



March 29, 2021

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. ER15-861-____
Energy Imbalance Market – Fourth Quarter 2019
Available Balancing Capacity Report**

Dear Secretary Bose:

The California Independent System Operator Corporation (CAISO) hereby submits its quarterly informational report for the fourth quarter of 2019 (October 1 to December 31, 2019) on the Available Balancing Capacity (ABC) enhancement for the western Energy Imbalance Market (EIM). The quarterly informational report is to provide the Commission with information on the performance of the ABC enhancement and to provide the same information the CAISO provides in its monthly informational reports submitted during an EIM entity's first six-month transition period.

Consistent with the Commission's directive in the December 17, 2015 order, the CAISO will continue to file such quarterly reports for at least the first year after implementation of the ABC enhancement, or until the Commission finds the quarterly informational reports are no longer needed.

Please contact the undersigned with any questions.

Respectfully submitted

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California ISO

Energy Imbalance Market

October 1 – December 31, 2019

Available Balancing Capacity Report

November 23, 2020

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I. Background

On December 17, 2015, the Federal Energy Regulatory Commission (Commission) approved the California Independent System Operator Corporation's (CAISO) proposed tariff revisions to comply with the Commission's July 20, 2015 order in FERC Docket No. ER15-861-006.¹ The CAISO's proposed tariff provisions enhanced the western Energy Imbalance Market (EIM) functionality so that the market systems automatically recognize and account for capacity an EIM entity has available to maintain reliable operations in its own balancing authority area (BAA), but has not been bid into the EIM.² This enhancement is referred to as the Available Balancing Capacity (ABC) enhancement. The CAISO implemented the ABC enhancement on March 23, 2016.

Consistent with the CAISO's commitments made in this proceeding, the Commission directed the CAISO to prepare and file with the Commission quarterly informational reports for at least the first year after implementation of the ABC enhancement, and until the Commission finds the quarterly informational reports are no longer needed.³ The quarterly informational reports are to provide information on the performance of the ABC enhancement and to include the same information the CAISO provides in its monthly informational reports submitted during an EIM entity's first six-month transition period.⁴

¹ *Cal. Indep. Sys. Operator Corp.*, 152 FERC ¶ 61,060 (2015) (July 20 Order); and *Cal. Indep. Sys. Operator Corp.*, 153 FERC ¶ 61, 305 (2015) (December 17 Order).

² December 17 Order at P 1.

³ December 17 Order at P 99

⁴ December 17 Order at P 39.

II. Highlights

- The CAISO implemented the ABC enhancement on March 23, 2016. No new EIM entities were undergoing the transitional period for price discovery.
- This report covers the following EIM entities: Pacificorp West (PAC West), Pacificorp East (PAC East), NV Energy, Arizona Public Service (APS), Idaho Power Corporation (IPCO), Puget Sound Energy (PSE), Powerex (PWRX), Portland General Electric (PGE), and Balancing Authority of Northern California, Sacramento Municipal Utility District (BANCSMUD).
- Most EIM entities submitted ABC in nearly all intervals of the fourth quarter of 2019, with some exceptions in which no ABC bids were submitted by IPCO.
- The EIM dispatched ABC, in either upward or downward direction very infrequently, as high as 0.9 percent for the APS BAA, but as low as zero percent in other EIM BAAs.
- The BANCSMUD BAA used as many as five different resources to support their ABC submissions.
- Overall, the impact of ABC was low, based on the relative low frequency of scheduling and availability when power constraint infeasibilities were observed.

III. Available Balancing Capacity

A. Available Balancing Capacity Submitted to the Market

Each EIM entity can identify and set the amount of ABC they will make available to the CAISO and the resources supporting this capacity through its EIM entities resource plan. The EIM entity submits this capacity to the CAISO on an hourly basis, and it is available for both the Fifteen-Minute Market (FMM) and the five-minute Real-Time Dispatch (RTD). The figures in this section show the ABC made available in each of the EIM BAAs. IPCO did not submit any ABC bids in the fourth quarter of 2019, thus is not displayed graphically below.

For each BAA, there are two plots to show the amount of ABC dispatched in the FMM and RTD, separately. The blue bars indicate positive values and illustrate the upward ABC made available by the EIM entity; the green bars indicate negative values and illustrate the downward ABC made available. Red markers indicate the instances where the ABC was dispatched in either the upward or downward direction.

Figure 1: Submitted and Dispatched ABC in the PAC West BAA – FMM

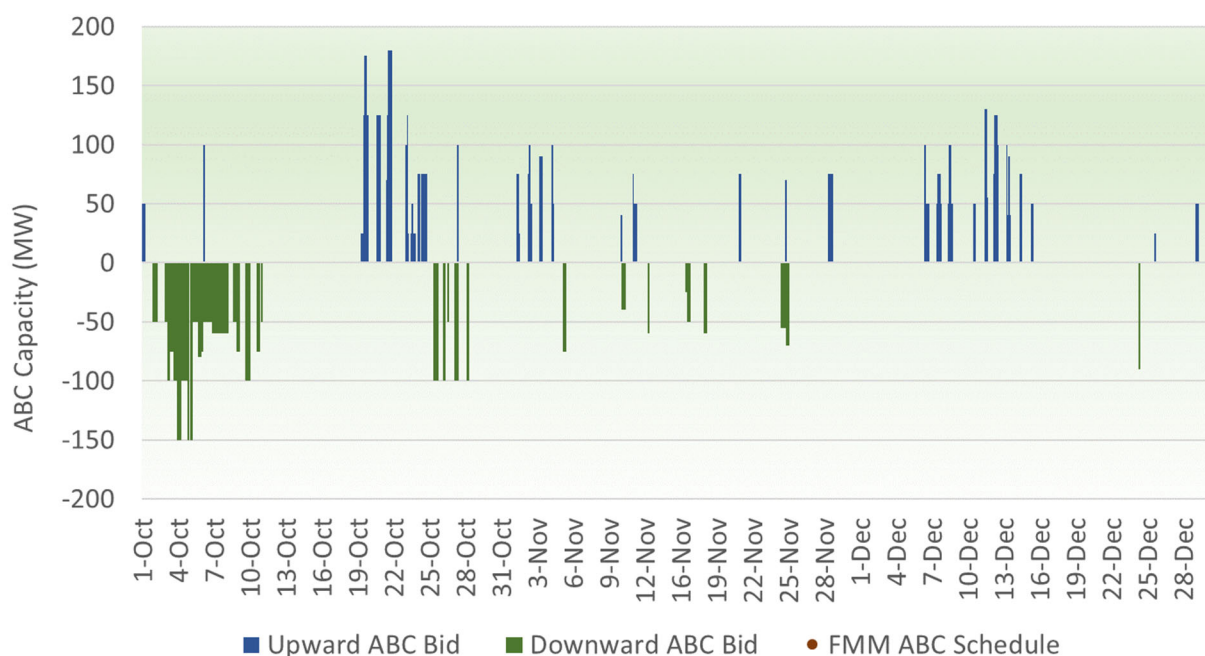


Figure 2: Submitted and Dispatched ABC in the PAC West BAA – RTD

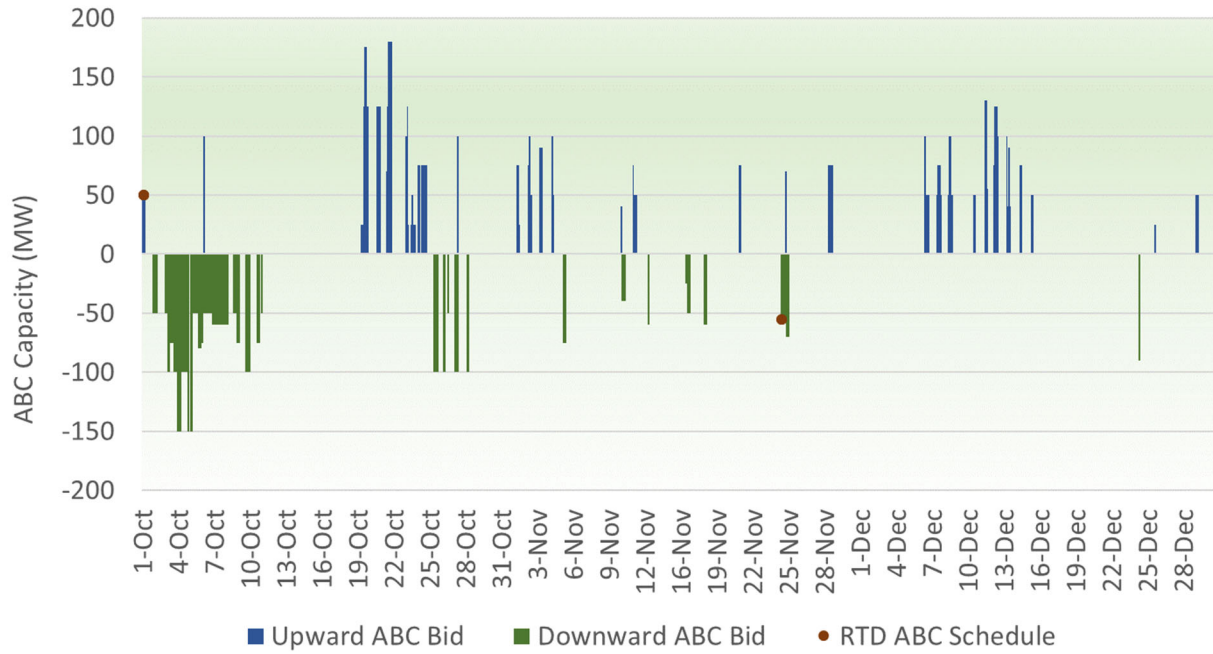


Figure 3: Submitted and Dispatched ABC in the PAC East BAA – FMM

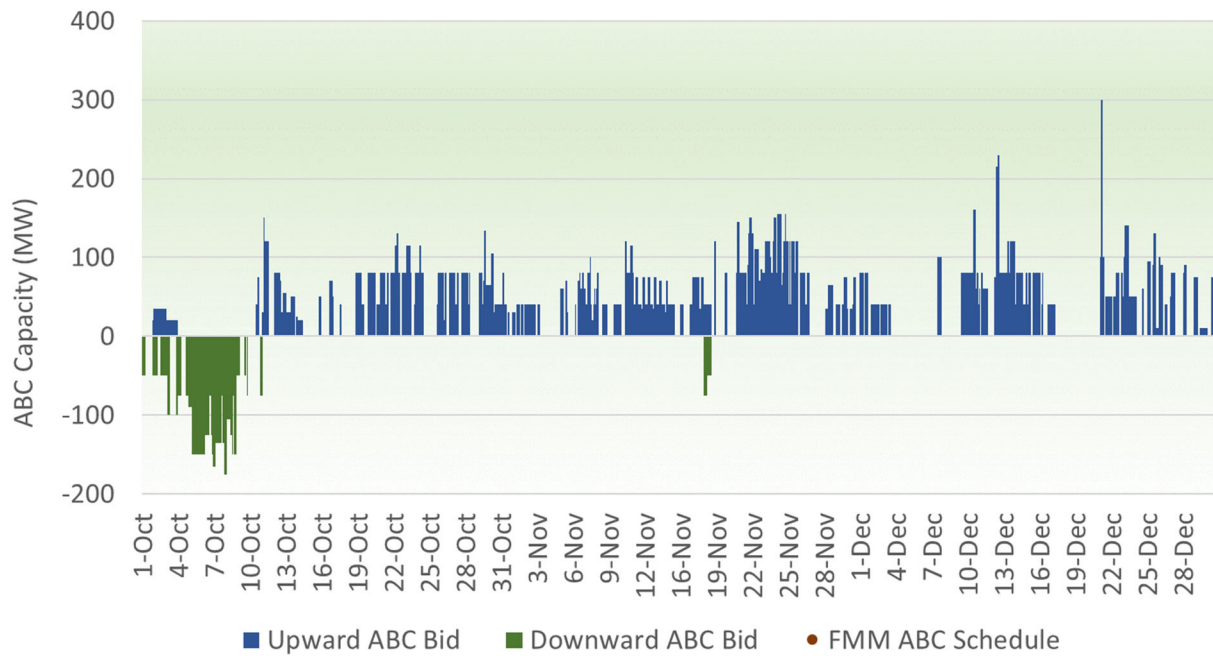


Figure 4: Submitted and Dispatched ABC in the PAC East BAA – RTD

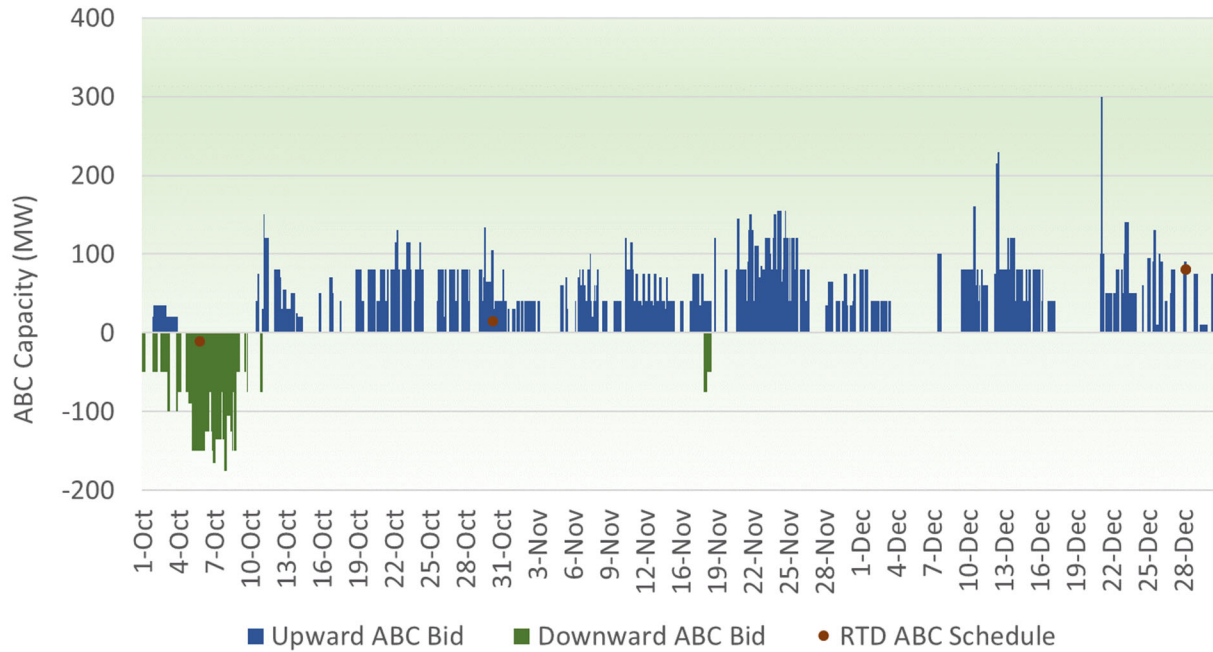


Figure 5: Submitted and Dispatched ABC in the NV Energy BAA – FMM

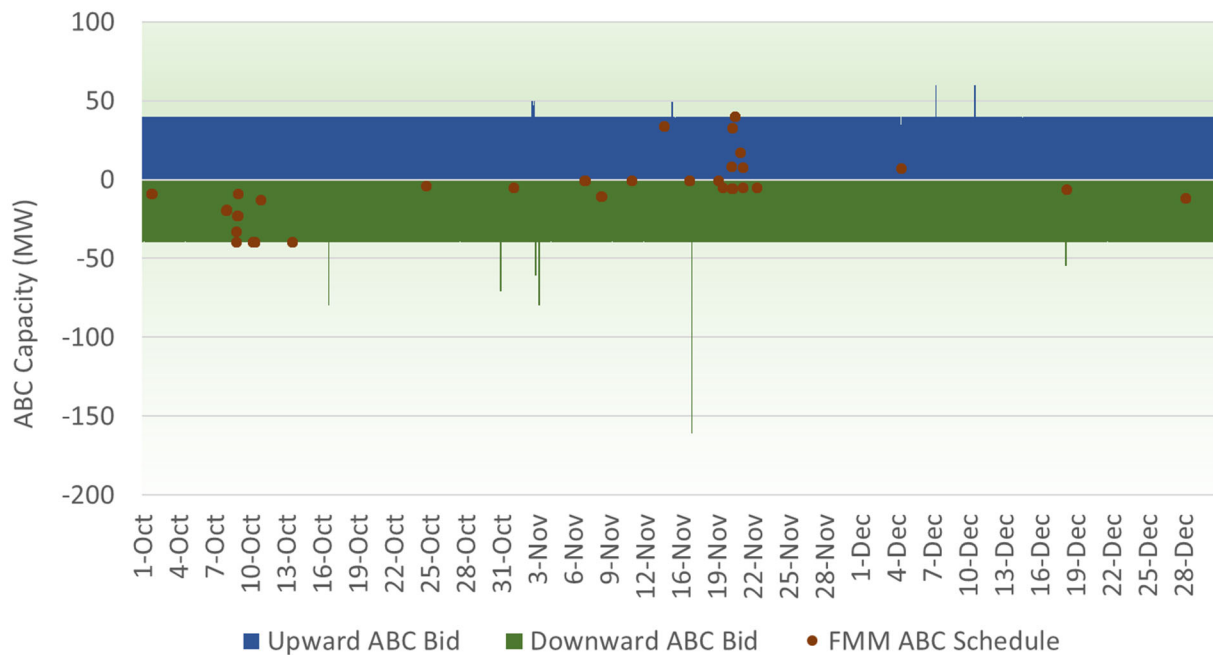


Figure 6: Submitted and Dispatched ABC in the NV Energy BAA – RTD

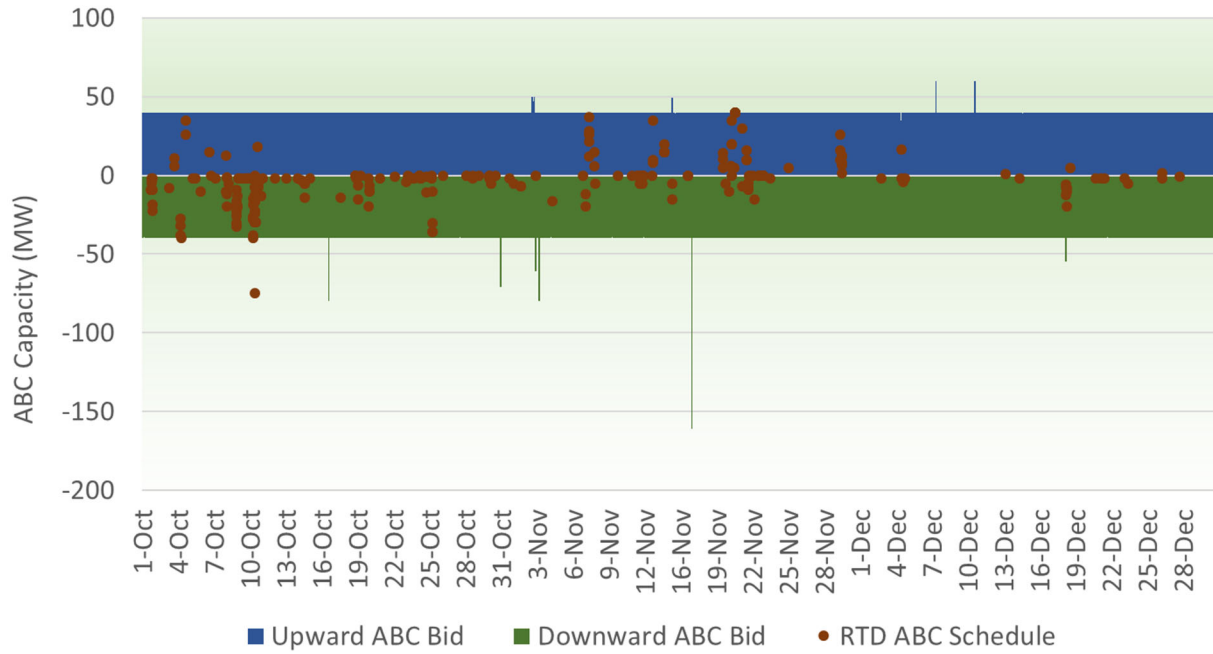


Figure 7: Submitted and Dispatched ABC in the APS BAA – FMM

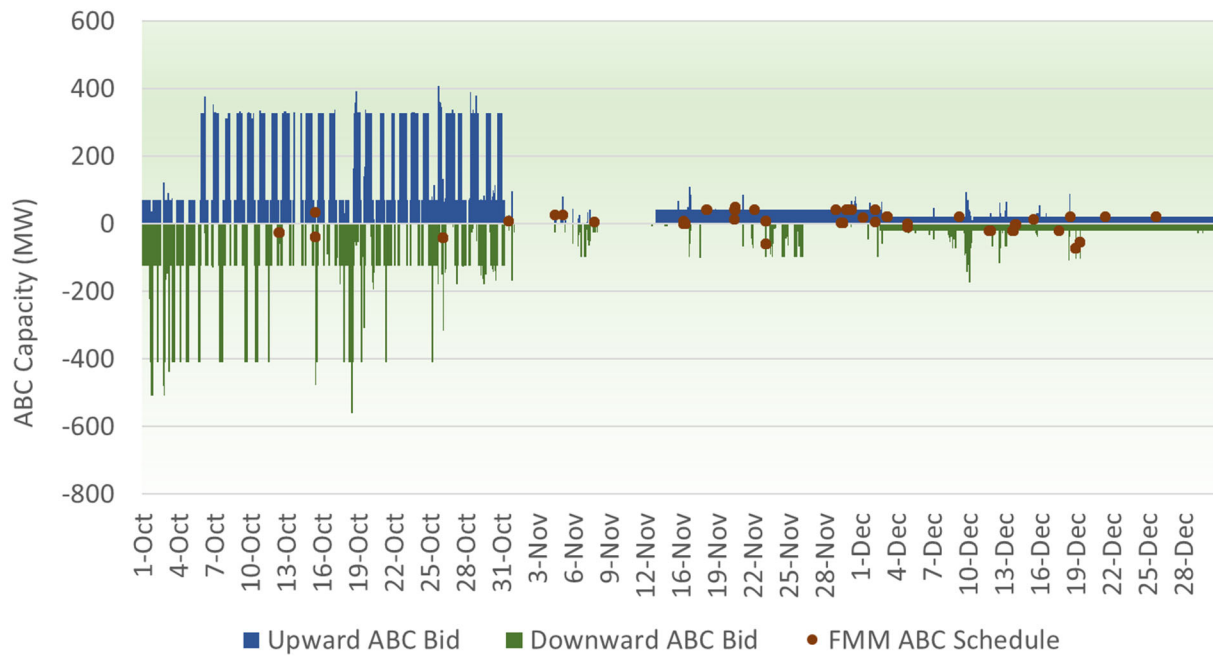


Figure 8: Submitted and Dispatched ABC in the APS BAA – RTD

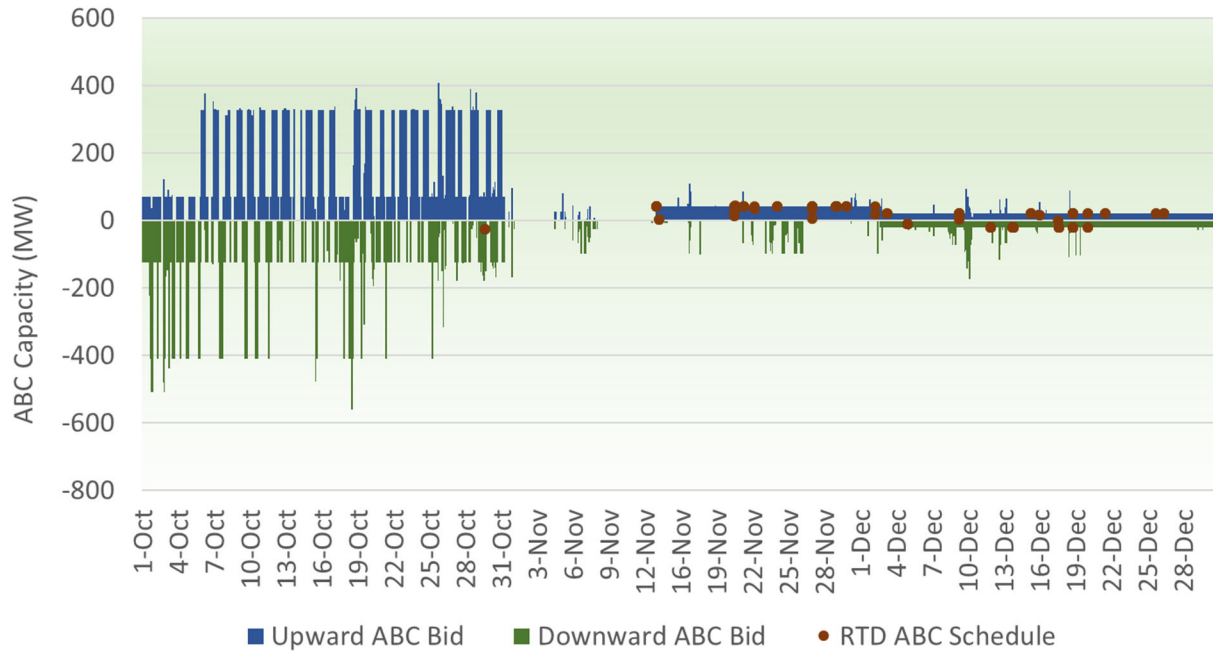


Figure 9: Submitted and Dispatched ABC in the PSE BAA – FMM

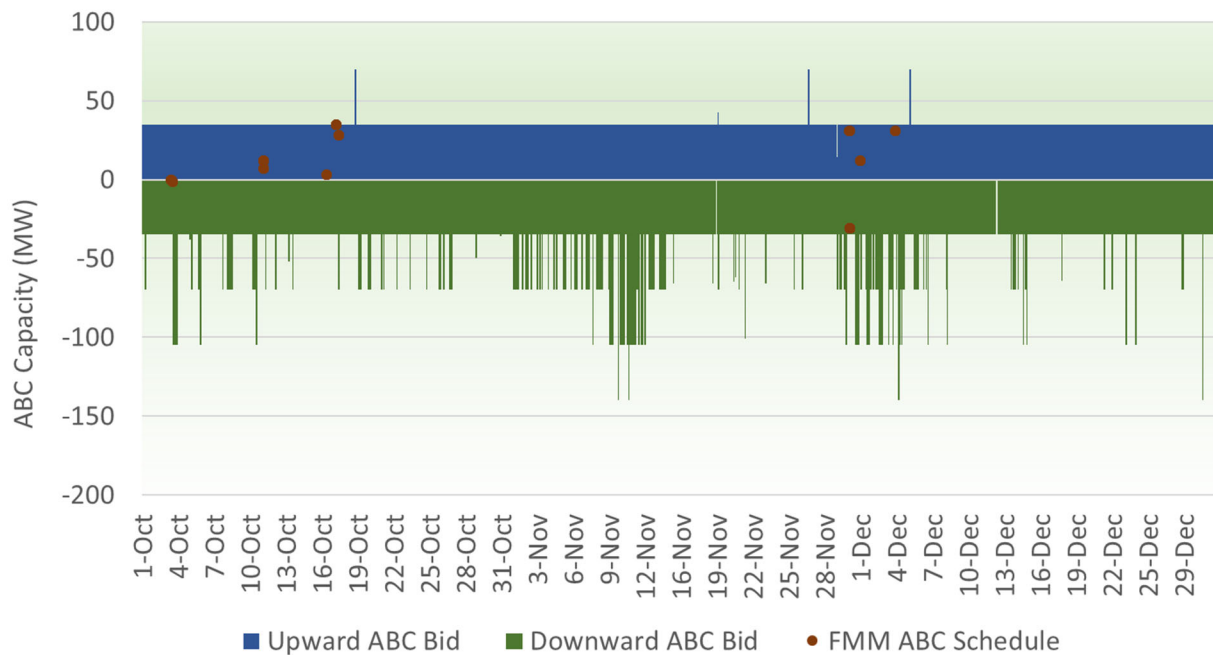


Figure 10: Submitted and Dispatched ABC in the PSE BAA – RTD

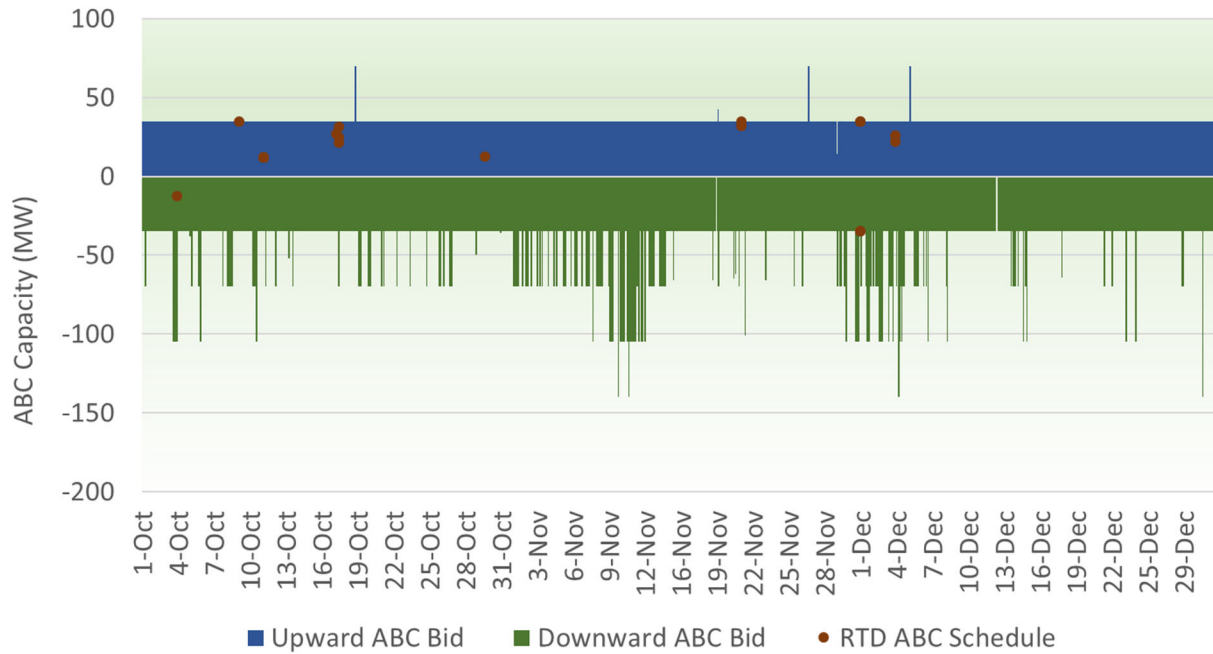


Figure 11: Submitted and Dispatched ABC in the PGE BAA – FMM

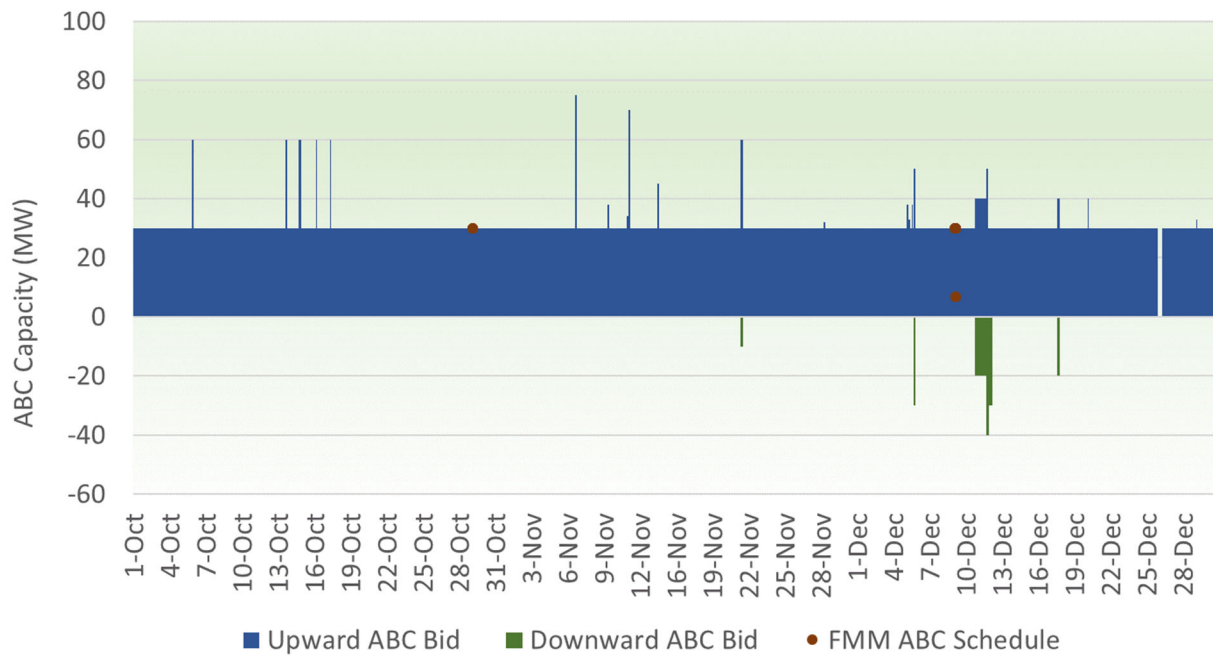


Figure 12: Submitted and Dispatched ABC in the PGE BAA – RTD

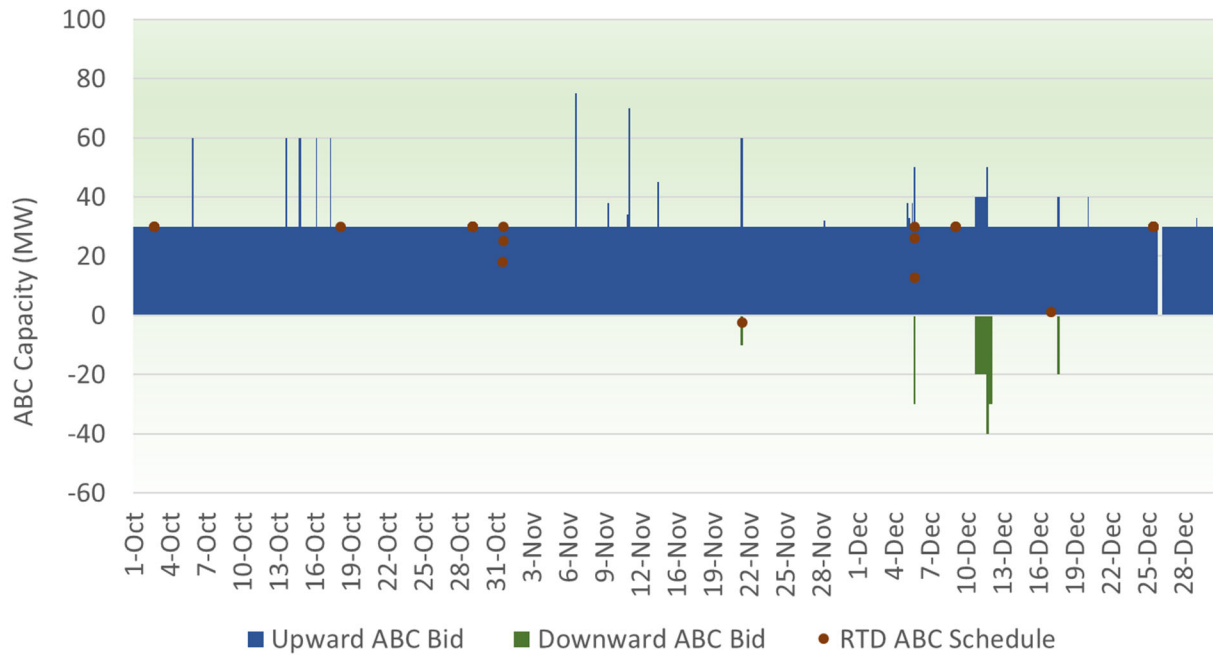


Figure 13: Submitted and Dispatched ABC in the PWRX BAA – FMM

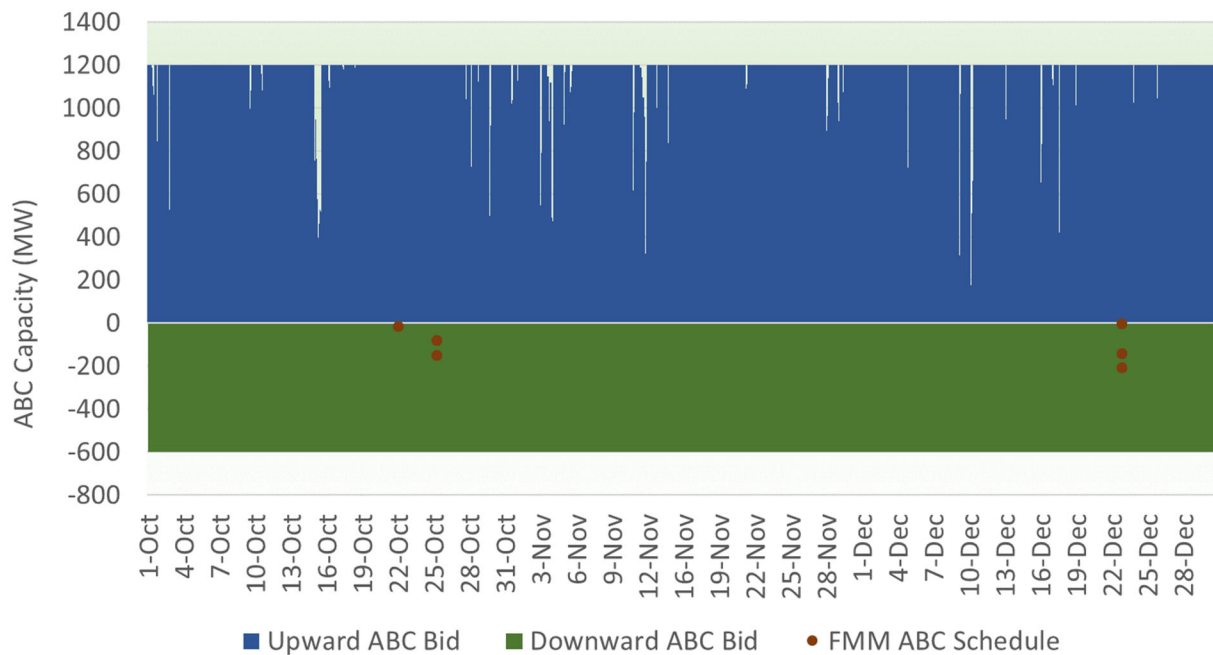


Figure 14: Submitted and Dispatched ABC in the PWRX BAA – RTD

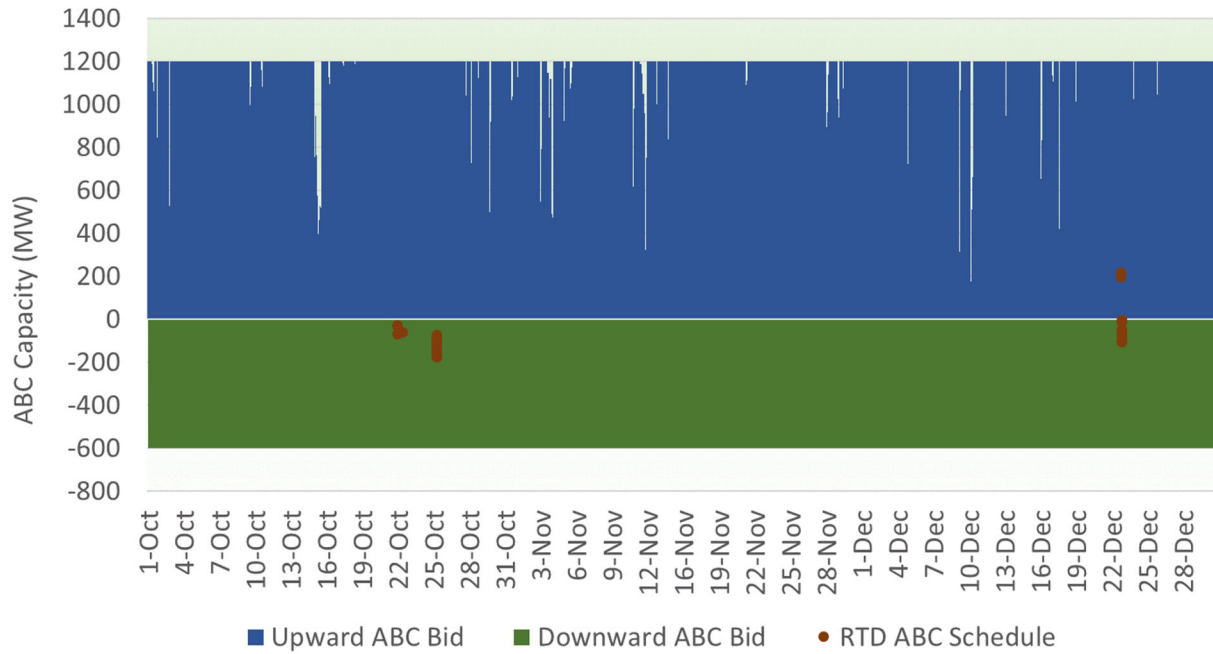


Figure 15: Submitted and Dispatched ABC in the BANCSMUD BAA – FMM

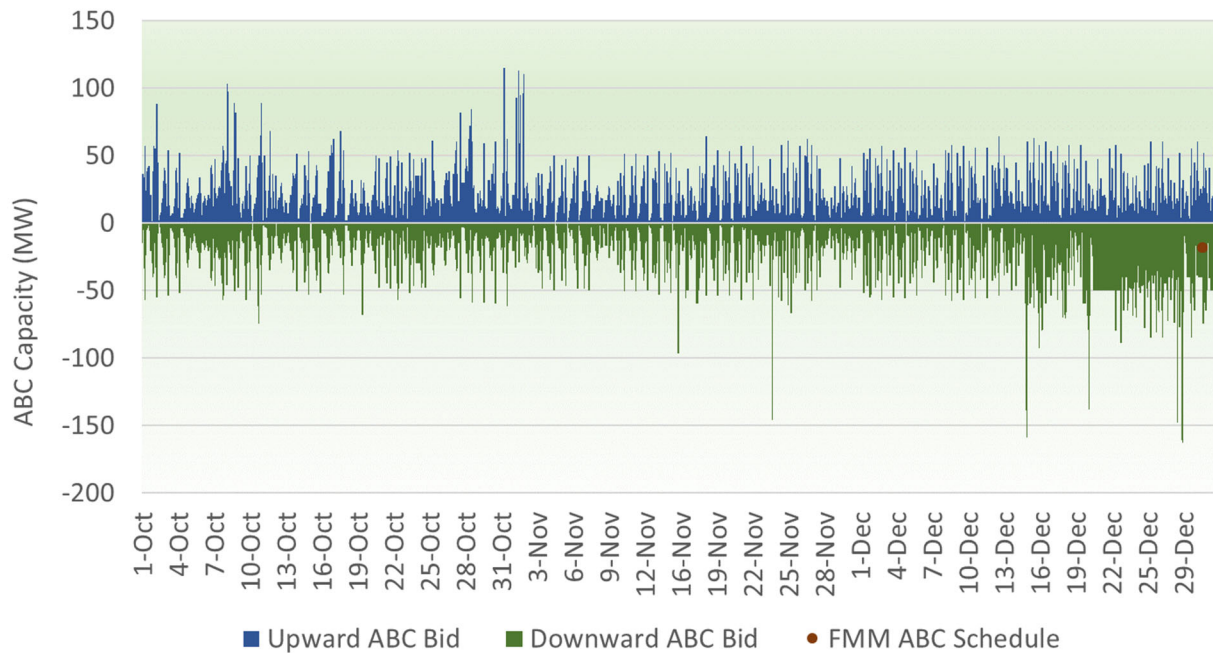


Figure 16: Submitted and Dispatched ABC in the BANCSMUD BAA – RTD

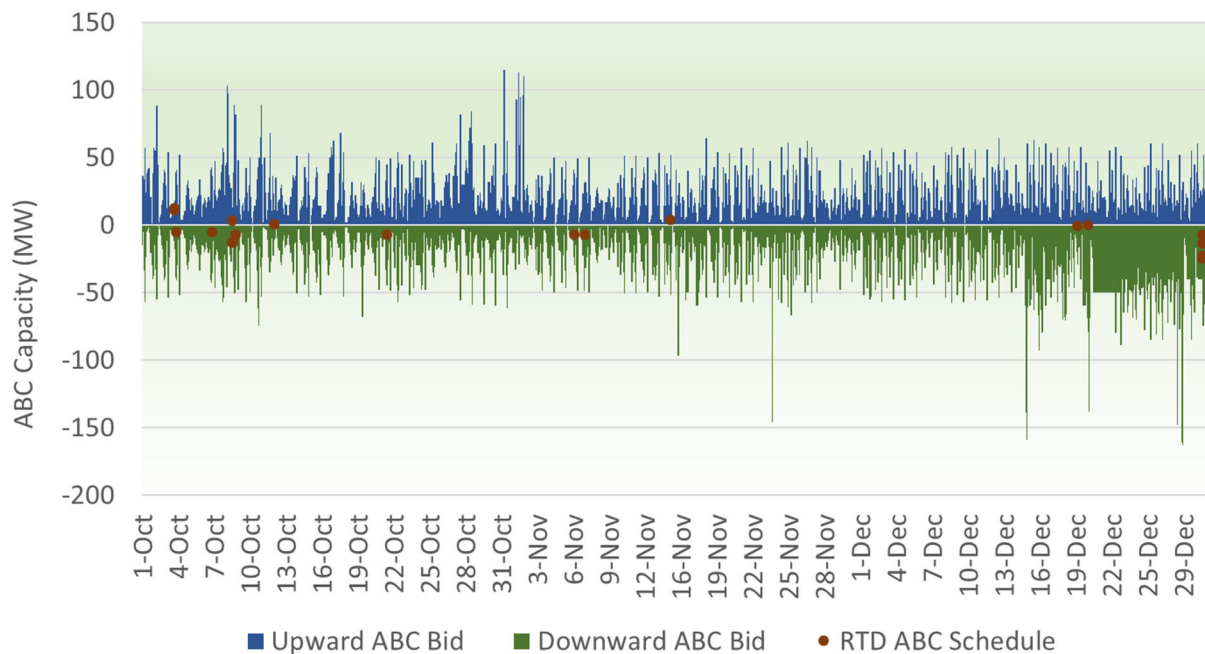


Table 1 summarizes the percentage of intervals in which each EIM entity submitted ABC to the EIM.

Table 1: Frequency of ABC Submitted to the EIM

Balancing Authority Area	Upward Capacity	Downward Capacity
PAC West	7.99%	10.71%
PAC East	50.42%	7.58%
NV Energy	99.95%	99.77%
APS	78.48%	52.29%
PSE	98.32%	99.04%
IPCO	--	--
PGE	99.02%	1.81%
PWRX	100%	100%
BANCSMUD	97.74%	97.15%

Table 2 shows the frequency of each EIM entity’s dispatched ABC, when the EIM entities made ABC available, for both the FMM and RTD.

Table 2: Frequency of EIM Dispatched ABC in the FMM and RTD

Balancing Authority Area	Upward Capacity		Downward Capacity	
	FMM	RTD	FMM	RTD
PAC West	0%	0.14%	0%	0.07%
PAC East	0%	0.02%	0%	0.05%
NV Energy	0.10%	0.22%	0.51%	0.81%
APS	0.93%	0.40%	0.87%	0.34%
PSE	0.13%	0.08%	0.06%	0.01%
IPCO	--	--	--	--
PGE	0.06%	0.12%	0%	0.21%
PWRX	0%	0.01%	0.07%	0.11%
BANCSMUD	0%	0.02%	0.01%	0.06%

B. Resources Supporting Available Balancing Capacity

The figures in this section show the number of different resources supporting the ABC the EIM entities submitted to the FMM and RTD in both the upward and downward directions. IPCO did not submit any ABC bids in the quarter and is not included graphically below.

Figure 17: Number of Resources Supporting the Submitted ABC in the PAC West BAA

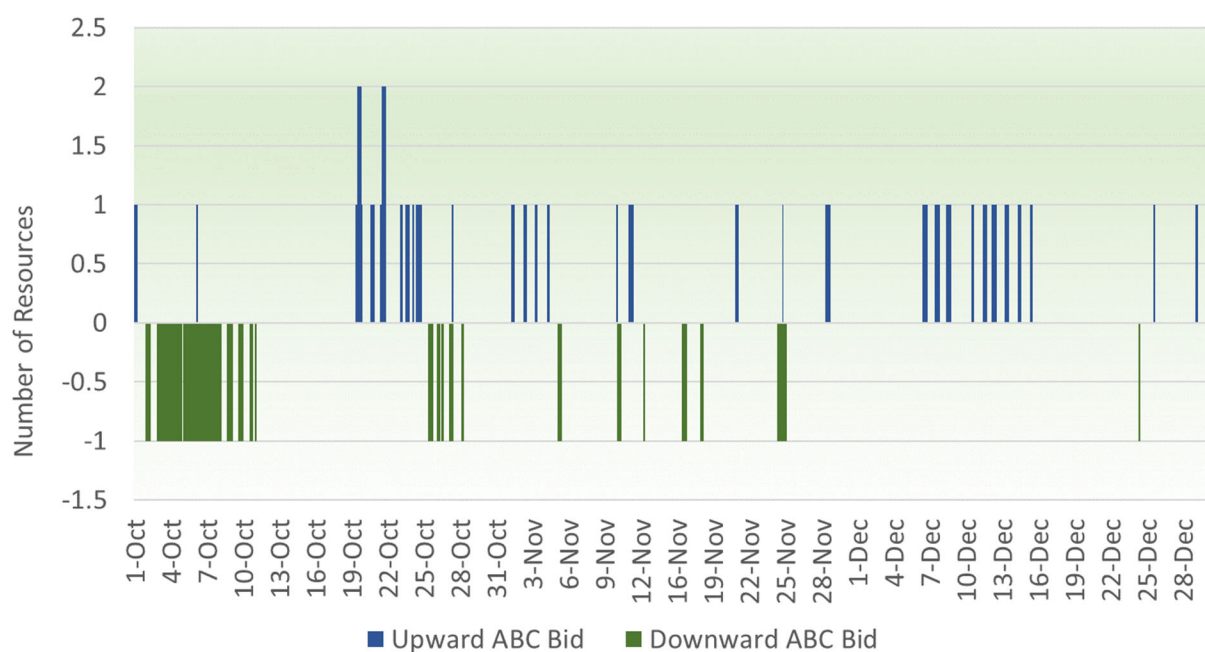


Figure 18: Number of Resources Supporting the Submitted ABC in the PAC East BAA

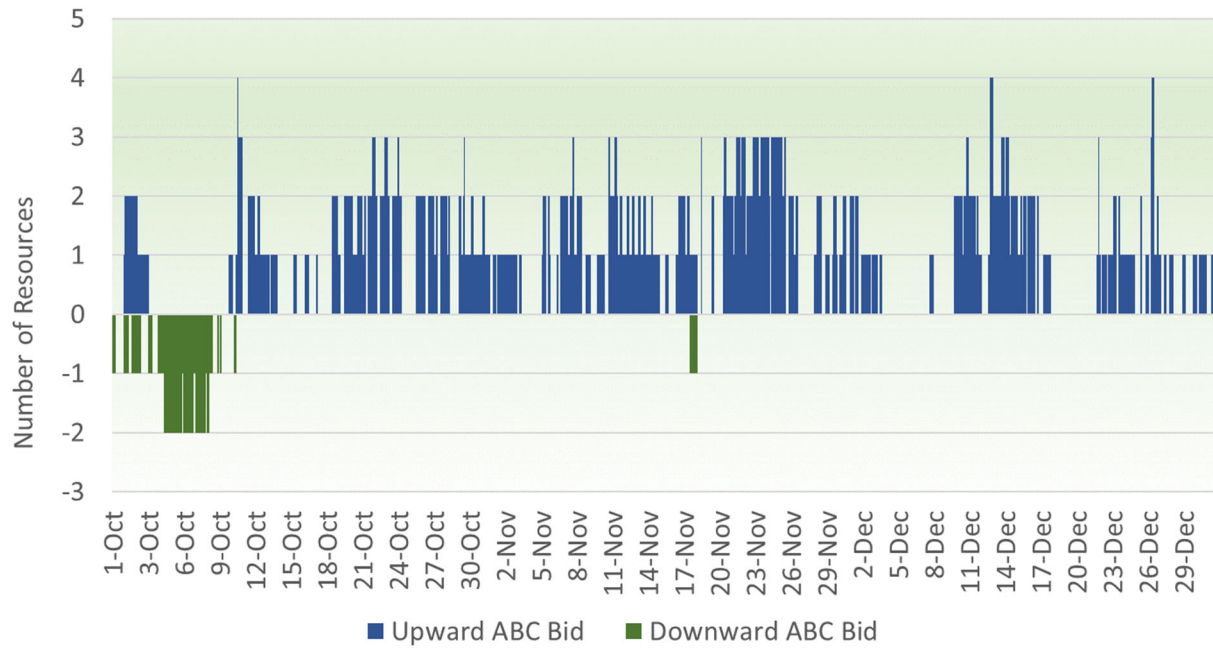


Figure 19: Number of Resources Supporting the Submitted ABC in the NV Energy BAA

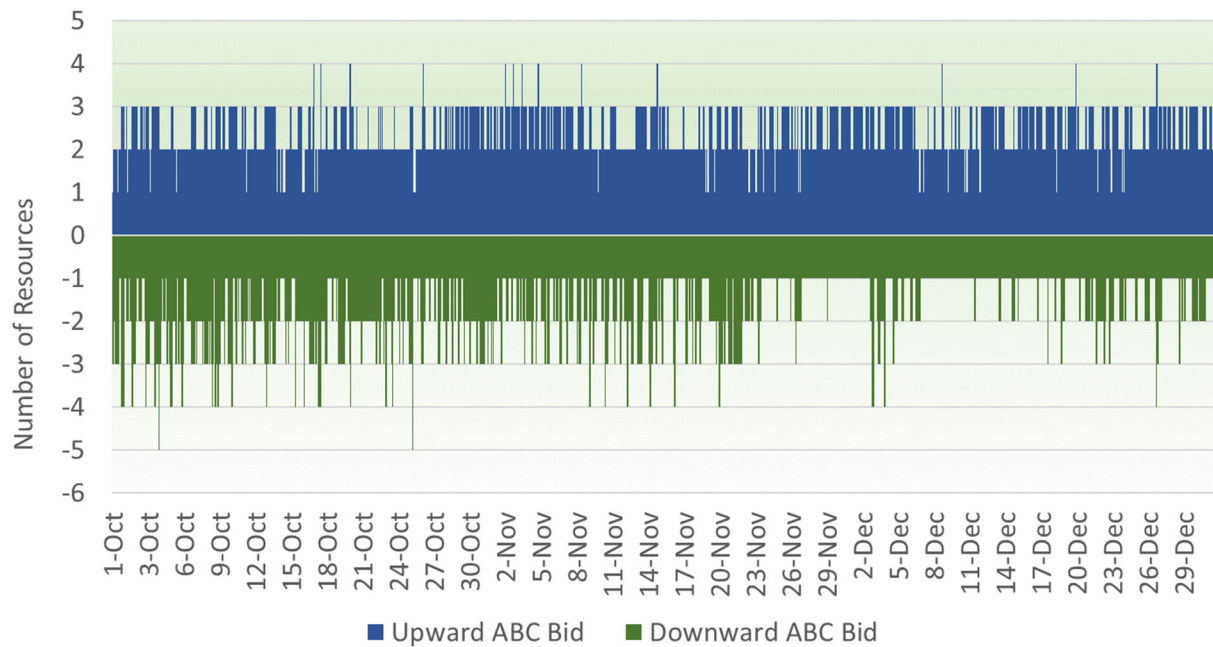


Figure 20: Number of Resources Supporting the Submitted ABC in the APS BAA

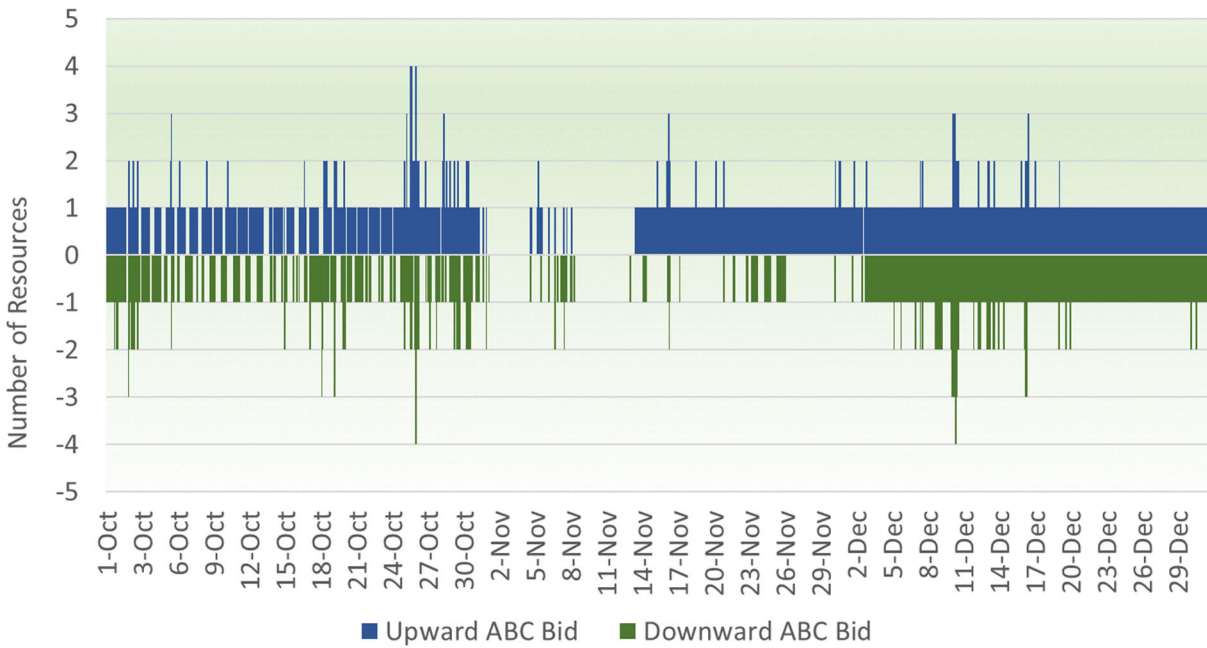


Figure 21: Number of Resources Supporting the Submitted ABC in the PSE BAA

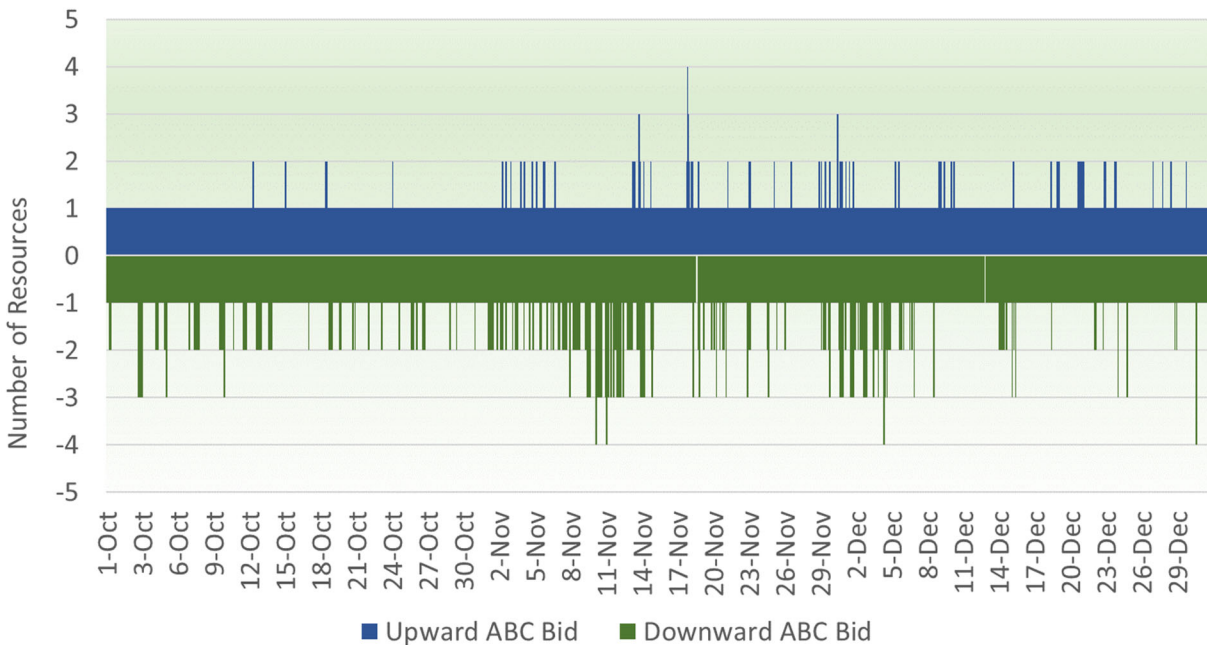


Figure 22: Number of Resources Supporting the Submitted ABC in the PGE BAA

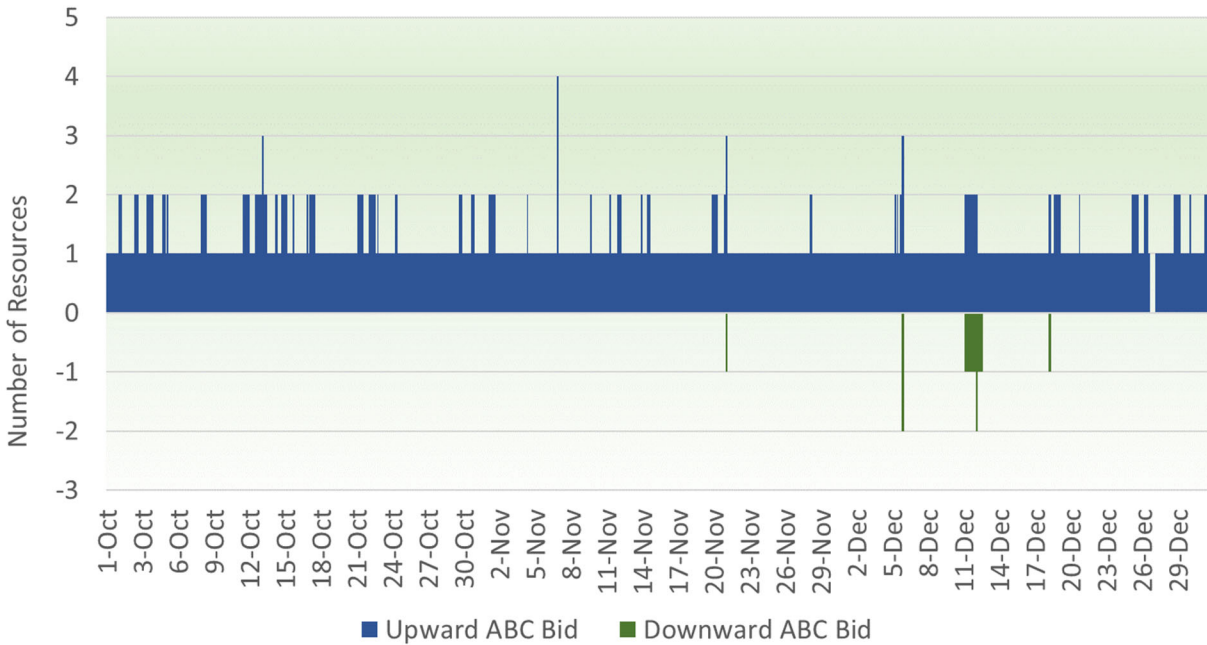


Figure 23: Number of Resources Supporting the Submitted ABC in the PWRX BAA

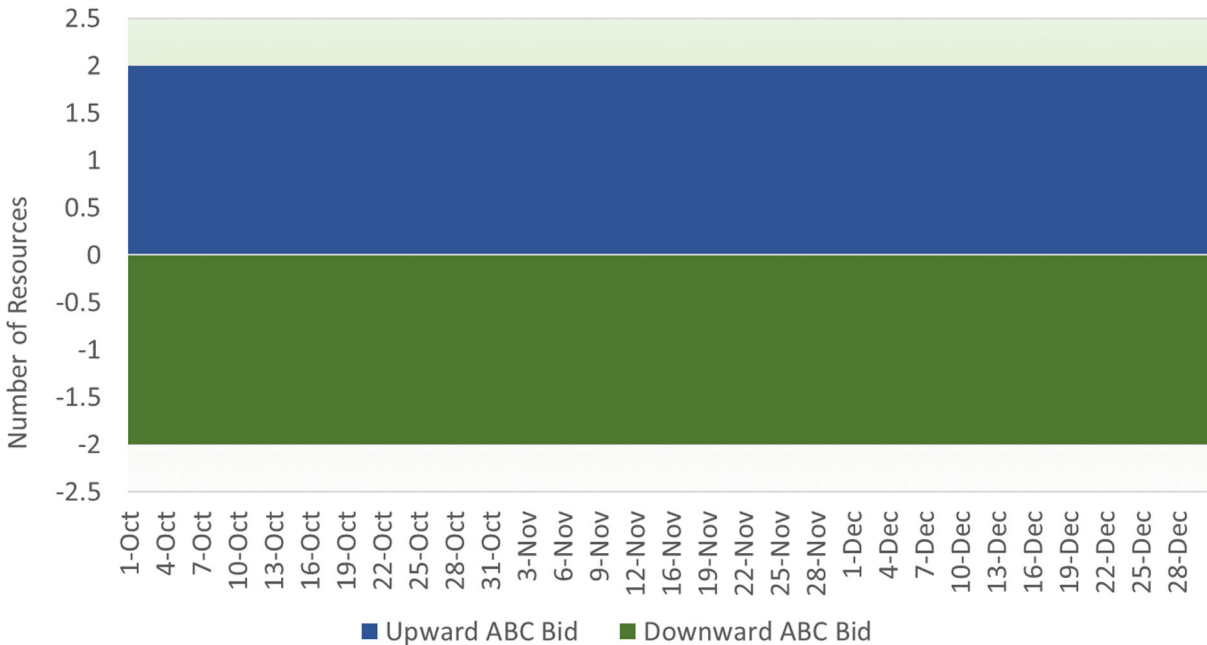
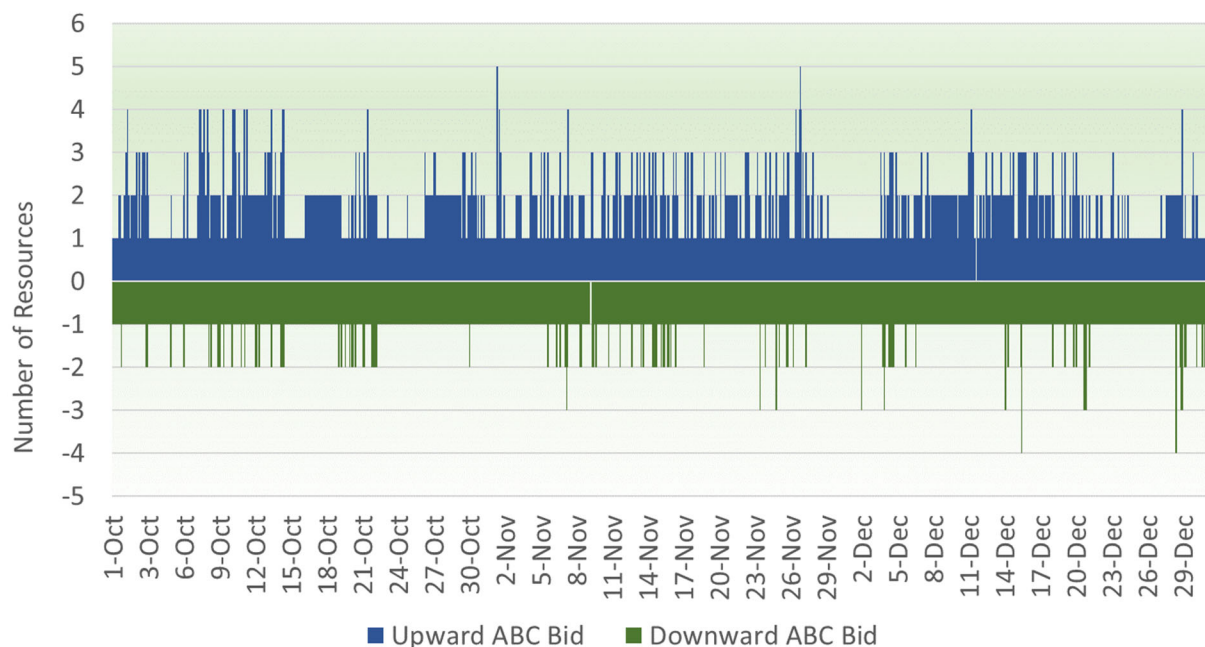


Figure 24: Number of Resources Supporting the Submitted ABC in the BANCSMUD BAA



C. Available Balancing Capacity and Power Balance Constraint Infeasibilities

The purpose of the ABC enhancement is to make capacity available that otherwise would not be visible to the EIM. The primary objective in making such capacity available is that the EIM can recognize and access that capacity when the conditions warrant its use, namely when the EIM is running out of capacity made available through economic bids. The ABC is capacity stacked above economic bids, but below the power balance constraint relaxation penalty price. When the market is tight in supply and it has exhausted all effective economic bids, the market clearing process will access the ABC. If there is sufficient ABC, the EIM will relax the power balance constraint to clear the market. As such, the market clearing process uses the ABC to resolve the power balance infeasibility. If instead the ABC identified is not sufficient to cure the infeasibility, the ABC may be exhausted and there may still be the need to relax the power balance constraint in order to clear the EIM.

The figures in this section show the amount of ABC bids submitted in the FMM and RTD, along with the power balance constraint infeasibilities, separately.

Powerex is not included below there were no FMM or RTD power balance constraint infeasibilities during that time. There were also no FMM infeasibilities for BANCSMUD.

Figure 25: Submitted ABC and Power Balance Constraint Infeasibilities in the PAC West BAA – FMM

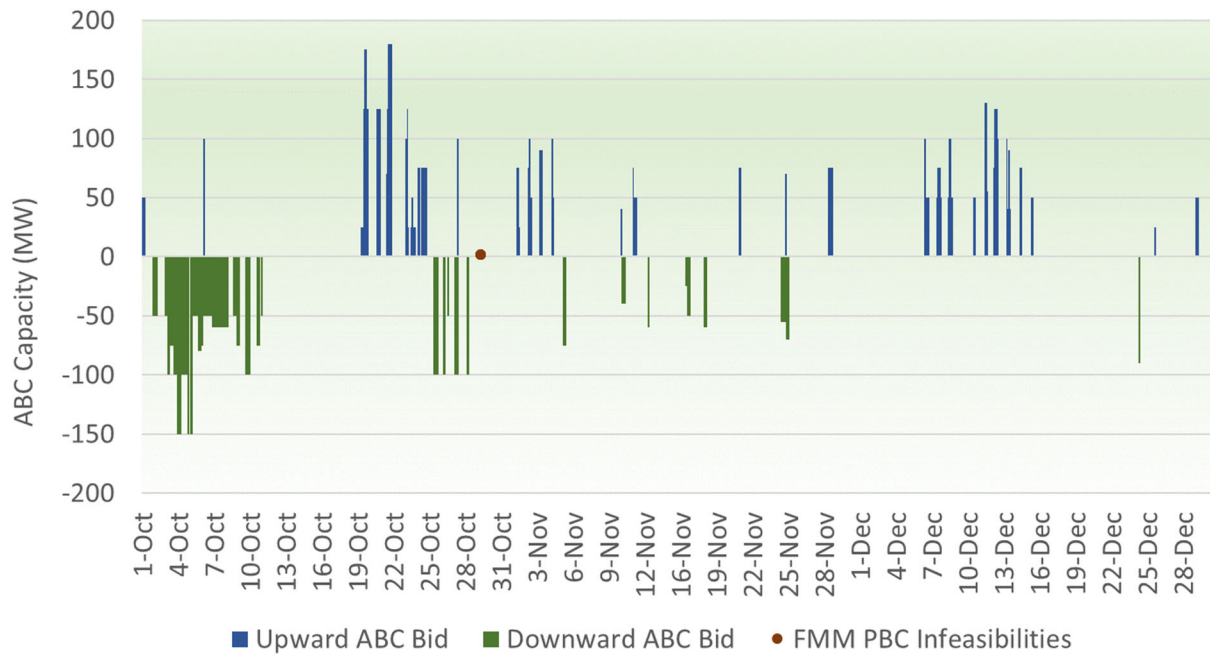


Figure 26: Submitted ABC and Power Balance Constraint Infeasibilities in the PAC West BAA – RTD

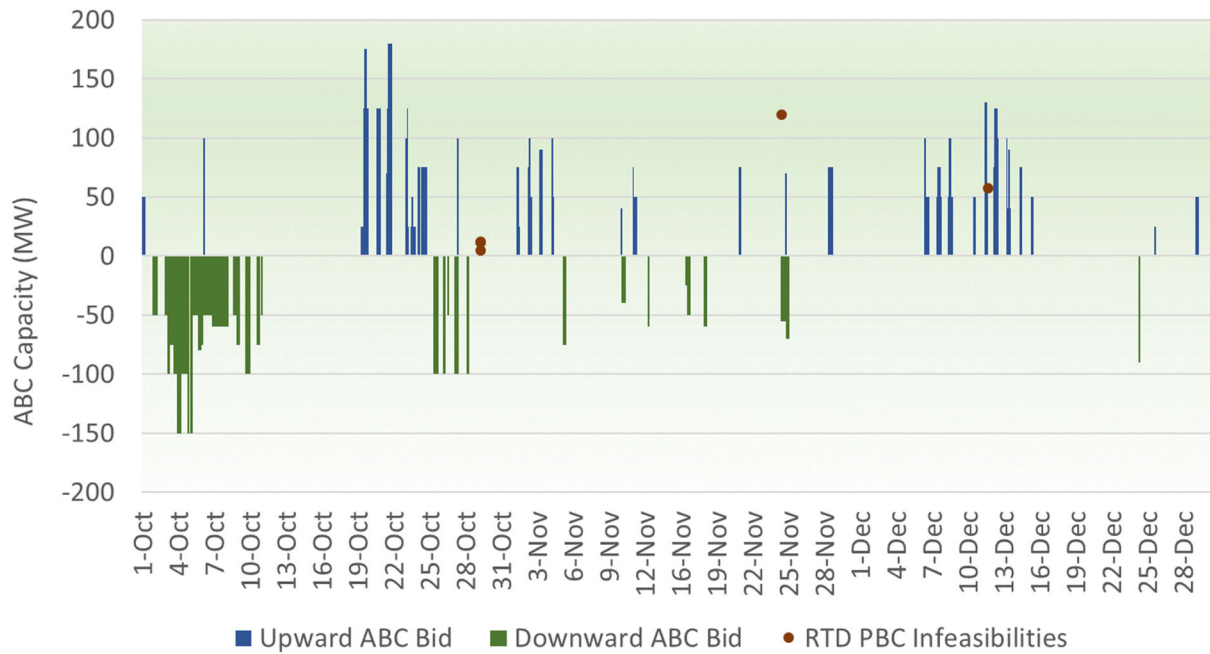


Figure 27: Submitted ABC and Power Balance Constraint Infeasibilities in the PAC East BAA – FMM

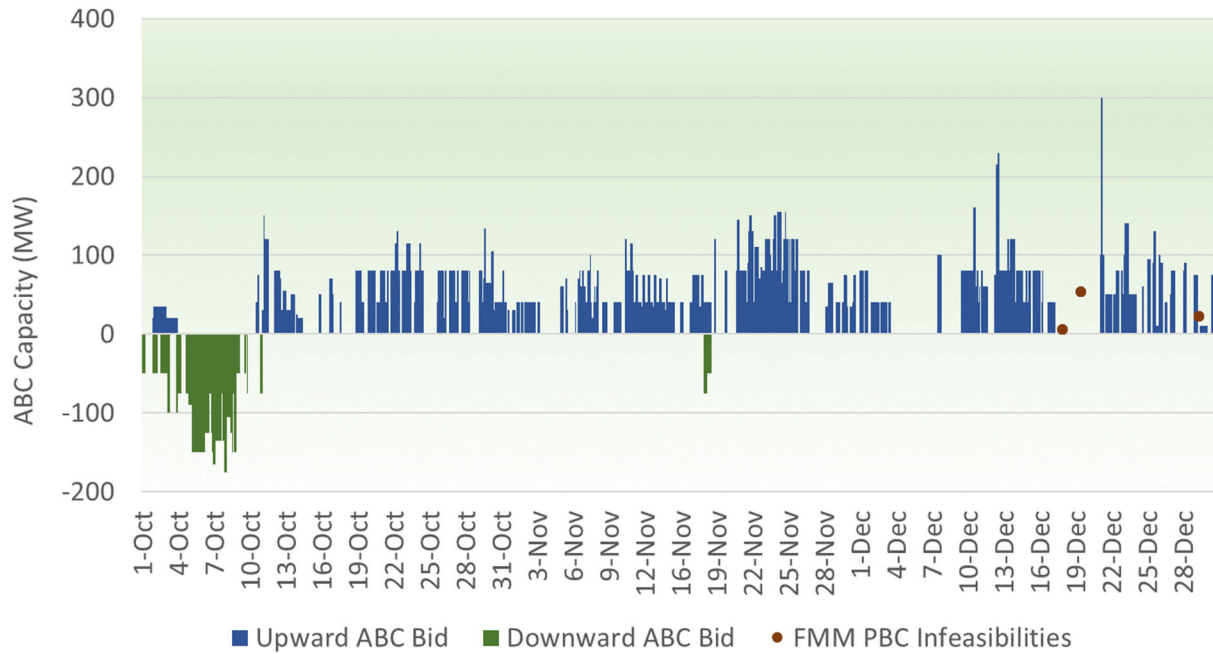


Figure 28: Submitted ABC and Power Balance Constraint Infeasibilities in the PAC East BAA – RTD

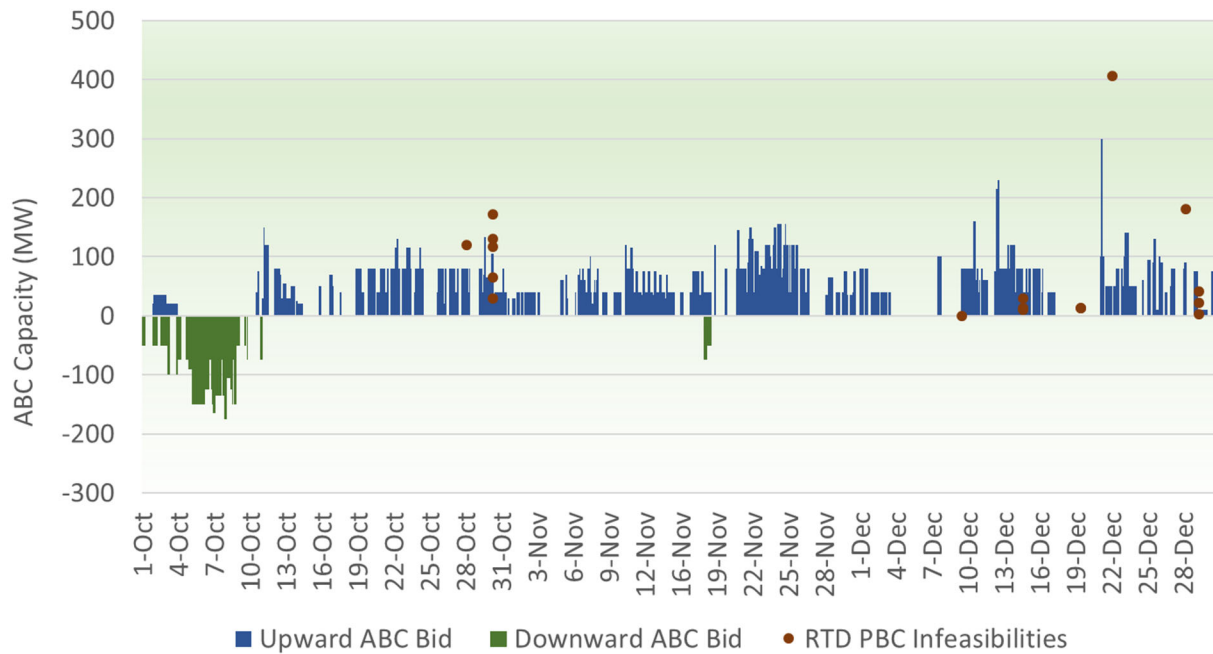


Figure 29: Submitted ABC and Power Balance Constraint Infeasibilities in the NV Energy BAA – FMM

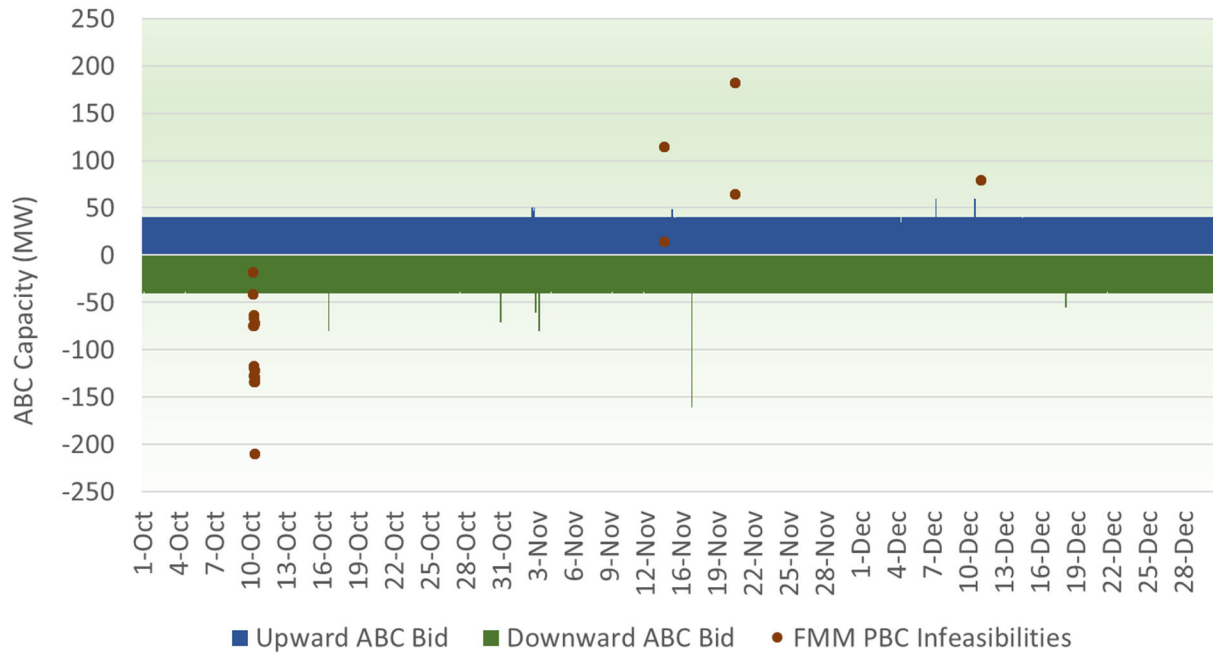


Figure 30: Submitted ABC and Power Balance Constraint Infeasibilities in the NV Energy BAA – RTD

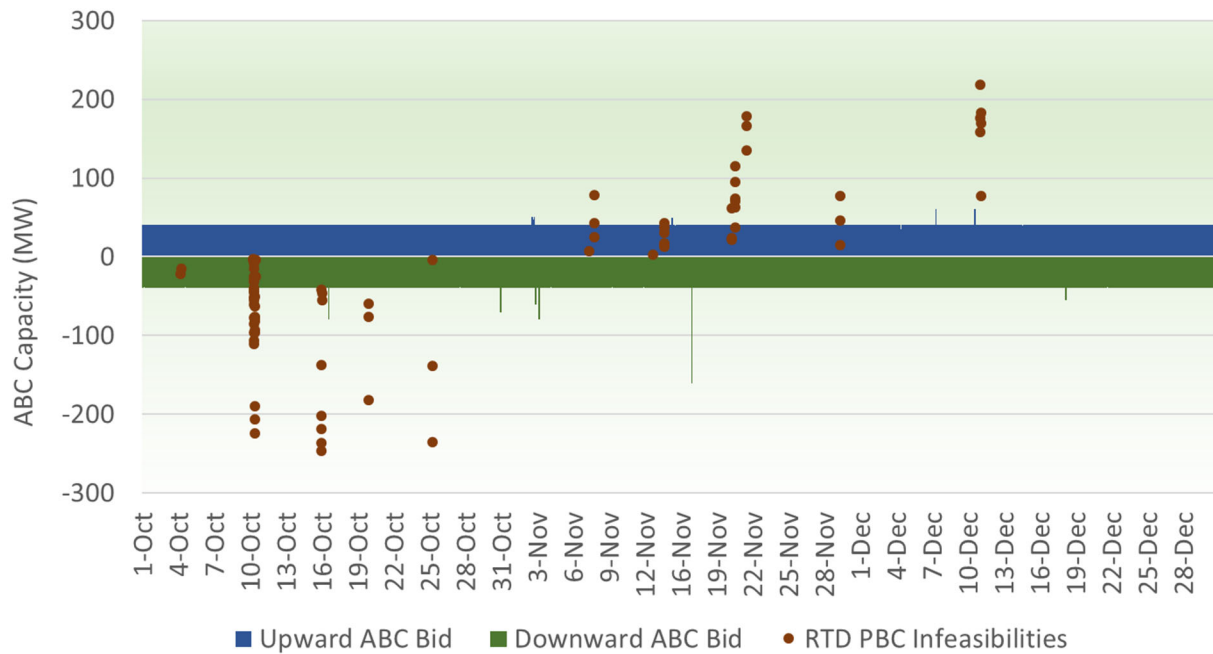


Figure 31: Submitted ABC and Power Balance Constraint Infeasibilities in the APS BAA – FMM

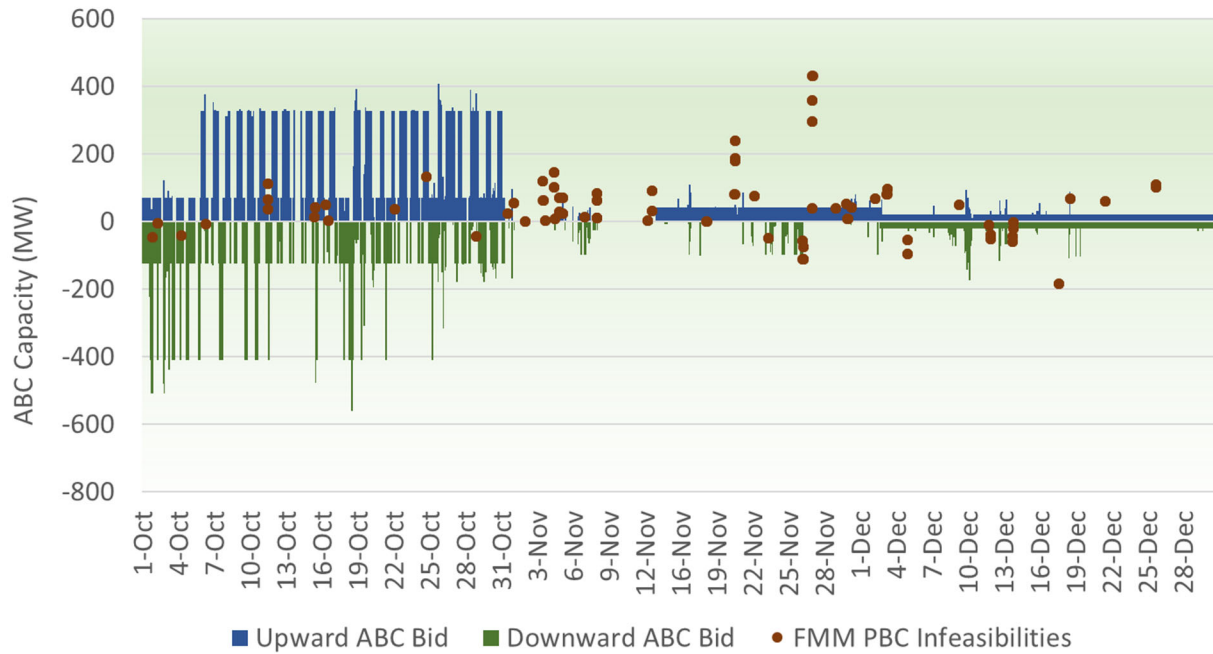


Figure 32: Submitted ABC and Power Balance Constraint Infeasibilities in the APS BAA – RTD

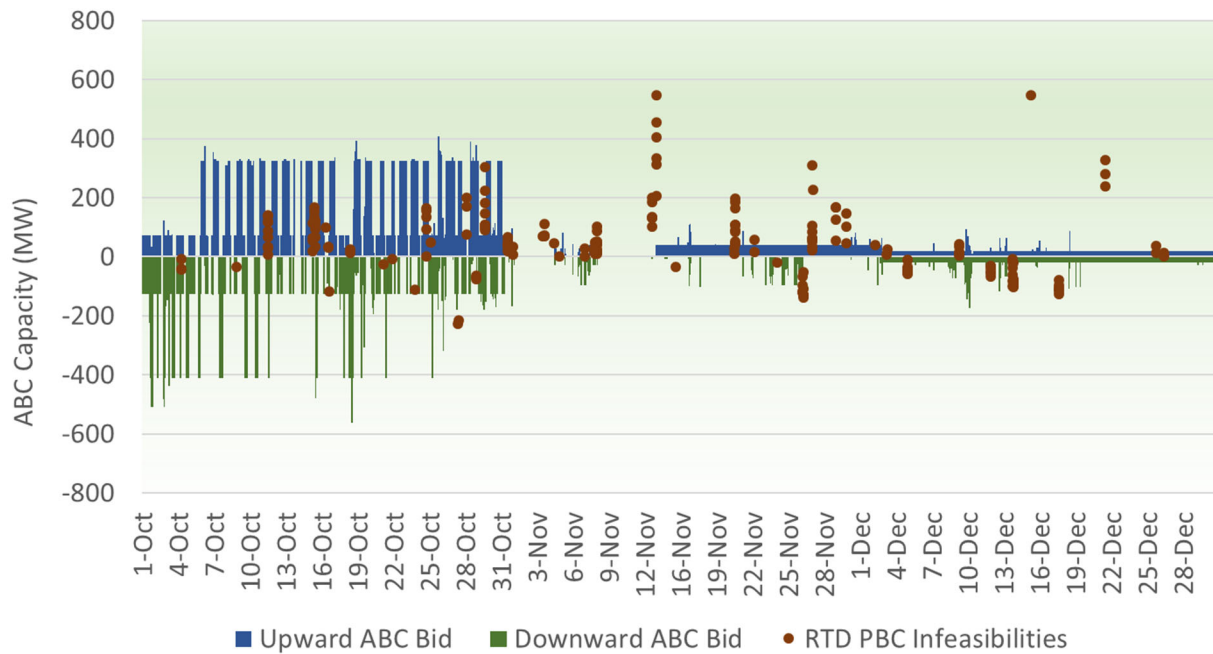


Figure 33: Submitted ABC and Power Balance Constraint Infeasibilities in the PSE BAA – FMM

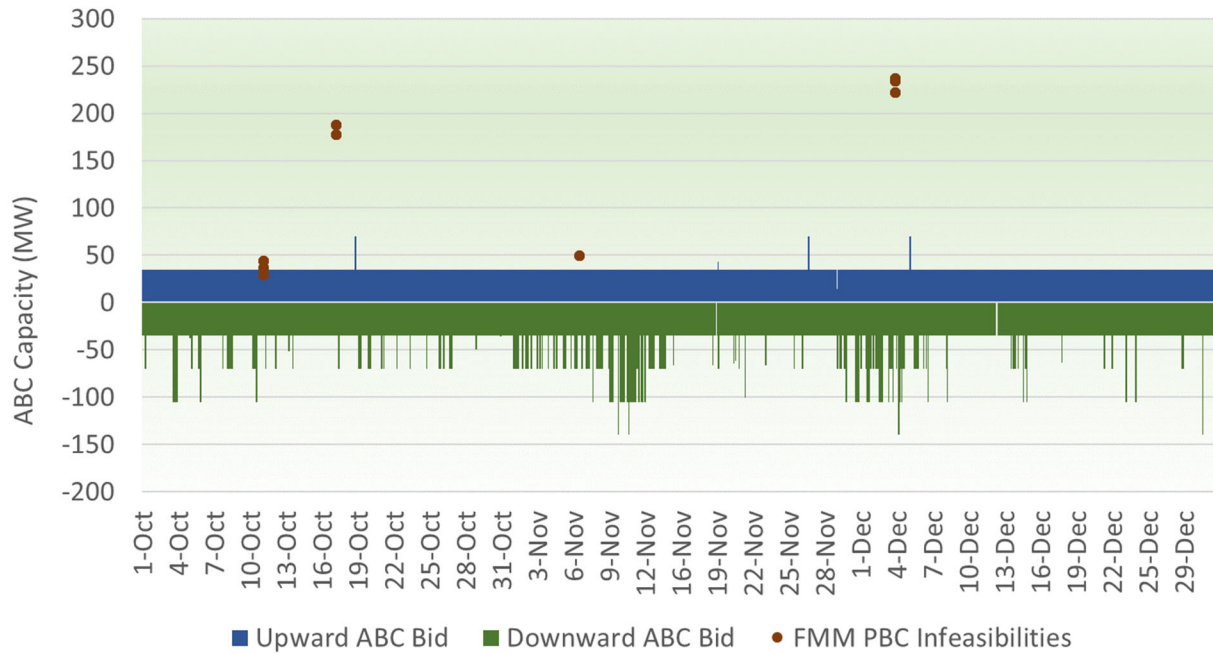


Figure 34: Submitted ABC and Power Balance Constraint Infeasibilities in the PSE BAA – RTD

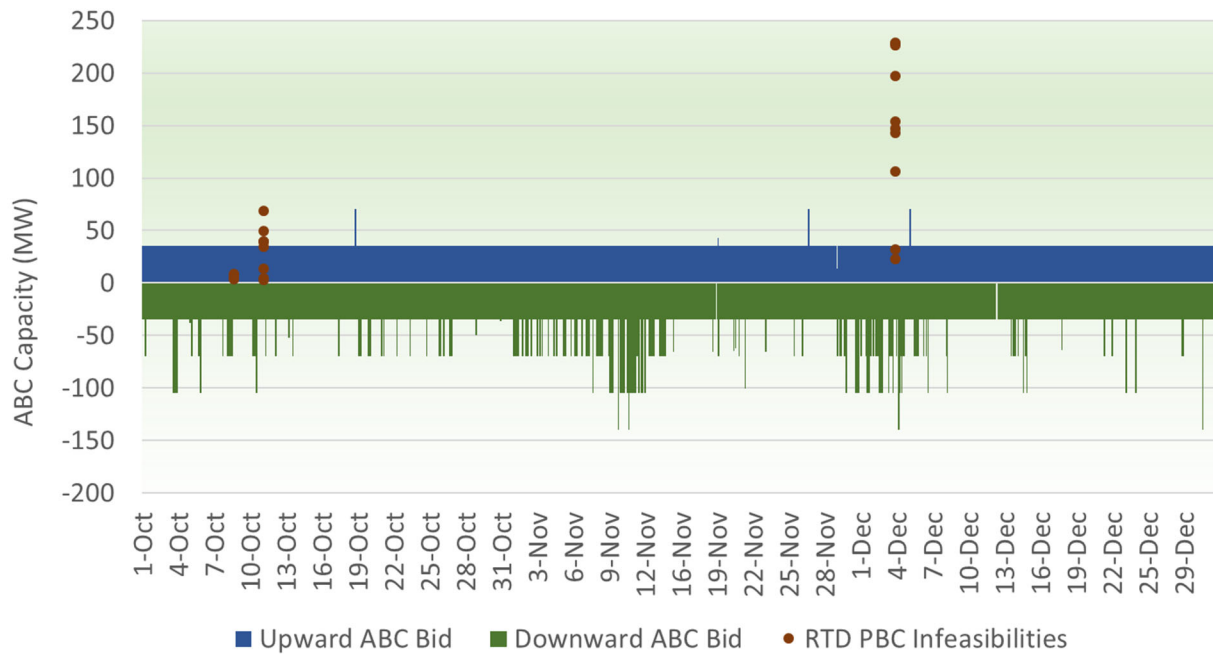


Figure 35: Submitted ABC and Power Balance Constraint Infeasibilities in the IPCO BAA – FMM

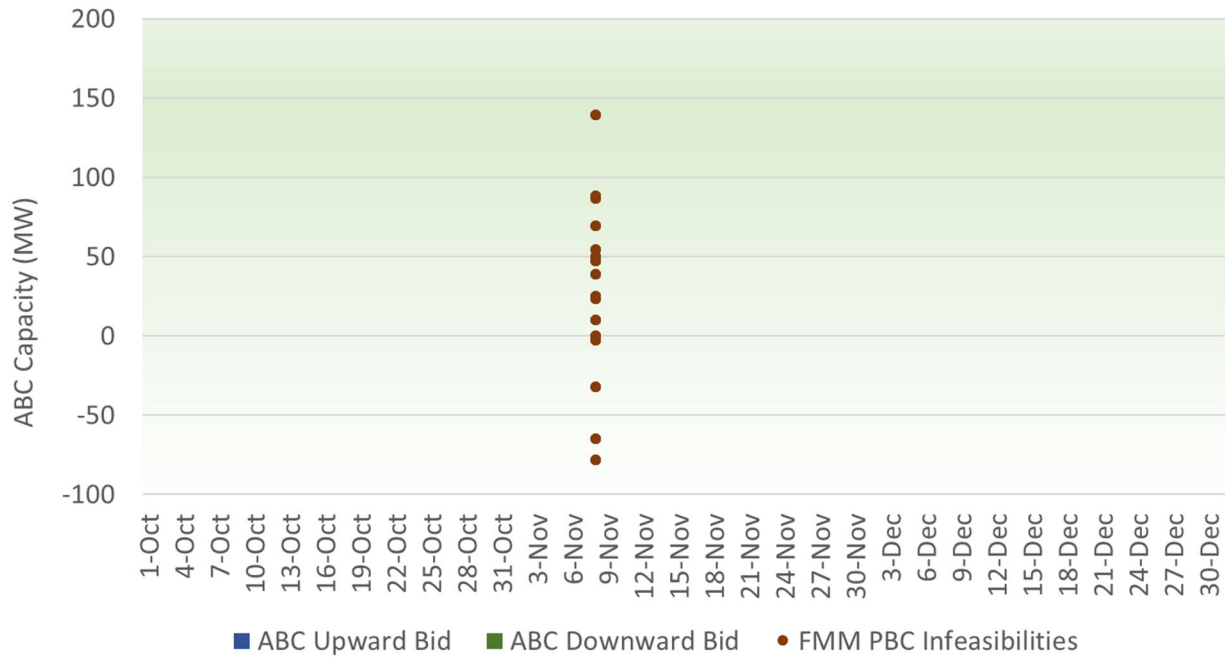


Figure 36: Submitted ABC and Power Balance Constraint Infeasibilities in the IPCO BAA – RTD

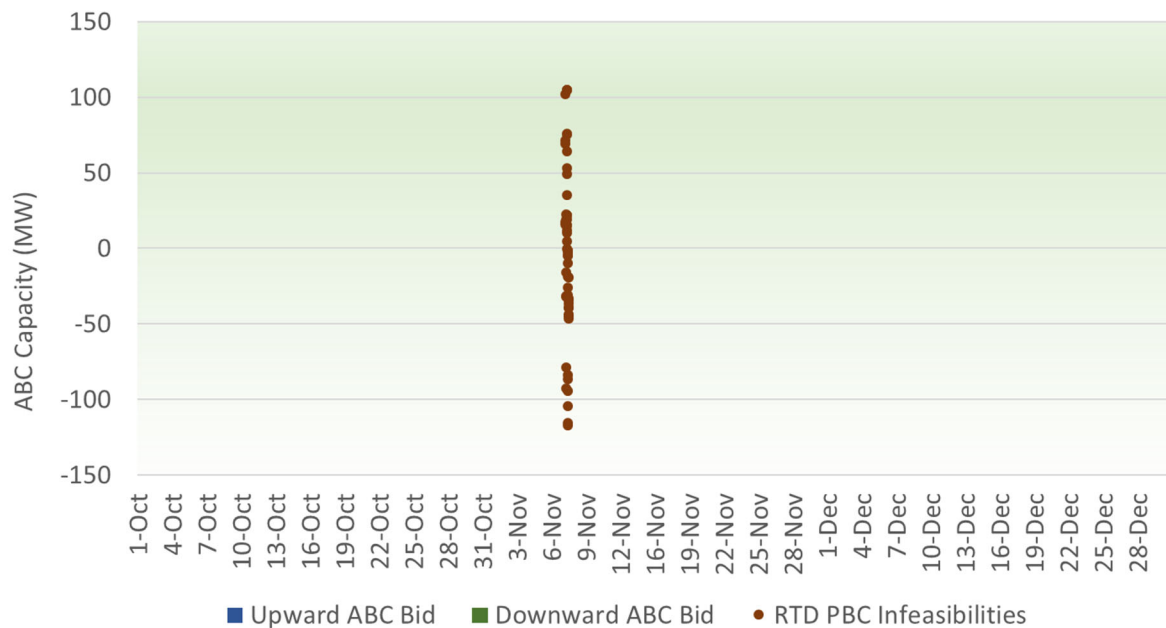


Figure 37: Submitted ABC and Power Balance Constraint Infeasibilities in the PGE BAA – FMM

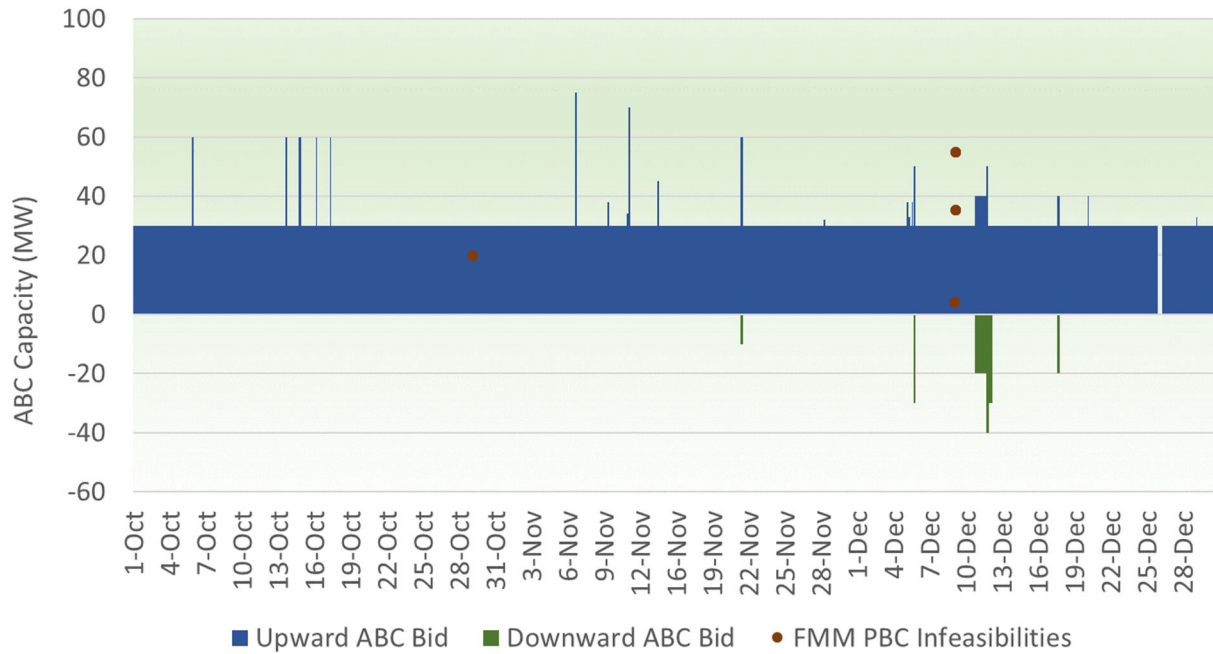


Figure 38: Submitted ABC and Power Balance Constraint Infeasibilities in the PGE BAA – RTD

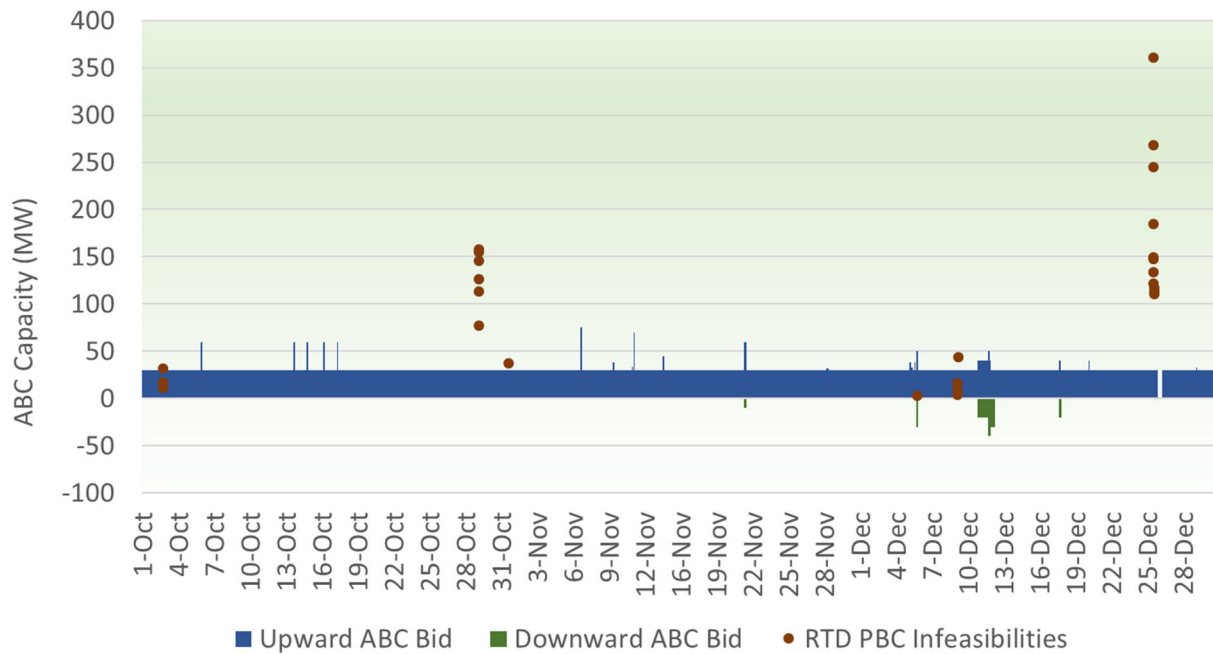
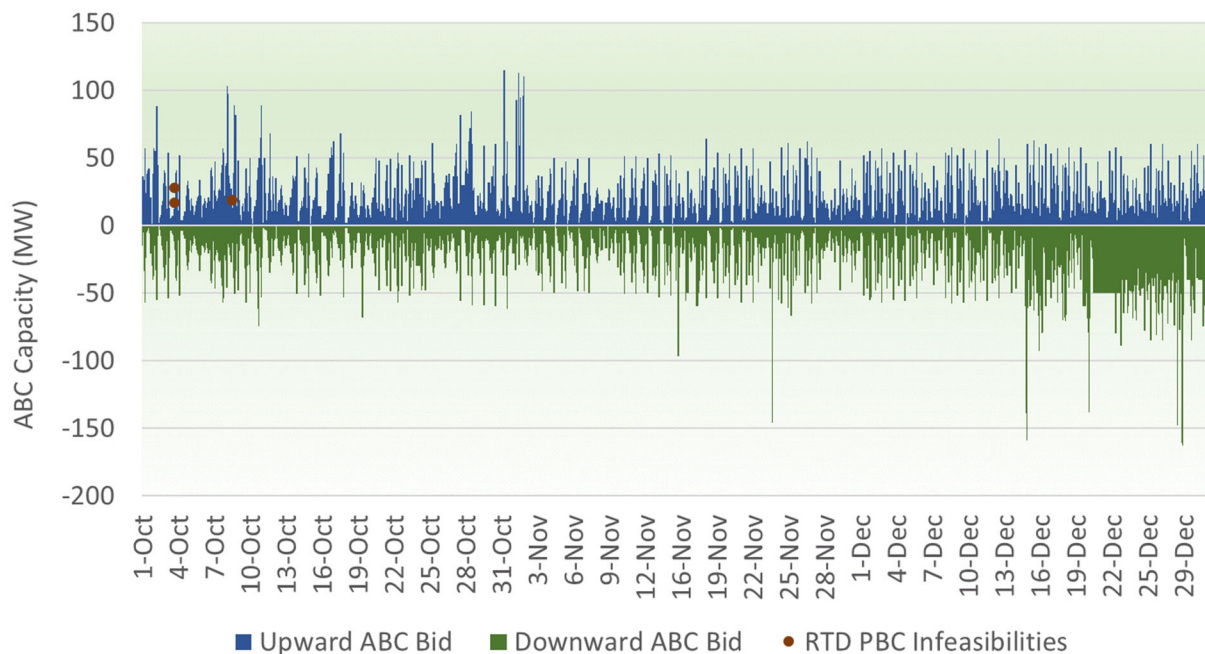


Figure 39: Submitted ABC and Power Balance Constraint Infeasibilities in the BANCSMUD BAA – RTD



Based on the data provided in the figures above, Table 3 shows the frequency of intervals in which the EIM entities did not make any ABC available to the EIM, which caused the power balance constraint to relax. Specifically, the data in Table 3 provides the percentage amount of over-supply infeasibilities where downward ABC was needed, and under-supply infeasibilities where upward ABC was needed. For example, if the metric for the RTD for undersupply was 100 percent, this indicates that in all intervals when an undersupply infeasibility was observed in the RTD, the EIM entity did not submit any ABC to the EIM.

Table 3: Frequency of Power Balance Infeasibilities When no ABC was Available in the Market

BAA	Over-supply		Under-supply	
	FMM	RTD	FMM	RTD
PAC West	0%	0%	100%	100%
PAC East	0%	0%	100%	76.47%
NV Energy	0%	0%	0%	0%
APS	30%	36.51%	50.94%	47.52%
PSE	0%	0%	0%	0%
IPCO	100%	100%	100%	100%
PGE	0%	0%	0%	0%
PWRX	--	--	--	--
BANCSMUD	--	--	0%	0%

Through its evaluation of the ABC performance, the CAISO has observed two additional scenarios that can occur in the EIM:

1. Use of ABC related to resource constraints: The CAISO market optimization software recognizes the resource constraints and characteristics of capacity identified as ABC, just as it does of any other participating capacity in the market. Therefore, at times the market is constrained from utilizing the identified capacity due to the operational characteristics of the resources identified as such. The CAISO has observed that in several instances when the power balance constraint was relaxed, the ABC identified by the EIM entity was not sufficient to resolve the power balance infeasibility because of the operational ramp limitations of the resources. In some cases, the resources ramp rate may be very limited because of the resource's operating point at any given point in time. In other cases, the resource is not available because in that particular interval the resource must cross a forbidden region first in order to access the ABC and that may take several market intervals, thereby preventing the market optimization software from utilizing the identified capacity. In some instances, a resource is required to cross the operational range where the ABC is defined, and given its ramp rate, the only way for the resource to reach an expected operating point is by dispatching it within the operating region with ABC.
2. Use of ABC related to congestion management: The CAISO market systems release the ABC in the scheduling run based on the scheduling run's assessment of system conditions. However, the CAISO schedules and prices resources in the CAISO markets. The ABC is considered as part of the market clearing process in the pricing run. The pricing run will optimize the entire EIM BAA, which is the combination of all BAAs that participate in the EIM, including the CAISO's BAA. The market software will simultaneously consider the ABC in clearing the least-cost congestion management solution based on resource constraints and system conditions it observes. Consequently, in some instances the market clearing process released the ABC in the EIM BAA it was necessary to release the capacity to address congestion in either the EIM or elsewhere in the system. The ABC is considered as part of the single market optimization for the entire EIM BAA, the need to re-dispatch resources to manage congestion efficiently would have resulted in the re-allocation of resources such that the ABC would need to be released to ensure the EIM could operate its system reliably.

However, because the CAISO aims to ensure the EIM BAA can operate its system reliably with the use of the ABC it identifies, the CAISO enforces a constraint that ensures that when the market clearing process clears ABC, it stays within the EIM entity BAA. While the CAISO is not able to isolate the electrons, the constraint ensures that EIM does not export the ABC to another BAA to the detriment of the specific EIM BAA by ensuring that the exports from the EIM BAA are net of the ABC

released in an EIM entity BAA.

IV. EIM Performance

This section provides the information the CAISO previously provided in its monthly informational reports submitted during an EIM entity's first six-month transition period.

A. Prices

The figures in this section show the EIM load aggregation point (ELAP) prices⁵ for the FMM and RTD in each EIM BAA. The red line represents FMM ELAP prices, the blue line represents RTD ELAP prices, and the dashed line represents proxy prices; there are no proxy prices to report for Powerex. These trends show only the factual prices, which are financially binding. In prior reports, the CAISO provided these factual prices in comparison to counterfactual prices in order to show the effect of using the pricing waiver of the price discovery mechanism.⁶

The CAISO may correct prices posted on its Open Access Same-time Information System (OASIS) pursuant to the CAISO's price correction authority in section 35 of the CAISO tariff, if it finds: (1) that the prices were the product of an invalid market solution; or (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 the figures below include all prices produced by the CAISO consistent with the CAISO tariff requirements. That is, the trends below represent: (1) prices as produced in the market for which the CAISO deemed valid; (2) prices that the CAISO could and did correct pursuant to section 35; and (3) any prices the CAISO adjusted pursuant to transition period pricing reflected in section 29.27 of the CAISO tariff.

Table 4 shows the average ELAP prices for all EIM BAAs observed in the quarter covered by this report.

⁵ The ELAP provides aggregate prices that are representative of pricing in the overall BAA.

⁶ In Docket ER15-402, the CAISO reported on prices based on the price discovery mechanism in effect during the term of the Commission's waiver granted in that docket and the prices as they would be if the waiver was not in effect, *i.e.*, what prices would have been had they been on the penalty prices in the CAISO tariff. Because pricing under the waiver pricing is based on the last economic bid price signal, these prices are a proxy of what the prices would have been absent the seven category of learning curve type issues experience in that market. The difference between the counterfactual pricing and the price in effect during the term of the reports in that docket illustrated the market impact of the waiver pricing.

Table 4: Average ELAP Prices for the Various EIM BAAs

BAA	FMM (\$/MWh)	RTD (\$/MWh)
PAC West	29.66	28.66
PAC East	29.04	27.36
NV Energy	30.05	28.37
APS	31.79	28.28
PSE	30.14	29.02
IPCO	31.23	29.47
PGE	29.85	28.92
PWRX	29.32	28.37
BANCSMUD	37.95	34.82

Figure 40: Daily Average Price for the PAC West BAA ELAP

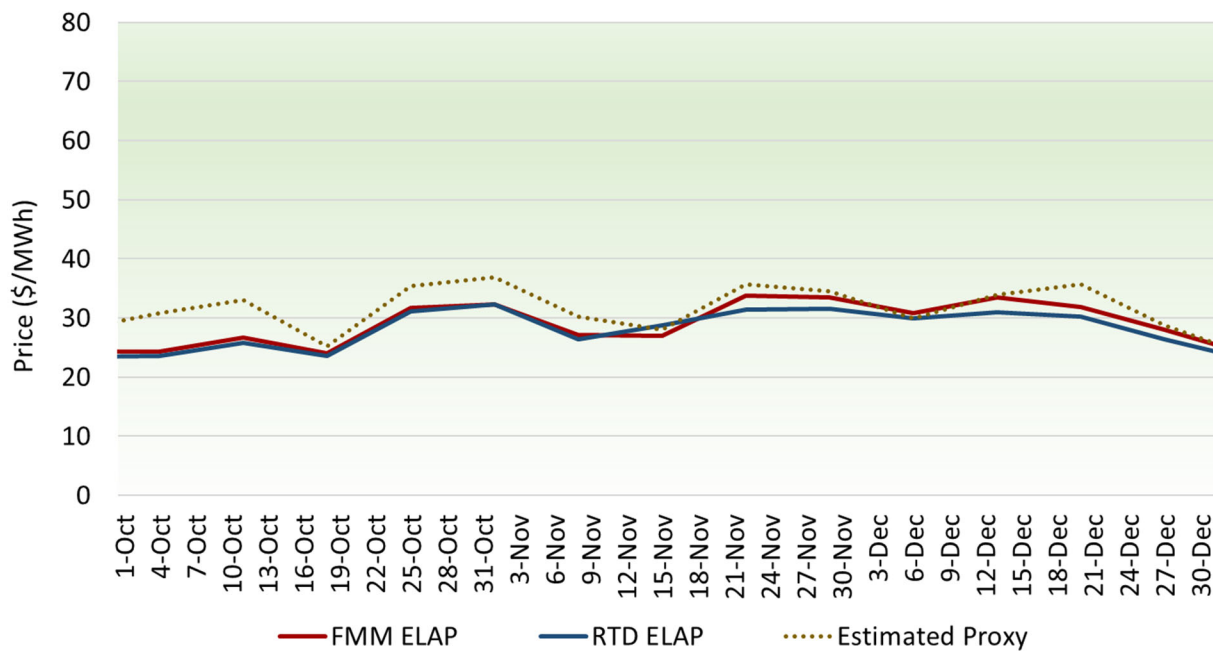


Figure 41: Daily Average Price for the PAC East BAA ELAP

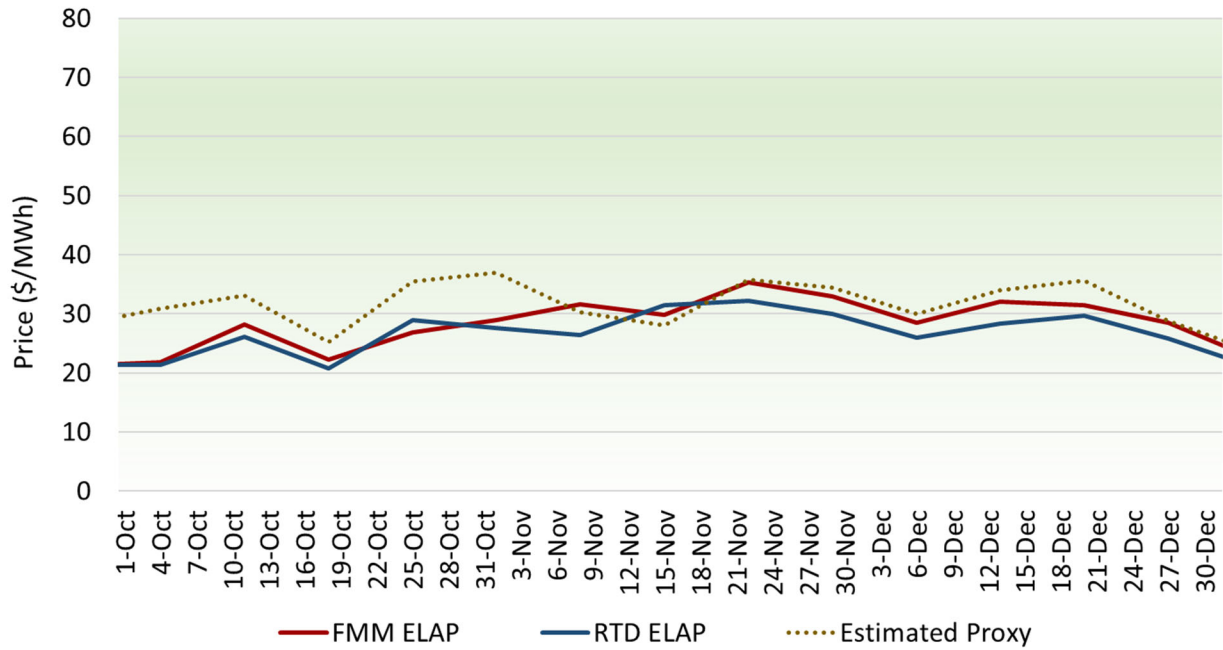


Figure 42: Daily Average Price for the NV Energy BAA ELAP

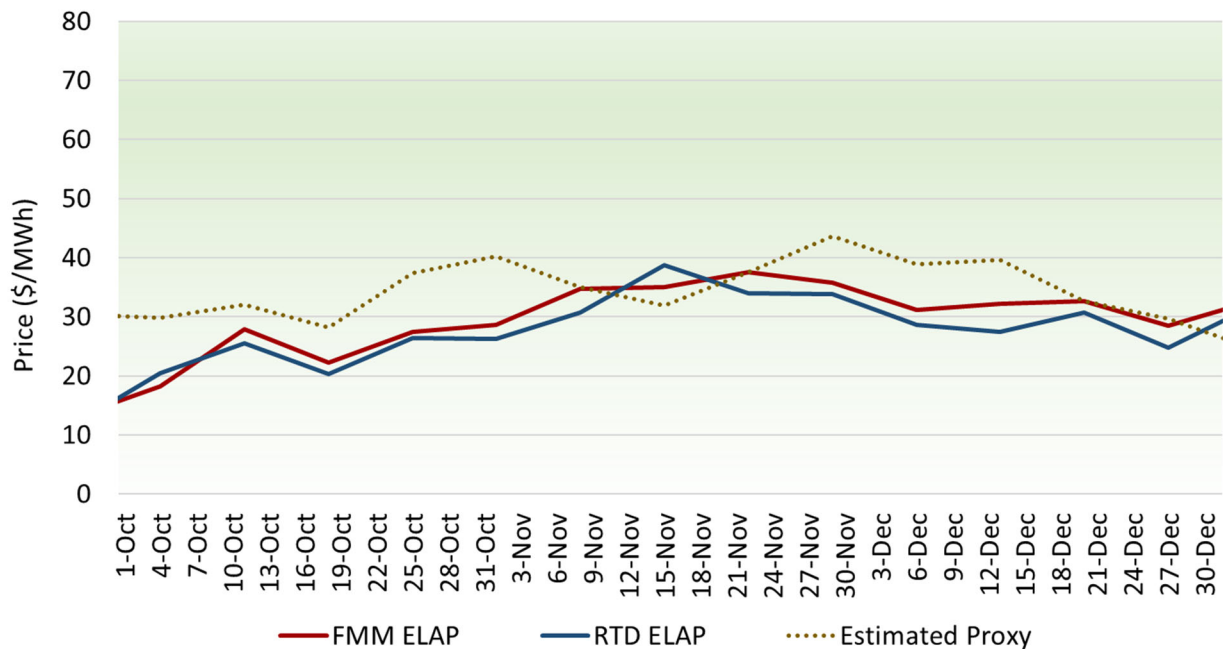


Figure 43: Daily Average Price for the APS BAA ELAP

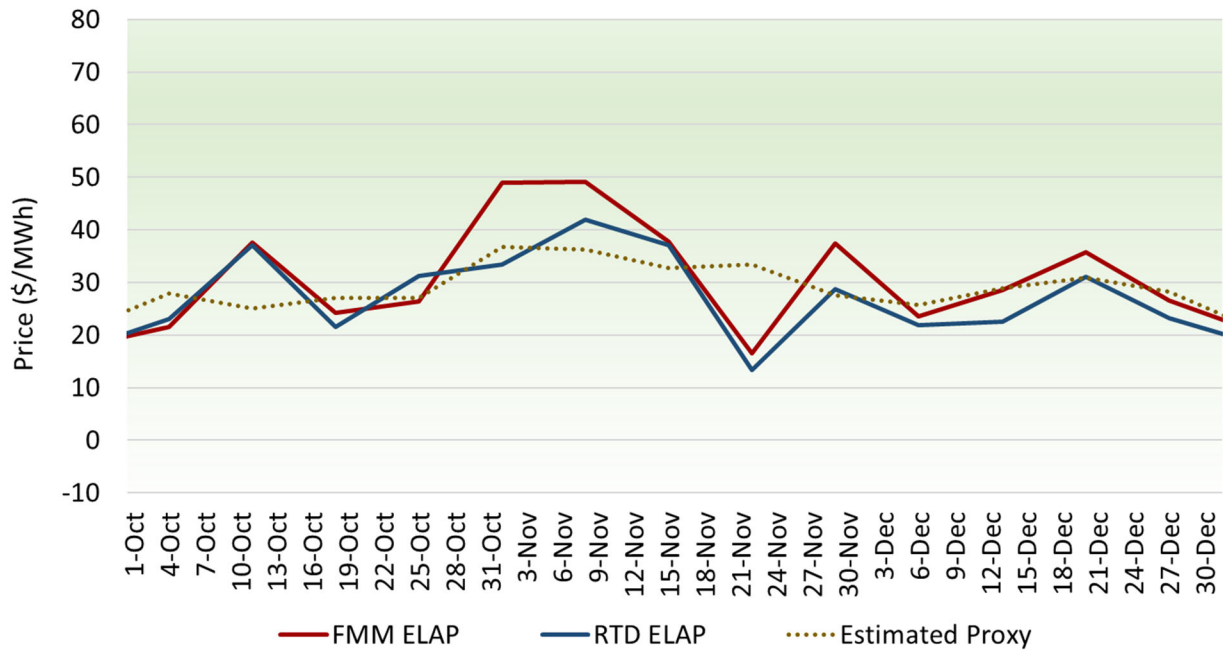


Figure 44: Daily Average Price for the PSE BAA ELAP

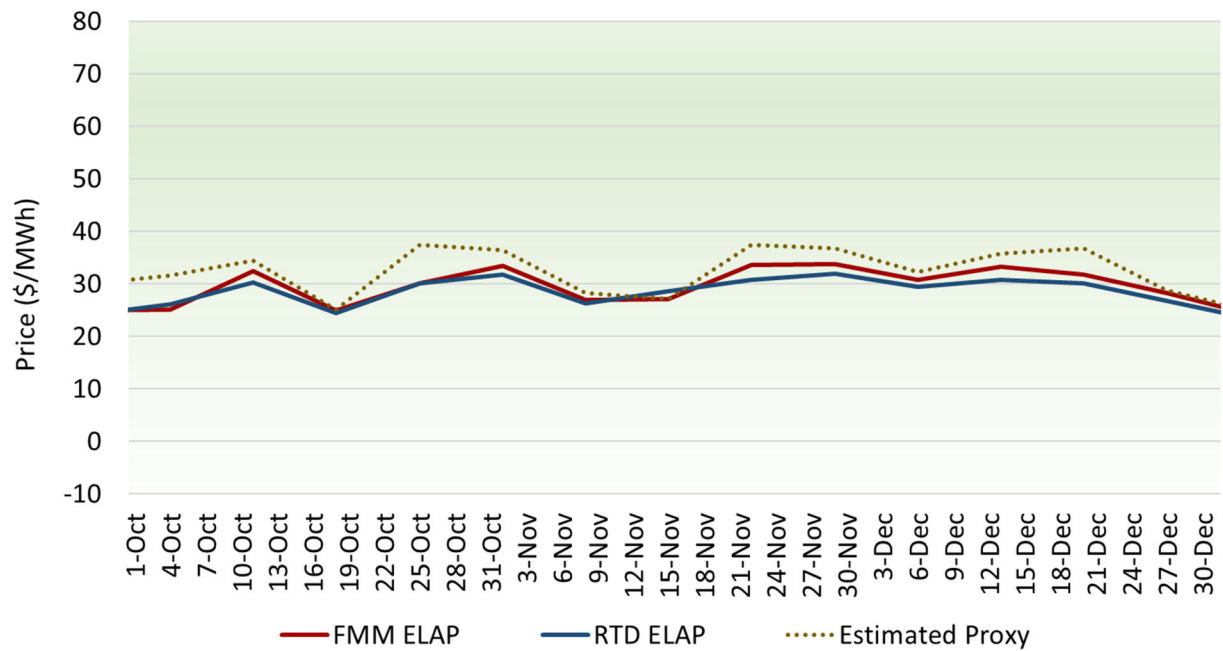


Figure 45: Daily Average Price for the IPCO BAA ELAP

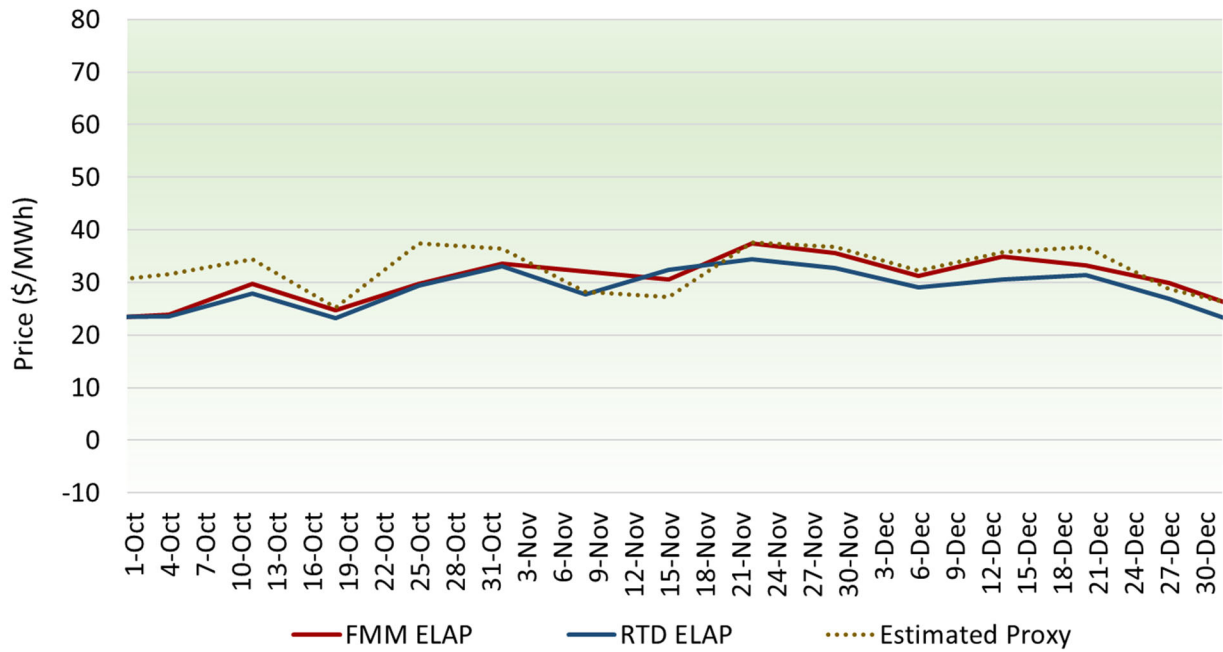


Figure 46: Daily Average Price for the PGE BAA ELAP

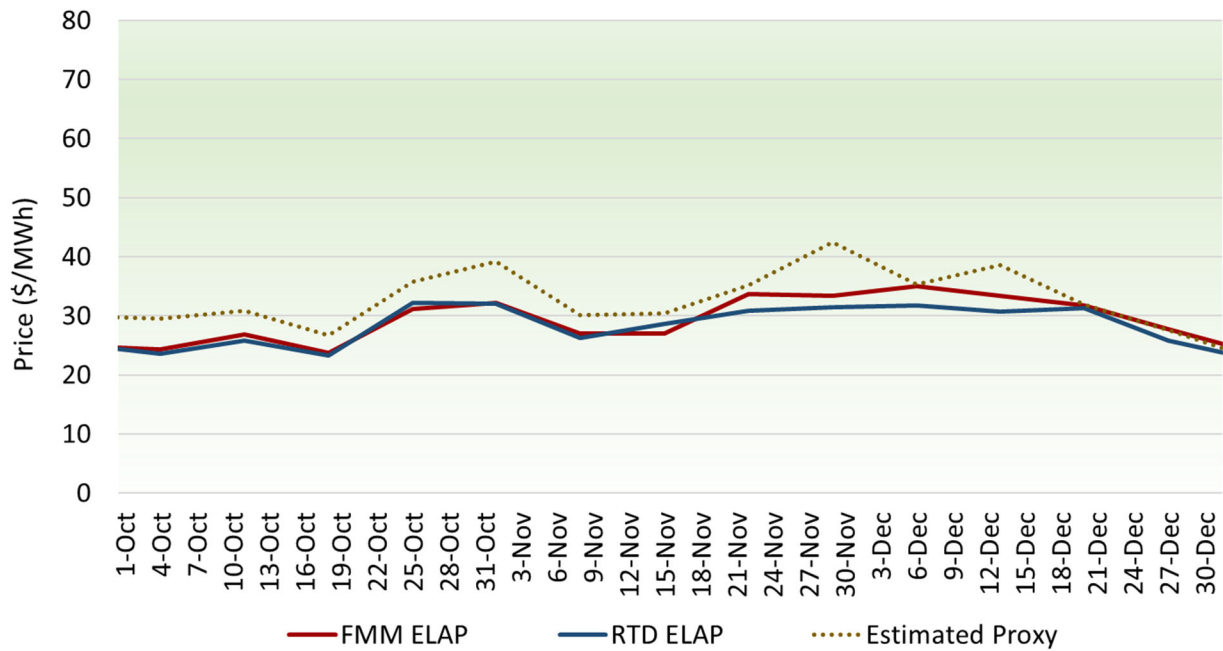


Figure 47: Daily Average Price for the PWRX BAA ELAP

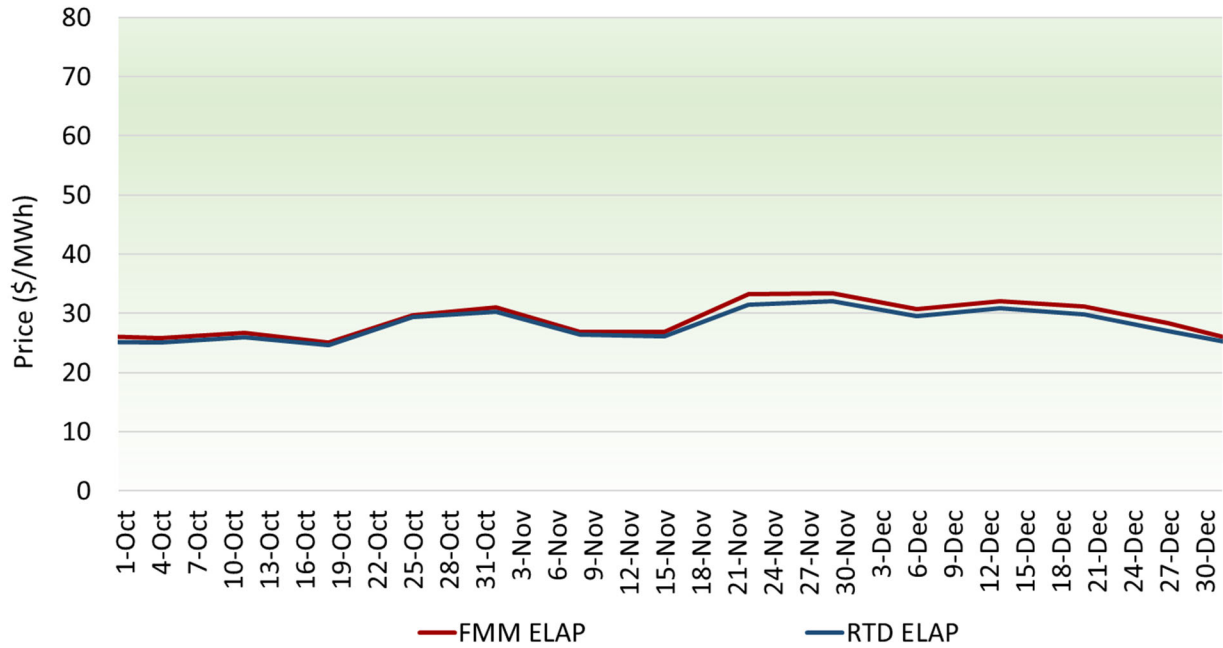
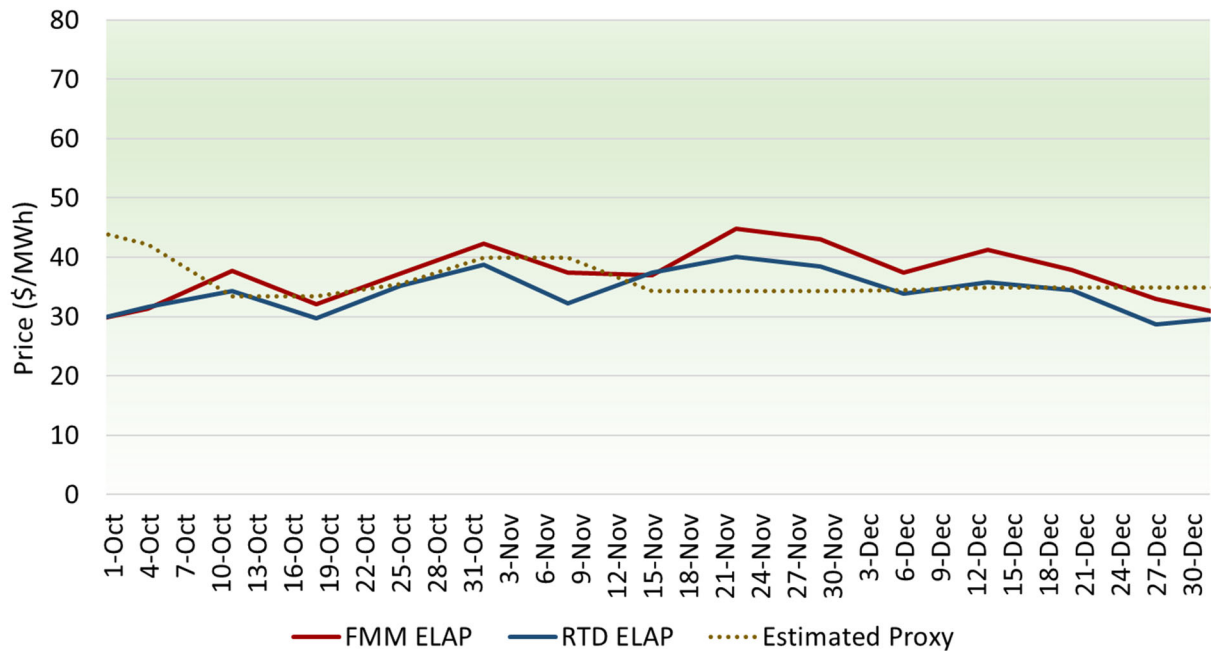


Figure 48: Daily Average Price for the BANCSMUD BAA ELAP



B. Frequency of Power Balance Constraint Relaxation

The figures in this section show the frequency of intervals in which the power balance constraint was relaxed in each EIM BAA for under-supply conditions in the FMM and RTD, respectively. A bar with positive frequency represents an under-supply power balance constraint infeasibility. The CAISO excluded invalid infeasibilities and therefore these frequencies reflect only actual infeasibilities. Invalid infeasibilities are power balance constraint infeasibilities for intervals that were subject to a price correction under the provisions of the CAISO tariff.

The CAISO uses a load conformance limiter in the CAISO BAA and the EIM BAAs to prevent over-adjustments through use of load conformance, and thus prevent an artificial infeasibility – that is, one that does not reflect actual scarcity. When the quantity of the infeasibility is less than the operator’s adjustment, and the infeasibility is in the same direction as the adjustment, the load conformance limiter automatically limits the operator’s adjustments to at least the feasibility level. In the pricing run, the limiter will remove an infeasibility that is less than or equal to the operator’s adjustment, *i.e.*, the load conformance. The limiter will not apply to infeasibilities greater than or in the opposite direction of the load conformance. Use of the load conformance limiter avoids invalid constraints that arise through operations rather than because of real supply issues.⁷ This feature applies to either over- or under-supply infeasibilities.

The table below shows the number of valid under-supply infeasibilities and number of instances covered by the load conformance limiter, for both FMM and RTD.

Table 5: Frequency of Under-Supply Infeasibilities in the FMM and RTD

Balancing Authority Area	Under-supply Infeasibilities		Instances covered by Load Conformance Limiter	
	FMM	RTD	FMM	RTD
PAC West	6	5	0	0
PAC East	9	17	0	0
NV Energy	15	32	3	4
APS	159	141	87	53
PSE	27	22	0	1
IPCO	36	26	0	13
PGE	12	26	0	5
PWRX	0	0	0	0
BANCSMUD	0	3	0	1

⁷ The CAISO amended its tariff to include enhancements to the limiter later in 2018, which were approved and became effective in February 2019: http://www.caiso.com/Documents/DraftTariffLanguage_ImbalanceConformanceEnhancements.docx.

Figure 49: Frequency of FMM Power Balance Infeasibilities in the PAC West BAA

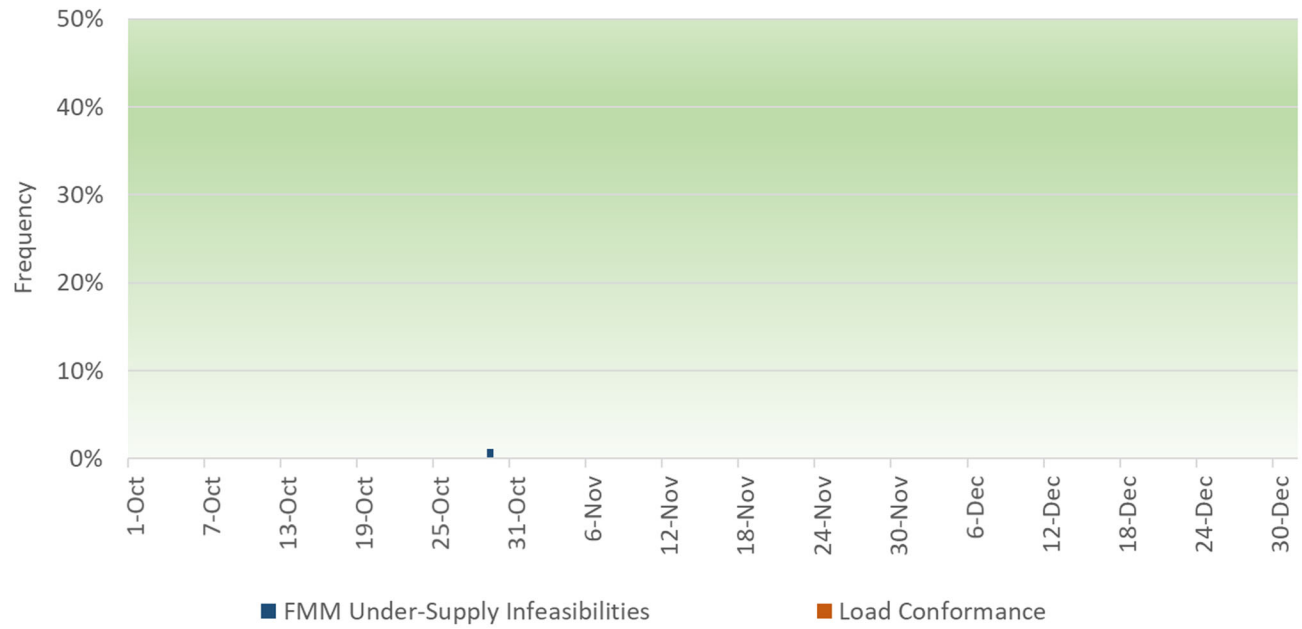


Figure 50: Frequency of RTD Power Balance Infeasibilities in the PAC West BAA

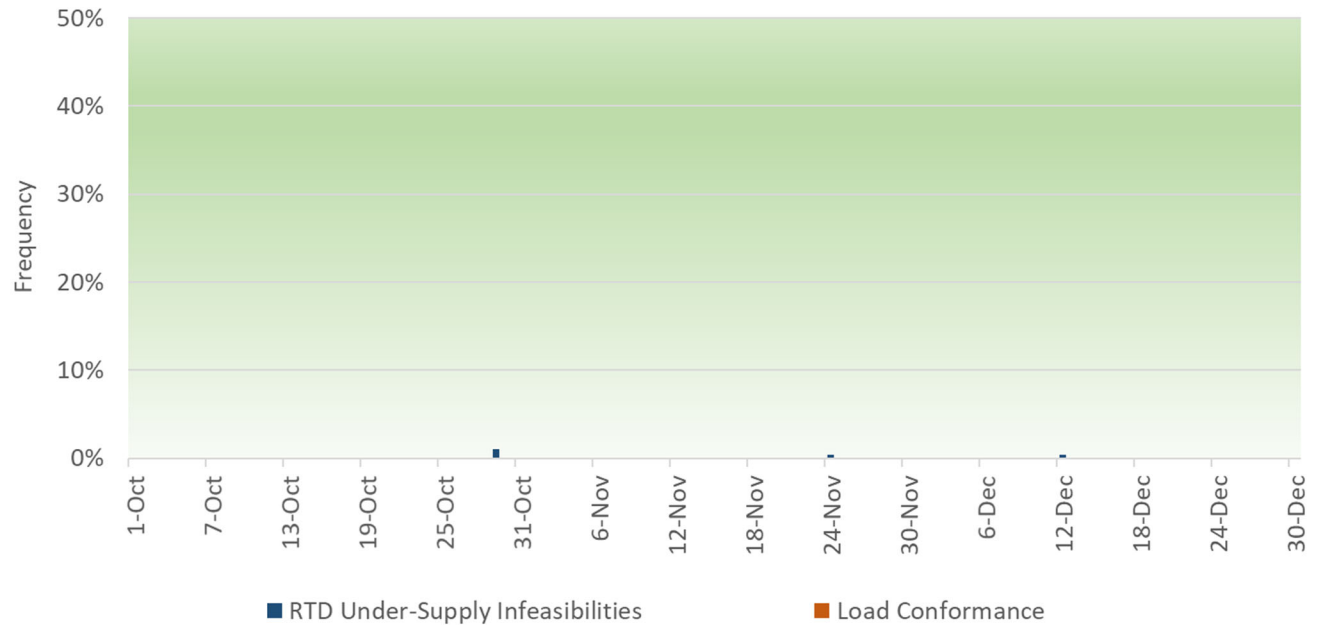


Figure 51: Frequency of FMM Power Balance Infeasibilities in the PAC East BAA

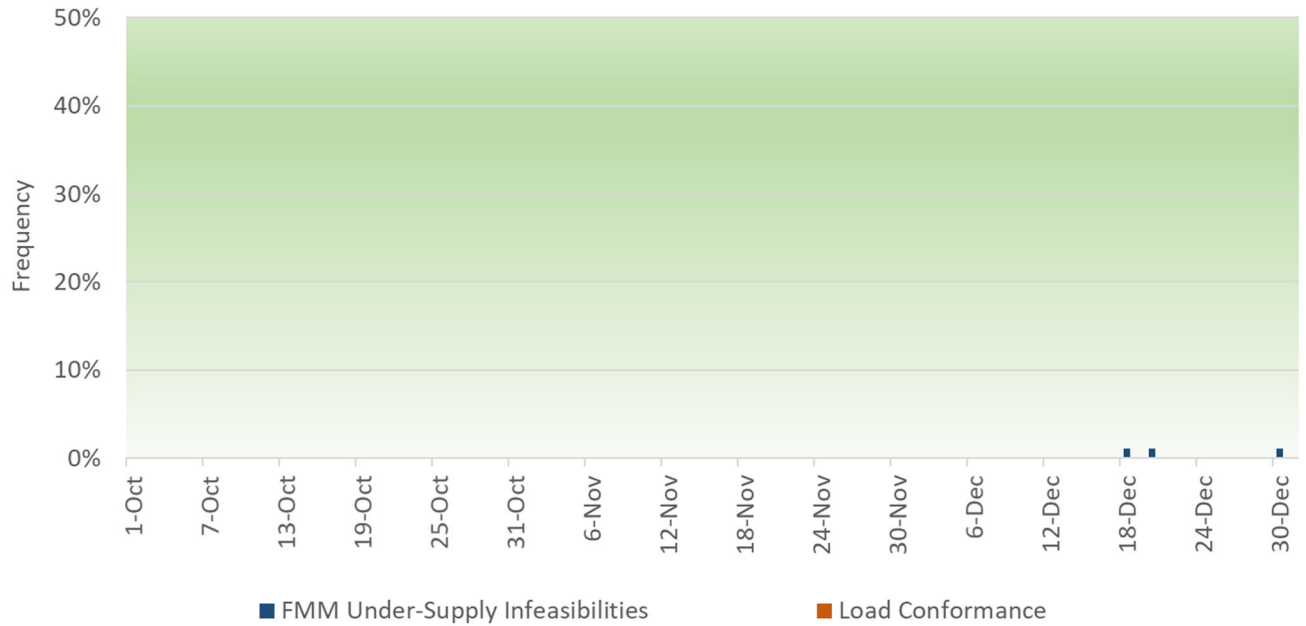


Figure 52: Frequency of RTD Power Balance Infeasibilities in PAC East BAA

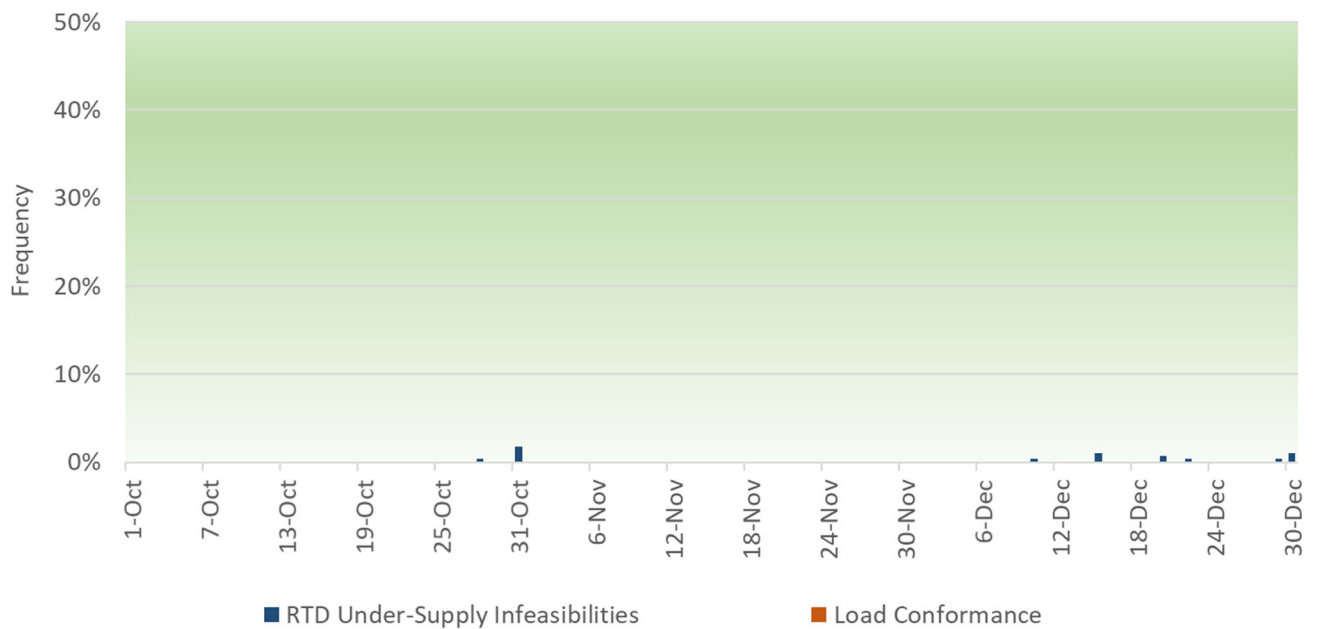


Figure 53: Frequency of FMM Power Balance Infeasibilities in the NV Energy BAA

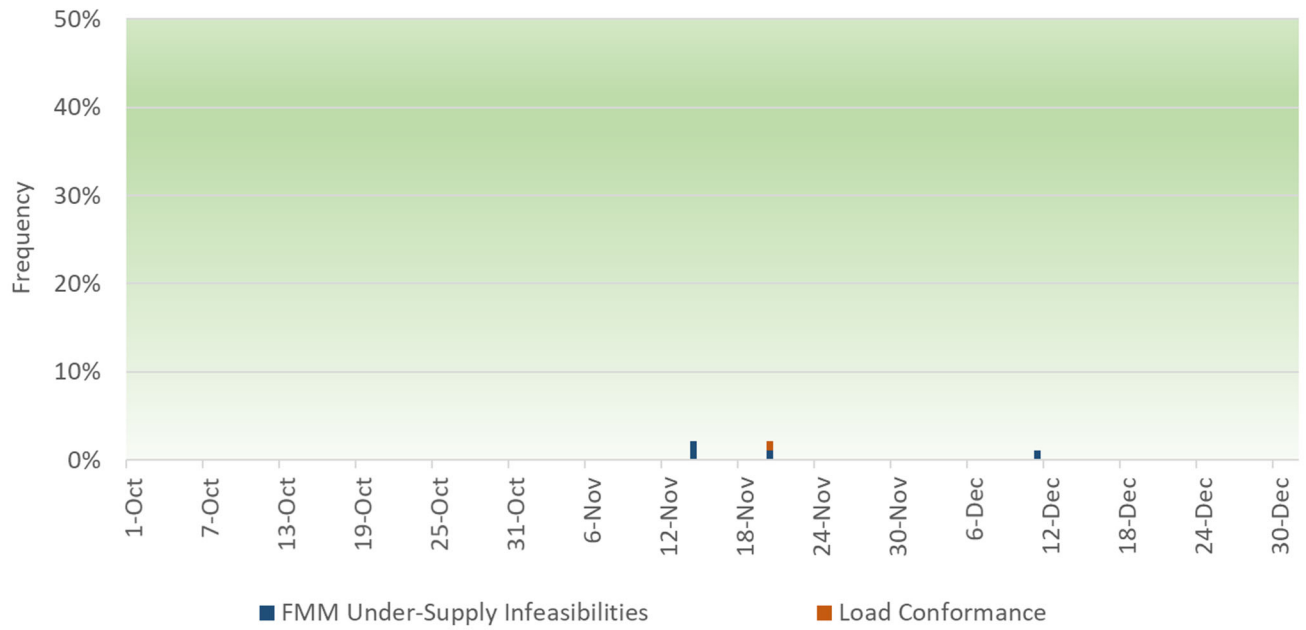


Figure 54: Frequency of RTD Power Balance infeasibilities in the NV Energy BAA

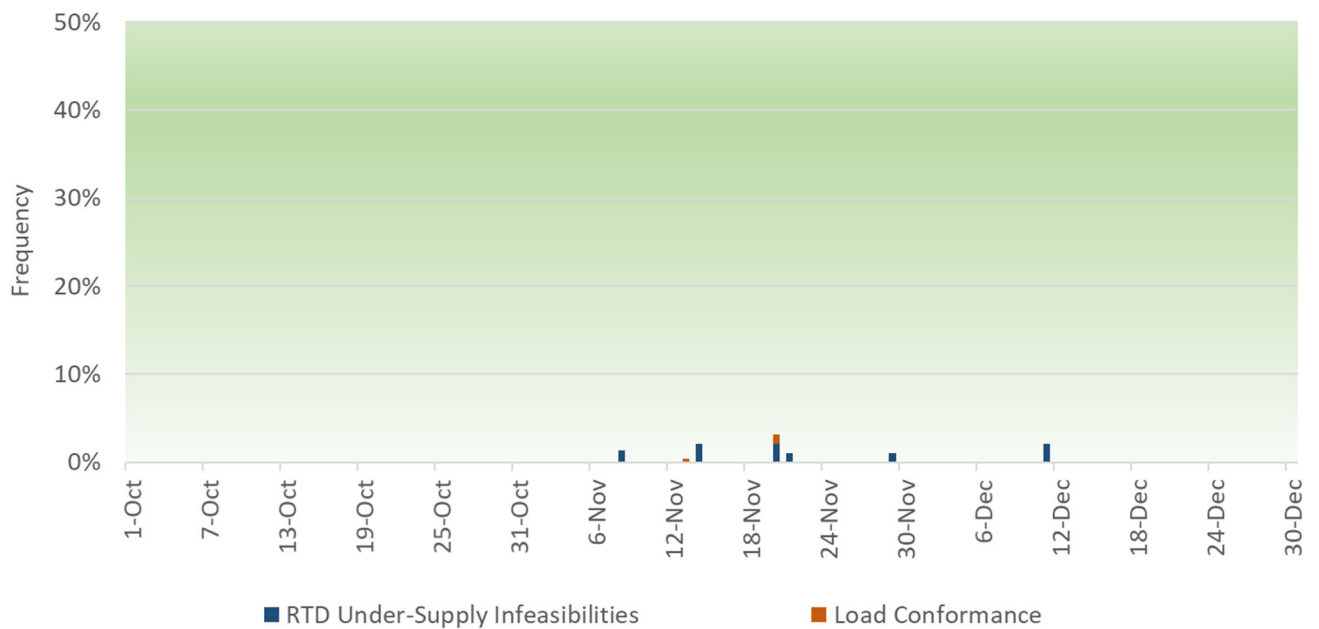


Figure 55: Frequency of FMM Power Balance Infeasibilities in the APS BAA

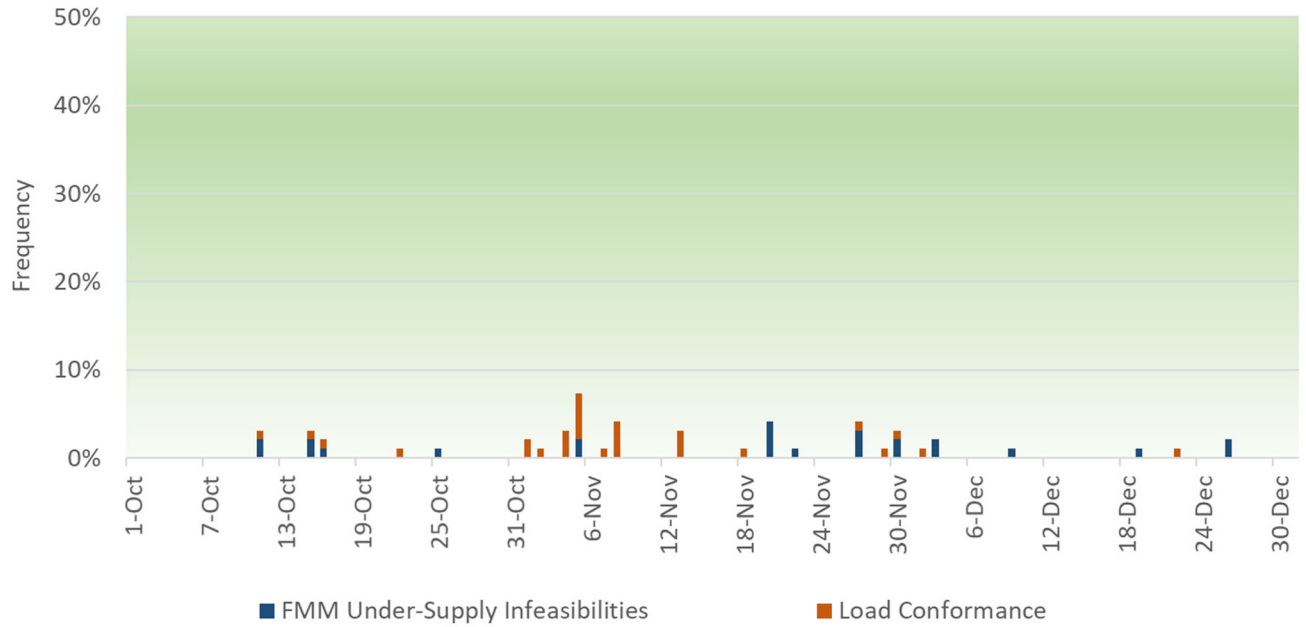


Figure 56: Frequency of RTD Power Balance Infeasibilities in the APS BAA



Figure 57: Frequency of FMM Power Balance Infeasibilities in the PSE BAA

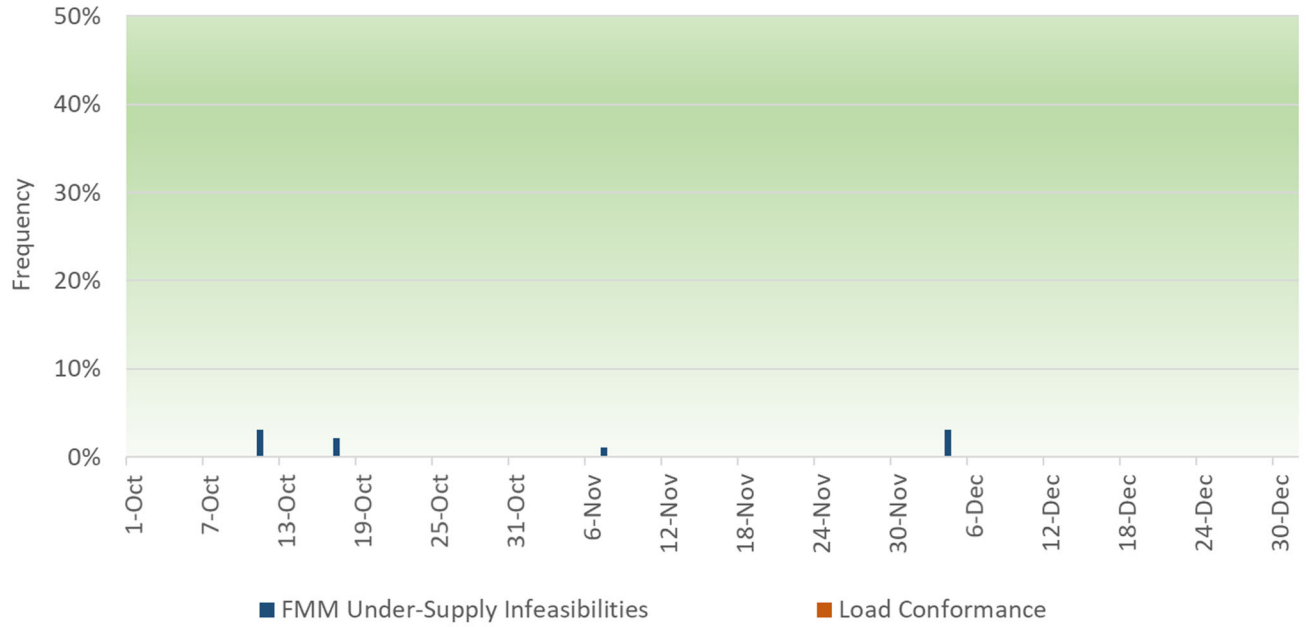


Figure 58: Frequency of RTD Power Balance Infeasibilities in the PSE BAA

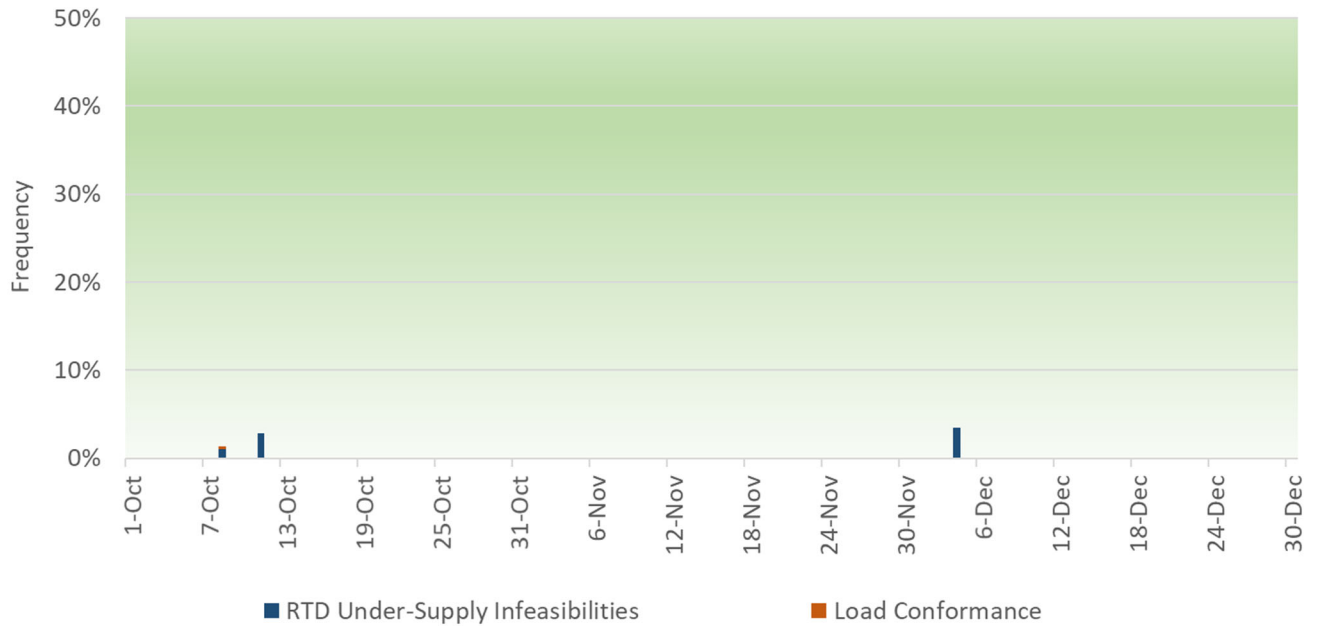


Figure 59: Frequency of FMM Power Balance Infeasibilities in the IPCO BAA

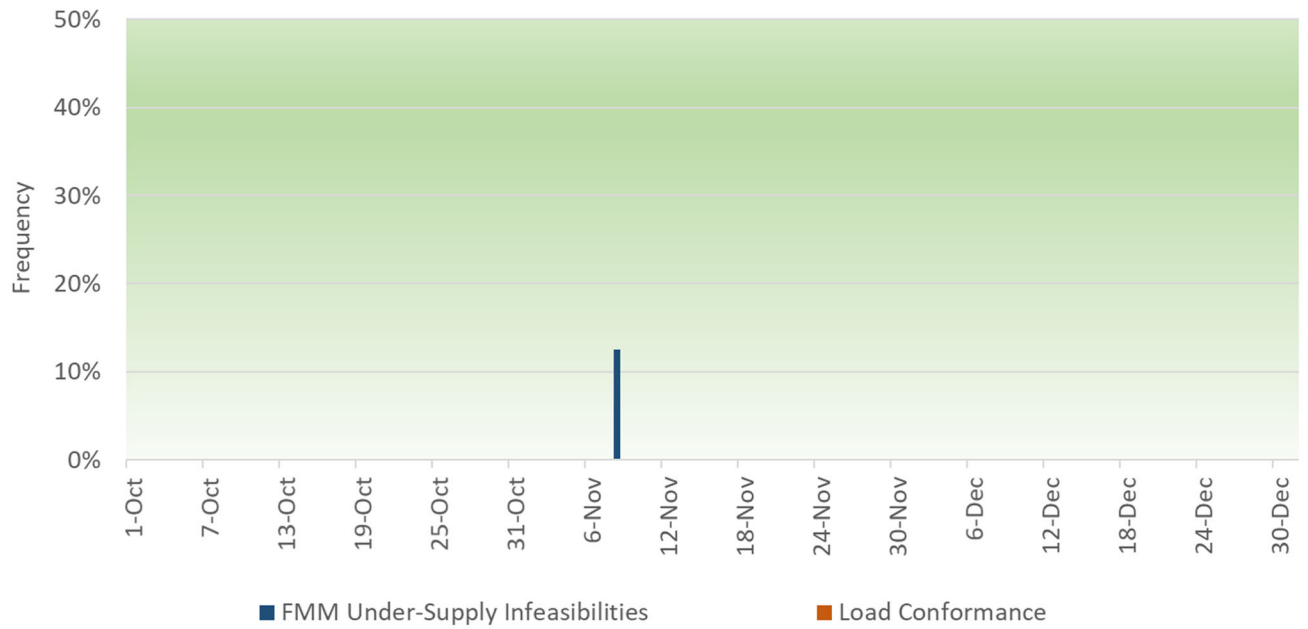


Figure 60: Frequency of RTD Power Balance Infeasibilities in the IPCO BAA



Figure 61: Frequency of FMM Power Balance Infeasibilities in the PGE BAA

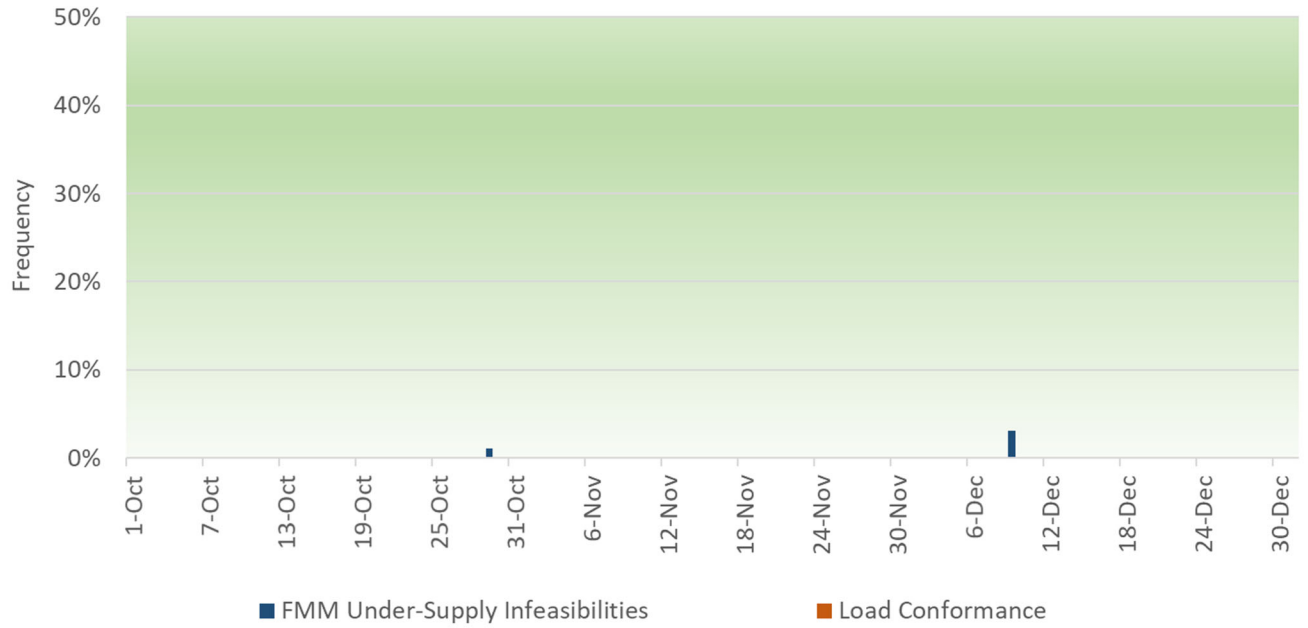


Figure 62: Frequency of RTD Power Balance Infeasibilities in the PGE BAA

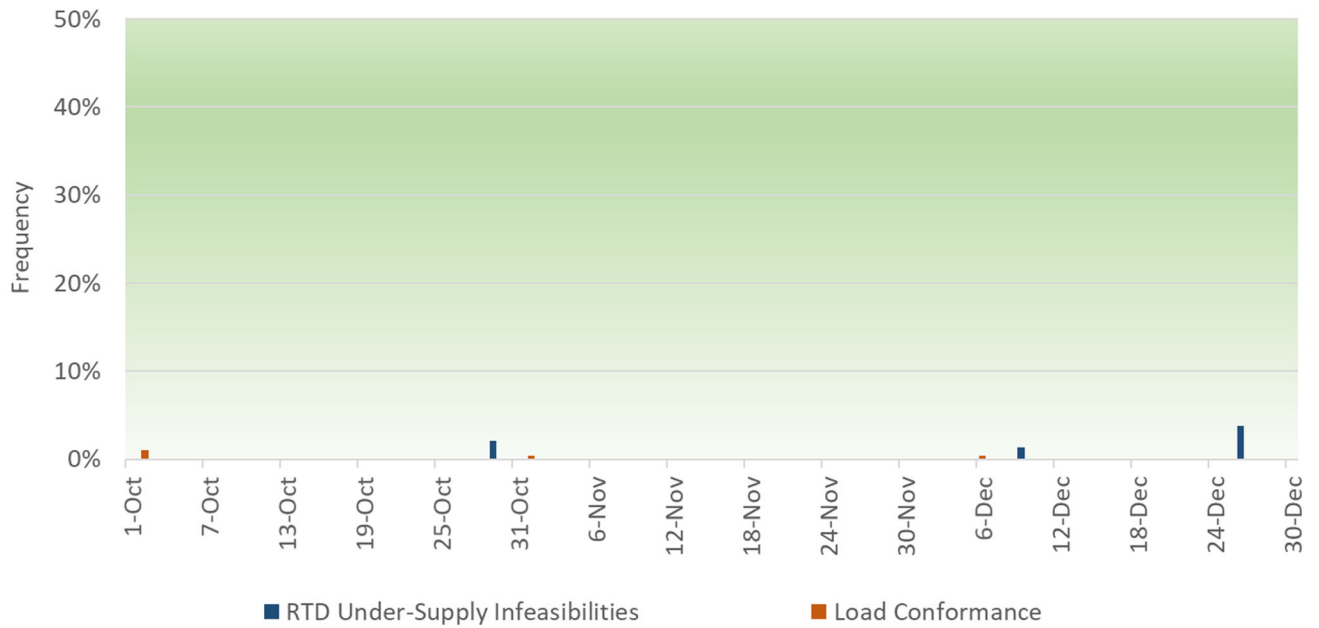
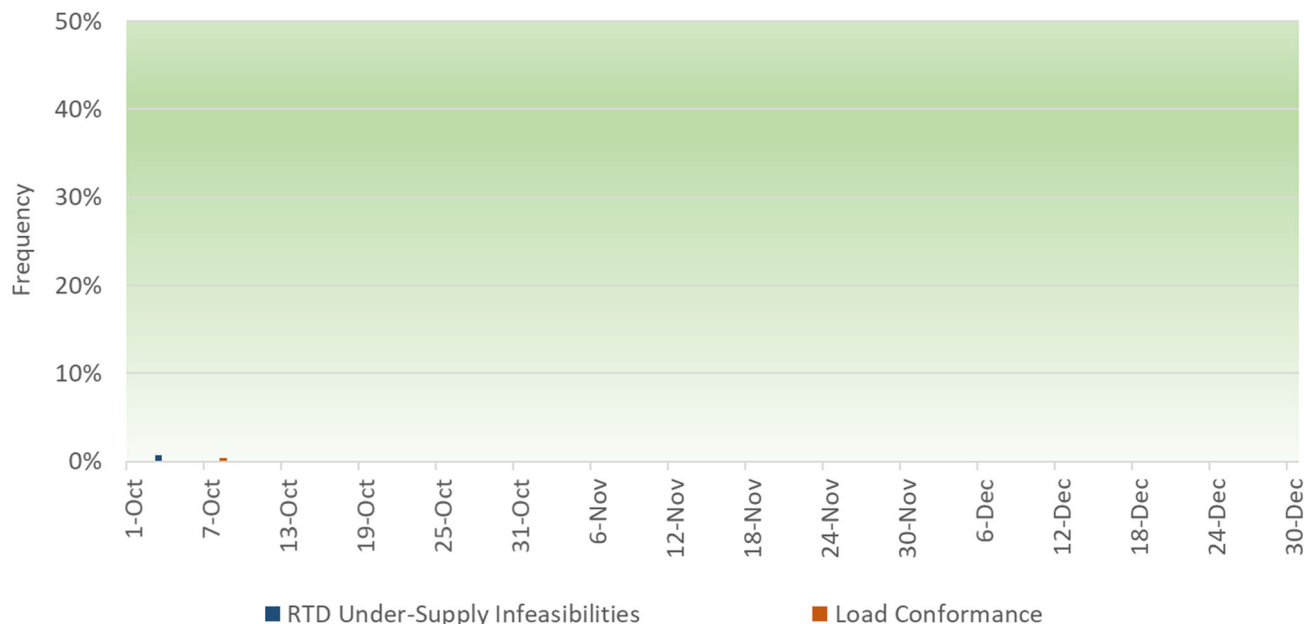


Figure 63: Frequency of RTD Power Balance Infeasibilities in the BANC SMUD BAA



C. Balancing and Sufficiency Test Failures

The figures in this section show the trend of balancing test failures for the quarter covered by this report, for each of the EIM entity BAAs. The CAISO performs the balancing test pursuant to Section 29.34(k) of the CAISO tariff. Powerex is not subject to the balancing test.

The table below shows the frequency each BAA passed the balancing test, as well as what percentage of balancing test failures were due to under-scheduling. In most cases, these failures are within normal ranges and reflect the incidence of the forecasting and balancing processes that have occurred at a frequency that is well within expected performance tolerances.

Table 6: Frequency of Passing Balancing Test

Balancing Authority Area	% Time Passing Balancing Test	% of Failures due to Under-Scheduling
PAC West	99.6%	66.7%
PAC East	99.5%	75.0%
NV Energy	98.9%	39.1%
APS	96.6%	52.7%
PSE	98.6%	53.3%
IPCO	99.8%	60.0%
PGE	99.5%	58.3%
BANC SMUD	99.5%	63.6%

Figure 64: Frequency of Balancing Test Failures for the PAC West BAA

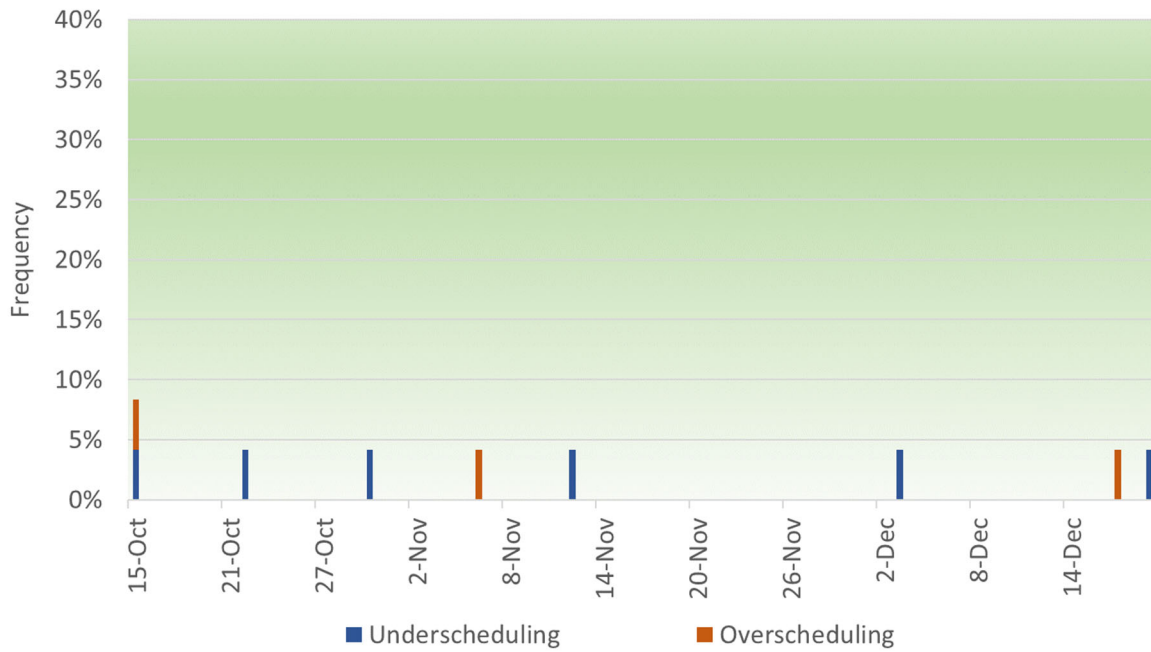


Figure 65: Frequency of Balancing Test Failures for the PAC East BAA

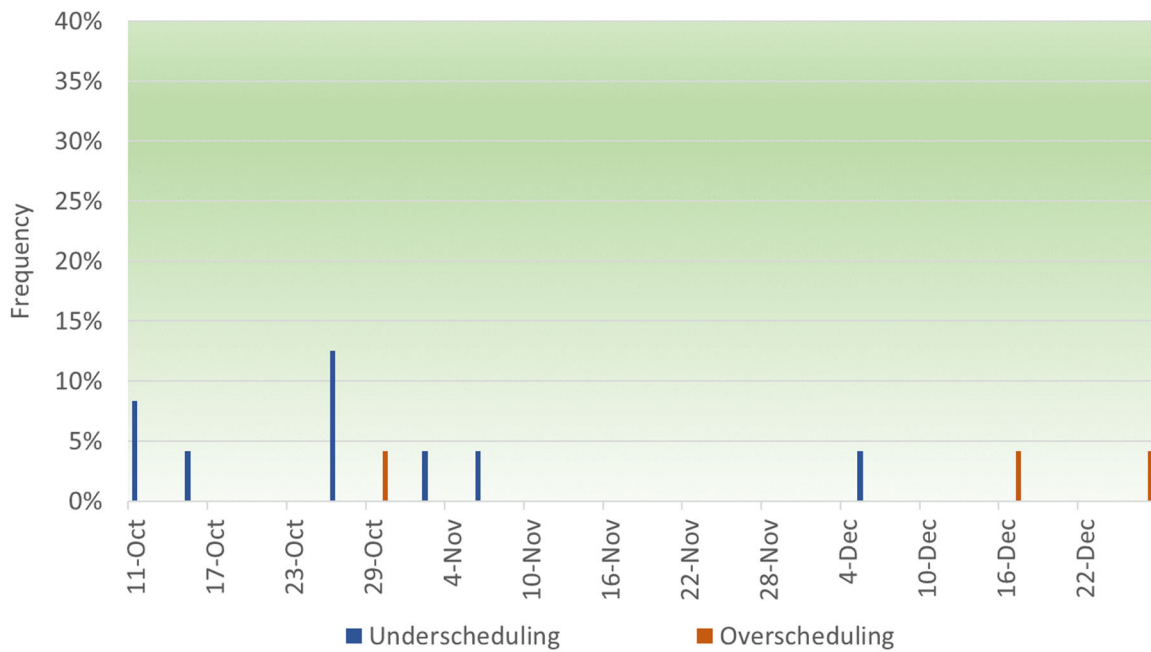


Figure 66: Frequency of Balancing Test Failures for the NV Energy BAA

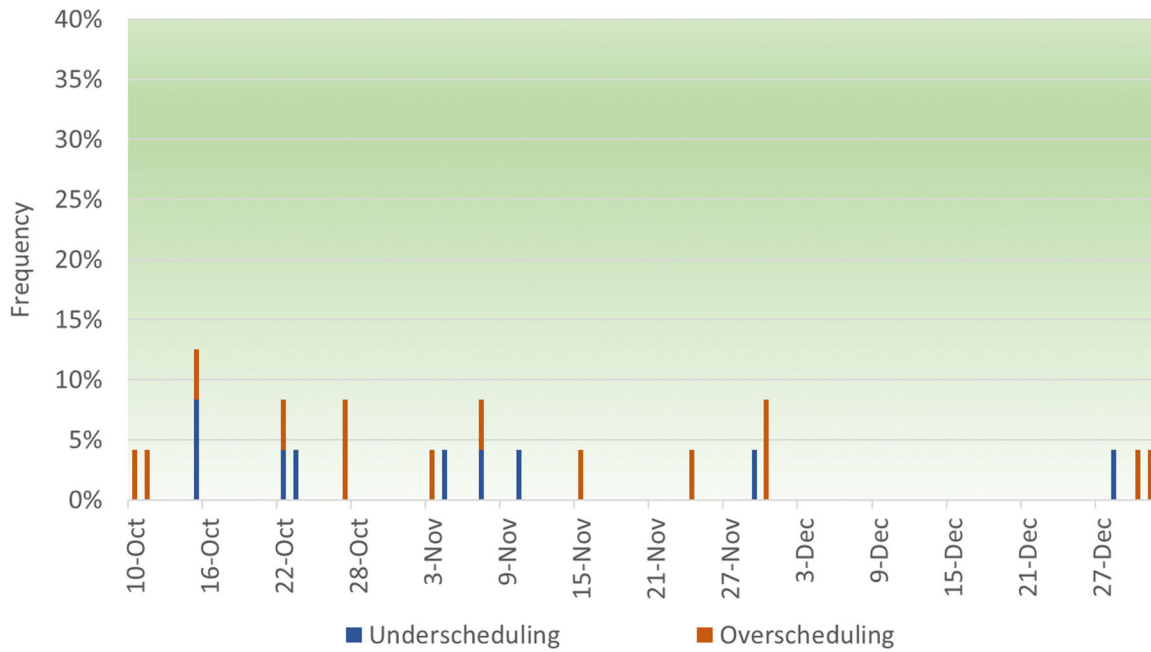


Figure 67: Frequency of Balancing Test Failures for the APS BAA

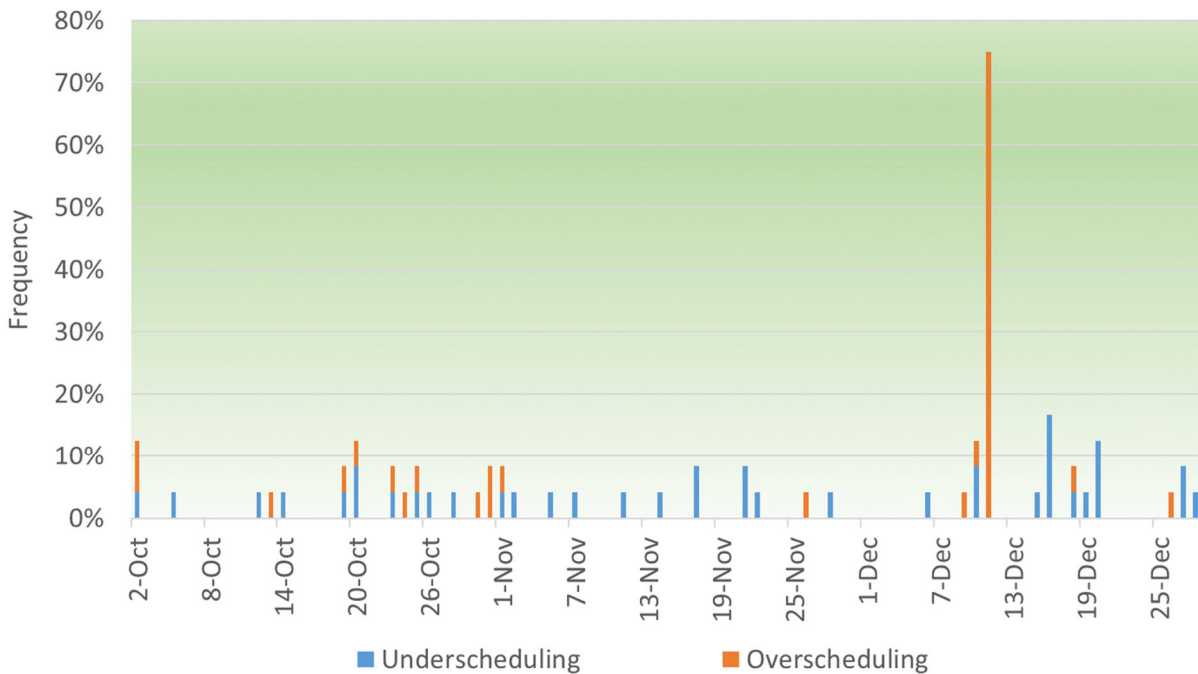


Figure 68: Frequency of Balancing Test Failures for the PSE BAA

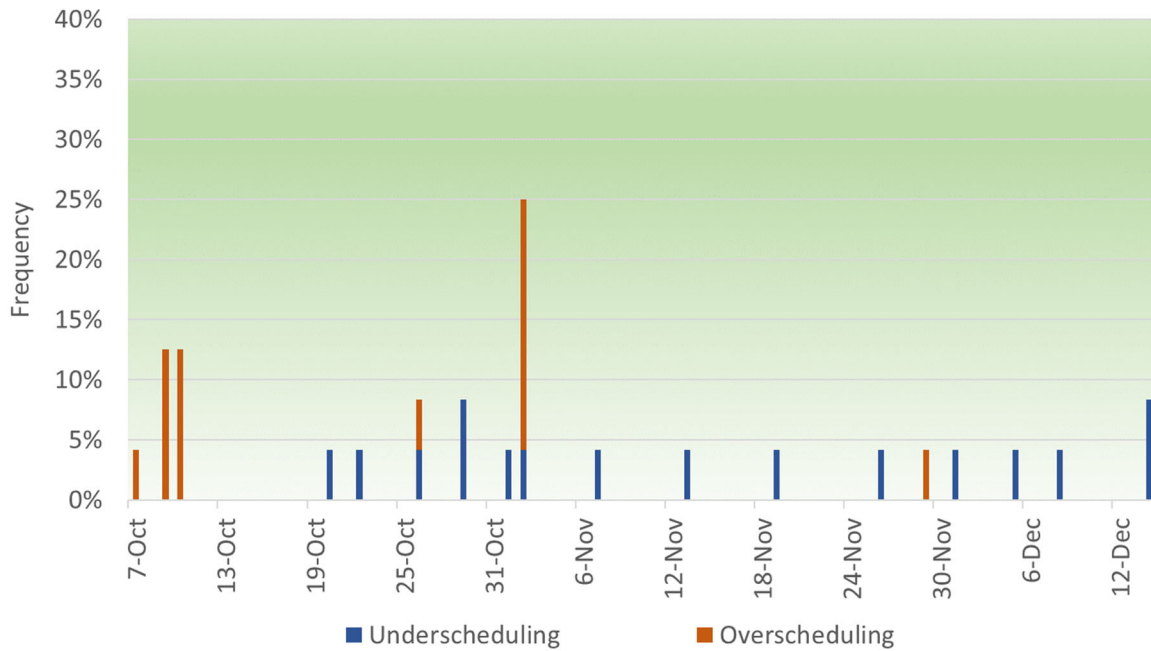


Figure 69: Frequency of Balancing Test Failures for the IPCO BAA

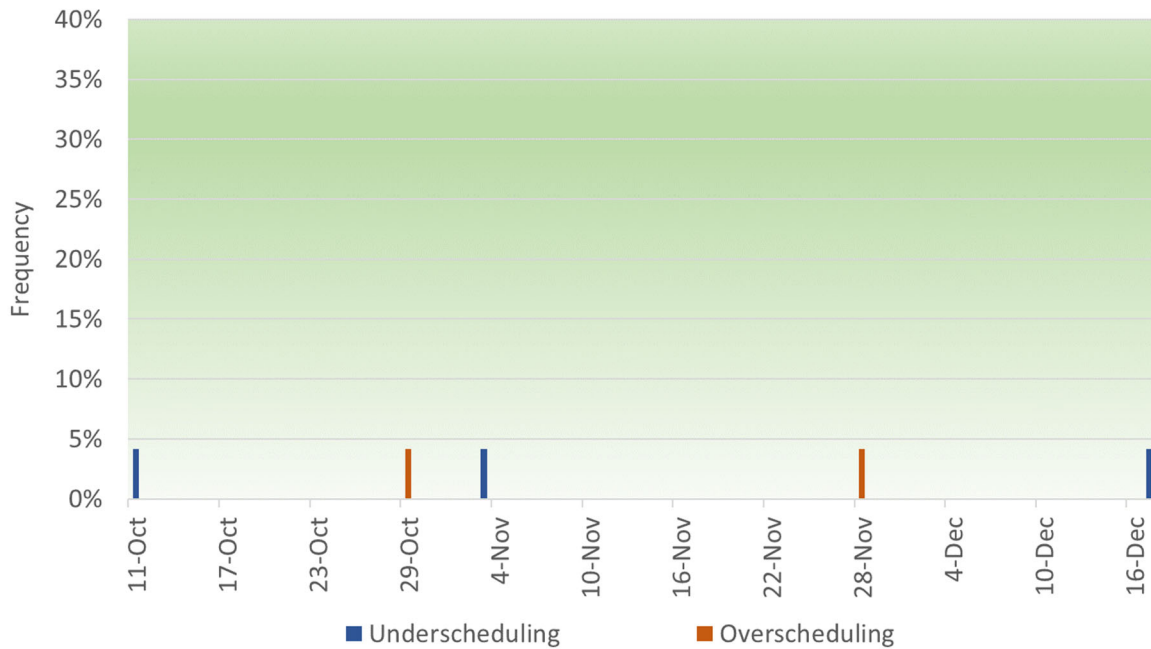


Figure 70: Frequency of Balancing Test Failures for the PGE BAA

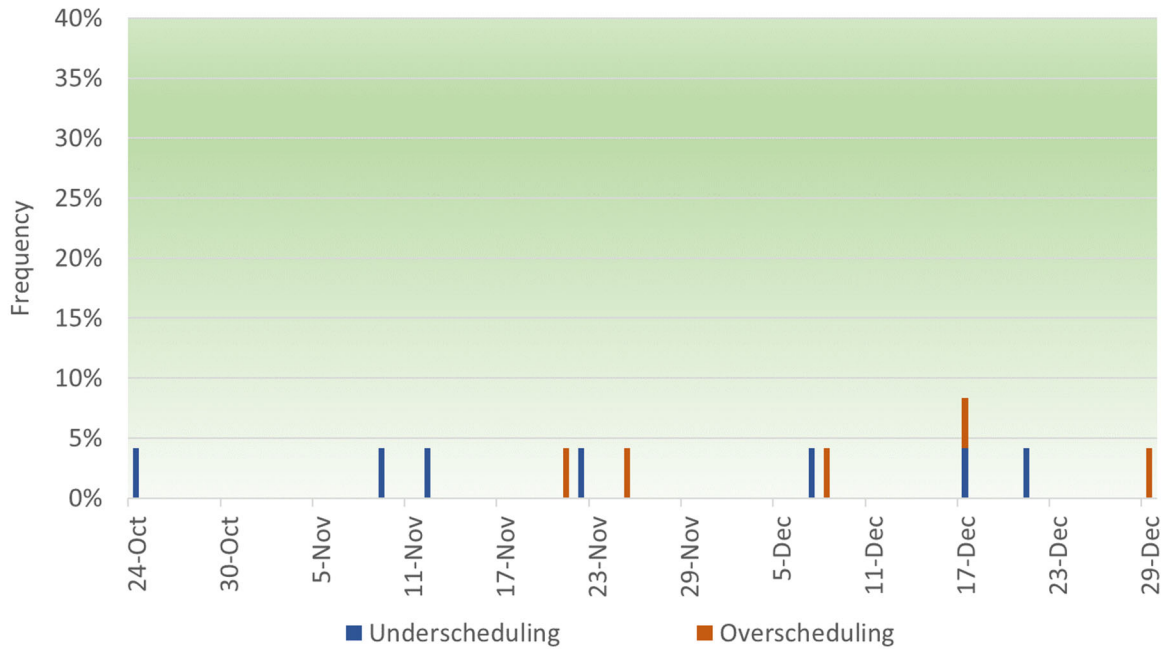
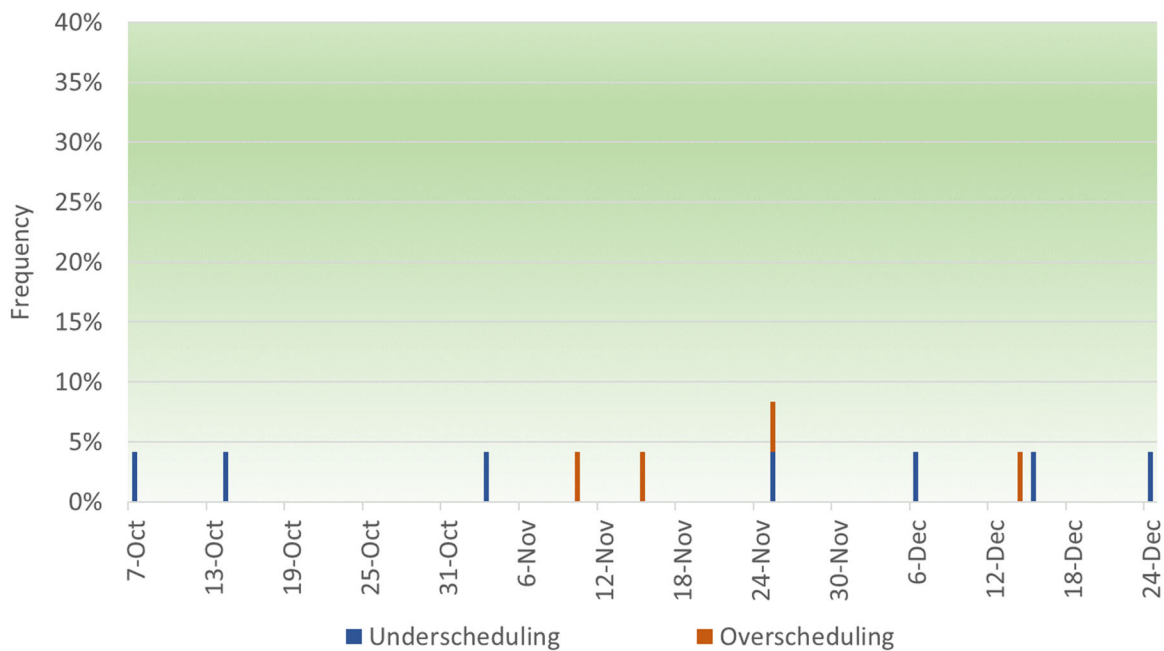


Figure 71: Frequency of Balancing Test Failures for the BANCSMUD BAA



The figures below represent the flexible ramping sufficiency test trends in each of the EIM entity’s BAA for the quarter covered in this report. The table below shows the percentage of hours in which each BAA passed the flexible ramping sufficiency test.

Table 7: Frequency of Passing Flexible Ramping Sufficiency Test

Balancing Authority Area	% Hours Passing Flex Ramp Test
PAC West	99.9%
PAC East	99.8%
NV Energy	98.6%
APS	97.3%
PSE	99.5%
IPCO	99.9%
PGE	99.6%
PWRX	99.6%
BANCSMUD	99.9%

Figure 72: Frequency of Flexible Ramping Sufficiency Test Failures in the PAC West BAA

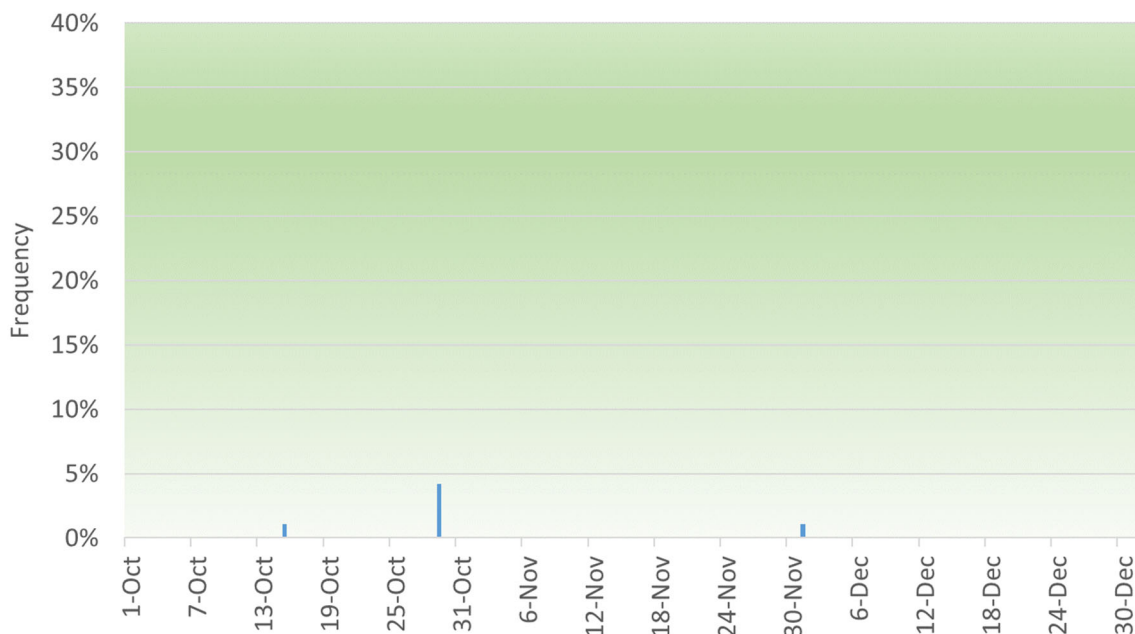


Figure 73: Frequency of Flexible Ramping Sufficiency Test Failures in the PAC East BAA

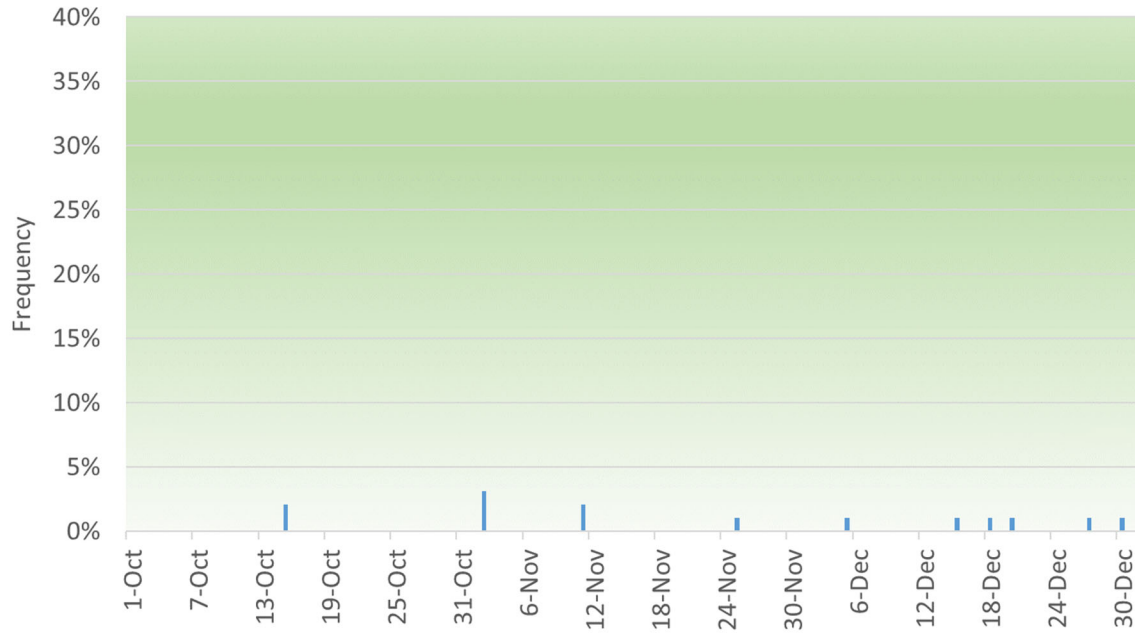


Figure 74: Frequency of Flexible Ramping Sufficiency Test Failures in the NV Energy BAA

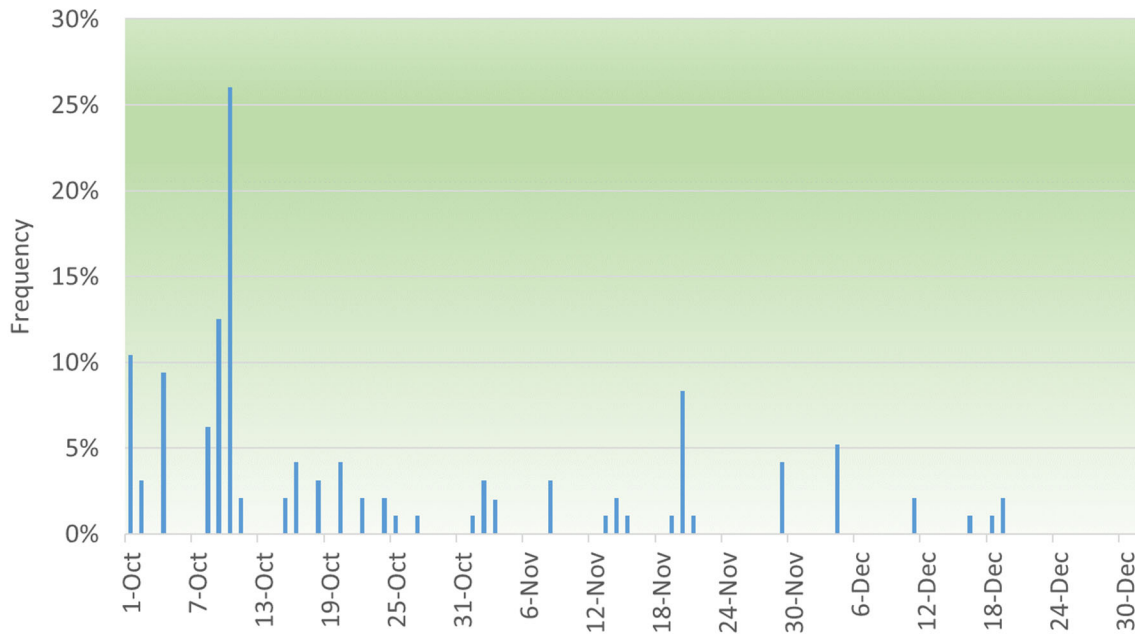


Figure 75: Frequency of Flexible Ramping Sufficiency Test Failures in the APS BAA

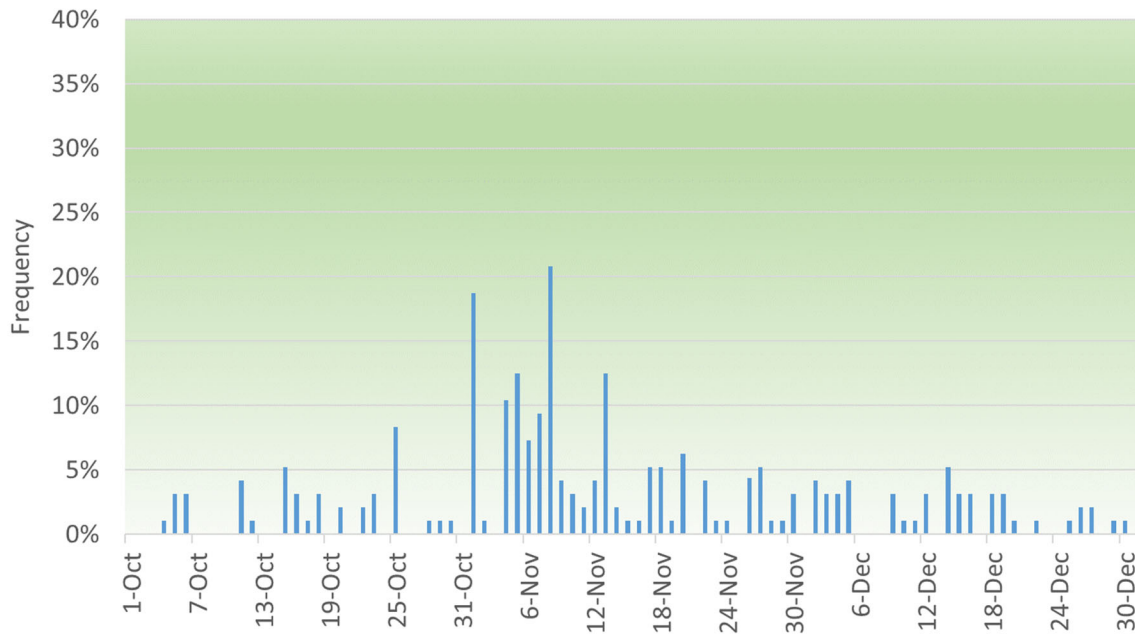


Figure 76: Frequency of Flexible Ramping Sufficiency Test Failures in the PSE BAA

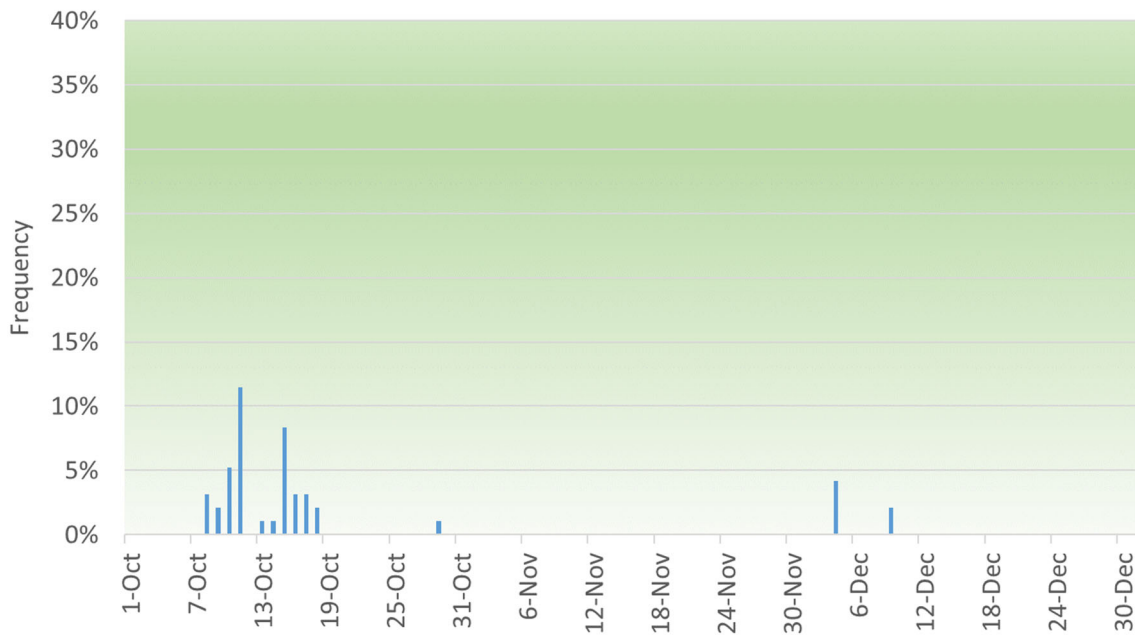


Figure 77: Frequency of Flexible Ramping Sufficiency Test Failures in the IPCO BAA

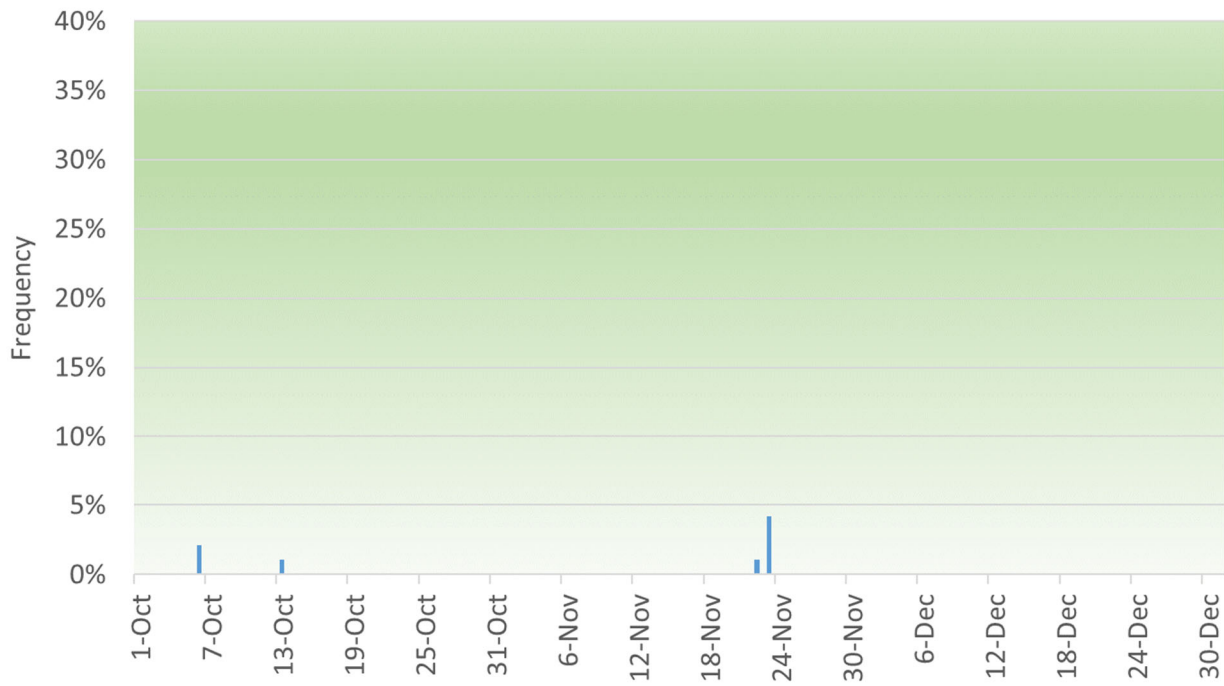


Figure 78: Frequency of Flexible Ramping Sufficiency Test Failures in the PGE BAA

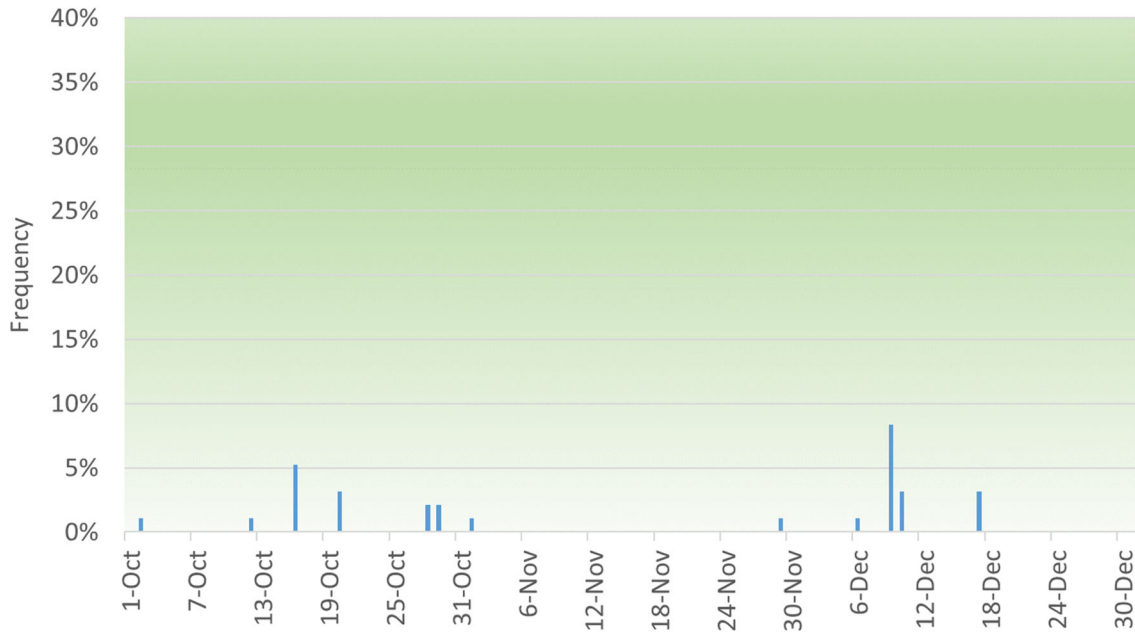


Figure 79: Frequency of Flexible Ramping Sufficiency Test Failures in the PWRX BAA

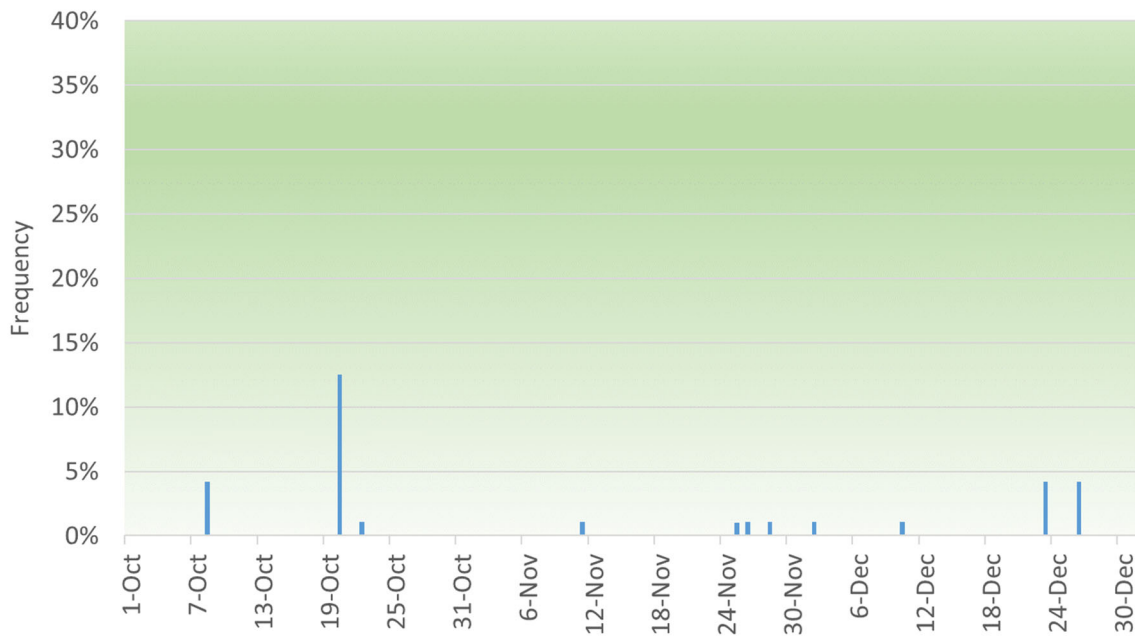
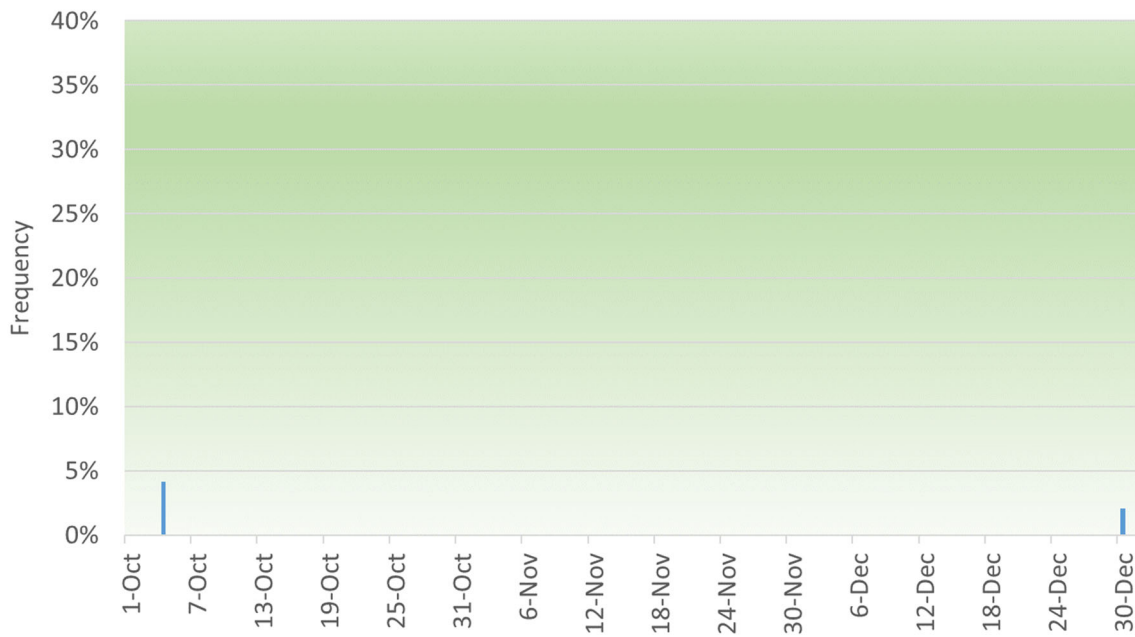


Figure 80: Frequency of Flexible Ramping Sufficiency Test Failures in the BANCSMUD BAA



D. Flexible Ramping Constraint Infeasibilities

The CAISO implemented the flexible ramping product on November 1, 2016. The flexible ramping product uses a price-responsive demand curve. Consequently, there no longer are constraint infeasibilities related to the flexible ramping constraint to report.

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 29th day of March 2021.

Is/ Anna Pascuzzo

Anna Pascuzzo