



April 27, 2018

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. ER15-2565-____
March 2018 Informational Report
Energy Imbalance Market – Transition Period Report – Portland General
Electric**

Dear Secretary Bose:

The California Independent System Operator Corporation (CAISO) hereby submits its final report on the transition period of Portland General Electric (PGE) during its first six months of participation in the western energy imbalance market (EIM) for March 2018.

Please contact the undersigned with any questions.

Respectfully submitted

By: /s/ Anna A. McKenna

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California ISO

**Energy Imbalance Market
March 1 – March 31, 2018**

**Transition Period Report
Portland General Electric Entity**

April 27, 2018

I. Introduction and Background

On October 29, 2015, the Federal Energy Regulatory Commission (Commission) approved the California Independent System Operator Corporation's (CAISO) proposed tariff amendments to allow a transition period for new western Energy Imbalance Market (EIM) entities during the first six months of EIM participation, effective November 1, 2015.¹ Portland General Electric (PGE) entered the EIM on October 1, 2017, and the transition period will apply to the PGE balancing authority area (BAA) until April 1, 2018.

During the six-month transition period, the pricing of energy in the new EIM entity's BAA is not subject to the pricing parameters that normally apply when the market optimization relaxes a transmission constraint or the power balance constraint. Instead, during the six-month transition period, the CAISO will clear the market based on the marginal economic energy bid (referred to herein as "transition period pricing"). In addition, during the six-month transition period, the CAISO sets the flexible ramping constraint relaxation parameter for the new EIM entity's BAA between \$0 and \$0.01, but only when the power balance or transmission constraints are relaxed in the relevant EIM BAA. This is necessary to allow the market software to determine the marginal energy bid price.

Consistent with the Commission's October 29 Order, the CAISO and the Department of Market Monitoring (DMM) will file informational reports at 30-day intervals during the six-month transition period for any new EIM entity. The CAISO provides this report for PGE to comply with the Commission's requirements in the October 29 Order. The CAISO anticipates filing these reports on a monthly basis. However, because the complete set of data is not available immediately at the end of the applicable month,² and depending on the market performance of each month, along with the need to coordinate with the EIM entity, the CAISO expects to continue to file the monthly reports approximately 25 days after the end of each month in order to provide the prior full month's data.

¹ *California Indep. Sys. Operator Corp.*, 153 FERC ¶ 61,104 (2015) (October 29 Order).

² The earliest the CAISO can start gathering the data is 10 business days after the last day for the reporting month since this is when the price correction window expires.

II. Highlights

Overall, PGE's transition into the EIM was smooth and without significant consequence, with the exception of some transitional data issues. Since PGE's EIM implementation on October 1, 2017, the market results have not been anomalous. The sixth month's market performance highlights are as follows:

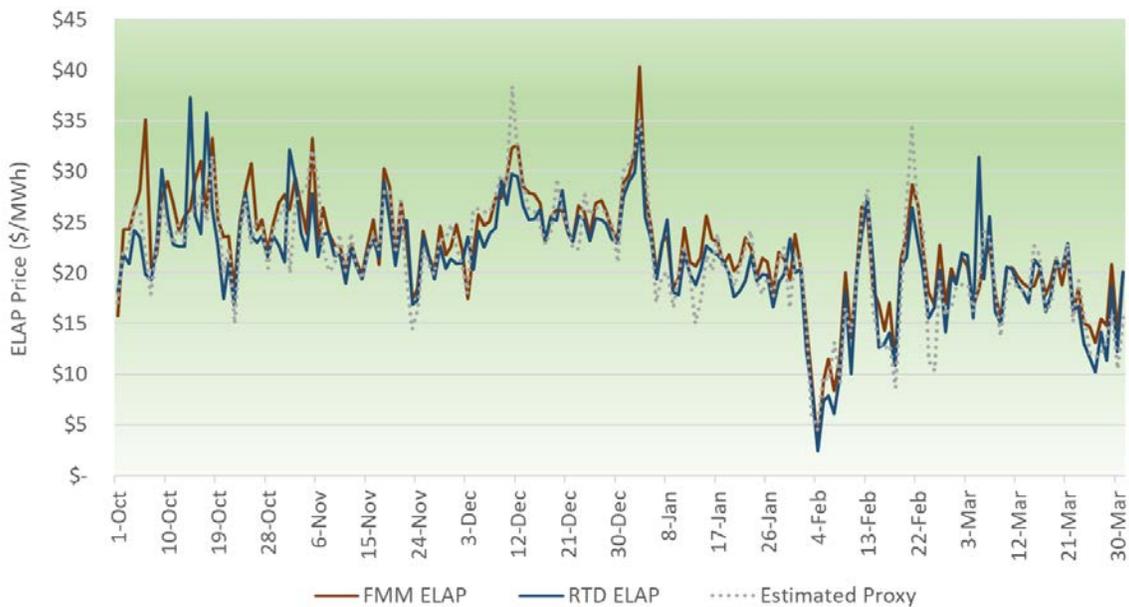
- In March, prices continued to be stable and within reasonable ranges, with the monthly average PGE BAA prices being \$18.47/MWh in the fifteen-minute market (FMM) and \$18.22/MWh in the real-time dispatch (RTD).
- Power balance constraint infeasibilities for under-supply conditions in the PGE BAA were minimal, with 0.13 percent of intervals in the FMM and 0.01 percent of the total intervals in the RTD. With such a low frequency of infeasibilities, the transitional period provisions for price discovery had a negligible impact on market prices.
- As part of the resource sufficiency test performed for each EIM entity prior to the real-time markets, PGE successfully passed 99.06 percent of its balancing tests in March.
- Also as part of the resource sufficiency test, PGE passed successfully 99.46 percent of its upward flexible ramping sufficiency tests in March.
- The price for upward flexible ramping product in the FMM for the PGE BAA averaged \$1.26/MWh in March, while prices for the downward flexible ramping product averaged \$0.28/MWh.

III. Market Performance Related to the Transitional Period

a. Prices

Figure 1 shows average prices in the PGE EIM Load Aggregation Point (ELAP) for October 1, 2017 through March 31, 2018. The March monthly average price in the FMM was \$18.47/MWh and \$18.22/MWh in the RTD. The proxy price for the PGE BAA, referenced as a grey dotted line, is the simple average from the Mid C hub price from Powerdex. The maximum daily average price in the five-minute market peaked on March 6, 2018, at \$31.44 MWh, which was mainly driven by near \$1000 price for the entire EIM system between hour ending 18 interval 9 through interval 12. These high system-wide spikes were driven by deviation of renewable resource and congestion in the southern area of the CAISO BAA.

Figure 1: Daily average prices for the PGE BAA.



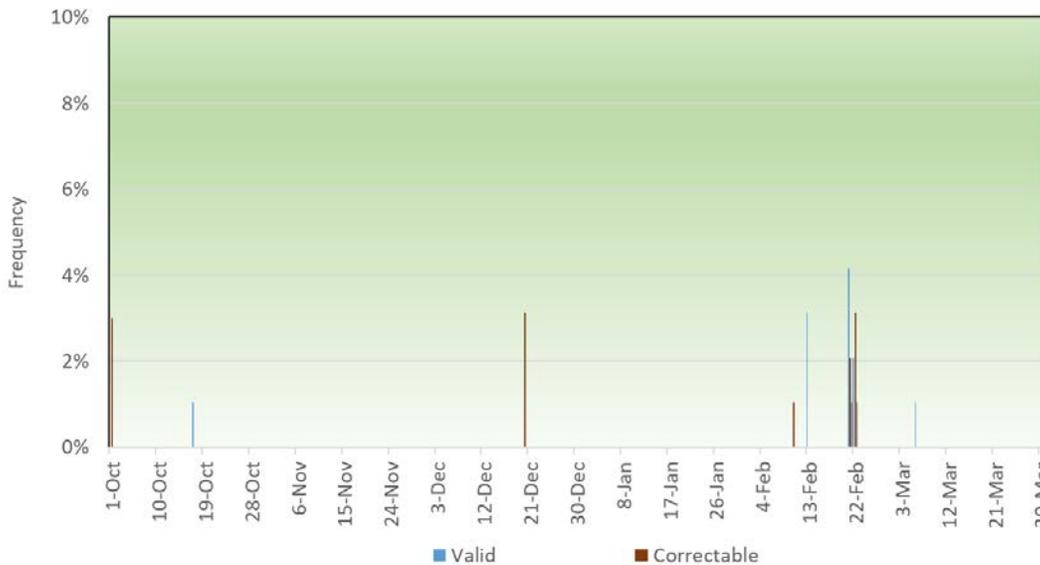
Under the CAISO’s price correction authority in Section 35 of the CAISO tariff, the CAISO may correct prices posted on its Open Access Same-Time Information System (OASIS) if it finds: (1) that the prices were the product of an invalid market solution; (2) the market solution produced an invalid price due to data input failures, hardware or software failures; or (3) a result that is inconsistent with the CAISO tariff. The prices presented in Figure 1 include all

prices produced by the CAISO consistent with its tariff requirements.³ That is, the trends represent: (1) prices as produced in the market that the CAISO deemed valid; (2) prices that the CAISO could, and did, correct pursuant to Section 35 of the CAISO tariff; and (3) any prices the CAISO adjusted pursuant to the transition period pricing reflected in Section 29.27 of the CAISO tariff.

b. Frequency of Power Balance Constraint Infeasibilities

Figures 2 and 3 show the frequency of intervals in which the power balance constraint relaxed for under-supply conditions in the PGE BAA for the FMM and RTD, respectively. The under-supply infeasibilities are categorized into “valid,” “load conformance,” and “correctable” instances. Prices for the intervals that fell in the “valid” category are instances with under-supply infeasibilities that were not in error and subject to the transitional period pricing.

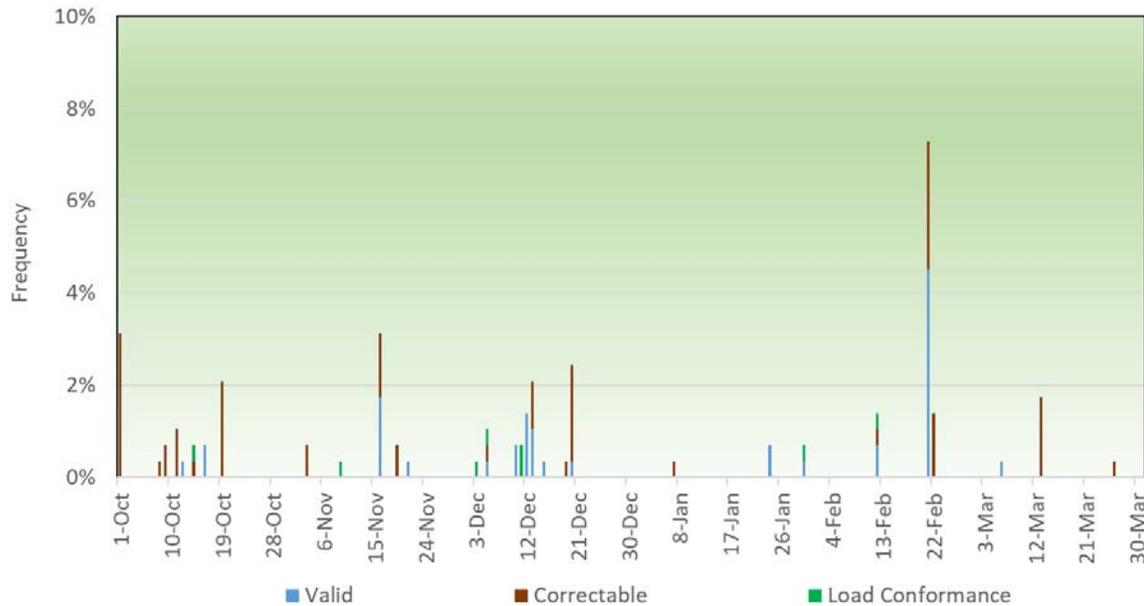
Figure 2: Frequency of FMM under-supply power balance infeasibilities in the PGE BAA.



Instances labeled as “load conformance” are the valid infeasibilities observed when a load conformance was in place for that market interval. Whereas the infeasibilities that fell in the “correctable” category had a correction based on the provisions of Section 35 of the CAISO tariff due to either a software defect or a data error.

³ Figure 1 also provides an estimated proxy price, which for PGE is the simple average of Mid C hub price taken from the Intercontinental Exchange (ICE).

Figure 3: Frequency of RTD under-supply power balance in feasibilities in the PGE BAA.



In the PGE BAA, there was one interval with valid under-supply infeasibility in both the FMM and RTD. In March 6, 2018, PGE observed an infeasibility in hour ending eight interval two in the FMM and in hour ending eight interval three in the five-minute market. For hour ending eight, PGE failed the upward flexible ramping sufficiency test due to an increase in export schedule. The increase in export resulted in upward ramping of a PGE resource, thus reducing the PGE resource’s upward ramping capacity. Even though PGE had upward capacity on several of its multi-stage generating resources, these resources could not transition to the higher configuration based on their initial conditions and transition times. Because of failing the upward flexible ramping test, its import transfers were limited to 130 MW, which were the EIM transfers in the last interval of the prior hour.

There were no intervals in the five-minute RTD for the PGE BAA that coincided with the load conformance limiter.

Tables 1 and 2 list the FMM and RTD intervals with infeasibilities observed in March, including the amount of load conformance to reflect the instances in which the load conformance limiter would have been triggered and offset the infeasibility.

Table 1: List of valid FMM under-supply infeasibilities in the PGE BAA.

Trade Date	Trade Hour	Trade Interval	MW Infeasibility	Load Conformance
06-Mar-18	8	2	13.82	0

Table 2: List of valid RTD under-supply infeasibilities in the PGE BAA.

Trade Date	Trade Hour	Trade Interval	MW Infeasibility	Load Conformance
06-Mar-18	8	3	3.63	0

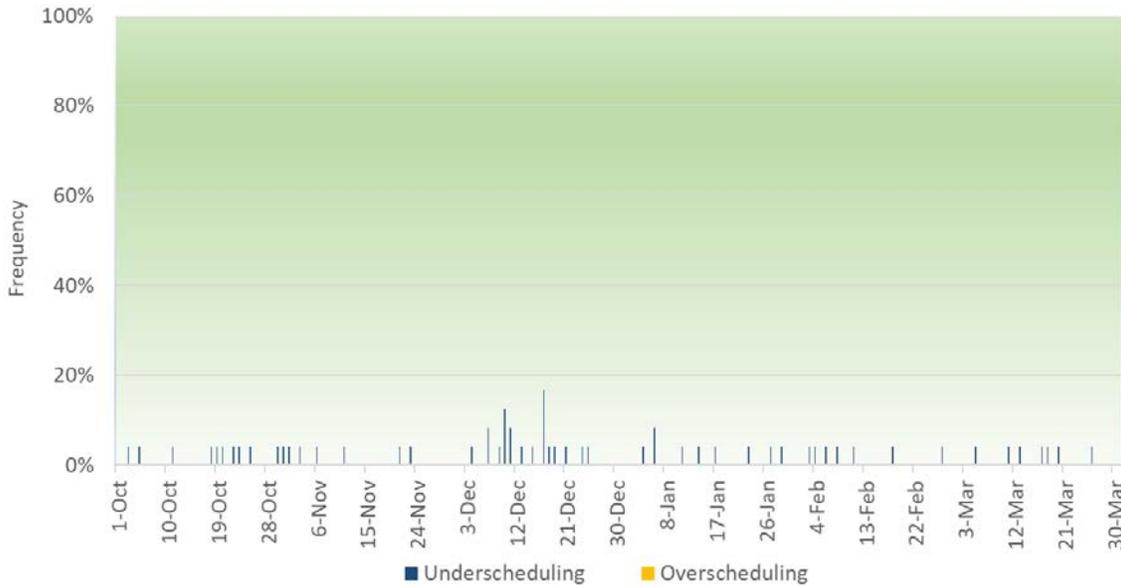
c. Balancing and Sufficiency Test Failures

The EIM provides an opportunity to various BAAs to serve its load while realizing the benefits of increased resource diversity. Since the EIM does not include resource adequacy requirements or obligations for resources to submit bids, the CAISO performs a series of resource sufficiency tests comprised of: (i) a balancing test; (ii) a capacity test; and (iii) a flexible ramping sufficiency test. These tests occur prior to the real-time market.

Performance of a balancing test prior to each trading hour ensures that each participating BAA submits a balanced base schedule of generation and a net schedule interchange to meet its demand. In addition, the participating BAA is required to submit bids with enough ramping capability to meet its net load forecast uncertainty and net load movement requirements. Figure 4 shows the trend of balancing test outcomes for the PGE BAA for the six-month period of October 1, 2017, through March 31, 2018.⁴ The PGE BAA passed the balancing test in 99.06 percent of the intervals in March. The frequency of these failures are within expected performance tolerances for balancing tests.

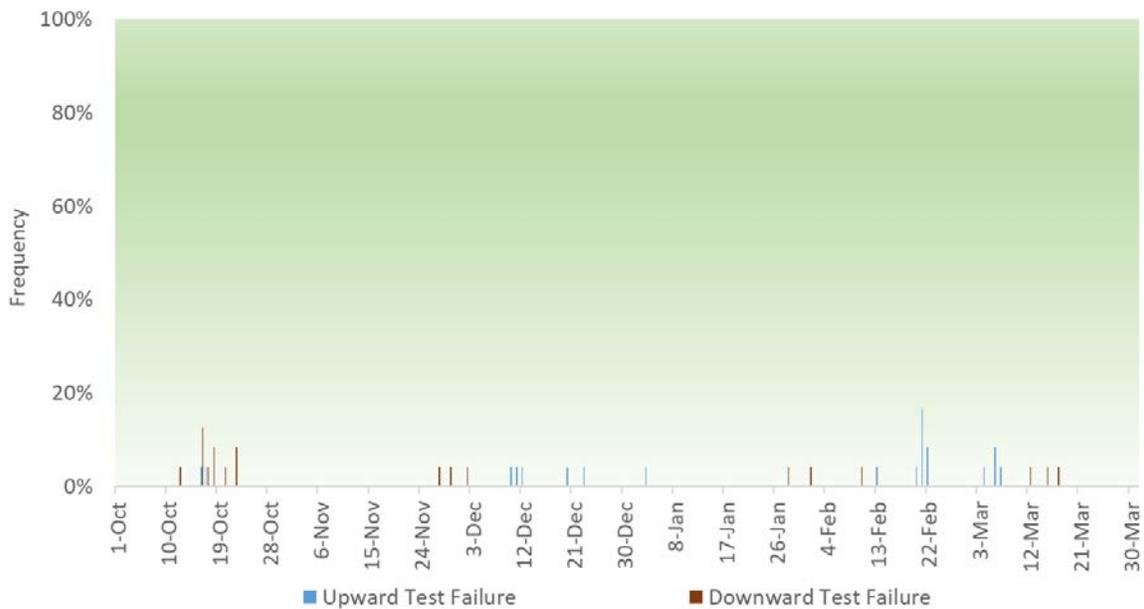
⁴ The CAISO performs resource sufficiency tests pursuant to Section 29.34(k) of the CAISO tariff.

Figure 4: Frequency of Balancing test failures in the PGE BAA.



The CAISO also performs the flexible ramping sufficiency test as specified in Section 29.34(m) of the CAISO tariff. Figure 5 shows the trend of the test failures for flexible ramping for the six-month period of October 1, 2017 through March 31, 2018. The PGE BAA passed the upward flexible ramping test in 99.46 percent of the intervals in March. The level of failures of this test is well within the expected and typical rate observed in the EIM.

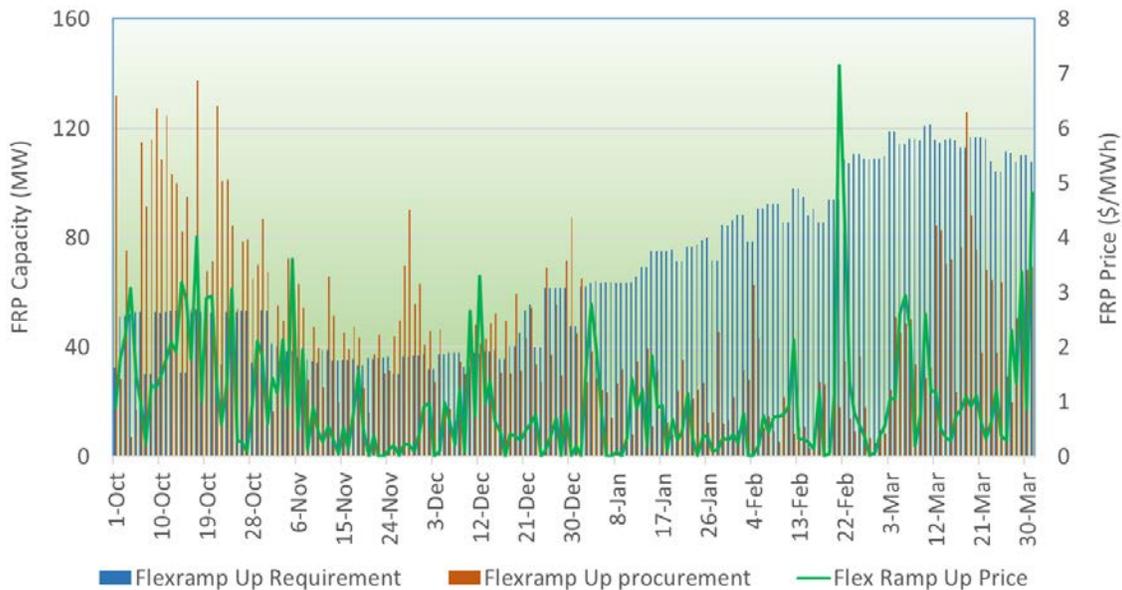
Figure 5: Frequency of flexible ramping sufficiency test failures in the PGE BAA.



d. Flexible Ramping Product

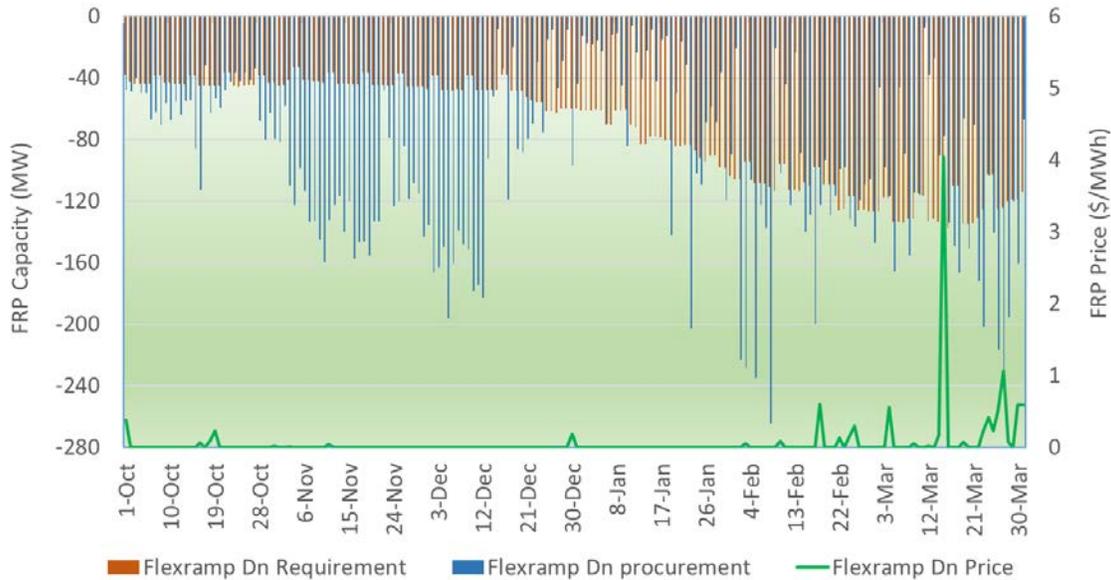
Figure 6 shows the daily average of the upward flexible ramping constraint requirement, procurement, and prices in the FMM. Figure 7 shows the daily average of the downward flexible ramping constraint requirement, procurement, and prices in the FMM. With the implementation of the flexible ramping product on November 1, 2016, calculation of the requirements consists of historical data for uncertainty with any applicable net import/export capability or credit. This effectively reduces the amount of flexible ramping the PGE BAA has to procure and, generally, the EIM system-wide area (which includes all the BAAs in the EIM, including the CAISO BAA) will drive the requirements. The market clearing process may result in procuring the PGE BAA capacity towards meeting the overall EIM-system-wide area requirement. This is the main reason why the individual PGE BAA procurement may generally fall below or be above the individual PGE BAA requirement.

Figure 6: Daily Average requirement, procurement, and price of upward flexible ramping in the FMM in the PGE BAA.



In addition, the price trend provided in Figure 6 and Figure 7 is the nested price determined by the summation of the shadow price of the individual PGE BAA, plus the shadow price of the EIM system-wide area. In March, the average upward flexible ramping capacity price was \$1.26/MWh and the average downward flexible ramping capacity price was \$0.28/MWh in the FMM.

Figure 7: Daily Average requirement, procurement, and price of downward flexible ramping in the FMM in the PGE BAA.



For most of the time, the flexible ramping procurement was above the area requirements, which naturally will lead to zero prices in the PGE BAA. Still, with the EIM area binding, the net price in the PGE BAA may be greater than zero.

e. Impact on Non-EIM Nodes

With the implementation of the EIM with PacifiCorp’s BAAs (PAC East and PAC West) with the first trading day on November 1, 2014, there was a price reporting issue for shared locations between the CAISO market and the EIM. These shared locations schedule energy for the CAISO BAA and are located in the EIM system-wide BAA, and have associated mirror resources. In late 2014, the CAISO worked on improving these shared locations’ modelling, and reported its progress in the corresponding transitional period reports for the PAC East and PAC West BAAs.

The CAISO identified a software defect that had affected these shared locations that were introduced in July 2017. The issue had to do with incorrectly adding the congestion price of EIM transfers into the market price for schedules settled at the intertie locations; this scenario may affect schedules for imports and exports coming into the CAISO BAA, and not the transactions for EIM entities. The CAISO has performed price corrections since the end of January, and the issue was resolved on March 15, 2018.

CERTIFICATE OF SERVICE

I hereby certify that I have served the foregoing document upon the parties listed on the official service list in the above-referenced proceeding, 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 27th day of April, 2018.

/s/ Grace Clark
Grace Clark