December 3, 2019

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 – Third Quarter 2018
Available Balancing Capacity Report

Dear Secretary Bose:

The California Independent System Operator Corporation (CAISO) hereby submits its quarterly informational report for the third quarter of 2018 (July 1 to September 30, 2018) 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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Energy Imbalance Market

July 1 – September 30, 2018

Available Balancing Capacity Report

December 3, 2019

California ISO Department of Market Quality and Renewable Integration

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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. Two EIM entities, IPCO and Powerex, were under the transitional period and under tariff provisions for price discovery during the third quarter of 2018.
- The Powerex, NV Energy, and PSE BAAs submitted ABC in all or nearly all intervals of the third quarter of 2018; this contrasts with the lower frequency of ABC submitted by other EIM entities.
- The EIM dispatched ABC, in either upward or downward direction very infrequently, as high as 5.04 percent for the APS BAA, but as low as zero percent in other EIM BAAs.
- The APS BAA used as many as twenty different resources and the NV Energy BAA used as many as twelve different resources to support their respective ABC submissions.
- Overall, the impact of ABC was low, based on the relatively 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). Figures 1 through 12 show the ABC made available in each of the EIM BAAs: PacifiCorp West (PAC West), PAC East, NV Energy, Arizona Public Service (APS), Puget Sound Energy (PSE), and Powerex (PWRX). Portland General Electric (PGE) and Idaho Power Corporation (IPCO) did not submit any ABC bids in the first quarter of 2018 thus are not included graphically below. Below are two plots for each BAA that 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. The red markers indicate when the ABC was dispatched in either the upward or downward direction.

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

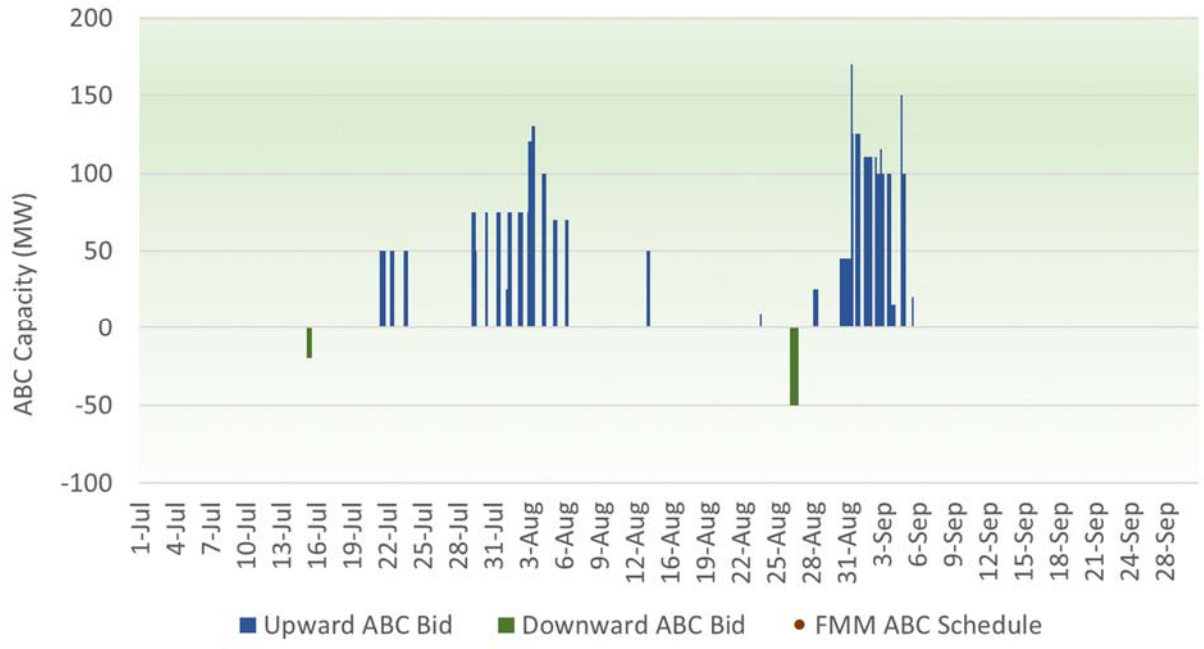


Figure 2: Submitted and Dispatched ABC in the PAC West BAA – RTD

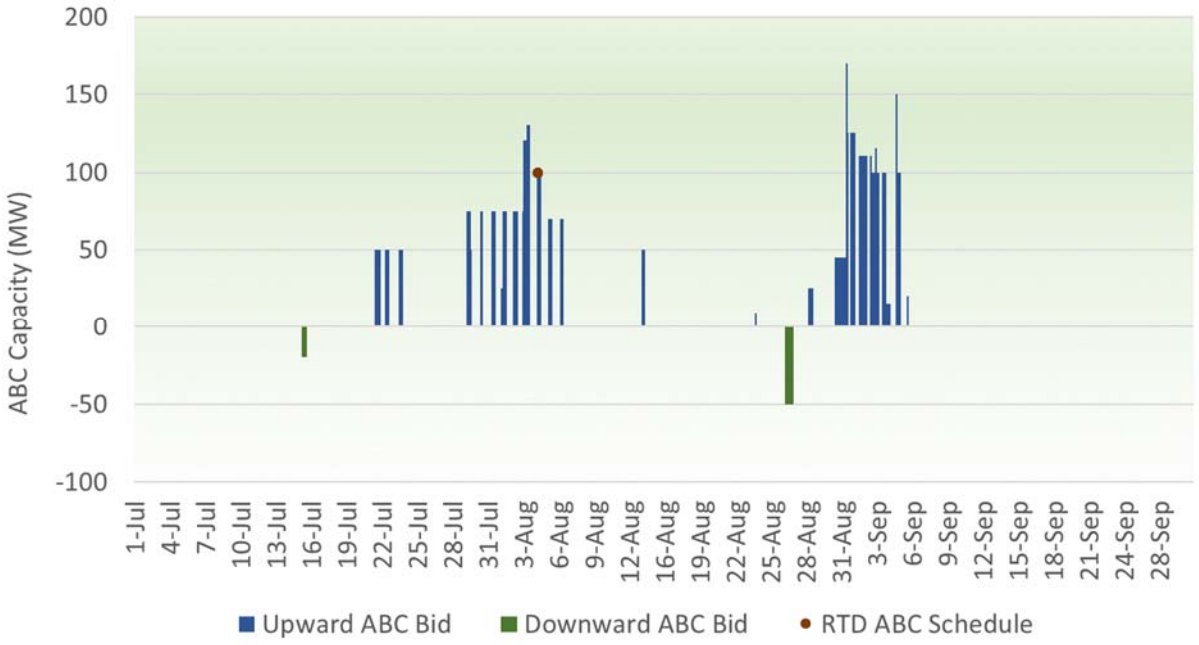


Figure 3: Submitted and Dispatched ABC in the PAC East BAA – FMM

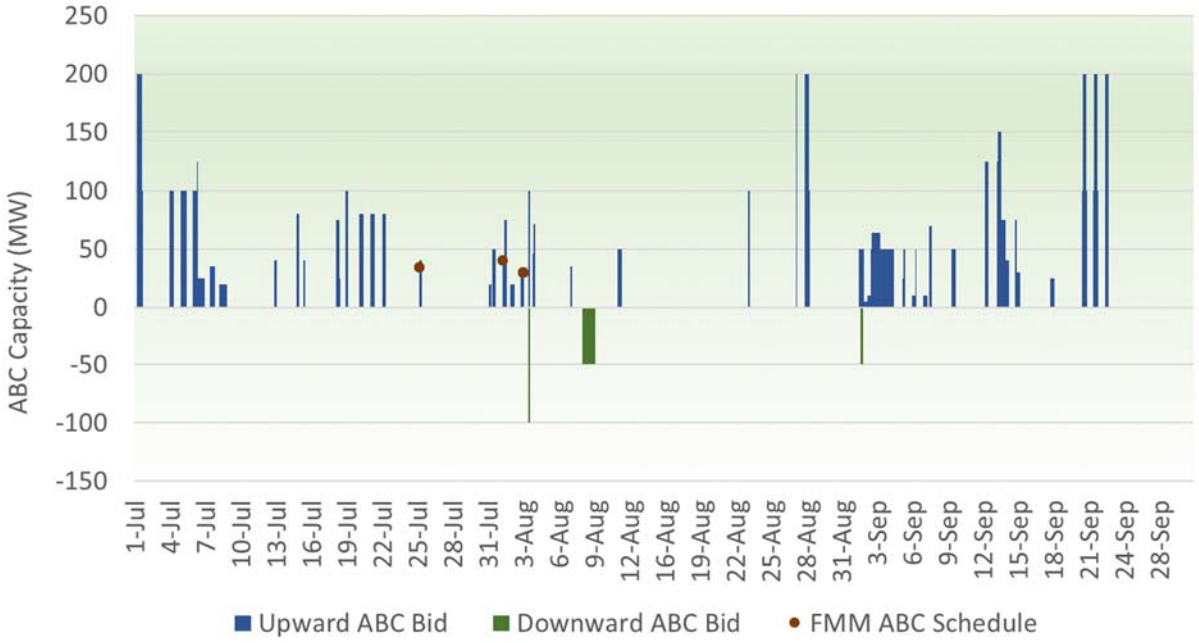


Figure 4: Submitted and Dispatched ABC in the PAC East BAA – RTD

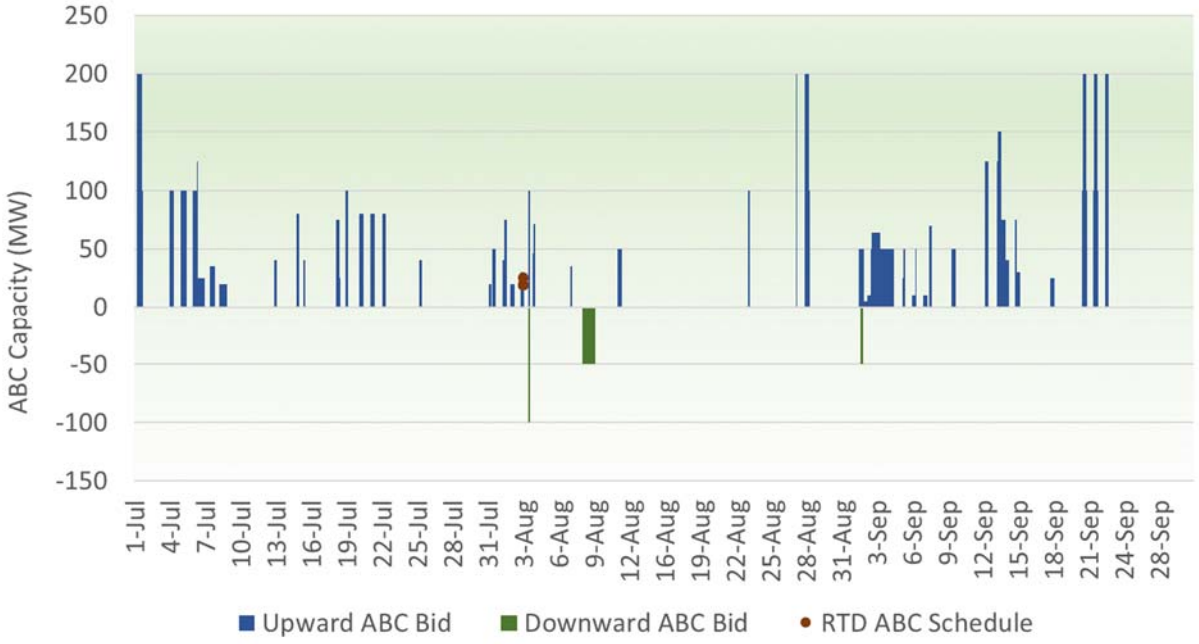


Figure 5: Submitted and Dispatched ABC in the NV Energy BAA – FMM

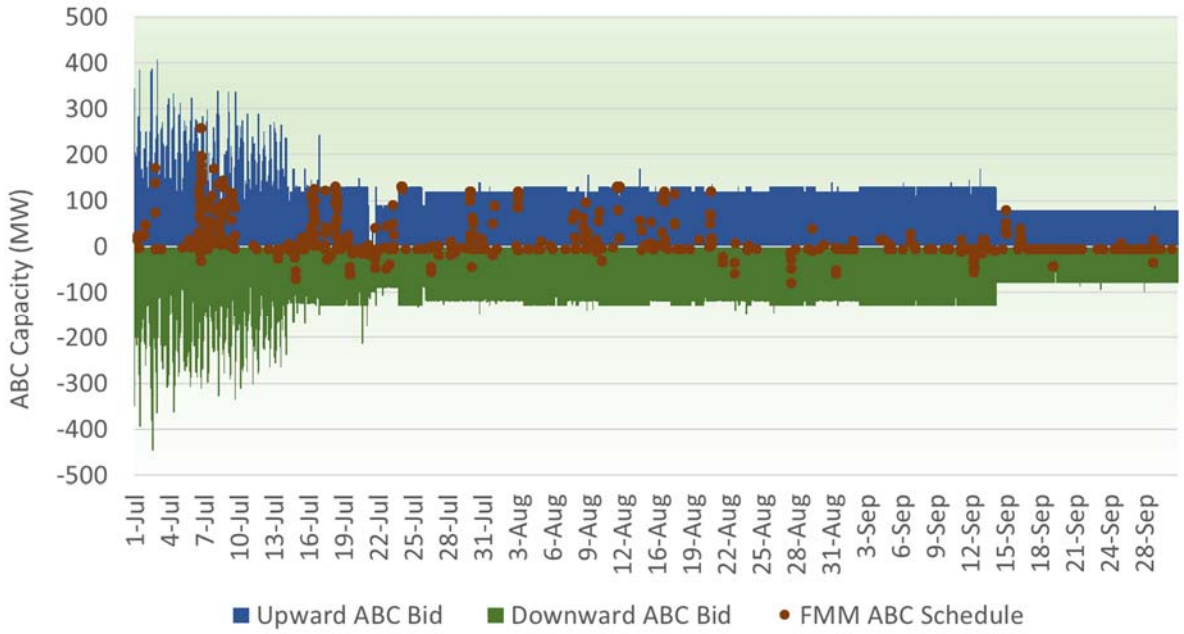


Figure 6: Submitted and Dispatched ABC in the NV Energy BAA – RTD

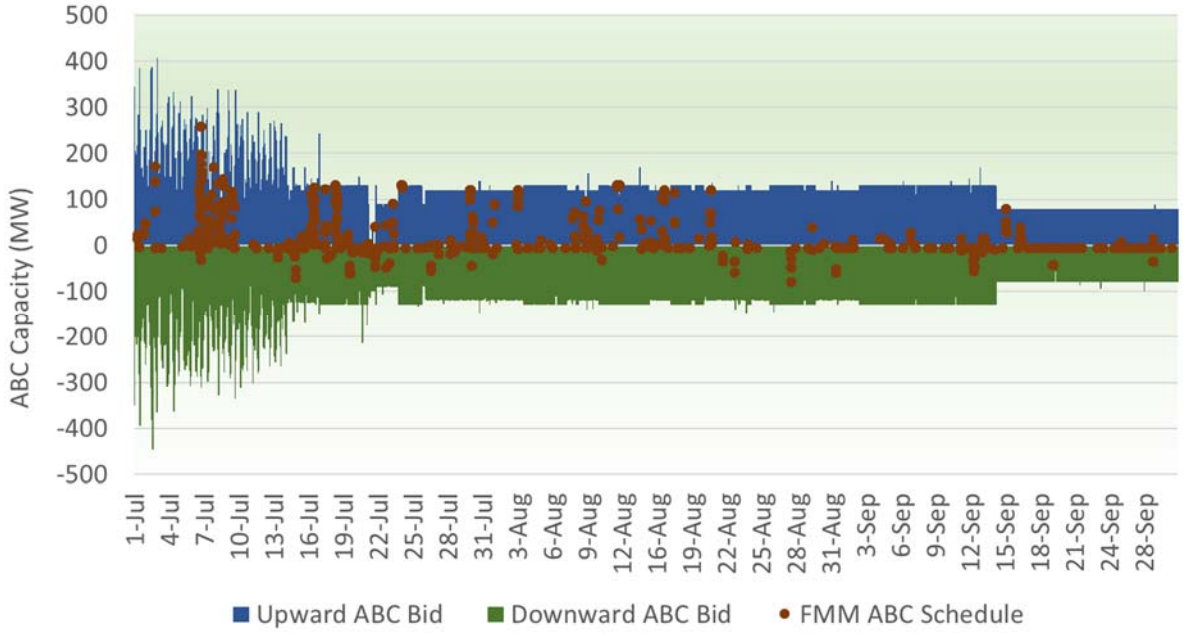


Figure 7: Submitted and Dispatched ABC in the APS BAA – FMM

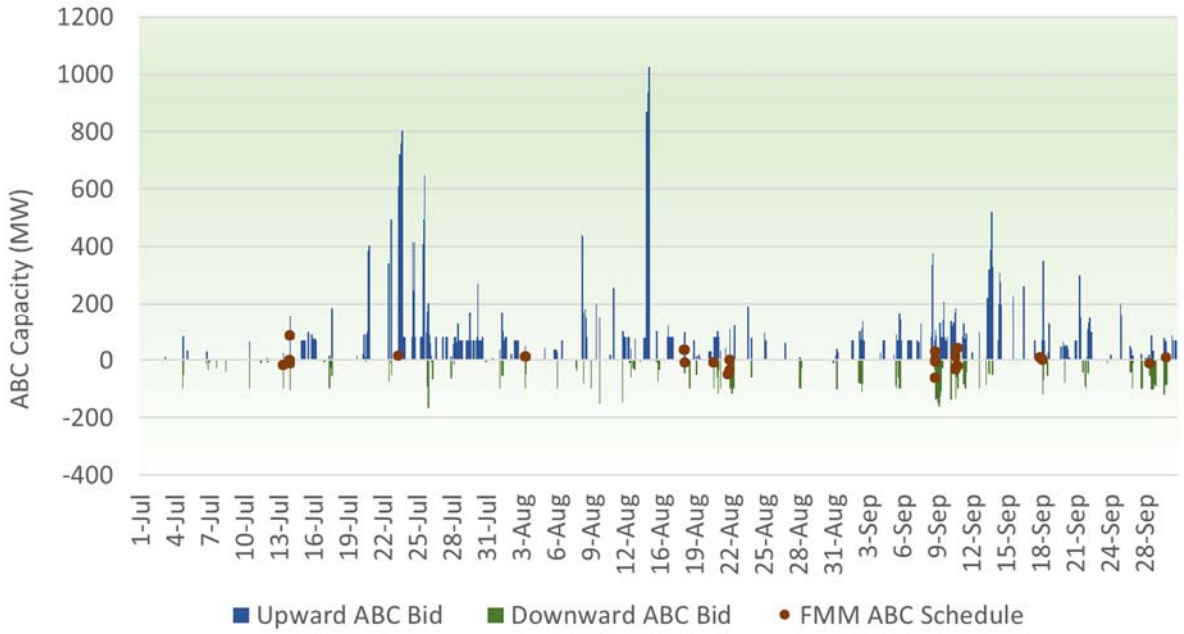


Figure 8: Submitted and Dispatched ABC in the APS BAA – RTD

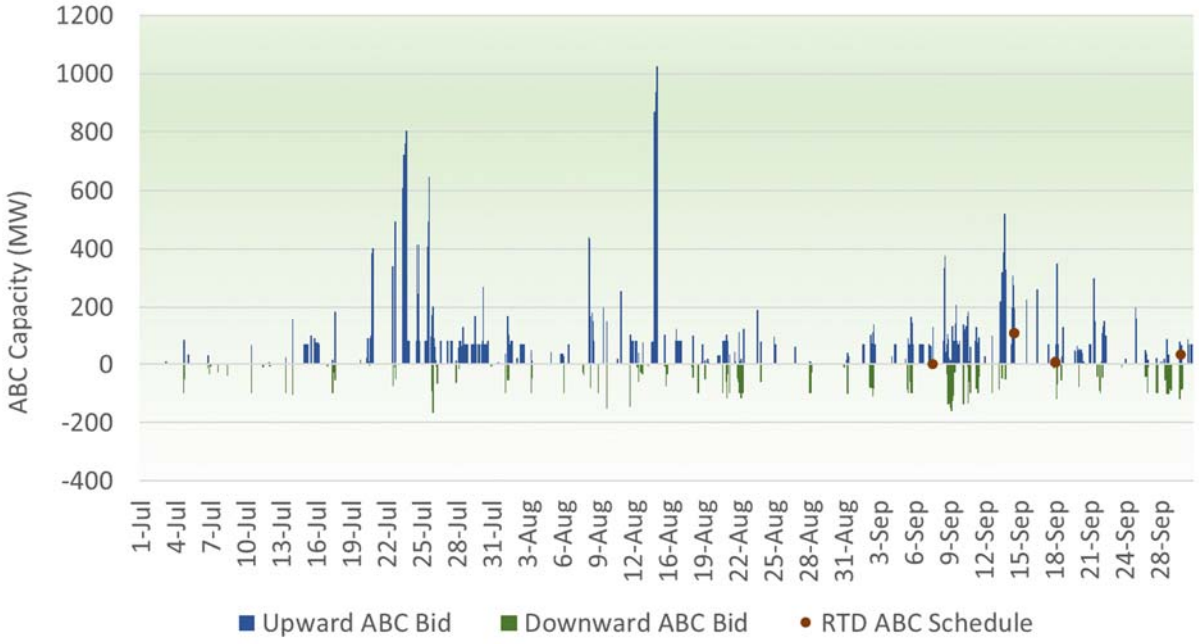


Figure 9: Submitted and Dispatched ABC in the PSE BAA – FMM

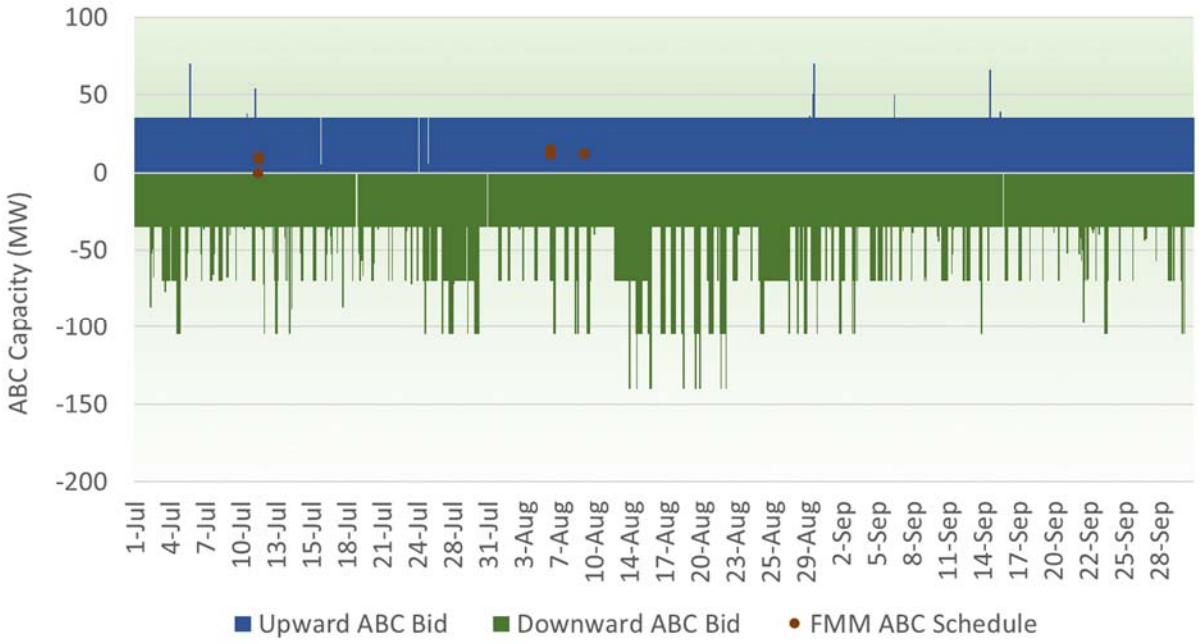


Figure 10: Submitted and Dispatched ABC in the PSE BAA – RTD

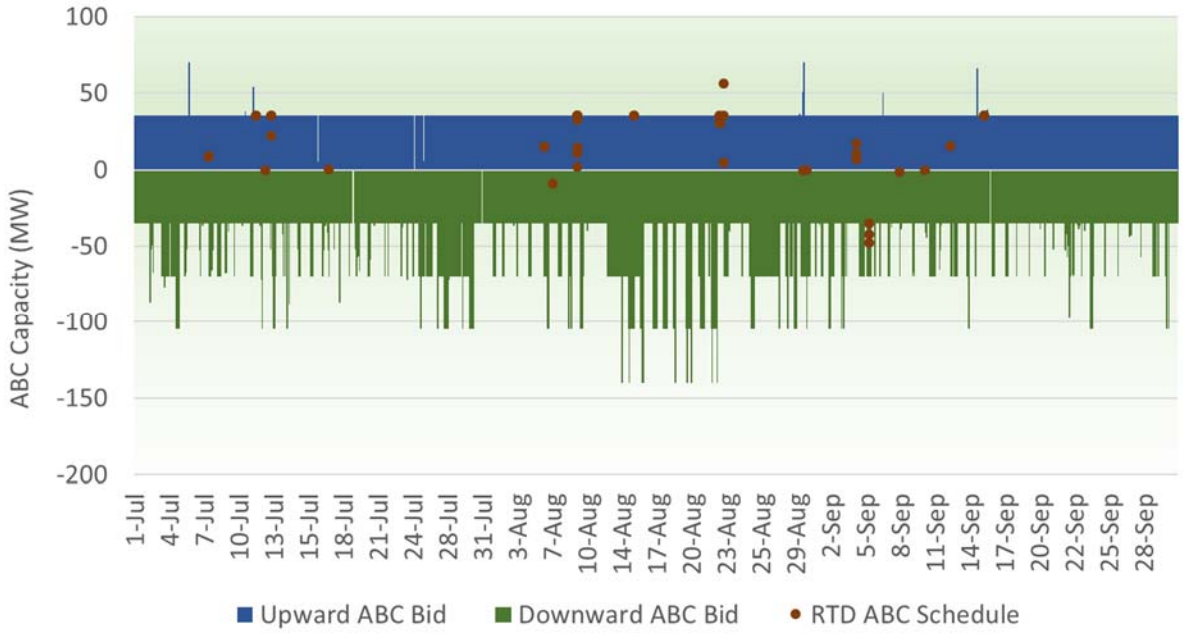


Figure 11: Submitted and Dispatched ABC in the PWRX BAA – FMM

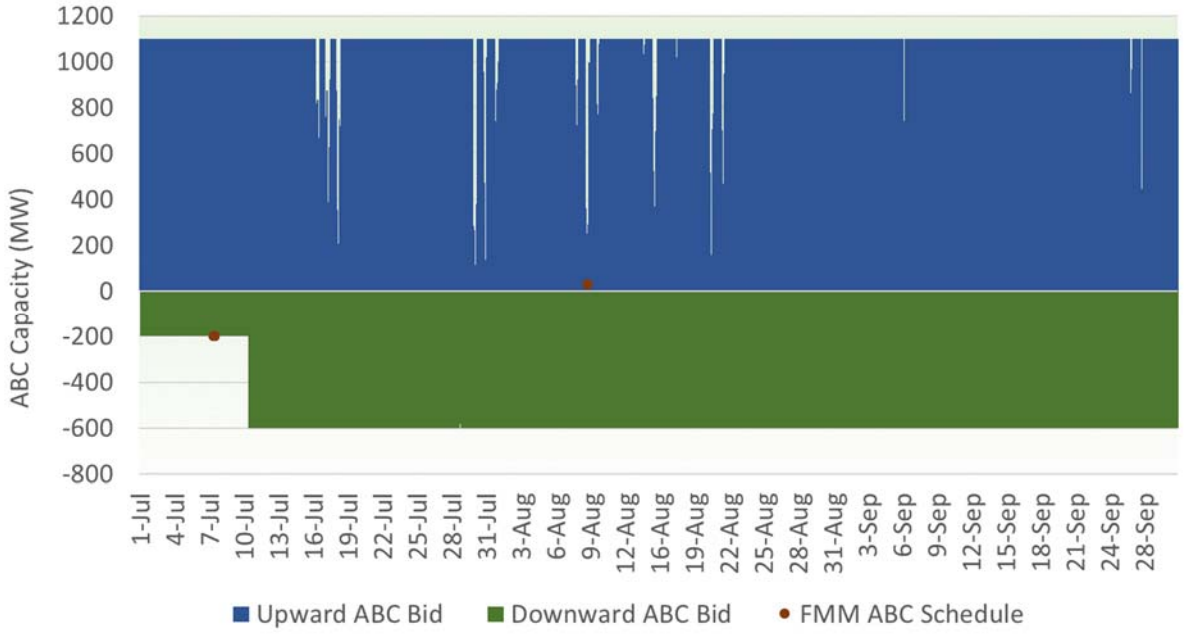


Figure 12: Submitted and Dispatched ABC in the PWRX BAA – RTD

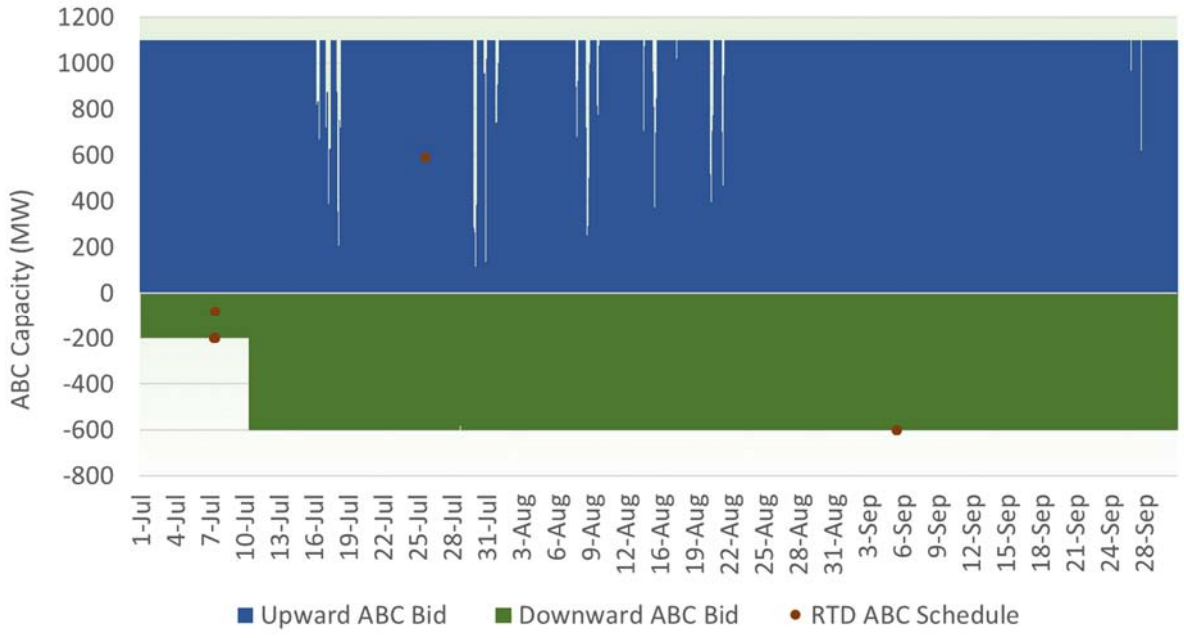


Table 1 summarizes the percentage of intervals in which each EIM entity submitted ABC to the EIM. The NV Energy, PSE, and PWRX BAAs submitted both upward and downward ABC to the EIM during nearly all of market intervals in the third quarter of 2018. In contrast, the other EIM entities submitted infrequent or no ABC to the EIM during the same period.

Table 1: Frequency of ABC Submitted to the EIM

Balancing Authority Area	Upward Capacity	Downward Capacity
PAC West	9.31%	1.14%
PAC East	14.96%	1.36%
NV Energy	99.36%	99.95%
APS	20.50%	7.44%
PSE	98.04%	98.58%
IPCO	0%	0%
PGE	0%	0%
PWRX	100%	100%

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. Overall, the CAISO dispatched ABC very infrequently with a maximum dispatch of 5.04 percent of submitted downward capacity by APS in the FMM.

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%	0.16%	0%	0%
PAC East	0.43%	0.30%	0%	0%
NV Energy	3.40%	3.40%	2.40%	2.76%
APS	1.77%	0.15%	5.04%	0%
PSE	0.08%	0.15%	0%	0.04%
IPCO	0%	0%	0%	0%
PGE	0%	0%	0%	0%
PWRX	0.01%	0%	0.03%	0.05%

B. Resources Supporting Available Balancing Capacity

Figures 13 through 18 show the number of different resources supporting the ABC the EIM entities submitted to the FMM and RTD. The Powerex, NV Energy, and PSE BAAs had a larger pool of resources to support the ABC while Idaho Power Corporation and PGE had none.

Figure 13: Number of Resources Supporting the Submitted ABC in the PAC West BAA

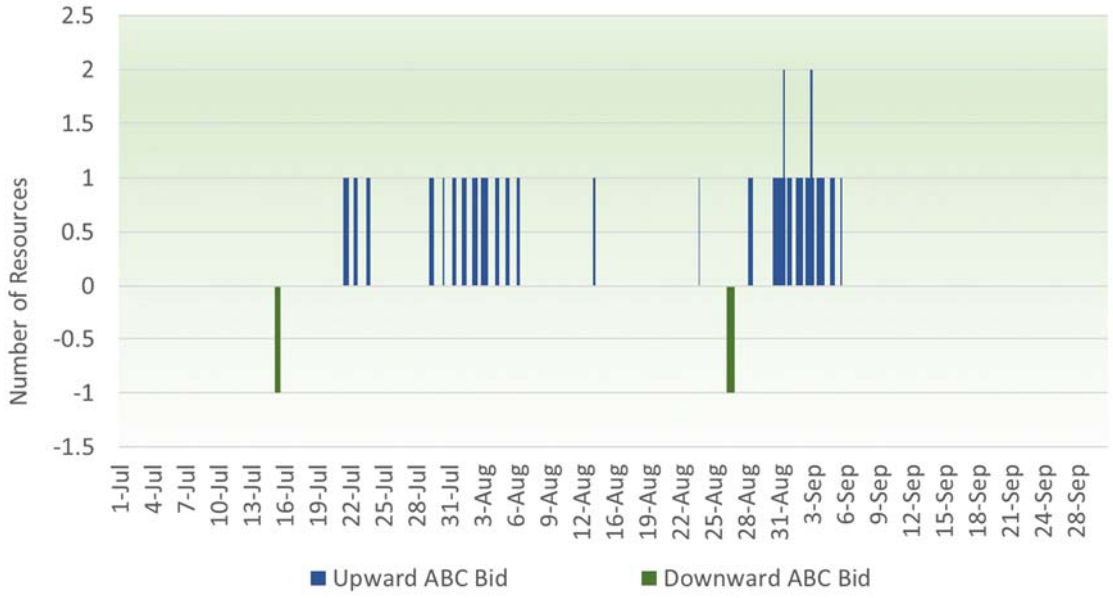


Figure 14: Number of Resources Supporting the Submitted ABC in the PAC East BAA

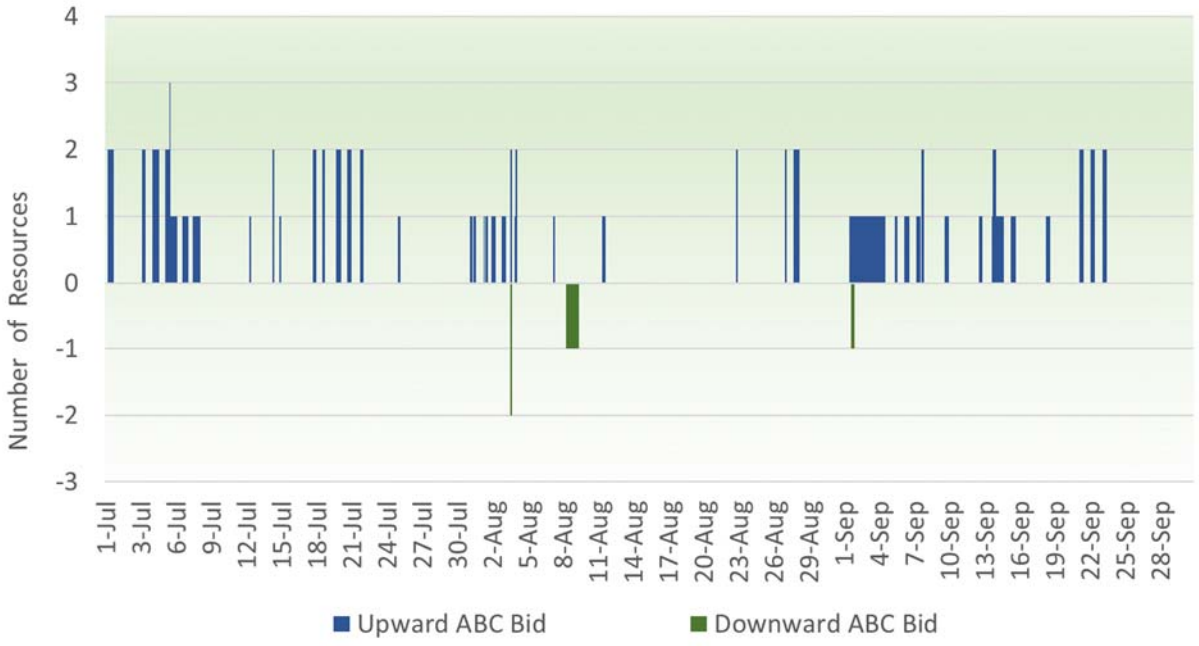


Figure 15: Number of Resources Supporting the Submitted ABC in the NV Energy BAA

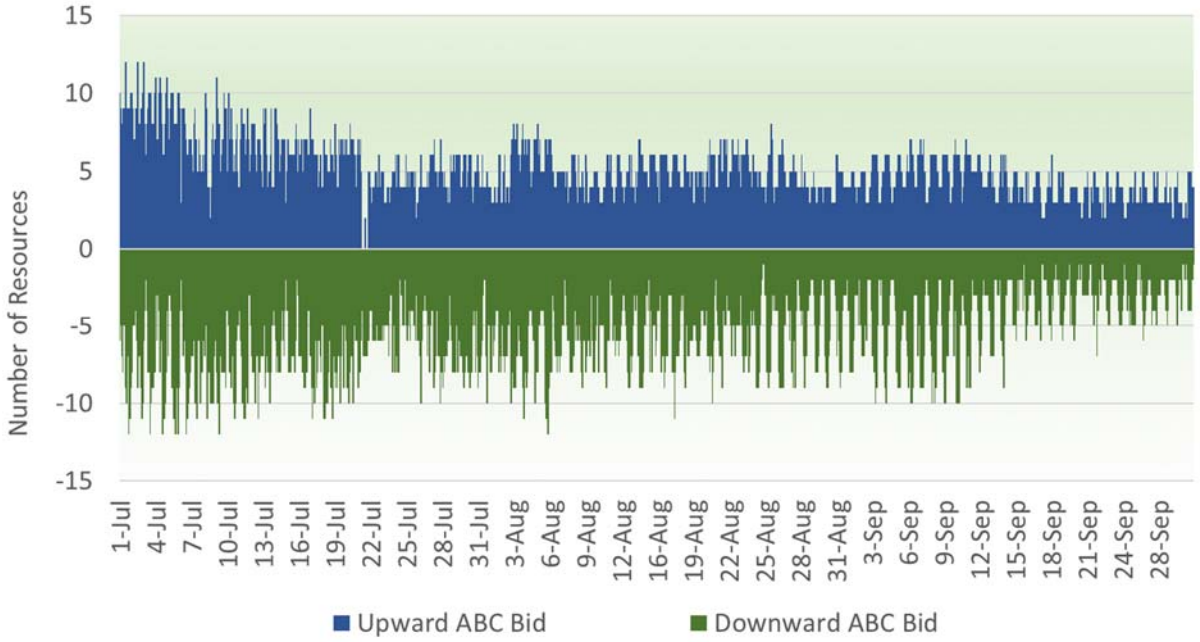


Figure 16: Number of Resources Supporting the Submitted ABC in the APS BAA

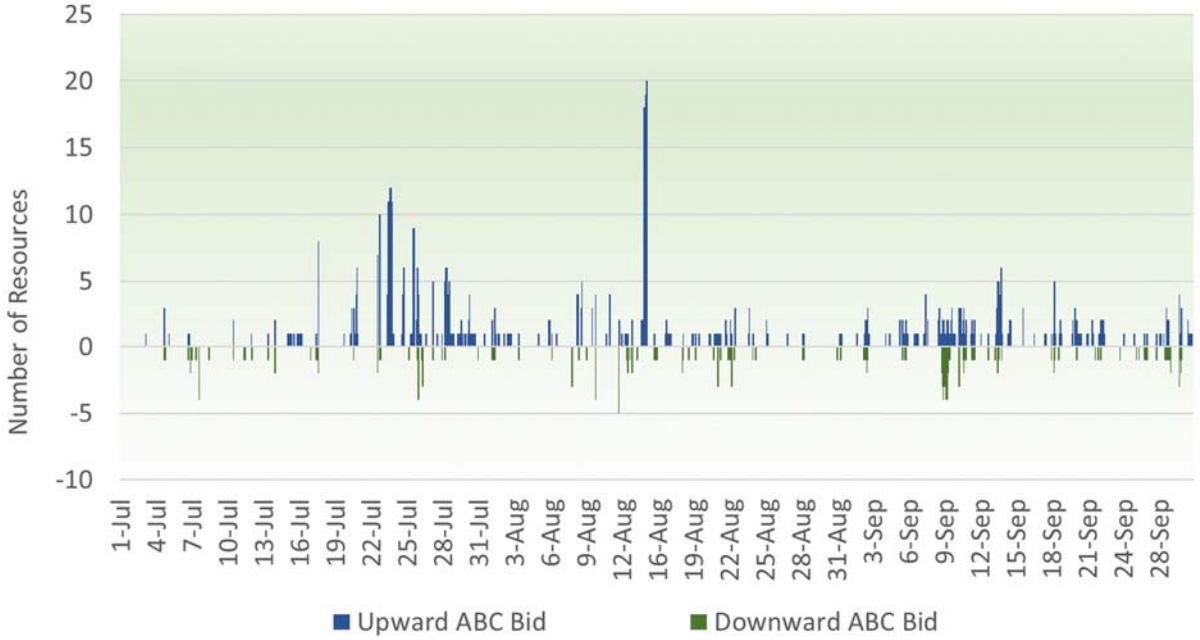


Figure 17: Number of Resources Supporting the Submitted ABC in the PSE BAA

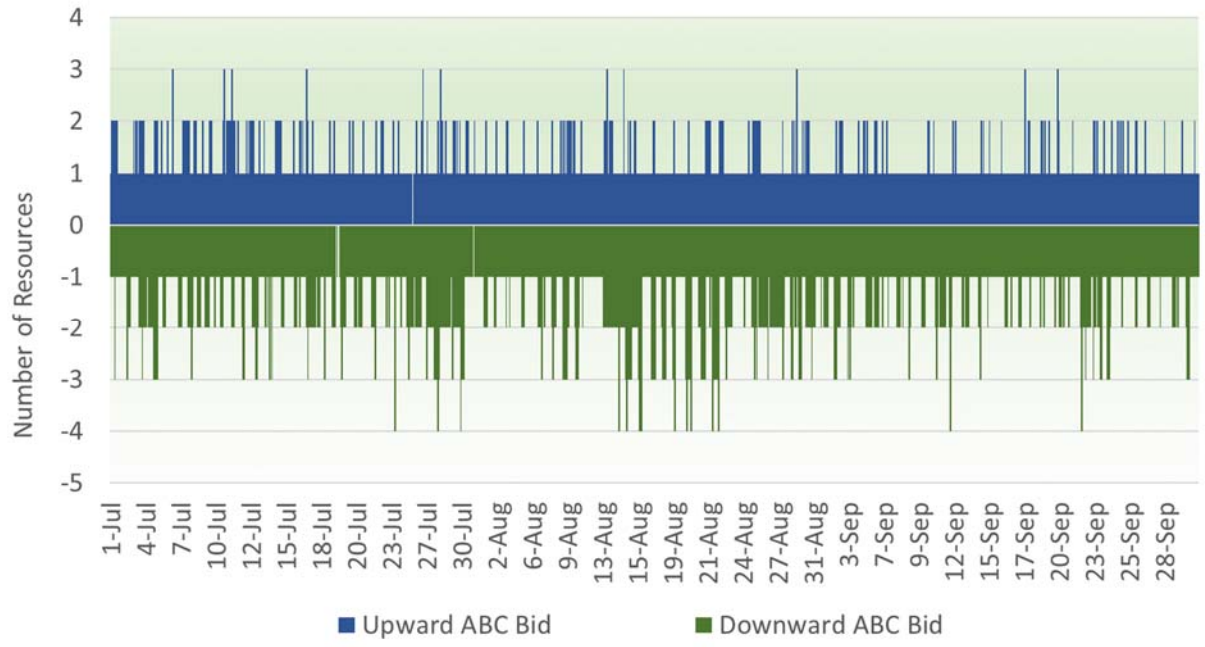
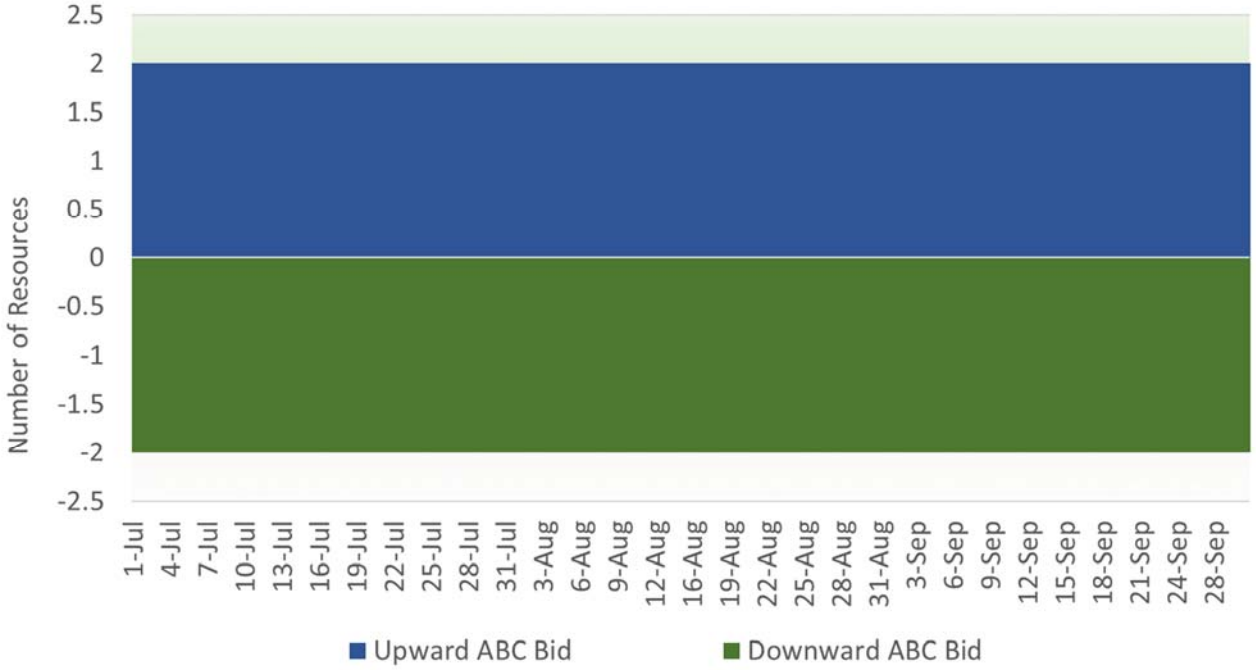


Figure 18: Number of Resources Supporting the Submitted ABC in the PWRX BAA



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.

Figures 19 through 34 show the amount of ABC bids submitted in the FMM and RTD, along with the power balance constraint infeasibilities, separately.

Figure 19: Submitted ABC and Power Balance Constraint Infeasibilities in the PAC West BAA – FMM

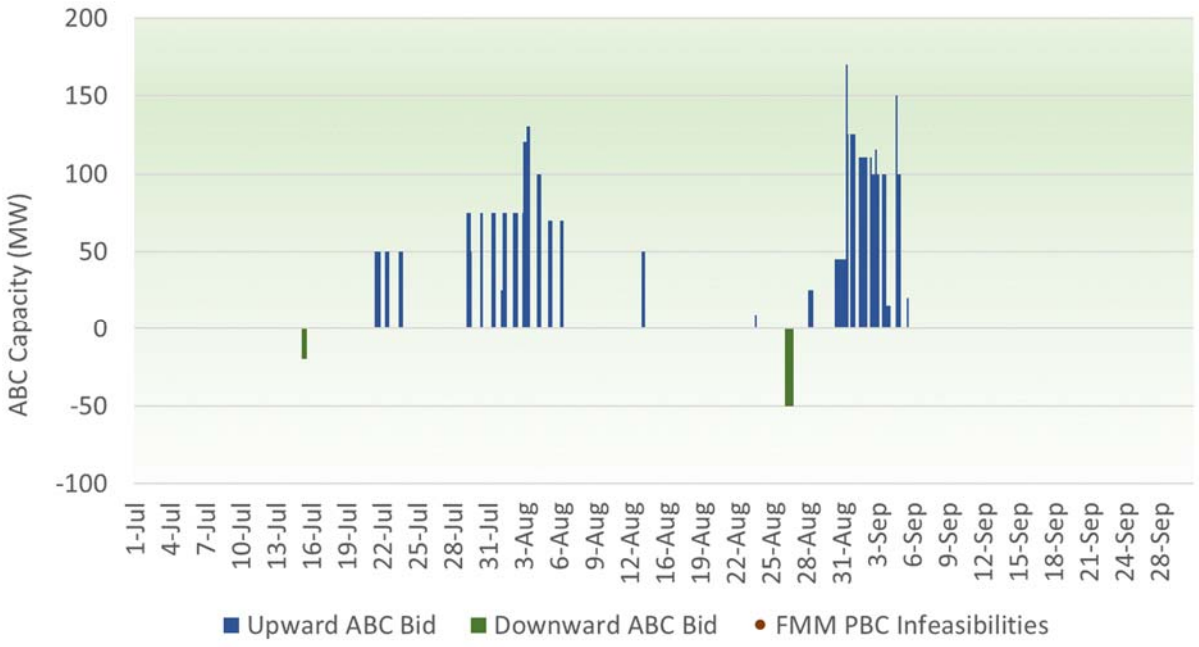


Figure 20: Submitted ABC and Power Balance Constraint Infeasibilities in the PAC West BAA – RTD

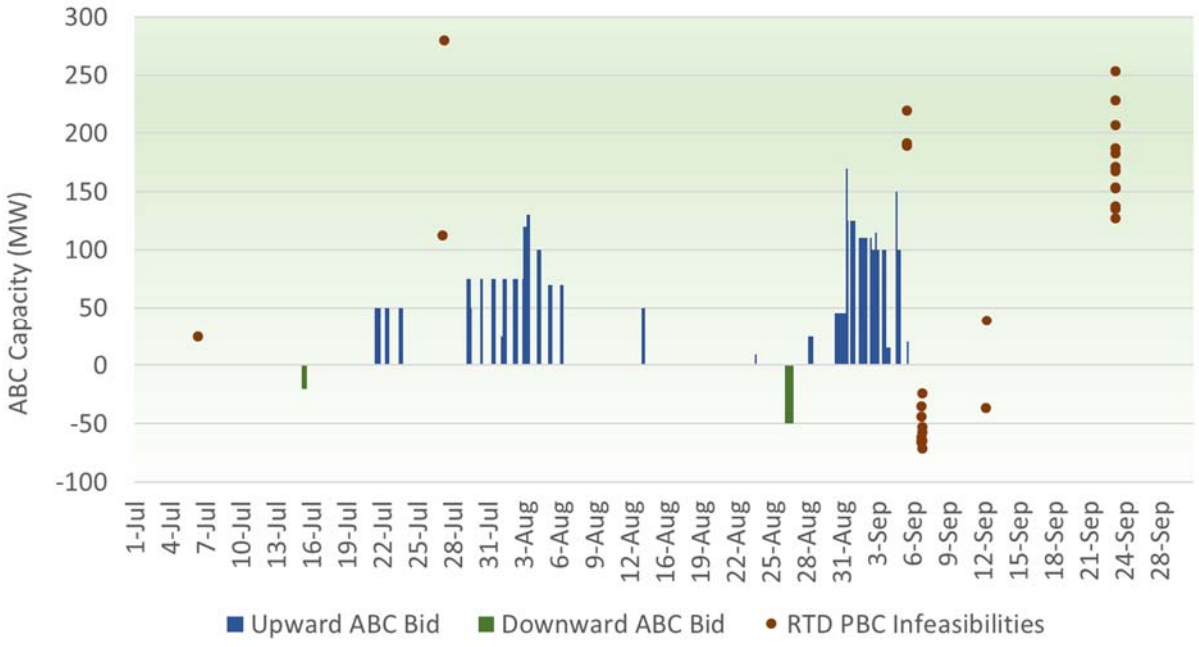


Figure 21: Submitted ABC and Power Balance Constraint Infeasibilities in the PAC East BAA – FMM

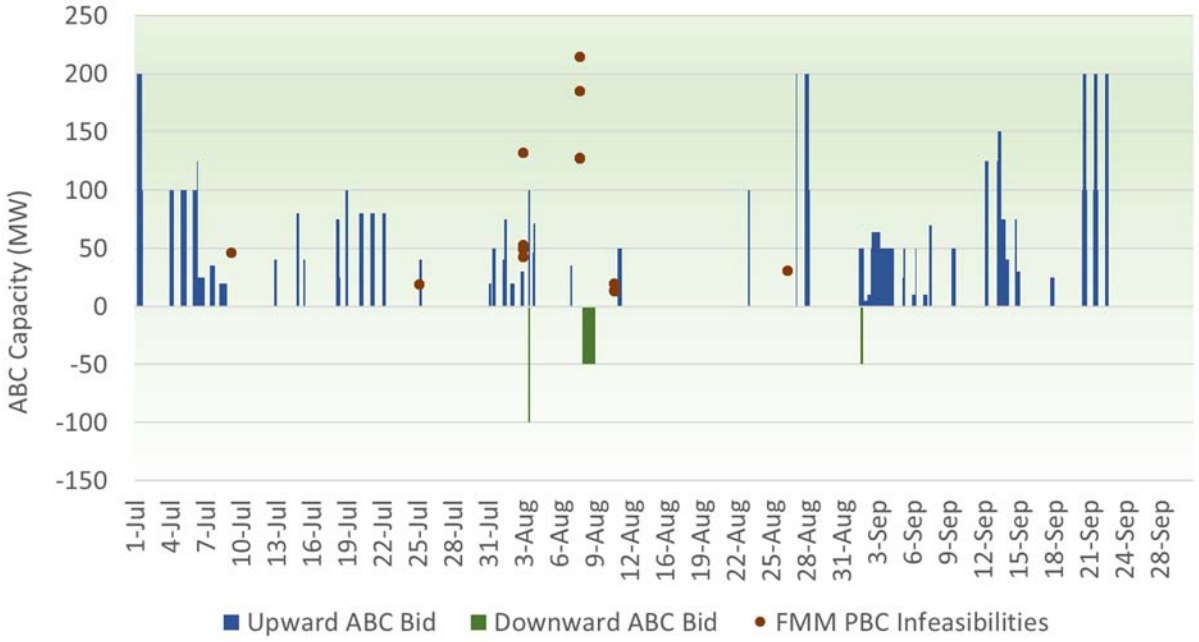


Figure 22: Submitted ABC and Power Balance Constraint Infeasibilities in the PAC East BAA – RTD

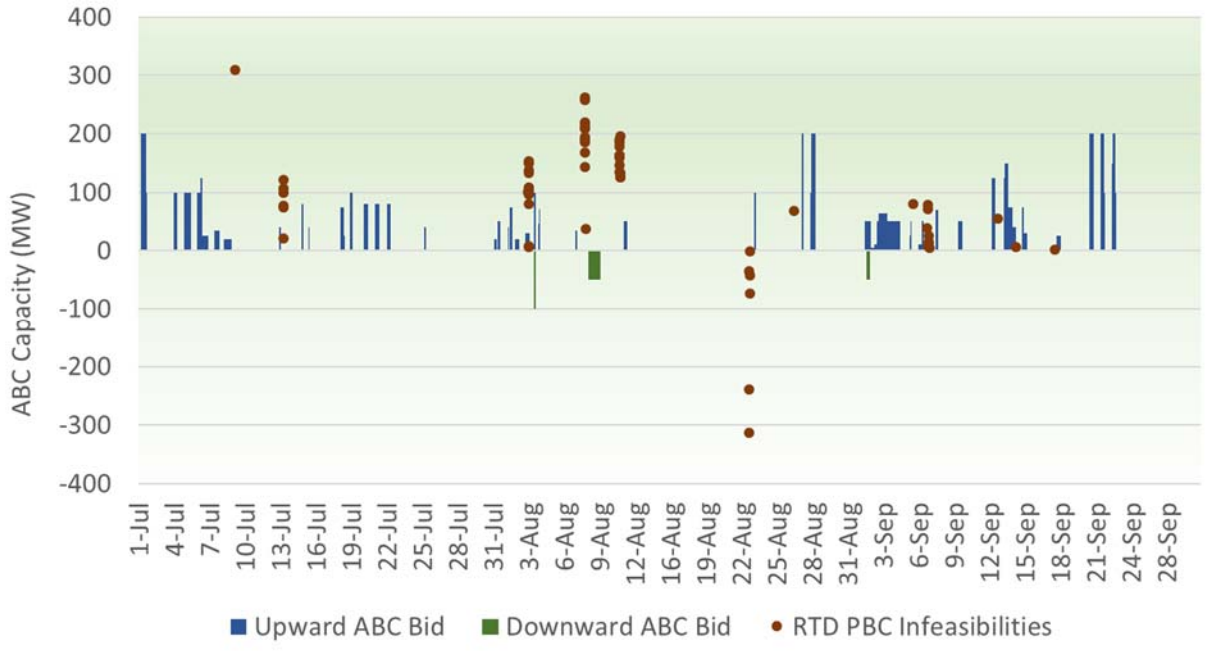


Figure 23: Submitted ABC and Power Balance Constraint Infeasibilities in the NV Energy BAA – FMM

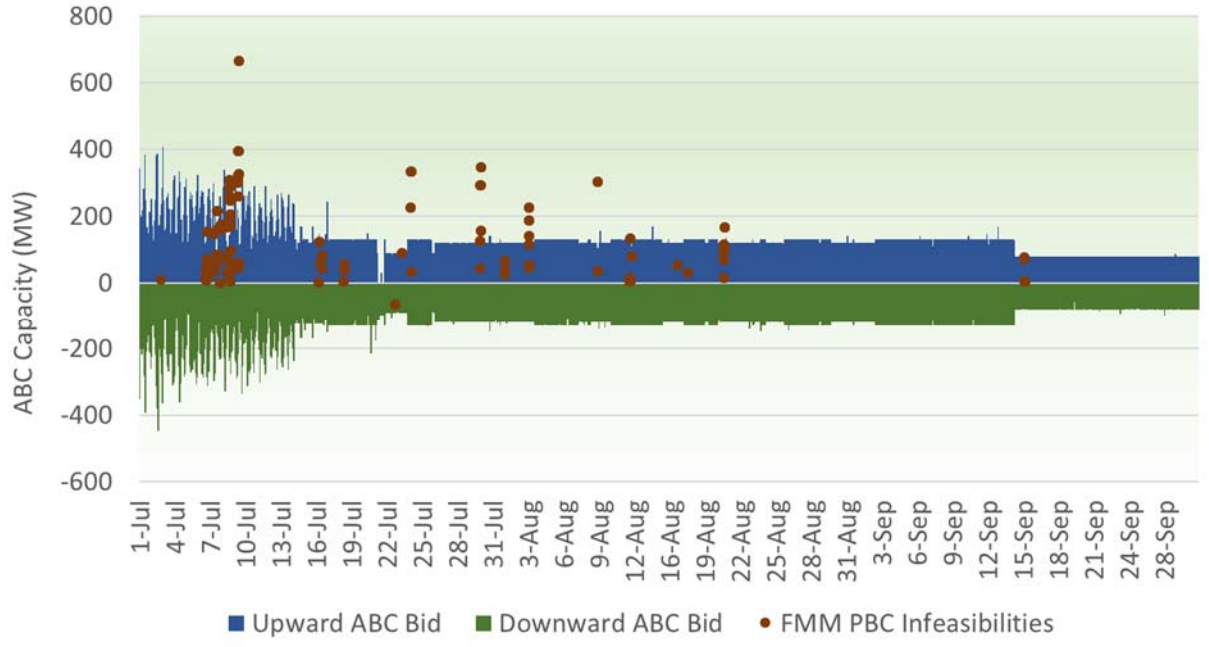


Figure 24: Submitted ABC and Power Balance Constraint Infeasibilities in the NV Energy BAA – RTD

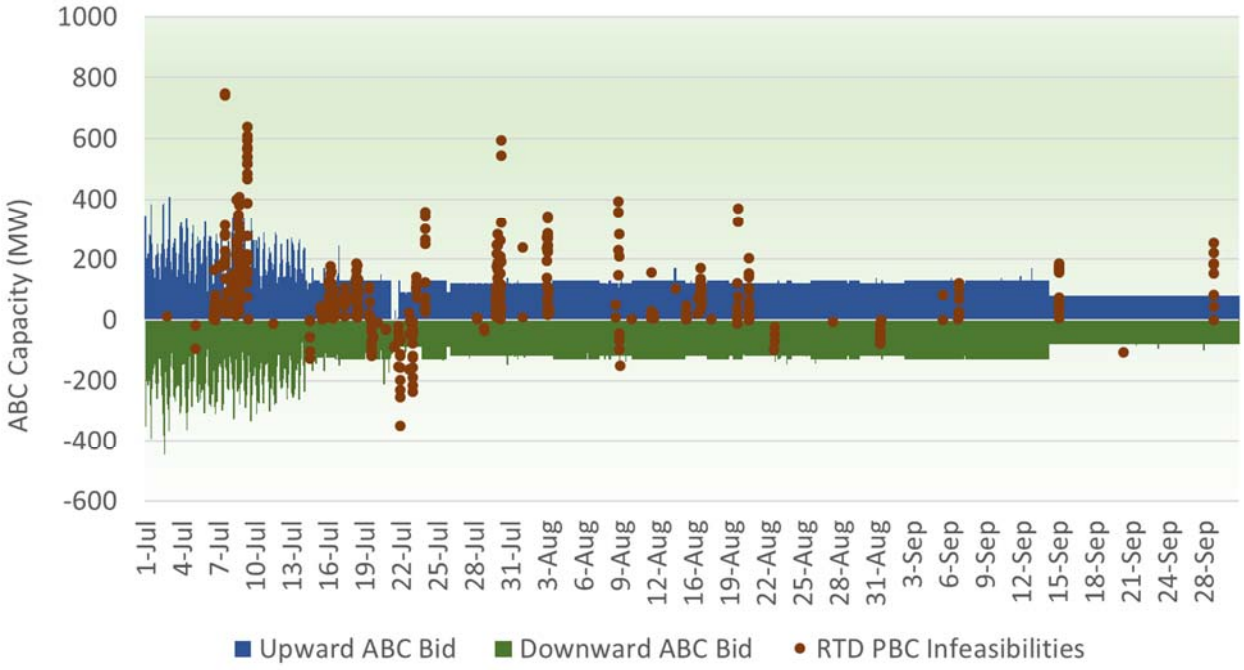


Figure 25: Submitted ABC and Power Balance Constraint Infeasibilities in the APS BAA – FMM

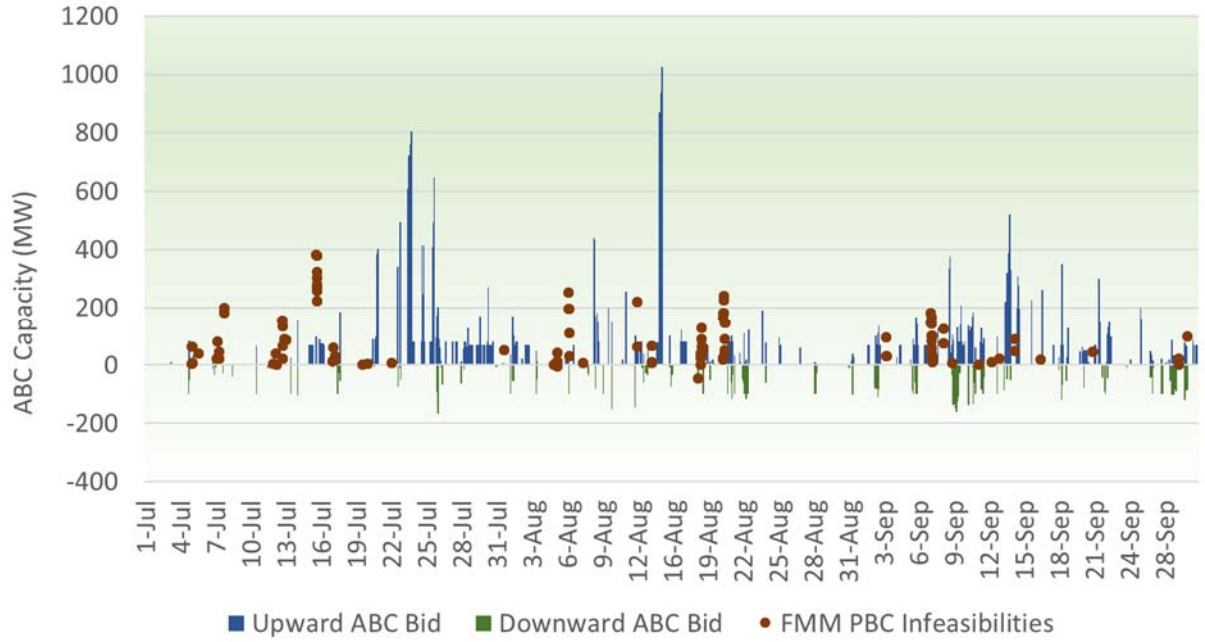


Figure 26: Submitted ABC and Power Balance Constraint Infeasibilities in the APS BAA – RTD

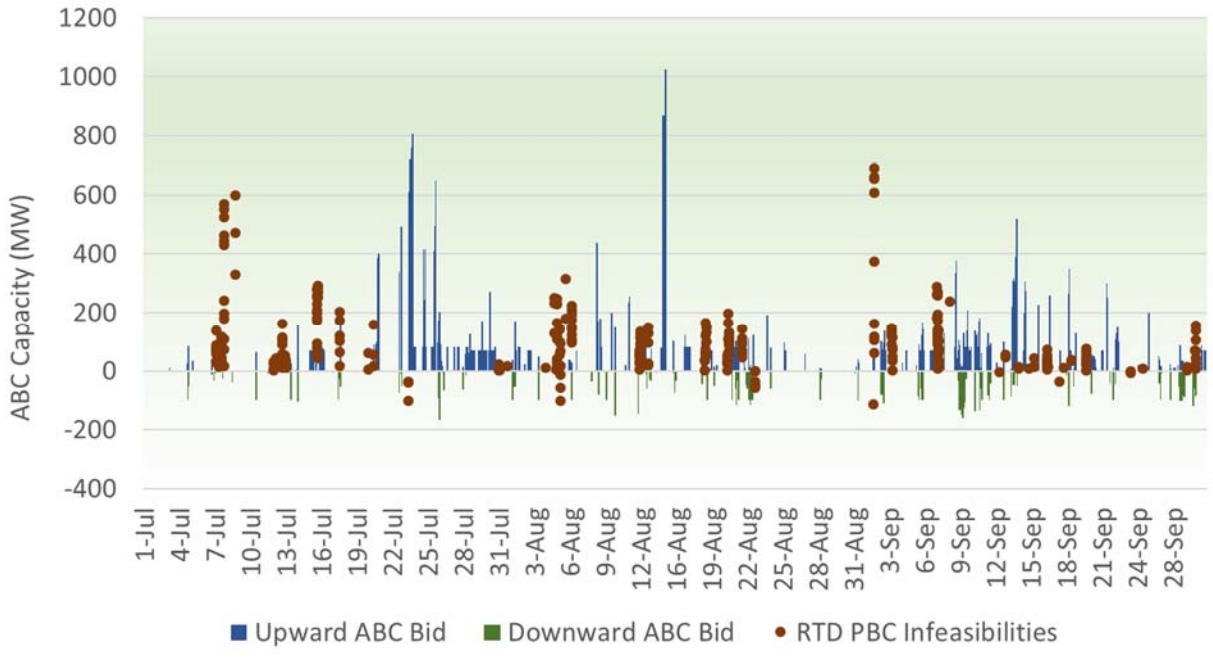


Figure 27: Submitted ABC and Power Balance Constraint Infeasibilities in the PSE BAA – FMM

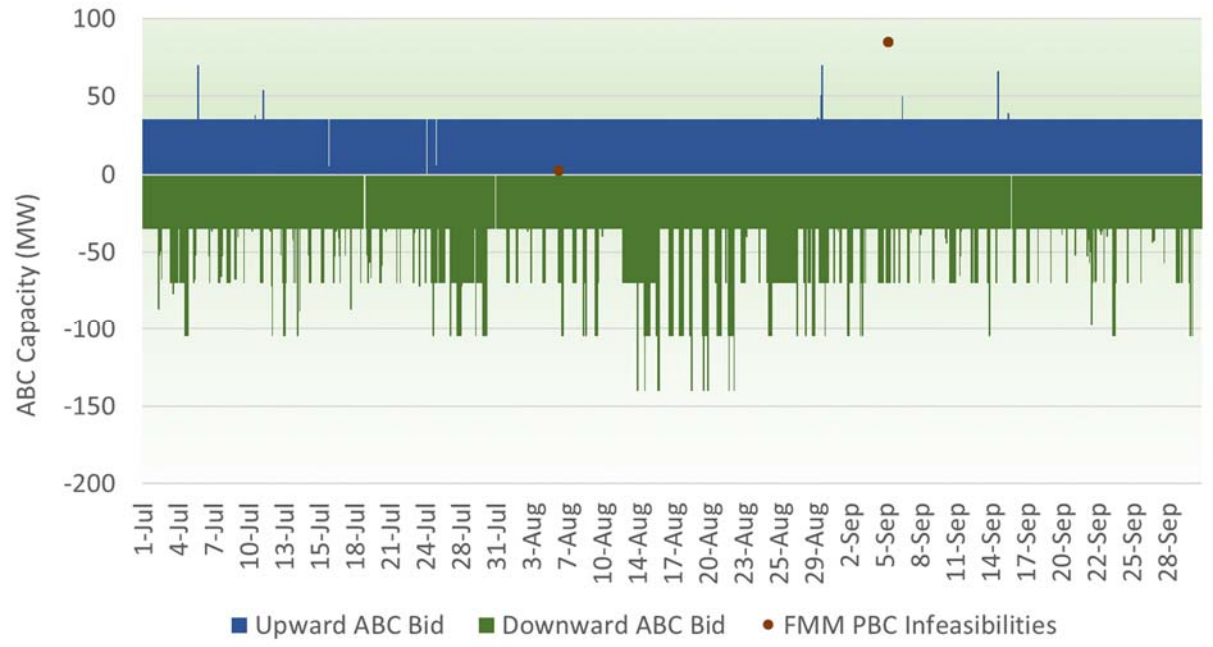


Figure 28: Submitted ABC and Power Balance Constraint Infeasibilities in the PSE BAA – RTD

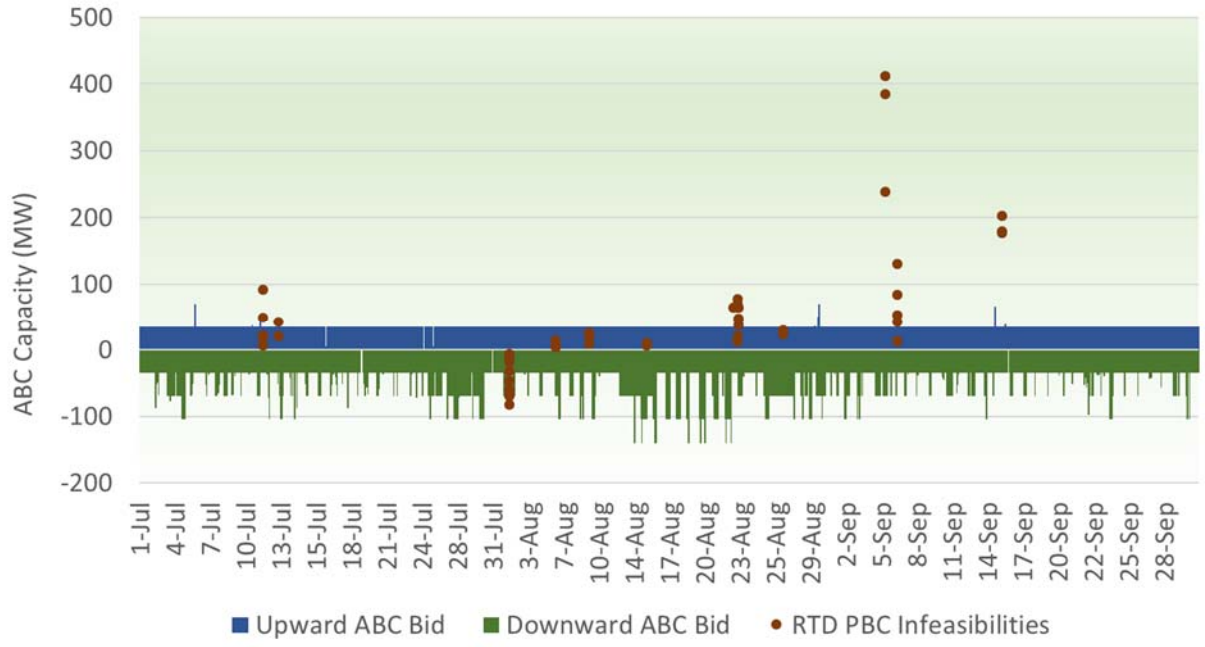


Figure 29: Submitted ABC and Power Balance Constraint Infeasibilities in the IPCO BAA – FMM

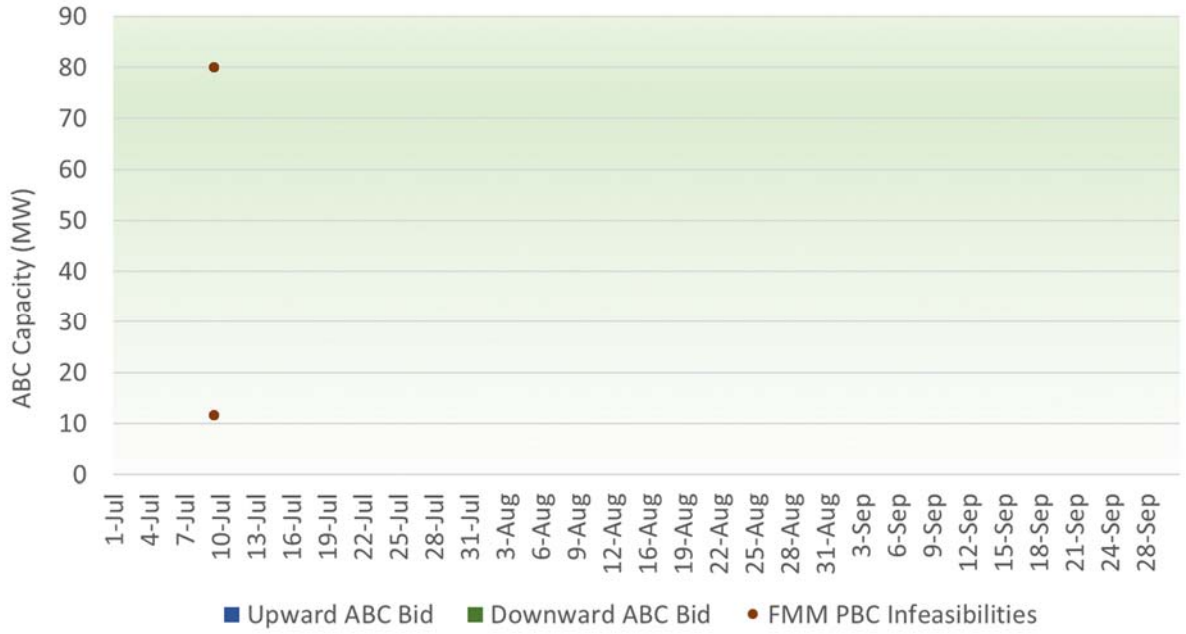


Figure 30: Submitted ABC and Power Balance Constraint Infeasibilities in the IPCO BAA – RTD

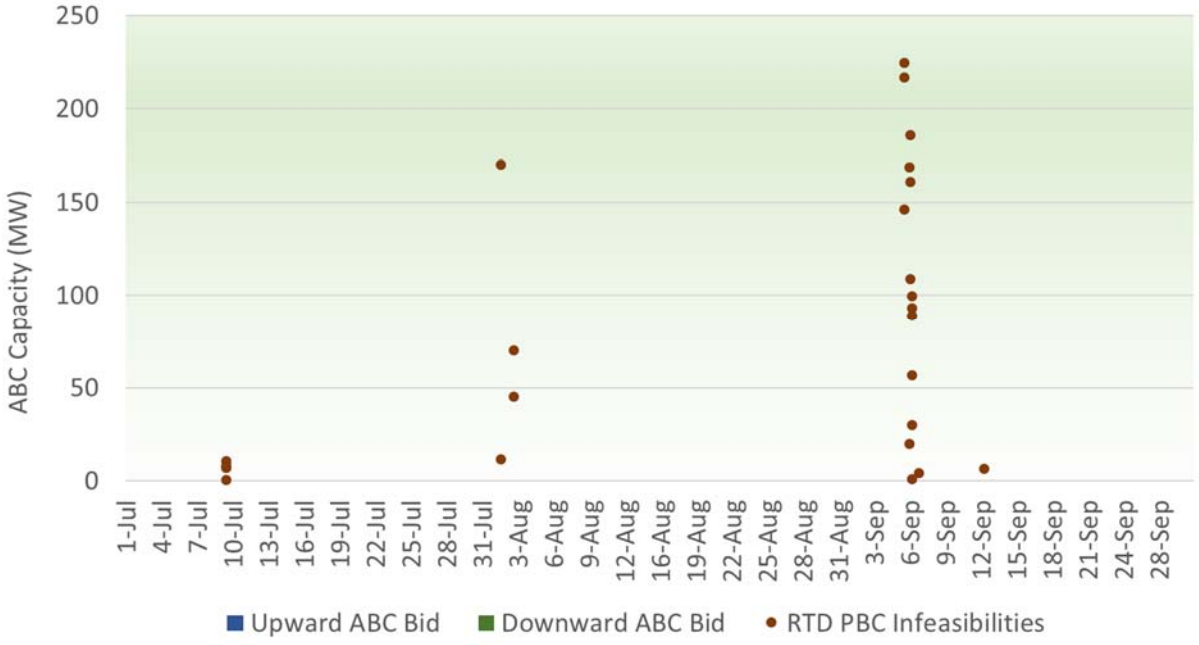


Figure 31: Submitted ABC and Power Balance Constraint Infeasibilities in the PGE BAA – FMM

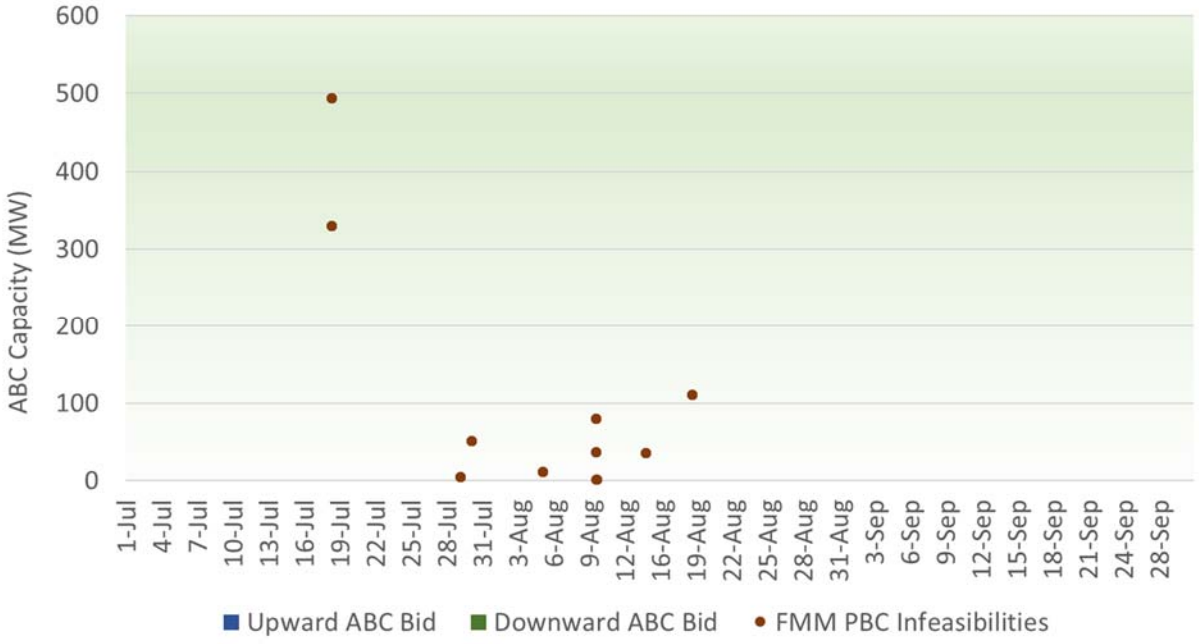


Figure 32: Submitted ABC and Power Balance Constraint Infeasibilities in the PGE BAA – RTD

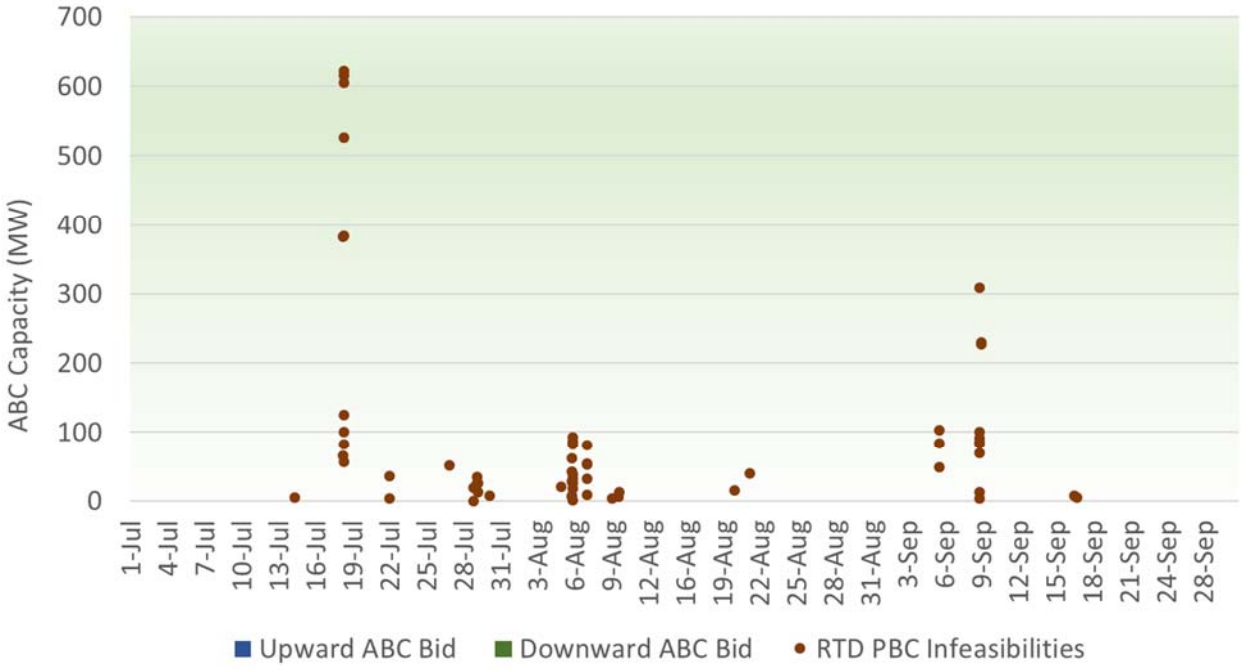


Figure 33: Submitted ABC and Power Balance Constraint Infeasibilities in the PWRX BAA – FMM

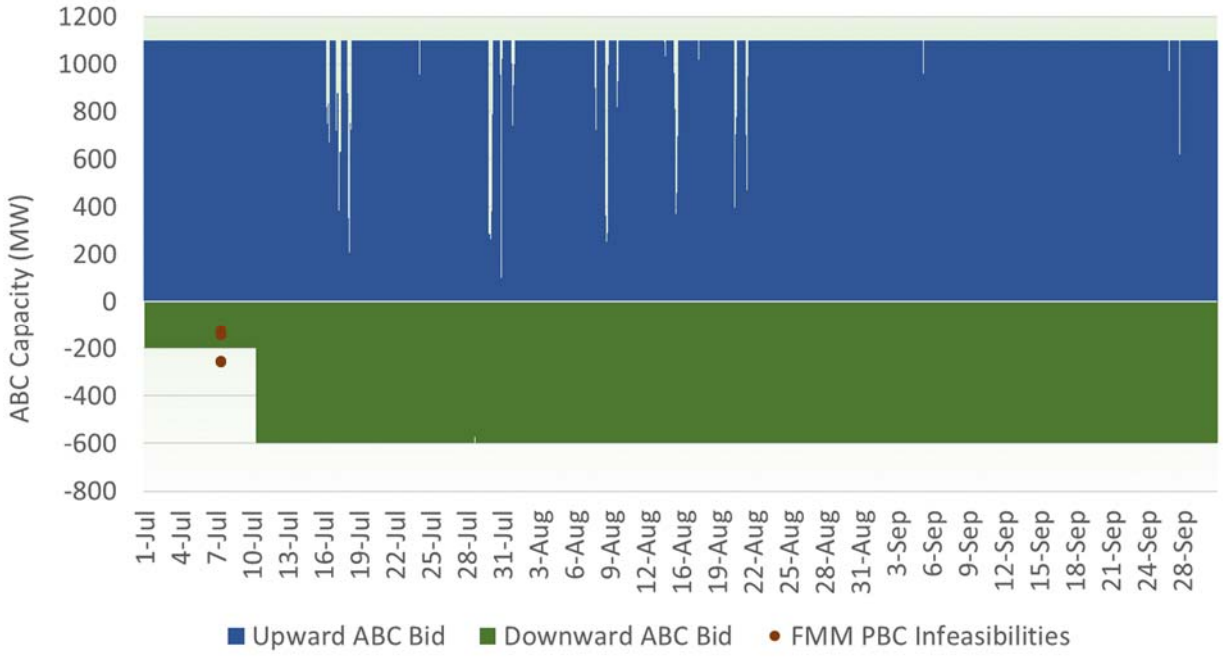
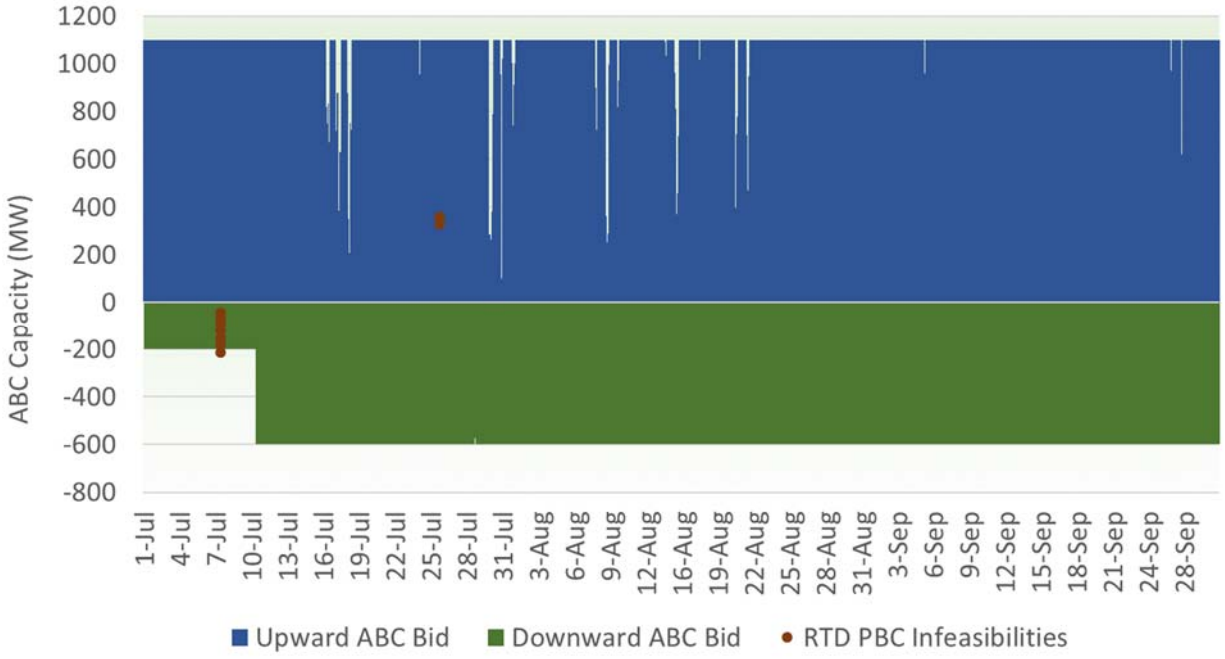


Figure 34: Submitted ABC and Power Balance Constraint Infeasibilities in the PWRX BAA – RTD



Based on the data presented in Figures 18 through 34, 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 instance, for the PAC West BAA, the metric for the RTD for undersupply was 100 percent, indicating that in all intervals when an infeasibility was observed in the RTD, the EIM entities did not submit any ABC to the EIM.

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

	Over-supply		Under-supply	
BAA	FMM	RTD	FMM	RTD
PAC West	0%	100%	0%	100%
PAC East	0%	100%	61.54%	79.66%
NV Energy	0%	0%	0%	0%
APS	50%	100%	93.71%	92.63%
PSE	0%	0%	0%	0%
IPCO	0%	0%	100%	100%
PGE	0%	0%	100%	100%
PWRX	0%	0%	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 there 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 are 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

Figures 35 through 40 show the EIM load aggregation point (ELAP) prices[5] for the FMM and RTD in each EIM BAA. 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.

This comparison remains meaningful because the transitional period provisions are applicable to the IPCO and Powerex EIM entities during the third quarter of 2018.[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

[5] The ELAP provides aggregate prices that are representative of pricing in the overall area of NV Energy.

[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.

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 Figures 35 through 40 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 period of July 1 through September 30, 2018. Average ELAP prices are not reported for the IPCO and PWRX BAAs because the entities remained in the transitional period in the third quarter of 2018, with monthly reports on price and performance having already been provided.

Table 4: Average ELAP Prices for the Various EIM BAAs

BAA	FMM	RTD
PAC West	$29.38/MWh	$29.04/MWh
PAC East	$36.19/MWh	$35.40/MWh
NV Energy	$50.20/MWh	$50.25/MWh
APS	$48.0/MWh	$47.11/MWh
PSE	$30.15/MWh	$30.15/MWh
PGE	$30.84/MWh	$30.70/MWh

Figure 35: Daily Average Price for the PAC West BAA ELAP

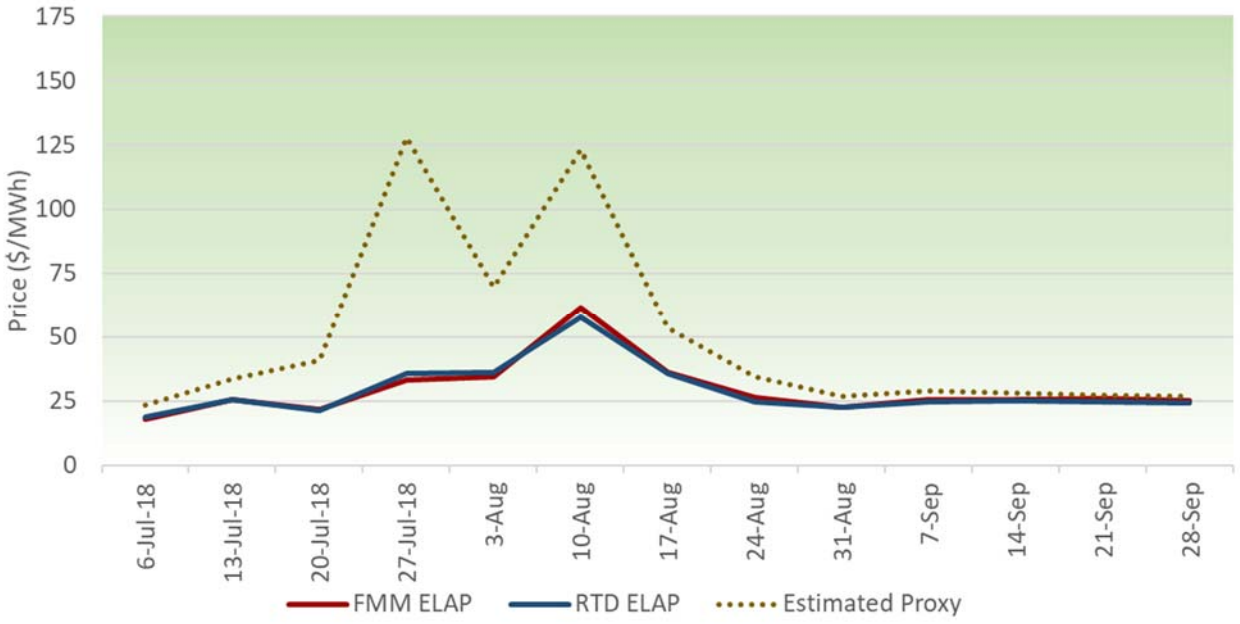


Figure 36: Daily Average Price for the PAC East BAA ELAP

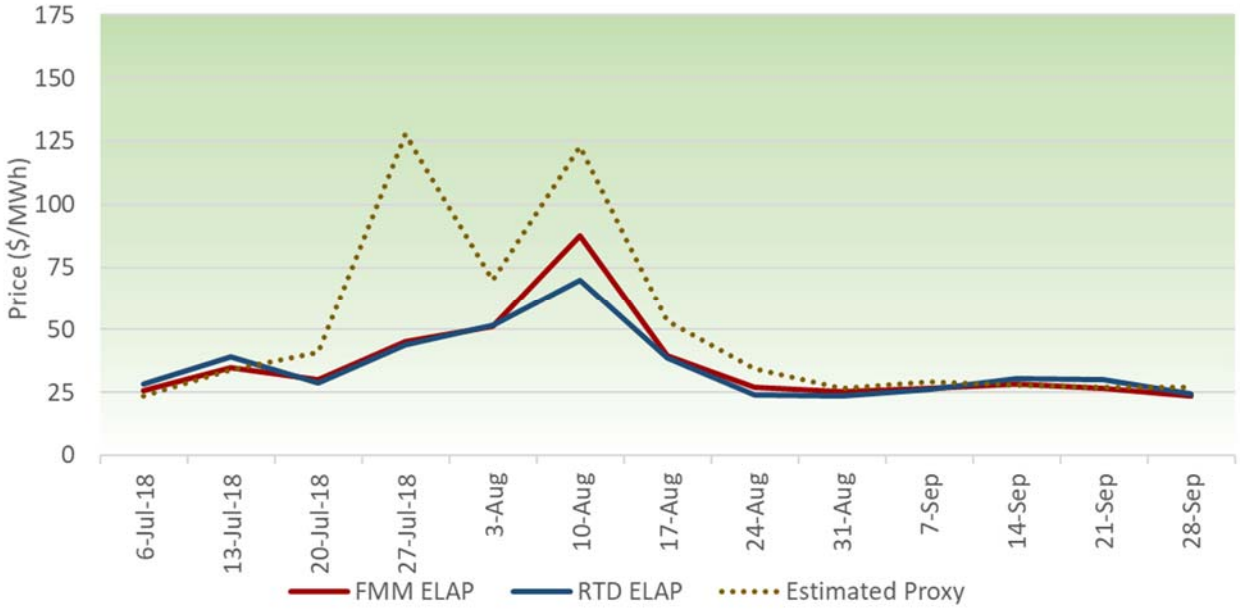


Figure 37: Daily Average Price for the NV Energy BAA ELAP

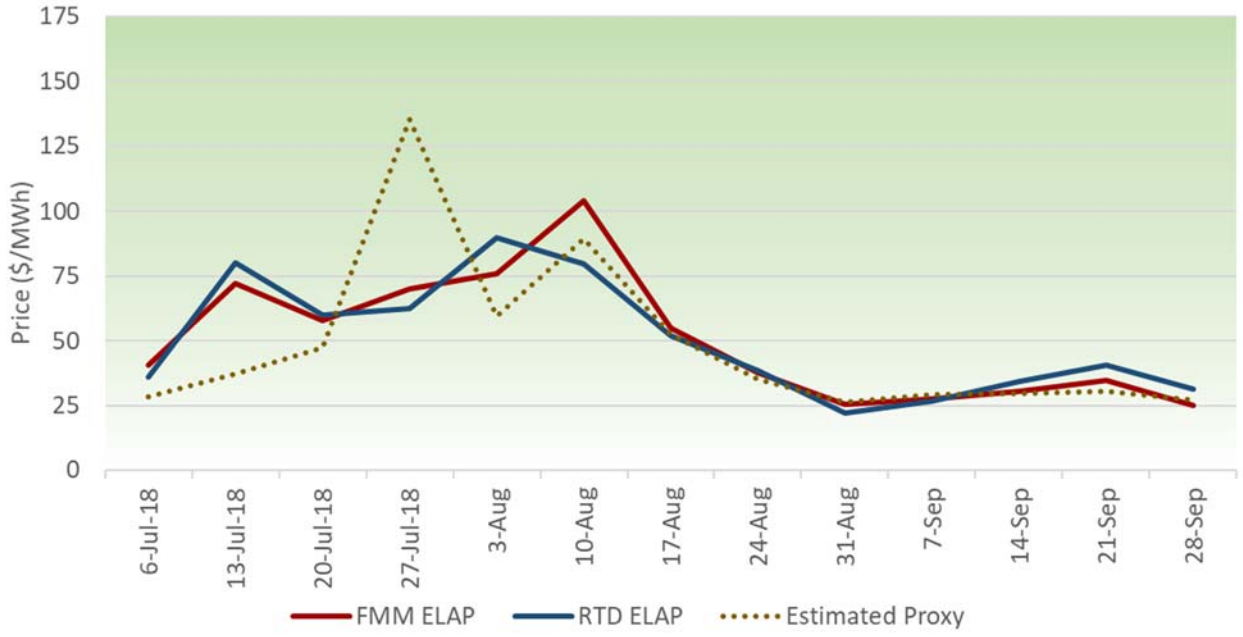


Figure 38: Daily Average Price for the APS BAA ELAP

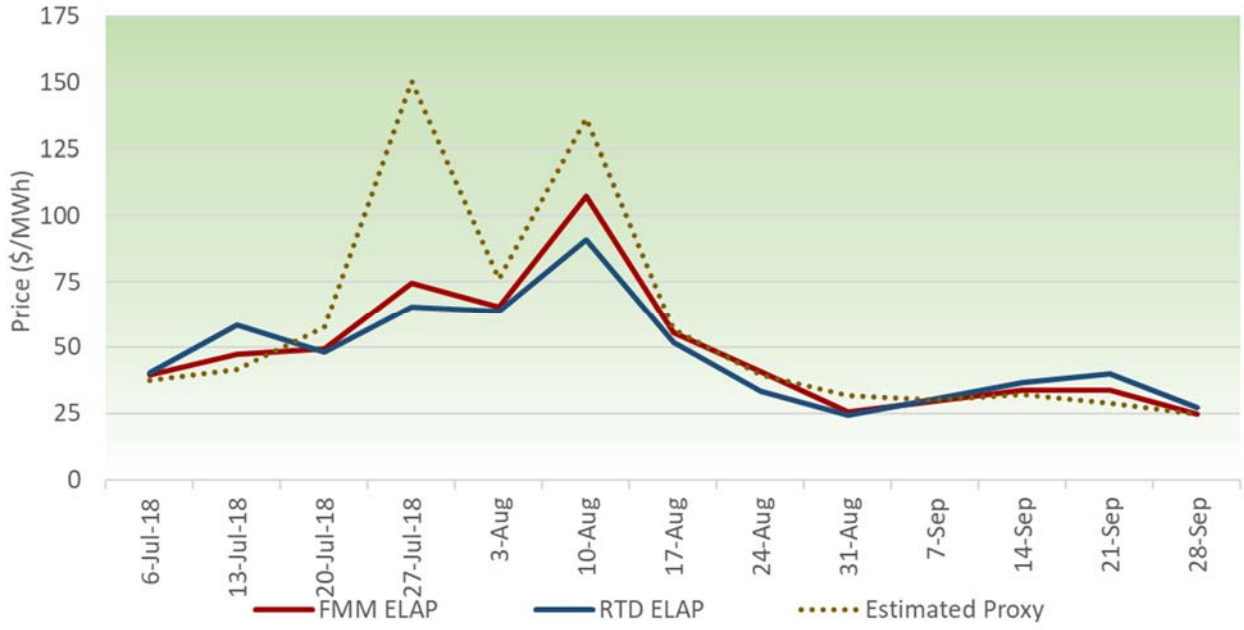


Figure 39: Daily Average Price for the PSE BAA ELAP

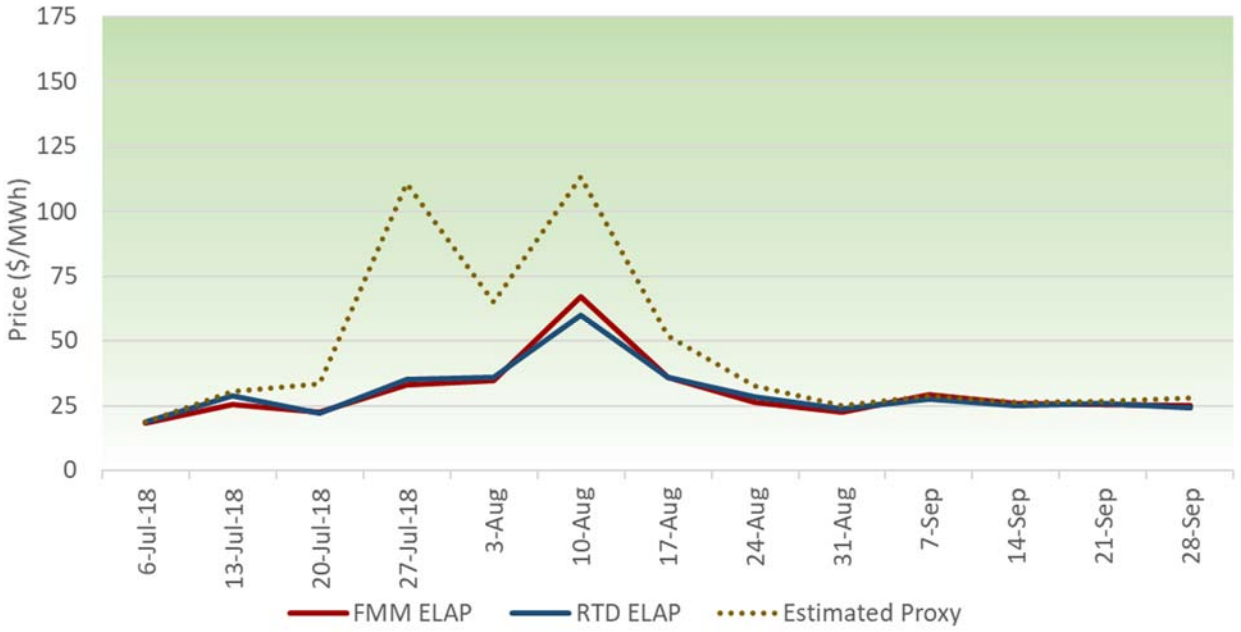
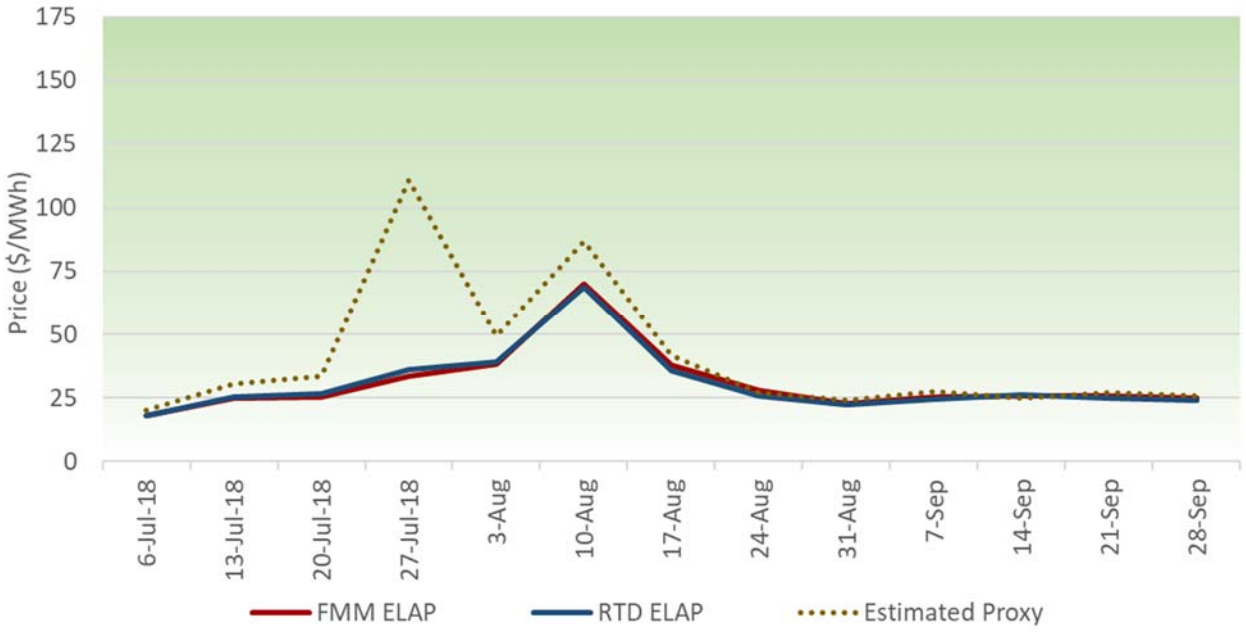


Figure 40: Daily Average Price for the PGE BAA ELAP



B. Frequency of Power Balance Constraint Relaxation

Figures 41 through 51 show the frequency of intervals in which the power balance constraint was relaxed in each EIM BAA for under-supply or over-supply conditions in the FMM and RTD, respectively. A bar with positive frequency represents an under-supply power balance constraint infeasibility, and a bar with negative frequency represents an over-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.

[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/informed/Pages/StakeholderProcesses/ImbalanceConformanceEnhancements.aspx.

There were 267 valid undersupply infeasibilities (3 percent of the time) in the FMM in the NV Energy BAA during the reported three-month period; the load conformance limiter covered 42 percent of these instances. For the RTD, there were 396 under-supply infeasibilities (1.5 percent of the time); the load conformance limiter covered approximately 38 percent of these instances.

Figure 41: Frequency of FMM Power Balance Infeasibilities in the NV Energy BAA

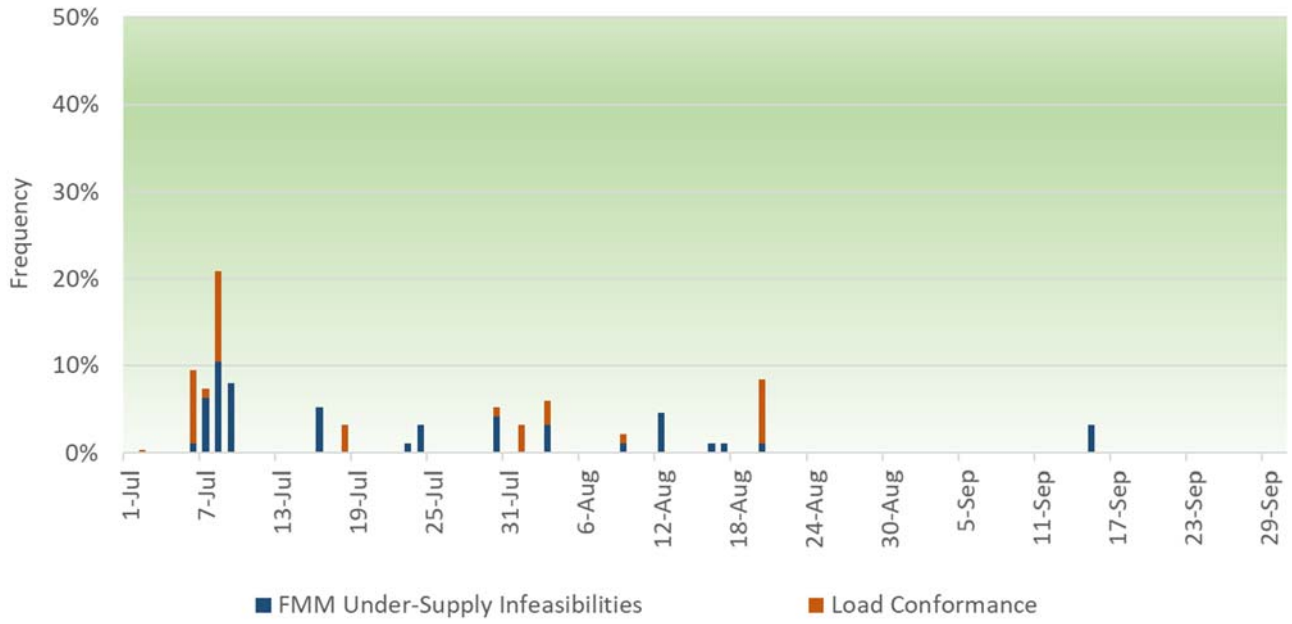


Figure 42: Frequency of RTD Power Balance infeasibilities in the NV Energy BAA

For the PAC West BAA, there were no valid undersupply infeasibilities in the FMM and no infeasibilities covered by the load conformance limiter. For the PAC West RTD, there were 19 under-supply infeasibilities (0.1 percent of the time); the load conformance limiter covered approximately 5 percent of these instances.

Figure 43: Frequency of RTD Power Balance in Feasibilities in the PAC West BAA

For the PAC East BAA, there were 39 valid undersupply infeasibilities in the FMM (0.4 percent of the time); the load conformance limiter covered approximately 28 percent of these instances. For the PAC East RTD, there were 58 under-supply infeasibilities (0.22 percent of the time). The load conformance limiter covered approximately 10 percent of these instances.

Figure 44: Frequency of FMM Power Balance Infeasibilities in the PAC East BAA

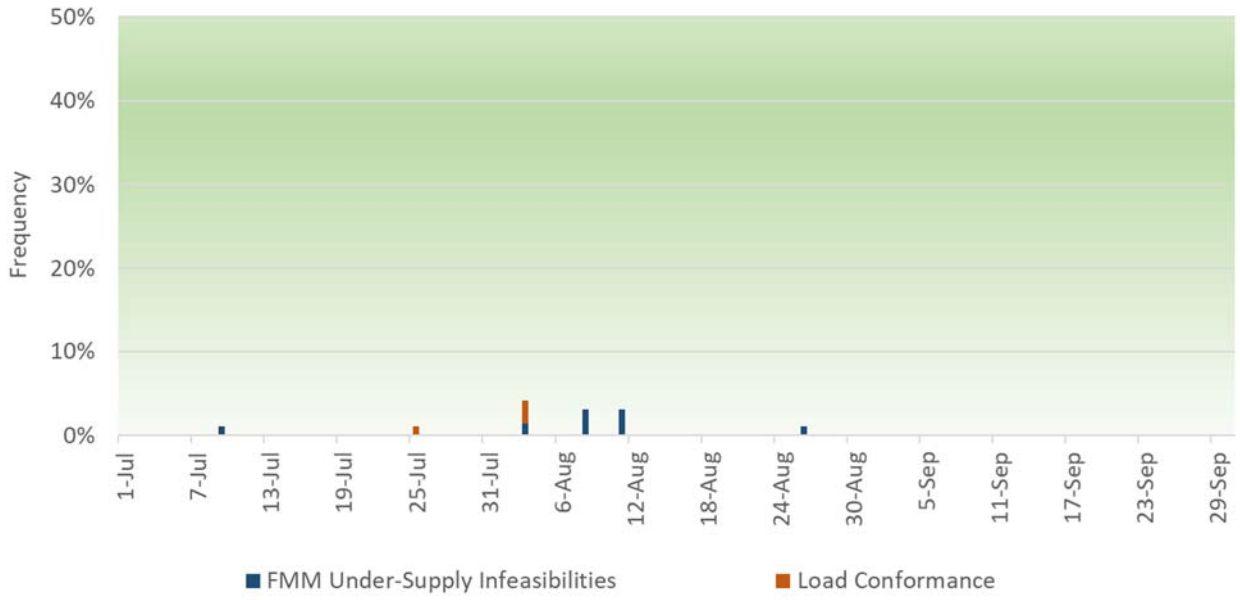


Figure 45: Frequency of RTD Power Balance Infeasibilities in PAC East BAA

There were 285 valid undersupply infeasibilities (3.2 percent of the time) in the FMM in the APS BAA during the reported three-month period; the load conformance limiter covered 80 percent of these instances. For the RTD, there were 329 under-supply infeasibilities (1.26 percent of the time); the load conformance limiter covered approximately 78 percent of these instances.

Figure 46: Frequency of FMM Power Balance Infeasibilities in the APS BAA

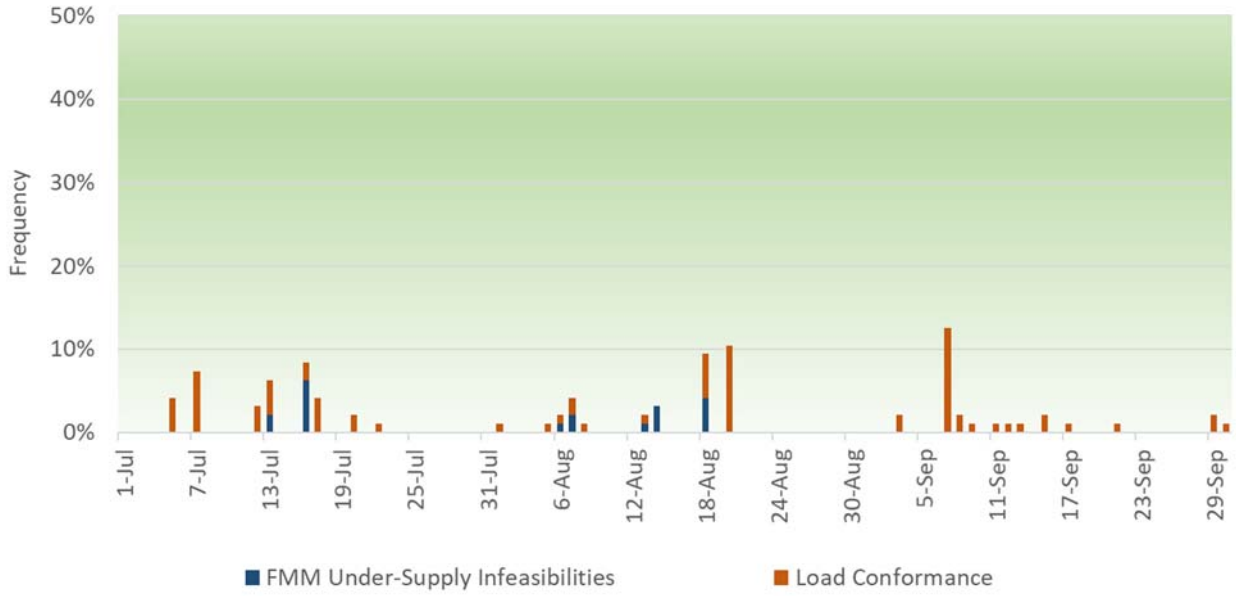
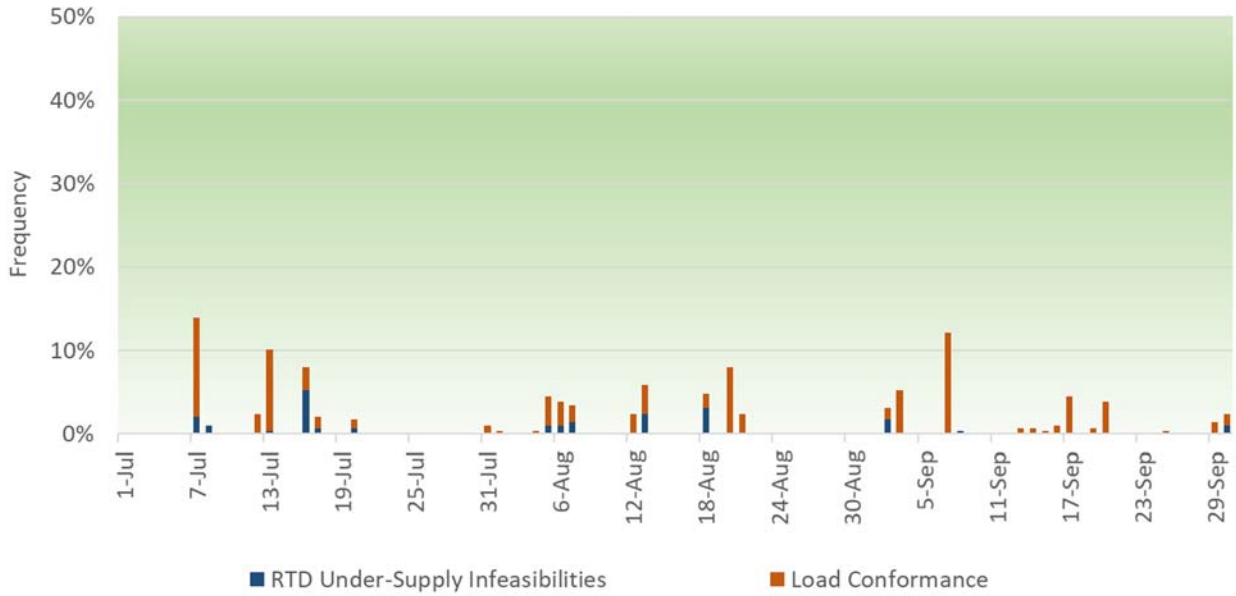


Figure 47: Frequency of RTD Power Balance Infeasibilities in the APS BAA



There were six (0.1 percent of the time) valid undersupply infeasibilities in the FMM in the PSE BAA during the reported three-month period with no instances of load conformance. For the RTD, there were 40 under-supply infeasibilities (0.2 percent of the time). The load conformance limiter covered approximately eight percent of these instances.

Figure 48: Frequency of FMM Power Balance Infeasibilities in the PSE BAA

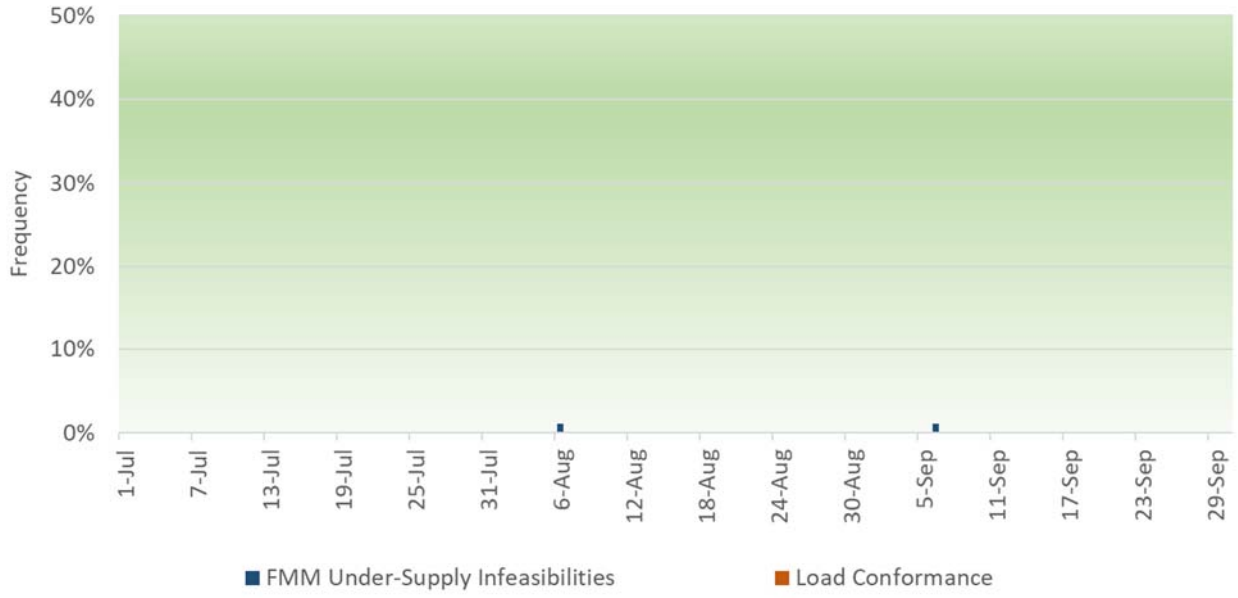
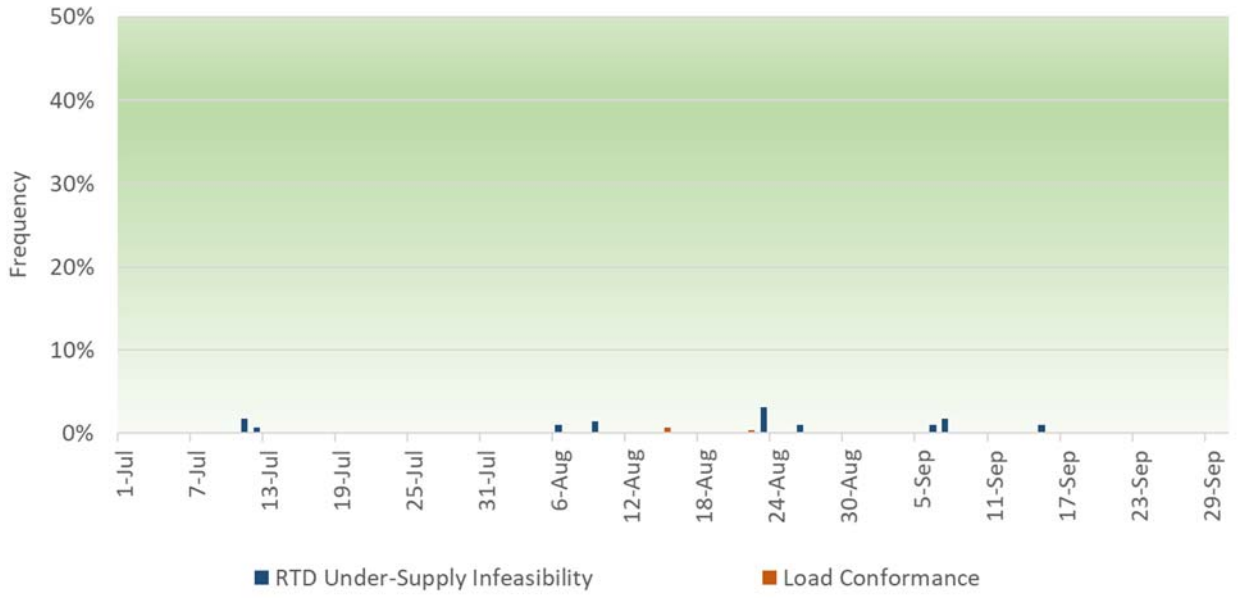


Figure 49: Frequency of RTD Power Balance Infeasibilities in the PSE BAA



There were 30 valid undersupply infeasibilities in the FMM in the PGE BAA (0.3 percent of the time) during the reported three-month period with no instances of load conformance. For the RTD, there were 66 under-supply infeasibilities (0.2 percent of the time). The load conformance limiter covered approximately 20 percent of these instances.

Figure 50: Frequency of FMM Power Balance Infeasibilities in the PGE BAA

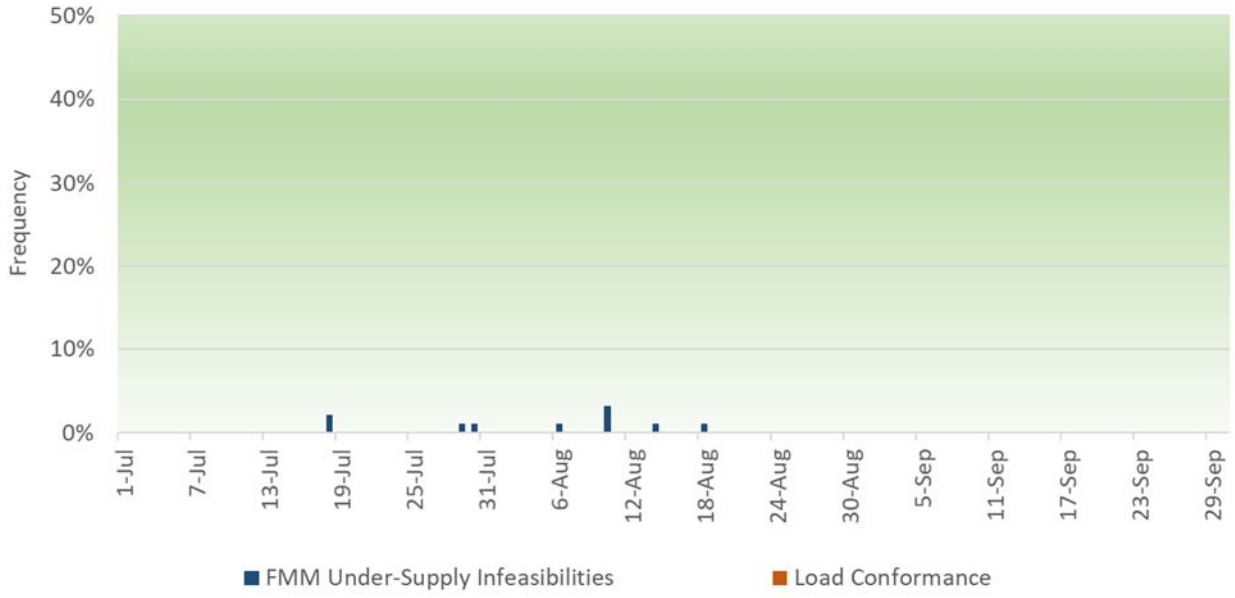


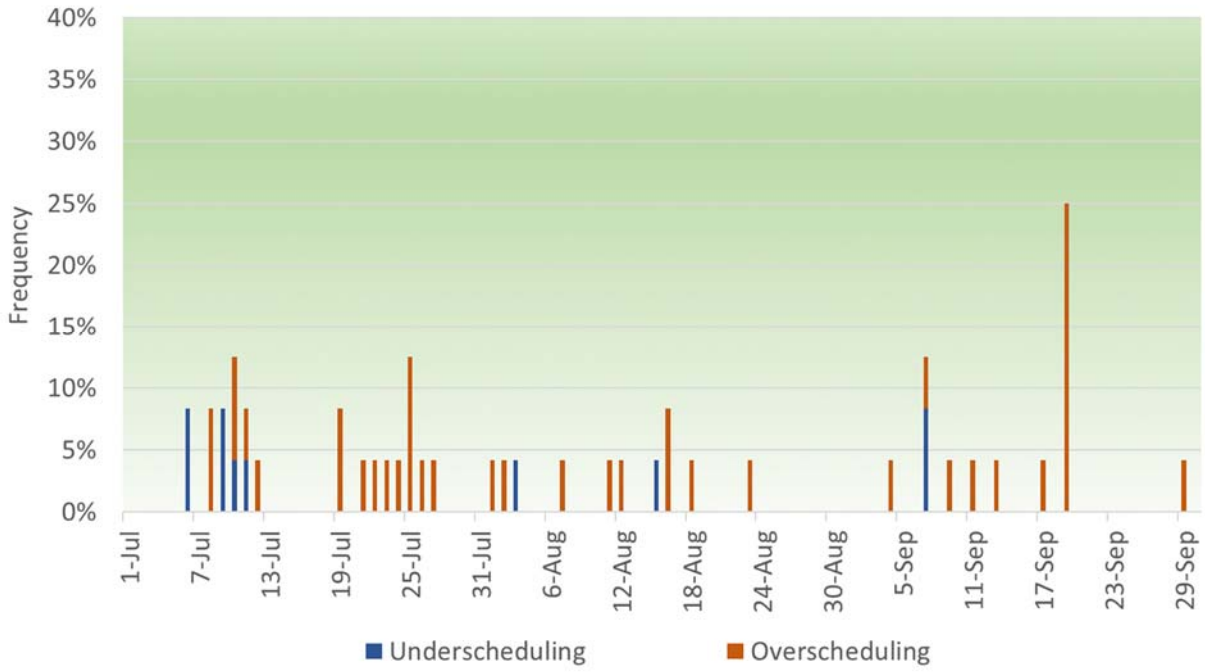
Figure 51: Frequency of RTD Power Balance Infeasibilities in the PGE BAA

C. Balancing and Sufficiency Test Failures

Figures 52 through 57 show the trend of balancing test failures for the period of July 1 through September 30, 2018 for each of the EIM entity BAAs. The CAISO performs the balancing test pursuant to Section 29.34(k) of the CAISO tariff.

The NV Energy BAA passed the balancing test 97.8 percent of the time, where approximately 20 percent of the failures were due to under-scheduling. These failures are within normal ranges and reflect the incidence of the forecasting and balancing process that has occurred at a frequency that is well within expected performance tolerances.

Figure 52: Frequency of Balancing Test Failures for the NV Energy BAA



The PAC West BAA passed the balancing test for the reported period approximately 99 percent of the time, where approximately half of the failures reflected under-scheduling. Similarly, the PAC East BAA passed the balancing test 98.9 percent of the time, and approximately 60 percent of the failures were associated with under-scheduling.

Figure 53: Frequency of Balancing Test Failures for the PAC West BAA

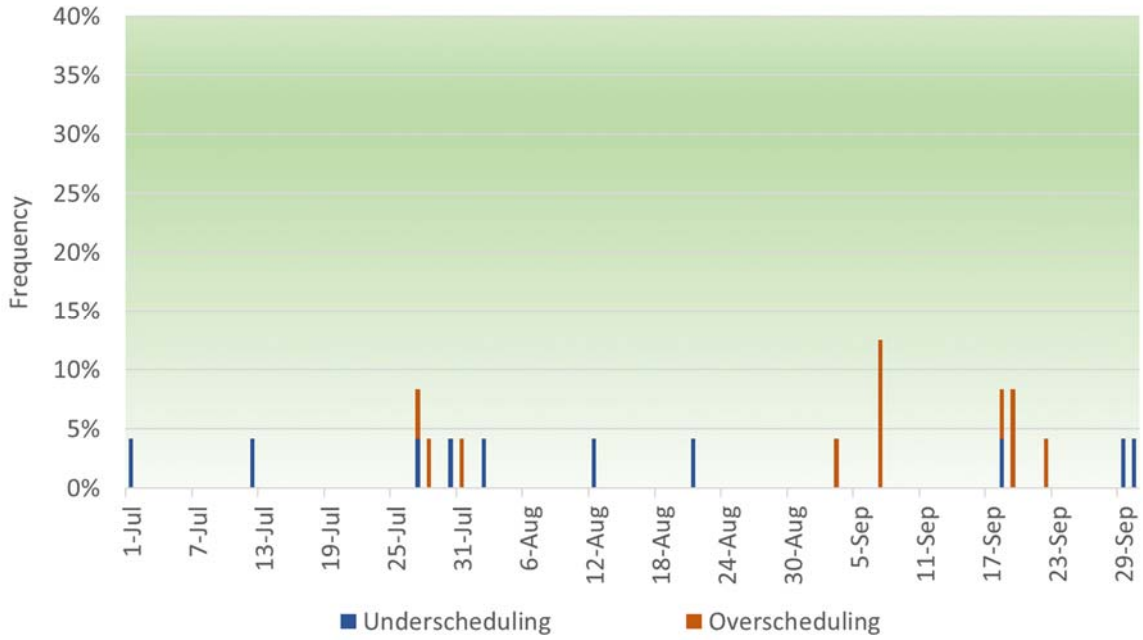
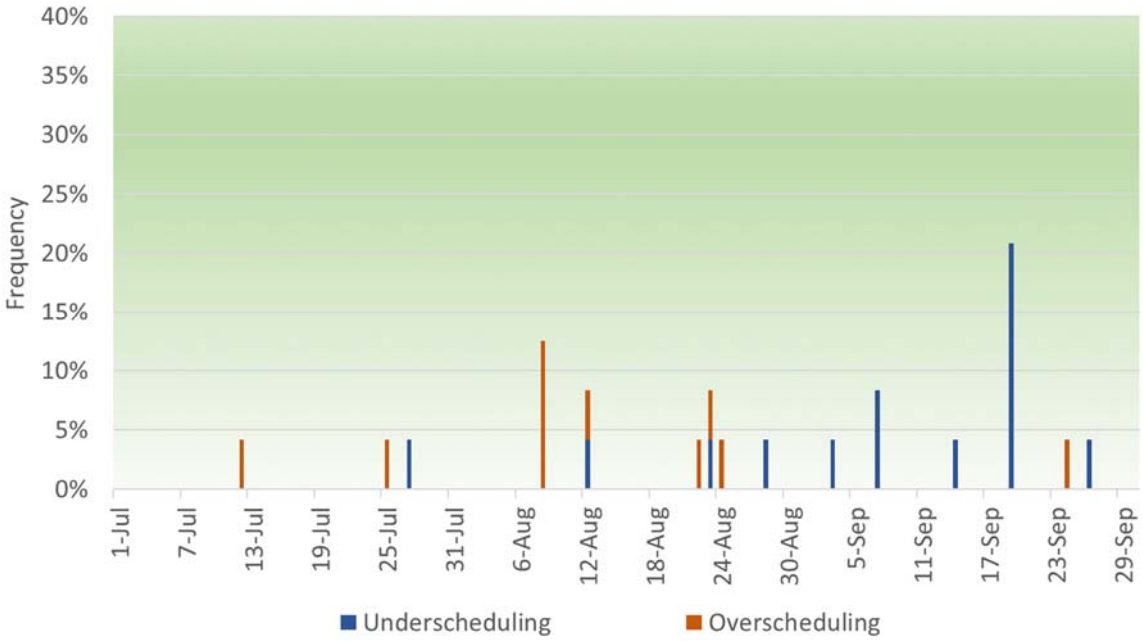


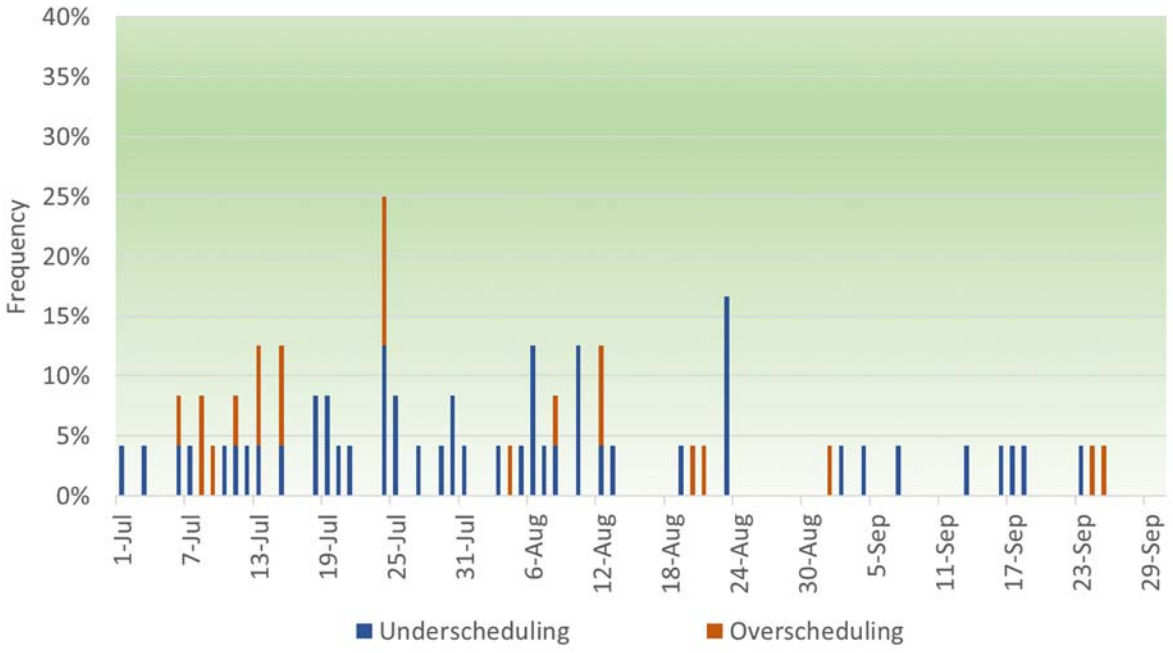
Figure 54: Frequency of Balancing Test Failures for the PAC East BAA



The APS BAA passed the balancing test in 97.6 percent of the hours and approximately two-thirds of the failures were for under-scheduling conditions. For the PSE BAA, the passing rate was approximately 96.8 percent of the hours and 70 percent of infeasibilities were for under-scheduling conditions.

Figure 55: Frequency of Balancing Test Failures for the APS BAA

Figure 56: Frequency of Balancing Test Failures for the PSE BAA



The PGE BAA passed the balancing test in 99.0 percent of the hours and approximately three-quarters of the failures were for under-scheduling conditions. Approximately 20 percent of the failures were due to over-scheduling conditions.

Figure 57: Frequency of Balancing Test Failures for the PGE BAA

Figures 58 through 63 represent the flexible ramping sufficiency test trends in each of the EIM entity's BAA for the period of July 1 through September 30, 2018. For the reported period, the NV Energy BAA passed the test approximately 95.6 percent of the hours; the PAC West BAA passed the balancing test approximately 99.9 percent of the hours; the PAC East BAA passed the test 98.1 percent of the hours; the APS BAA passed the test in 97.6 percent of the hours; and the PSE BAA passed the test in 99.4 percent of the hours. All of these passing rates are within the expected range.

Figure 58: Frequency of Flexible Ramping Sufficiency Test Failures in the NV Energy BAA

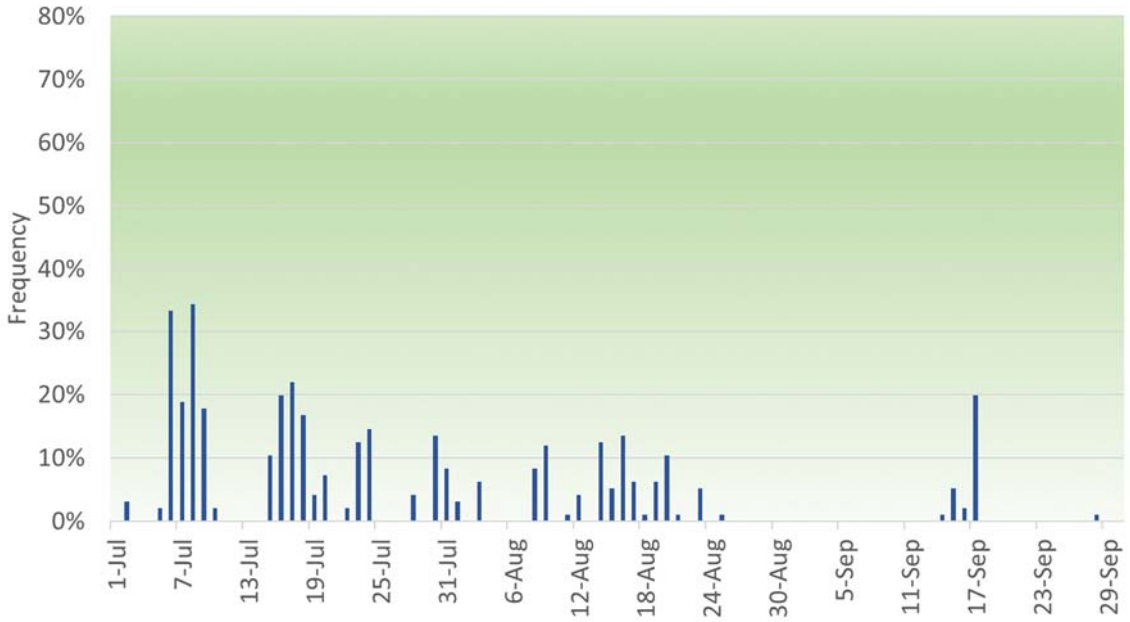


Figure 59: Frequency of Flexible Ramping Sufficiency Test Failures in the PAC West BAA

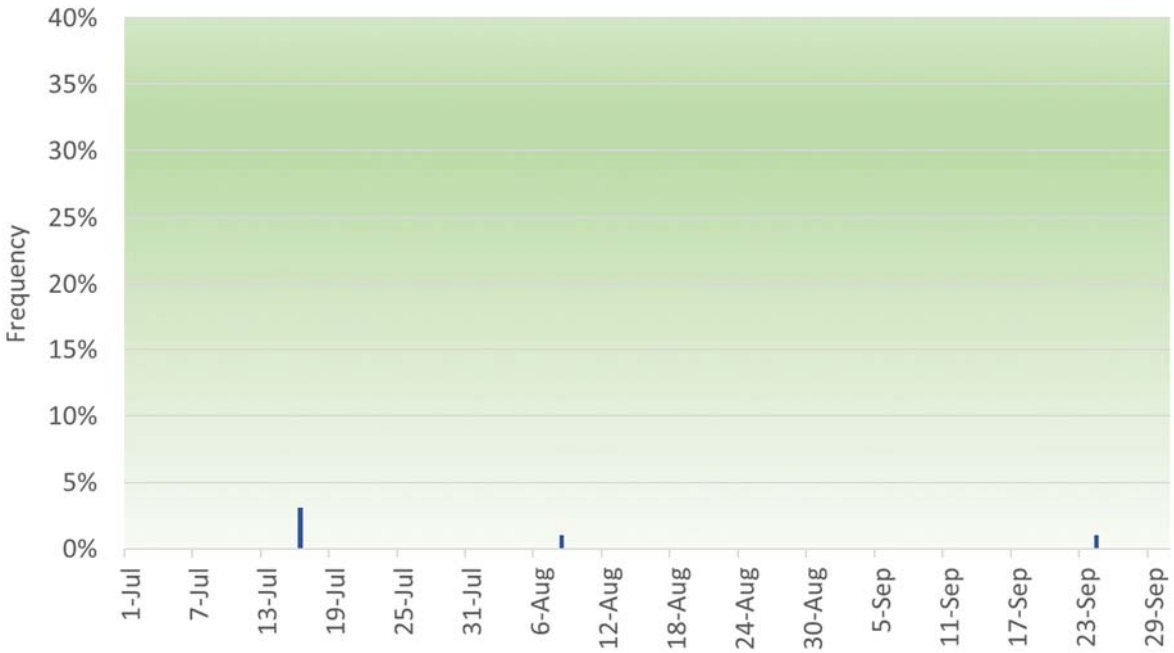


Figure 60: Frequency of Flexible Ramping Sufficiency Test Failures in the PAC East BAA

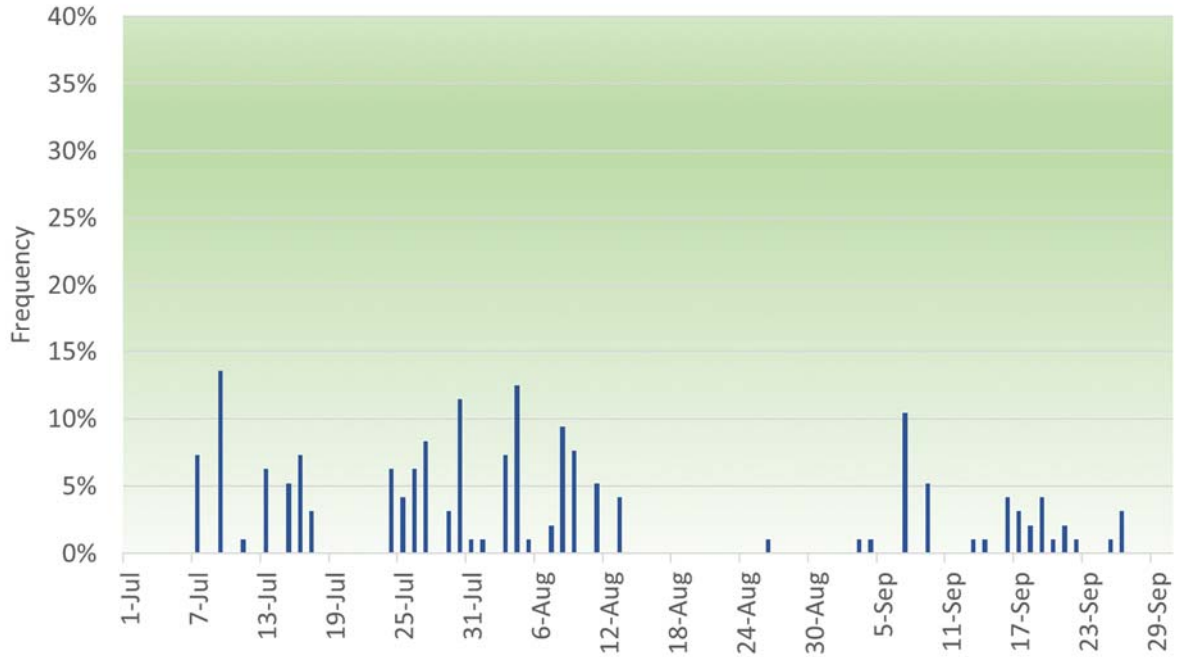


Figure 61: Frequency of Flexible Ramping Sufficiency Test Failures in the APS BAA

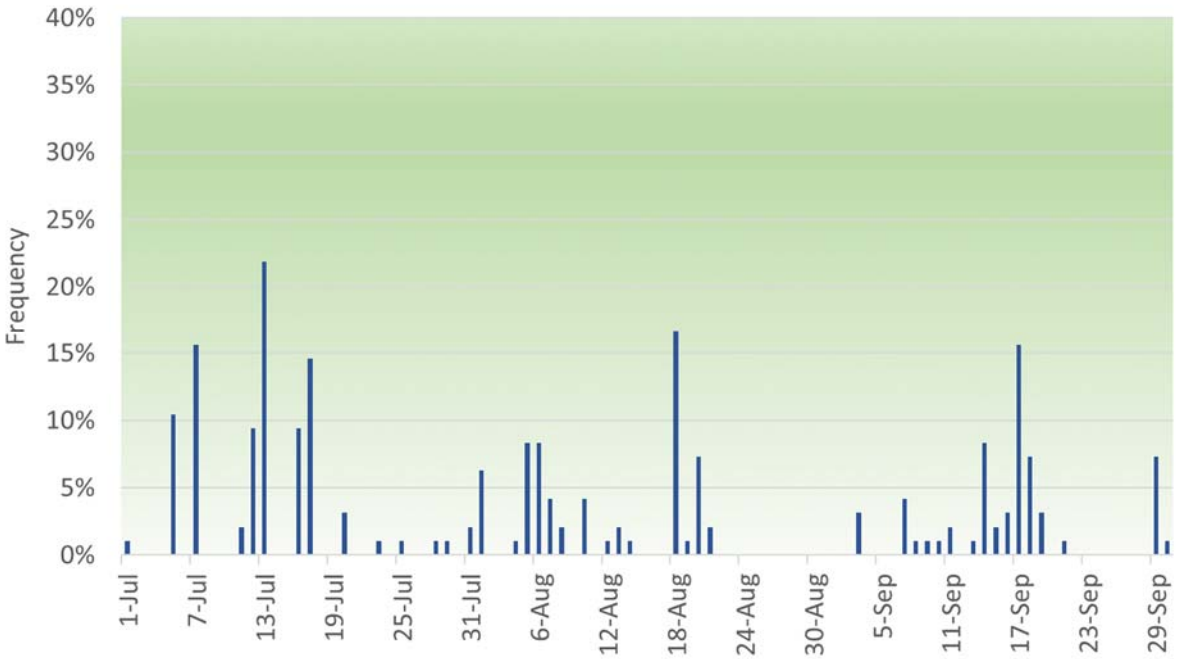


Figure 62: Frequency of Flexible Ramping Sufficiency Test Failures in the PSE BAA

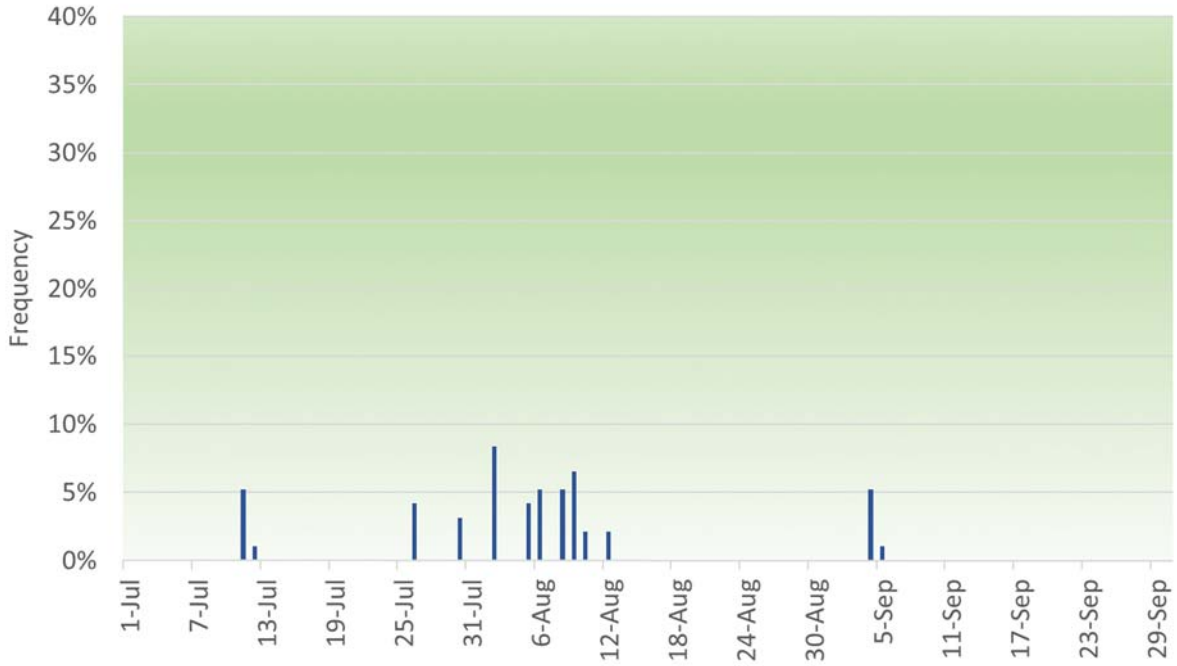
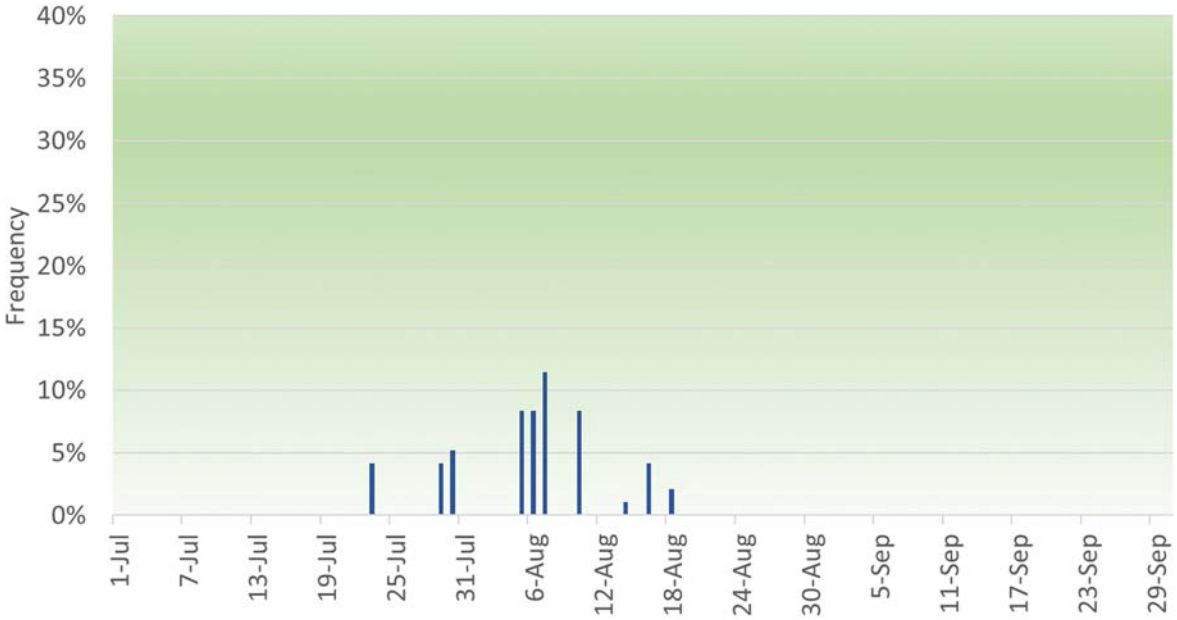


Figure 63: Frequency of Flexible Ramping Sufficiency Test Failures in the PGE BAA



D. Flexible Ramping Constraint Infeasibilities

As described in the monthly EIM transitional period reports for APS and PSE, 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 3rd day of December, 2019.

/s/ Anna Pascuzzo

Anna Pascuzzo