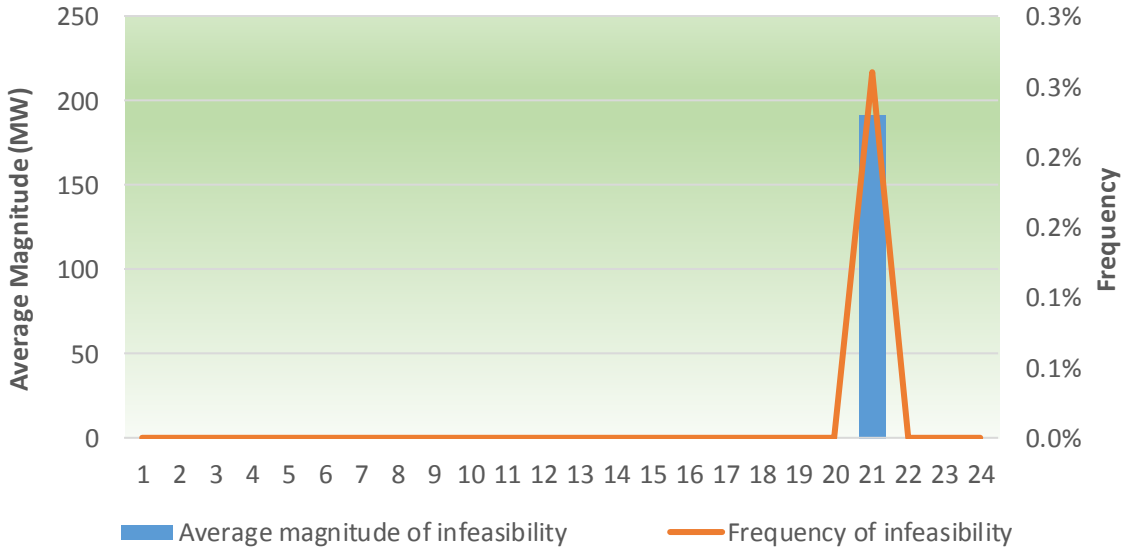


Figure 25: Hourly undersupply infeasibilities for PAC East. Fifteen-minute market.

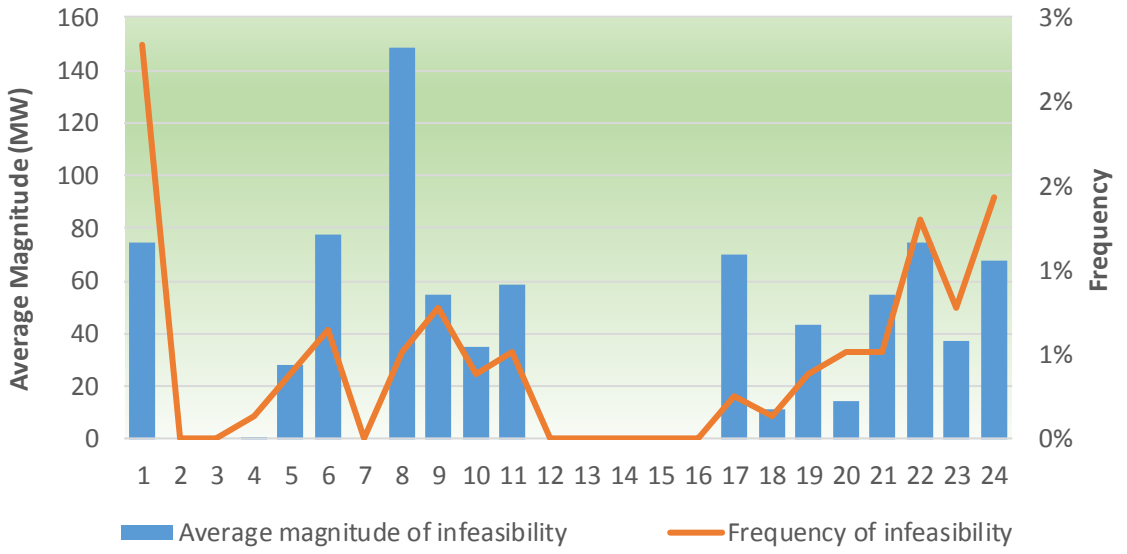


Figure 26: Hourly undersupply infeasibilities for PAC West. Five-minute market.

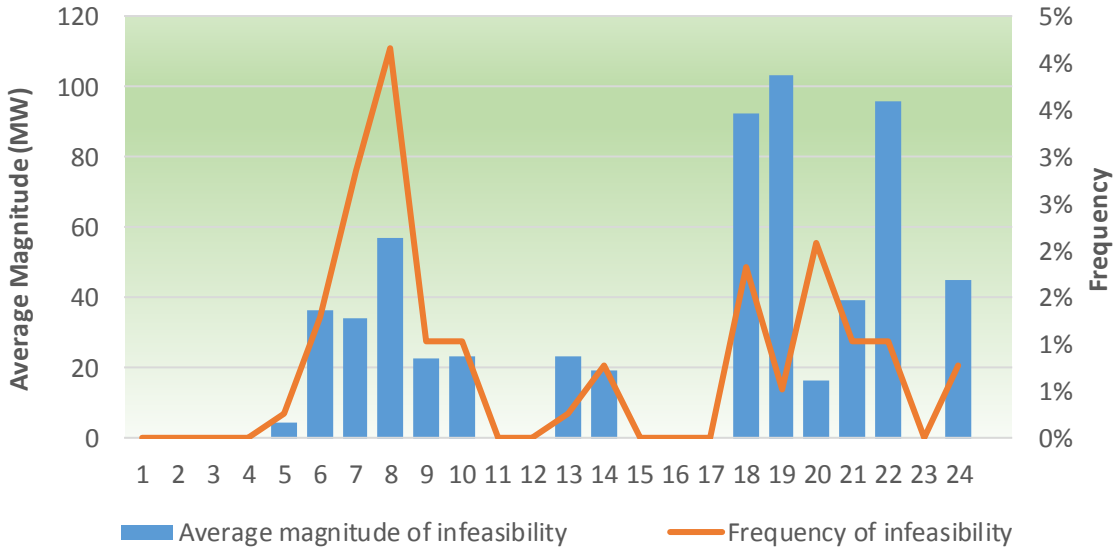
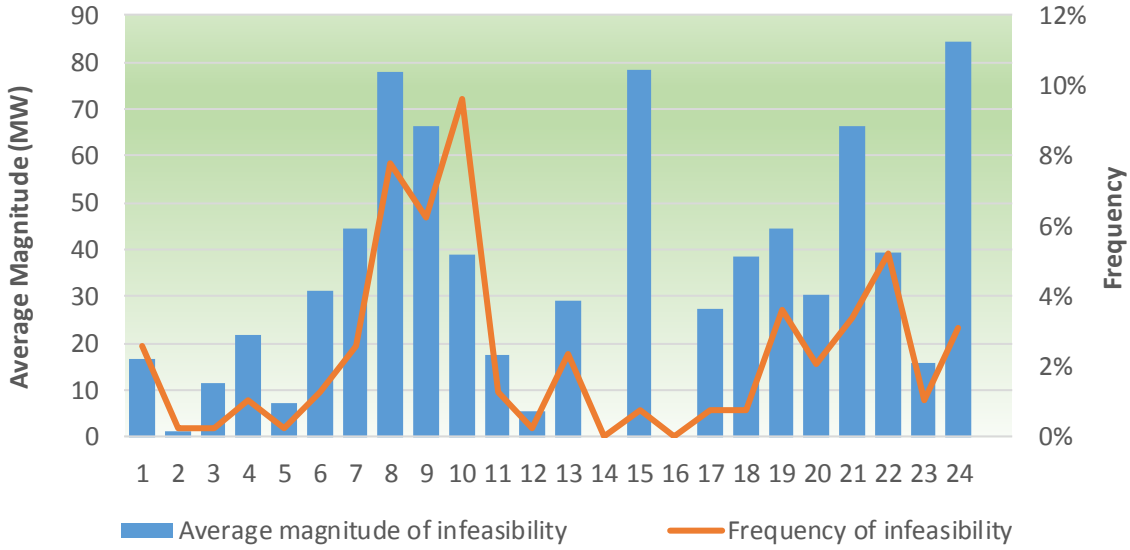


Figure 27: Hourly undersupply infeasibilities for PAC East. Five-minute market.



The imbalance energy transfers may also be subject to relaxation to address infeasibilities; there were few instances only in the PAC East transfer that resulted in relaxation; there were no instances of relaxation of EIM transfers between PAC and CAISO. The summary of these instances are listed in Table 1

Table 2. All these instances occurred before the period applicable for the waiver associated with this report; there were no valid EIM transfer infeasibilities observed in January and February. There were three invalid infeasibilities on PAC East on January 15

due to a software issue that were addressed through the standard process of price corrections.

Table 1: Statistics of EIM transfer infeasibilities for PAC East. Fifteen-minute market.

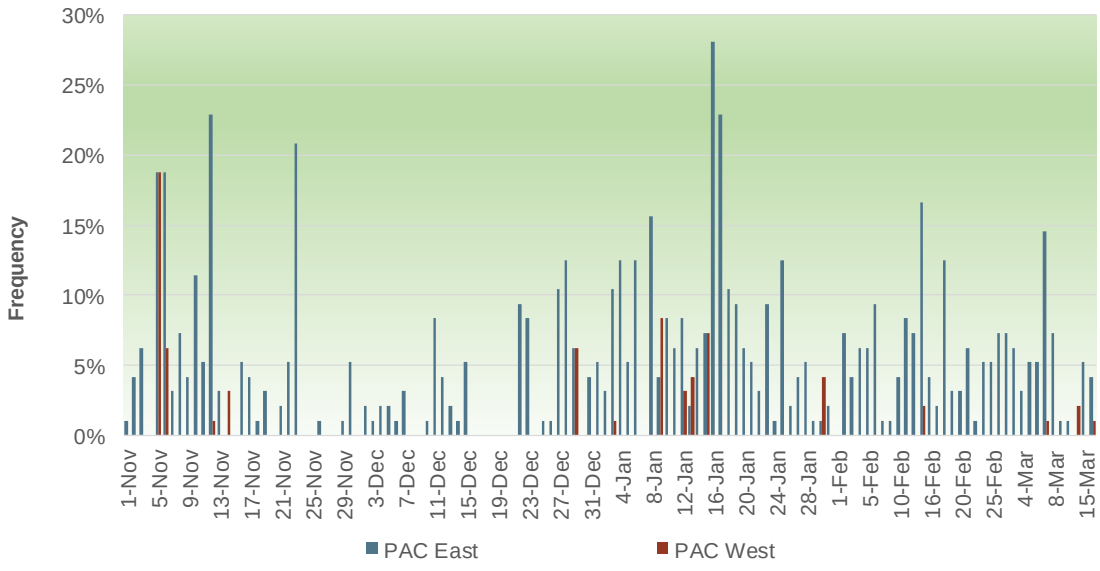
Date	Maximum	Minimum	Average	Count
6-Nov-14	51.4	1.1	26.2	2
10-Nov-14	121.0	121.0	121.0	1
12-Nov-14	126.7	72.0	99.3	2
13-Nov-14	130.9	16.9	76.2	3

Table 2: Statistics of EIM transfer infeasibilities for PAC East. Five-minute market.

Date	Maximum	Minimum	Average	Count
6-Nov-14	65.2	65.2	65.2	1
10-Nov-14	114.3	97.9	106.1	2

For completeness, the data in this report also includes those cases in which there was a relaxation of flexible ramp constraint; the data is organized by PAC West and East in Figure 28. This metric does not include intervals that were subject to price corrections.

Figure 28: Frequency of flexible ramp constraint infeasibility in PAC



Finally, this report also includes information about infeasibility for over supply conditions even though these cases are not reflected in the waiver requested in this proceeding. The penalty prices specified in sections 27.4.3.2 and 27.4.3.4 only pertain to infeasibility cases in which there is under-supply. The penalty prices for the over-supply conditions are specified in section 6.6.5 of the BPM for Market Operations. The over-supply metrics are provided in Figure 29 through Figure 36.

Figure 29: Frequency of oversupply infeasibility PAC West. Fifteen-minute market.

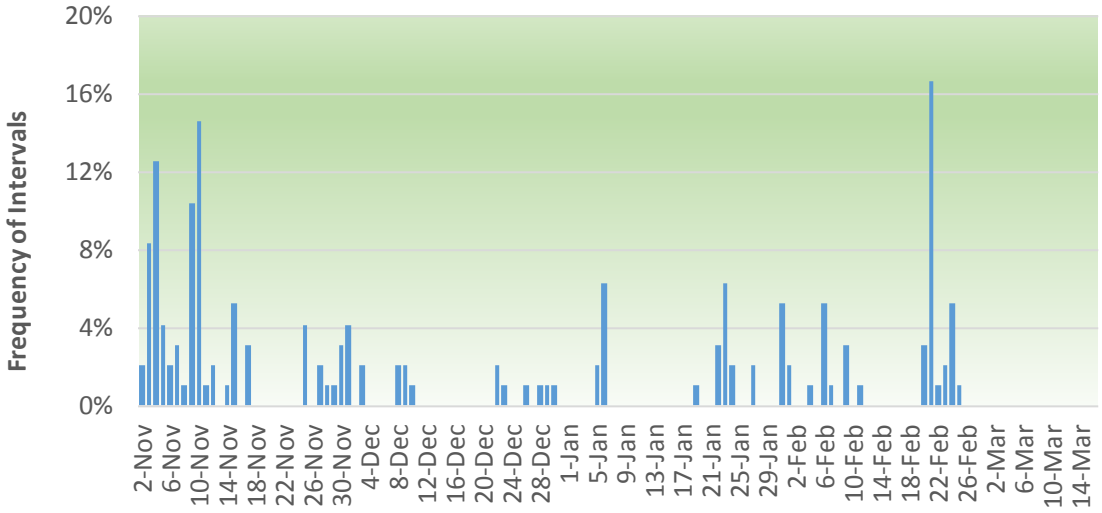


Figure 30: Magnitude of oversupply infeasibility PAC West. Fifteen-minute market.

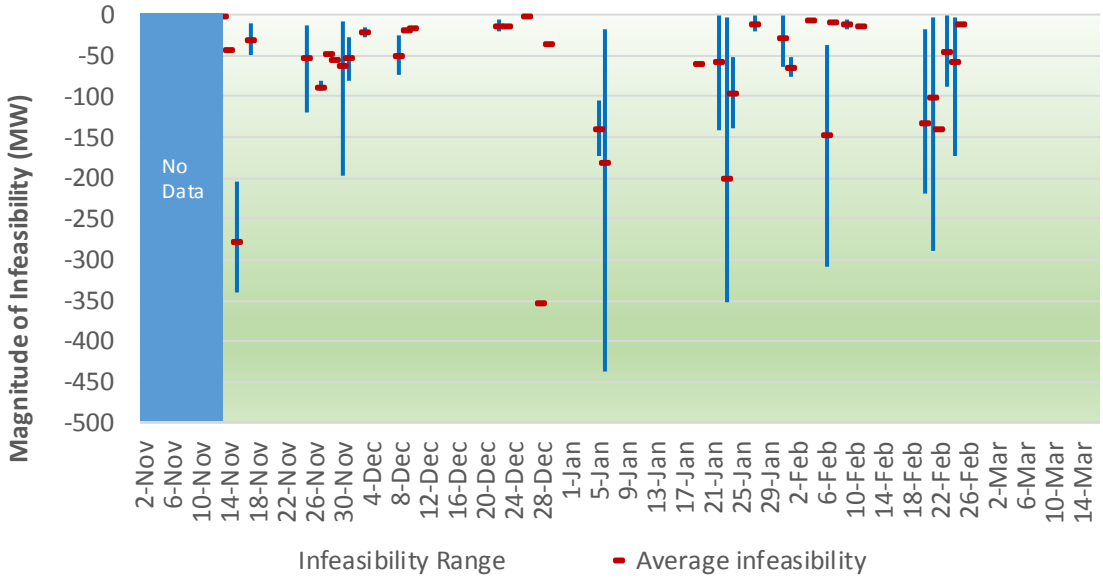


Figure 31: Frequency of oversupply infeasibility PAC East. Fifteen-minute market.

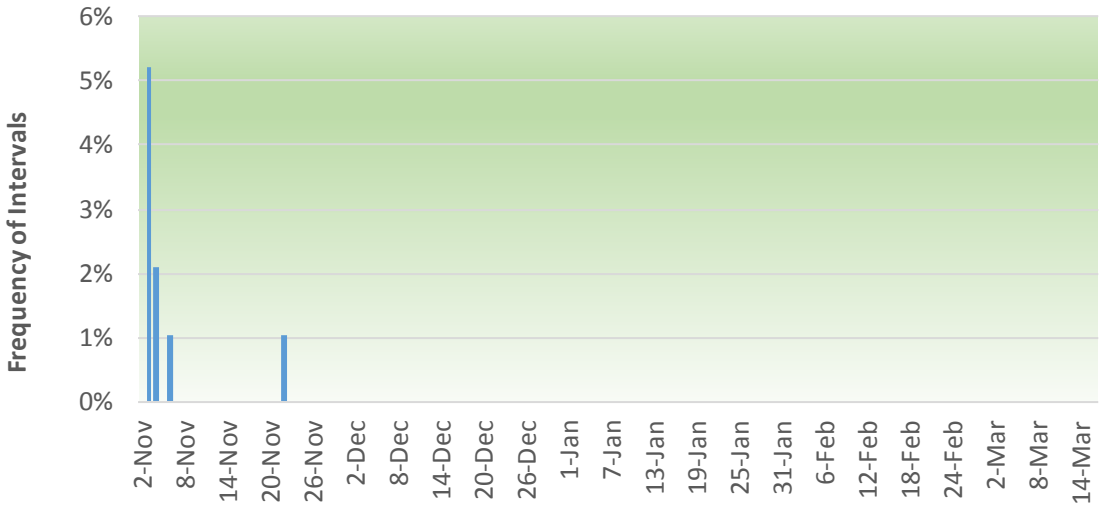


Figure 32: Magnitude of oversupply infeasibility PAC East. Fifteen-minute market.

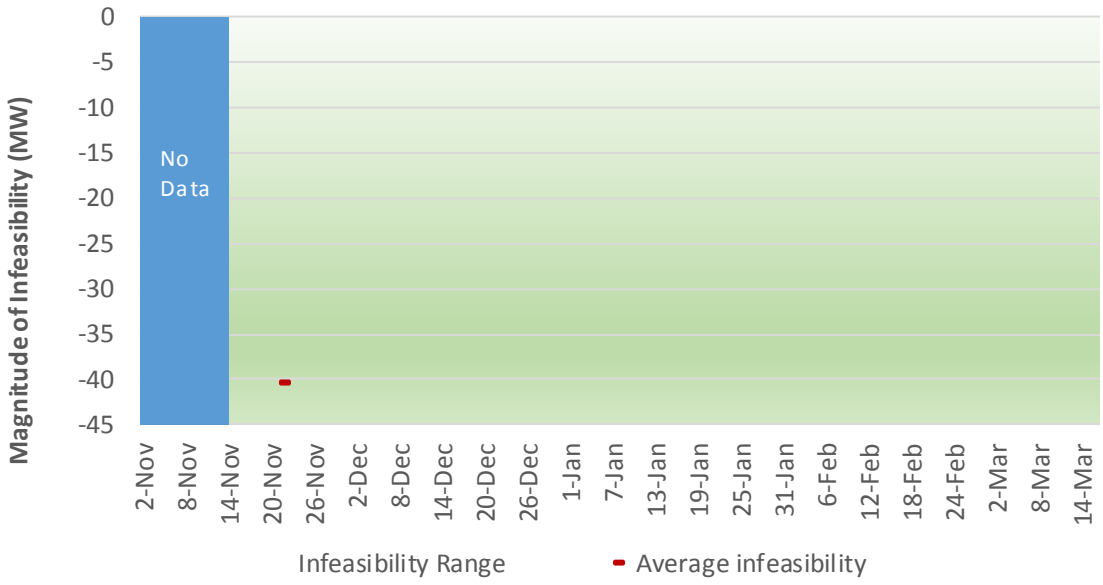


Figure 33: Frequency of oversupply infeasibility PAC West. Five-minute market.

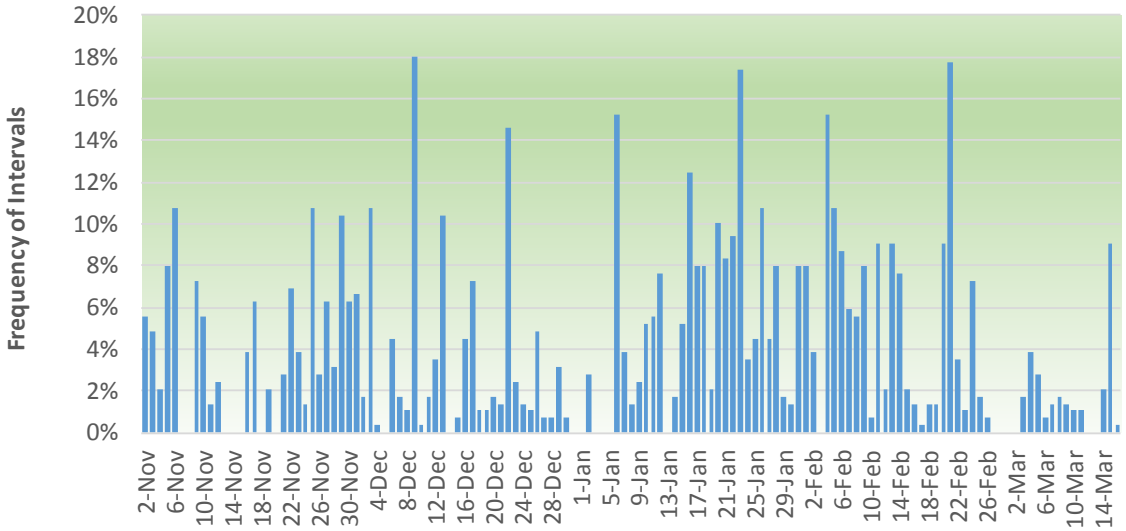


Figure 34: Magnitude of oversupply infeasibility PAC West. Five-minute market.

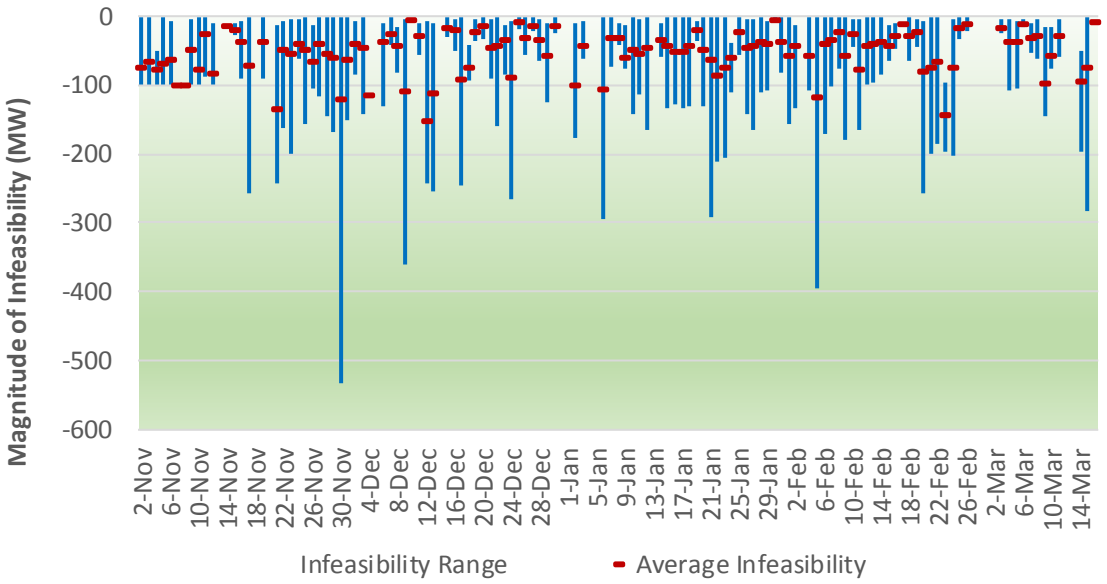


Figure 35: Frequency of oversupply infeasibility PAC East. Five-minute market.

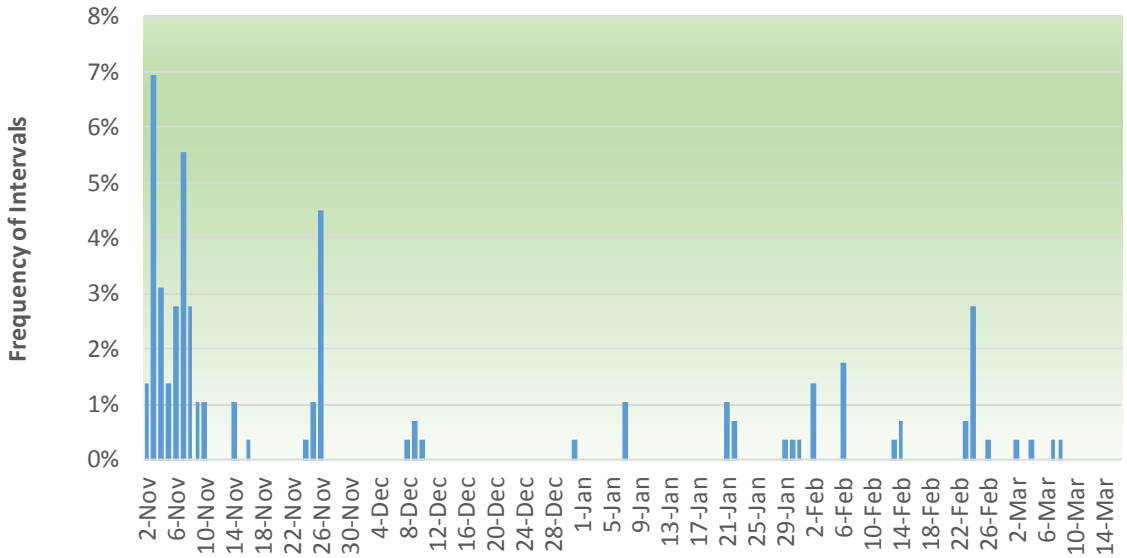
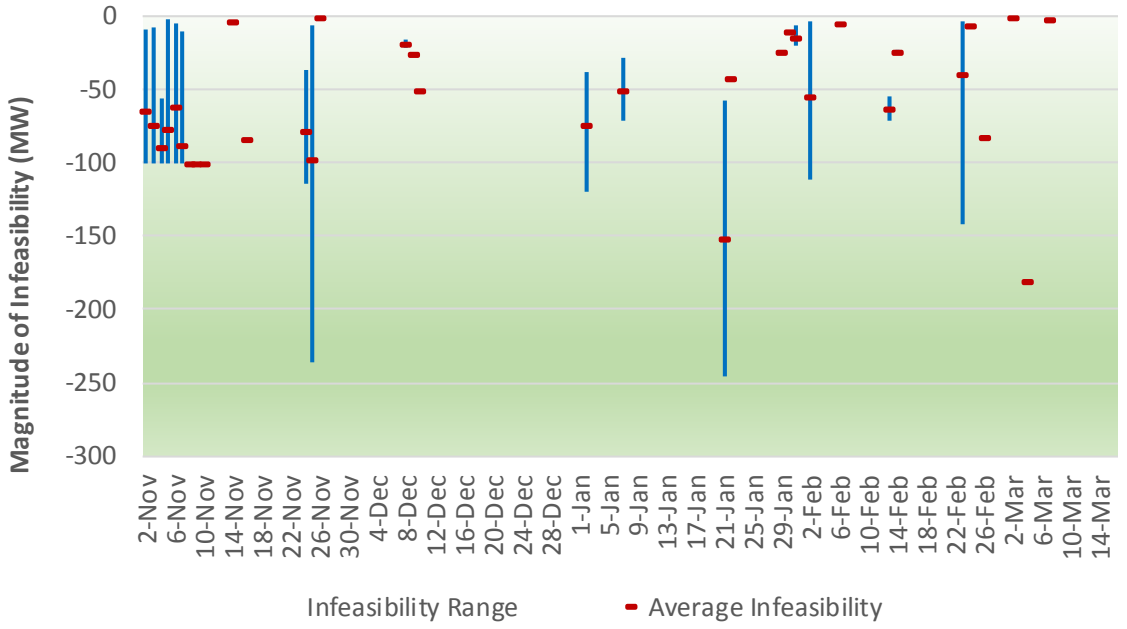


Figure 36: Magnitude of oversupply infeasibility PAC East. Five-minute market.



CERTIFICATE OF SERVICE

I hereby certify that I have served the foregoing document upon the parties listed on the official service list in the captioned 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 26h day of March, 2015.

/s/ Anna Pascuzzo

Anna Pascuzzo