May 30, 2017

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 2016
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 2016 (July 1 to September 30, 2016) on the Available Balancing Capacity (ABC) enhancement for the 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, an 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, 2016
Available Balancing Capacity Report

May 30, 2017

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 to enhance the 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, 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 provide 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); 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. The price discovery mechanism for the PacifiCorp West (PAC West) and PacifiCorp East (PAC East) balancing authority areas ended with the activation of the ABC enhancement.

- In the third quarter of 2016, the PAC West and PAC East submitted limited ABC for both upward capacity and downward capacity.

- PAC East submitted ABC upward capacity in 15 percent of the intervals for its balancing authority area and PAC East submitted ABC upward capacity in 5.2 percent of the intervals for its balancing authority area. NV Energy submitted ABC upward capacity in 85.6 percent of the intervals for its balancing authority area.

- The EIM dispatched ABC infrequently in either upward or downward direction. With the exception of the PAC East balancing authority area for downward capacity, the EIM dispatched ABC in less than 10 percent of the intervals.

- A low number of resources continued to support submissions of ABC during the third quarter, with as few as one resource in the PAC West balancing authority area and as many as six resources in the NV Energy balancing authority area.

III. Available Balancing Capacity

A. Available Balancing Capacity Submitted to the Market

Each EIM entity can set and define to the CAISO, through the EIM entities resource plan, the amount of ABC and the resources supporting this capacity. 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 Real-Time Dispatch (RTD). Figure **1**1 through 6 show the ABC in each of the EIM balancing authority areas: PAC West, PAC East, and NV Energy. For each balancing authority area, there are two plots to show the ABC dispatched in the FMM and RTD.

Figure 1: Submitted and cleared ABC in the PAC West balancing authority area – FMM

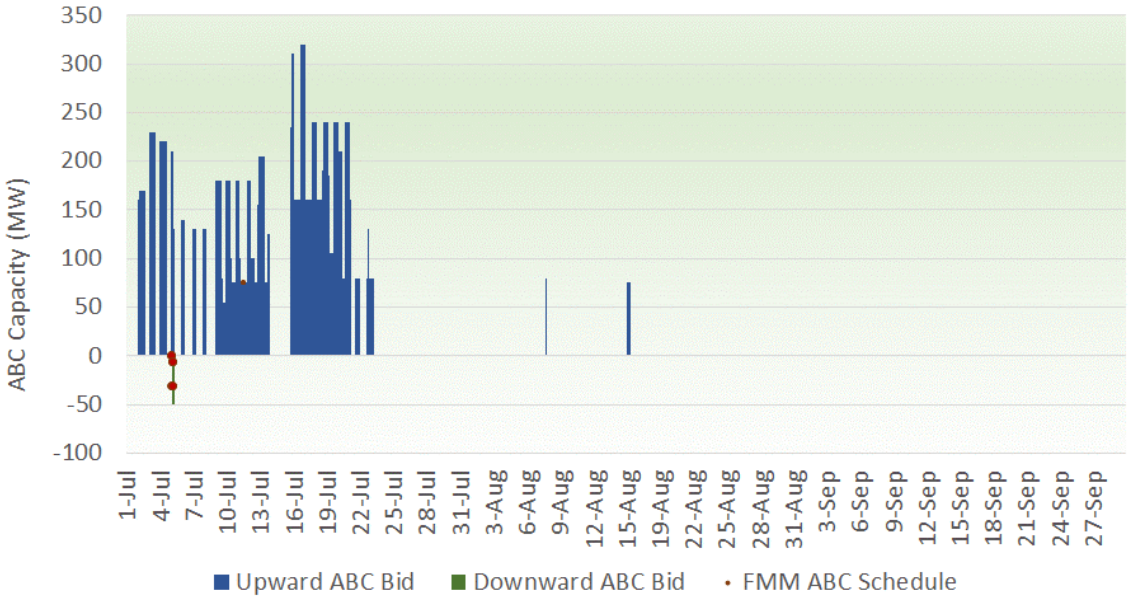
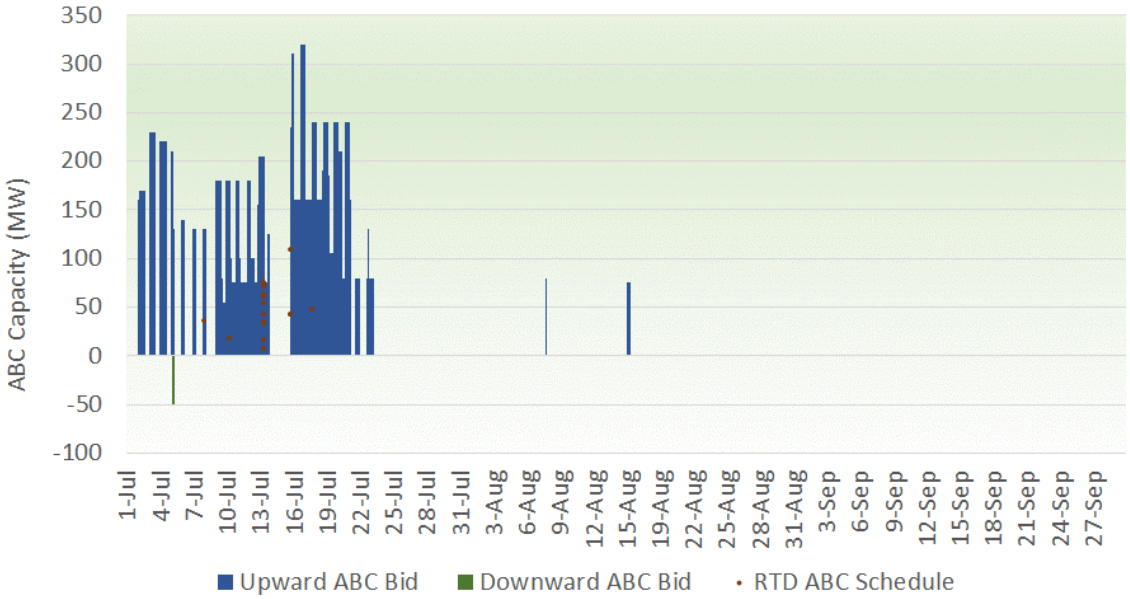


Figure 2: Submitted and cleared ABC in the PAC West balancing authority area – RTD



The blue bars and positive values illustrate upward capacity, while the green bars and negative values illustrate downward capacity. After July, PAC West stopped submitting both upward ABC and downward ABC. Table 1 summarizes the percentage of intervals in which each of the balancing authority areas had submitted ABC.

Table 1: Frequency of ABC submitted to the EIM

Balancing Authority Area	Upward Capacity	Downward Capacity
PAC West	15%	0.14%
PAC East	5.12%	0.36%
NV Energy	86.56%	99.27%

The PAC East intermittently submitted upward ABC throughout the reported period, while it frequently reported downward ABC. In contrast, NV Energy submitted both upward ABC and downward ABC the majority of the time.

Regarding the awards for ABC in both the FMM and RTD, all the EIM entities in the three balancing authority areas had infrequently scheduled ABC. Table 2 shows the frequency in the EIM dispatched ABC in the FMM or RTD when there was ABC made available.

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

	Upward Capacity		Downward Capacity	
Balancing Authority Area	FMM	RTD	FMM	RTD
PAC West	0.08%	0.43%	25%	0%
PAC East	0%	0%	9.4%	33.7%
NV Energy	1.83%	4.3%	1.64%	2.37%

Overall, the EIM dispatched ABC was at a relatively low rate in both the FMM and RTD when there was ABC made available. Although the EIM cleared ABC for the NV Energy balancing authority area at a low rate, the absolute number of instances in which the EIM dispatched ABC in the FMM and RTD demonstrates that the EIM balancing authority scheduled ABC multiple times in the reported period.

Figure 3: Submitted and dispatched ABC in the PAC East balancing authority area – FMM

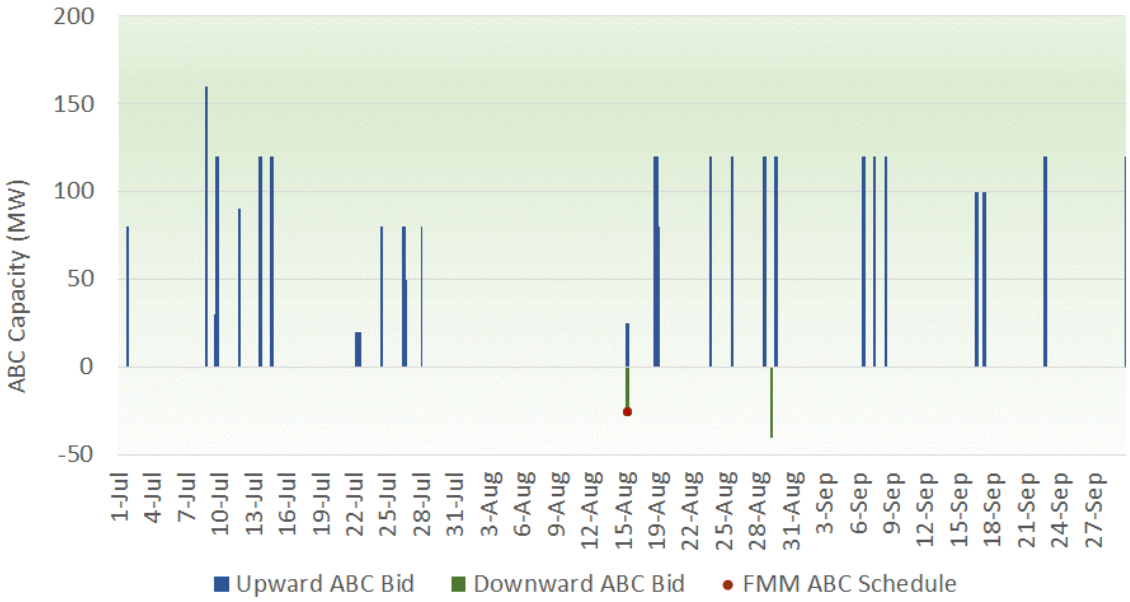


Figure 4: Submitted and dispatched ABC in the PAC East balancing authority area – RTD

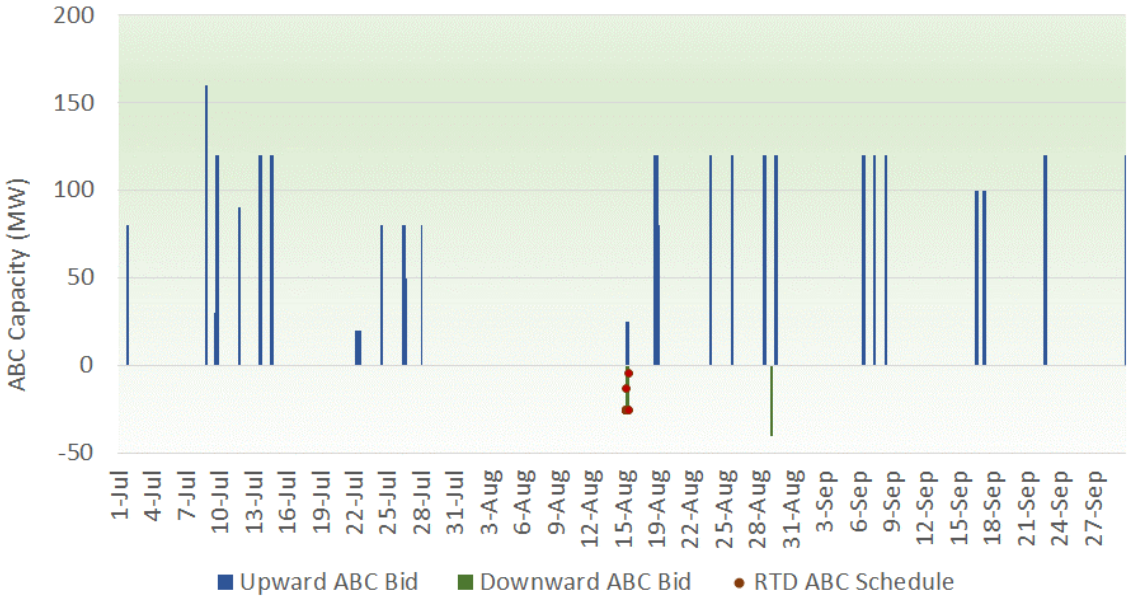


Figure 5: Submitted and dispatched ABC in the NV Energy balancing authority area – FMM

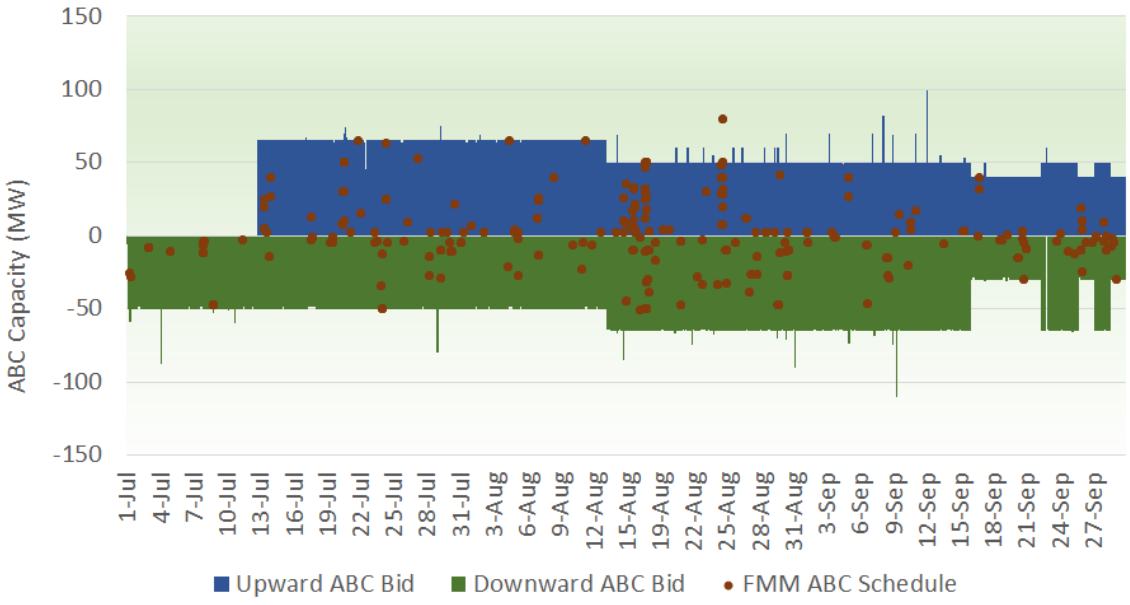
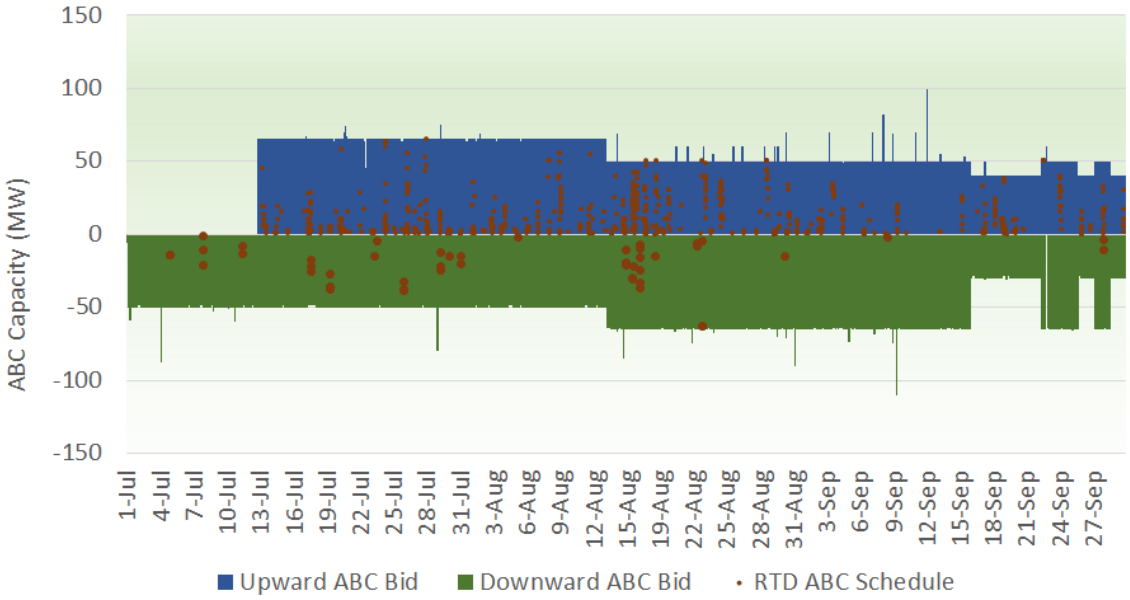


Figure 6: Submitted and dispatched ABC in the NV Energy balancing authority area – RTD



B. Resources Supporting Available Balancing Capacity

Figures 7 through 9 show the number of different resources supporting the ABC the EIM entities submitted to the FMM and RTD. NV Energy was the EIM entity with the largest spread of its ABC among different resources, with up to six different resources supporting ABC.

Figure 7: Number of resources supporting the submitted ABC in the PAC West balancing authority area

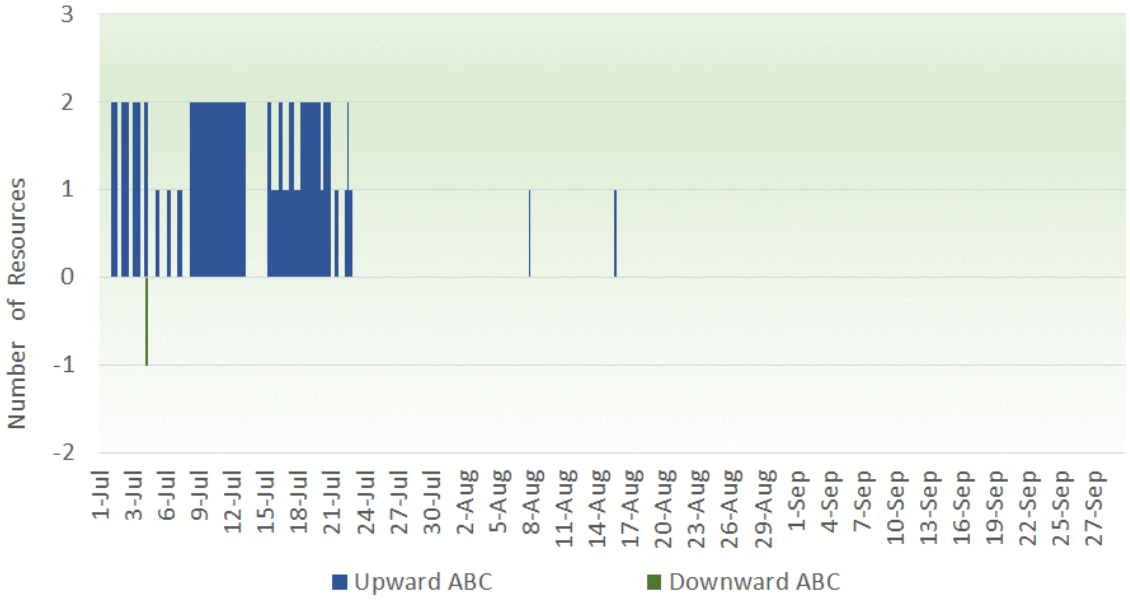


Figure 8: Number of resources supporting the submitted ABC in the PAC East balancing authority area

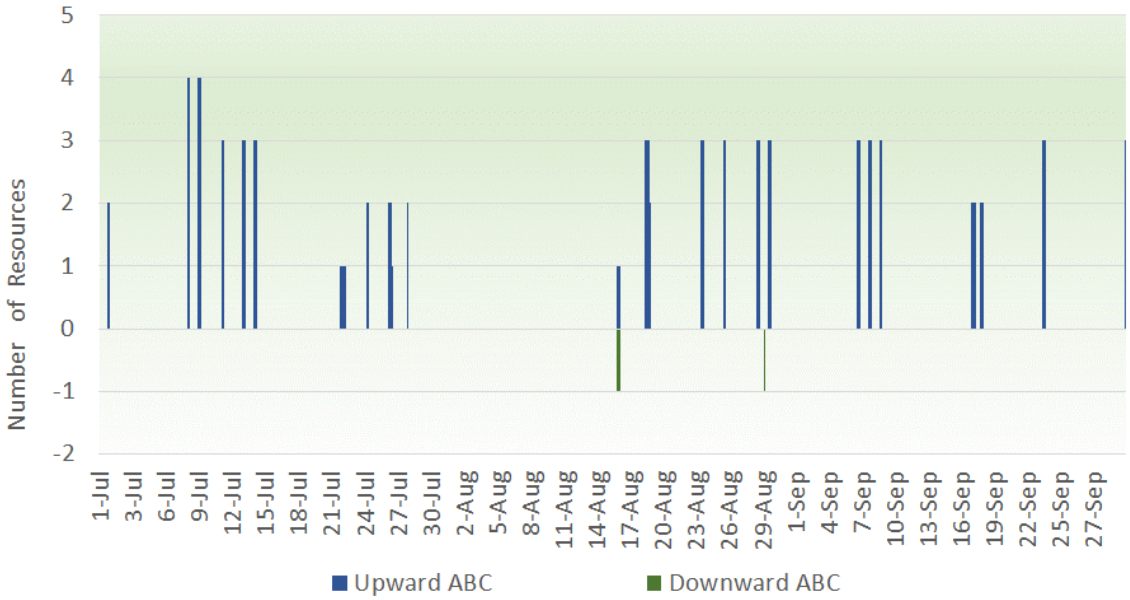
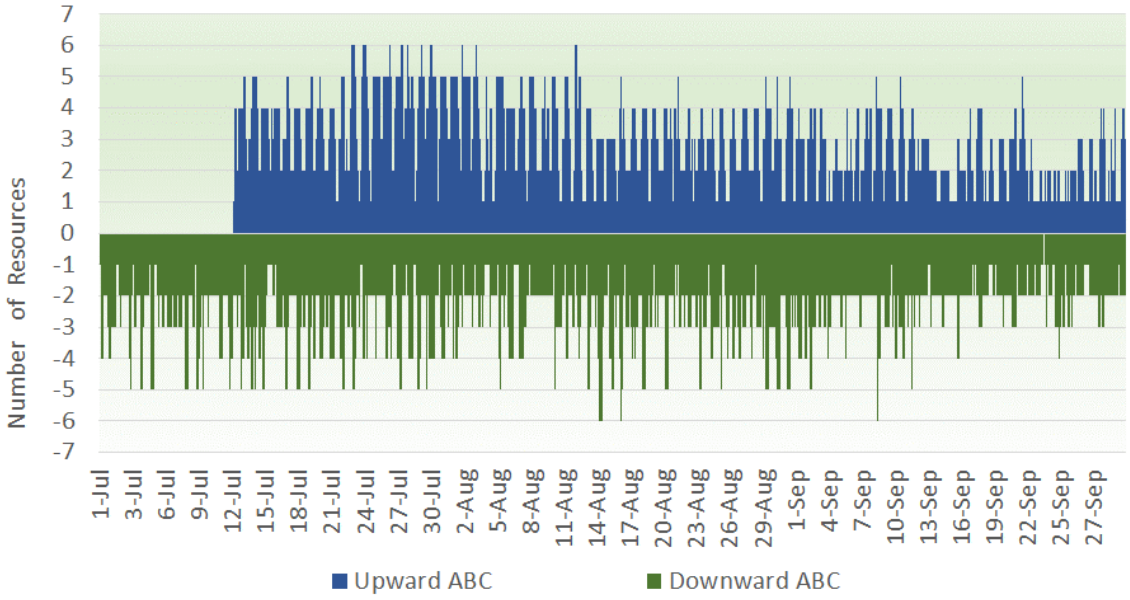


Figure 9: Number of resources supporting the submitted ABC in the NV Energy balancing authority area



C. Available Balancing Capacity and Power Balance Constraint Infeasibilities

The purpose of the ABC enhancement is to make capacity available to the market that otherwise would not be visible. The primary objective in making such capacity available is that the market can recognize and access that capacity when the conditions warrant its use, namely when the market 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. The market clearing process will go through the bid stack in economic order. 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 market will relax the power balance constraint to clear. 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 market.

Figures 10 through 15 show the amount of ABC submitted in the market relative to the power balance constraint relaxations in both the FMM and RTD. In the PAC West balancing authority area, the power balance constraints were not relaxed during intervals with ABC available in the FMM. However, in the RTD, the power balance constraint was relaxed and in most cases it was for over-supply conditions and the ABC available was to cover under-supply infeasibilities (upward ABC). For the PAC East balancing authority area, towards the end of the reporting period, the power balance constraint was relaxed frequently, which coincided with a time when less ABC was available.

NV Energy consistently made downward ABC available for its balancing authority area, but the power balance constraint was relaxed mostly when there were under-supply conditions, which can only be resolved with upward ABC. NV Energy indicated that before mid-July, it had modeled its contingency reserves and upward regulating reserves in a single reserve calculation. NV Energy, therefore, did not offer that capacity into the market because it could not represent its contingency reserves as available to the market.

Since mid-July, NV Energy has offered some upward ABC (regulating reserves), which are separate from the Contingency Reserves calculation. However, NV Energy has indicated that most of its capacity over the summer is either base-scheduled, bid into the market, or reserved for contingencies.

Figure 10: Submitted ABC and power balance constraint infeasibilities in the FMM in the PAC West balancing authority area

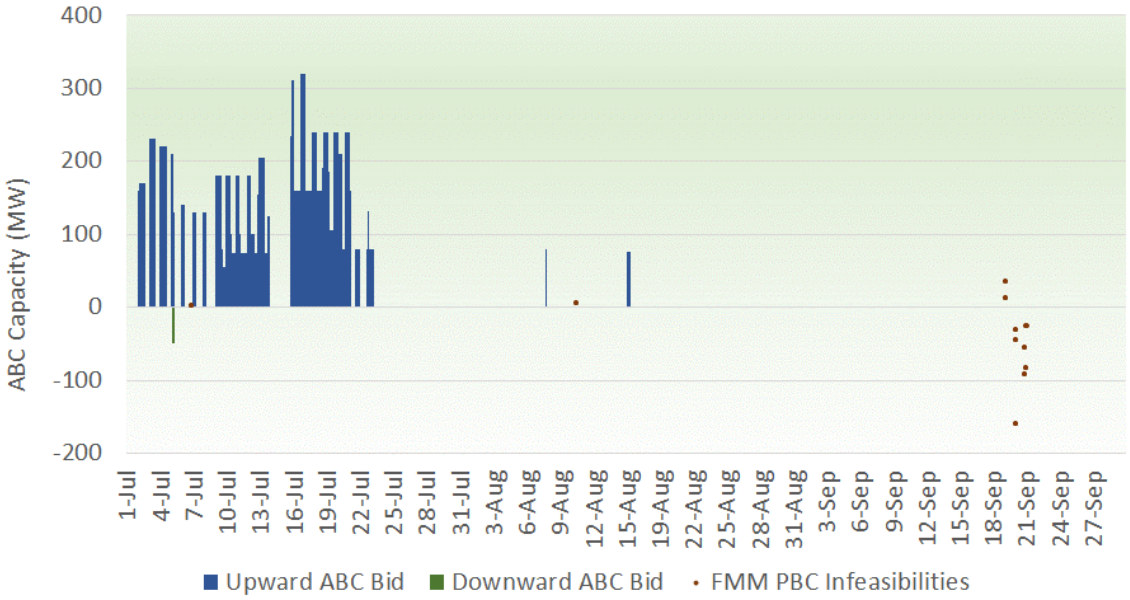


Figure 11: Submitted ABC and power balance constraint infeasibilities in the RTD in the PAC West balancing authority area

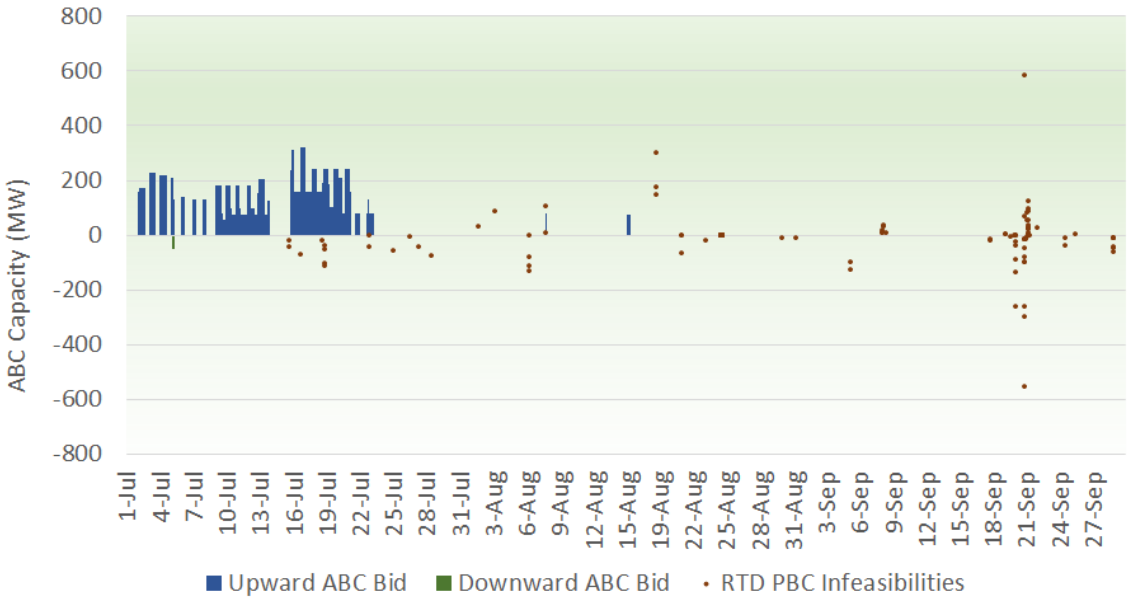


Figure 12: Submitted ABC and power balance constraint infeasibilities in the FMM in the PAC East balancing authority area

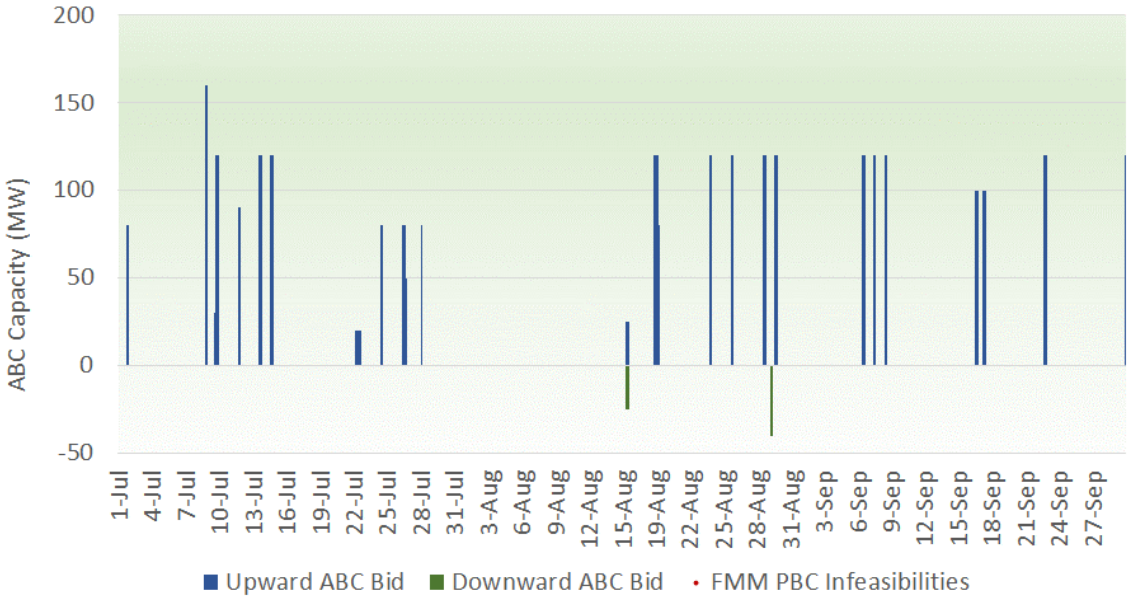


Figure 13: Submitted ABC and power balance constraint infeasibilities in the RTD in the PAC East balancing authority area

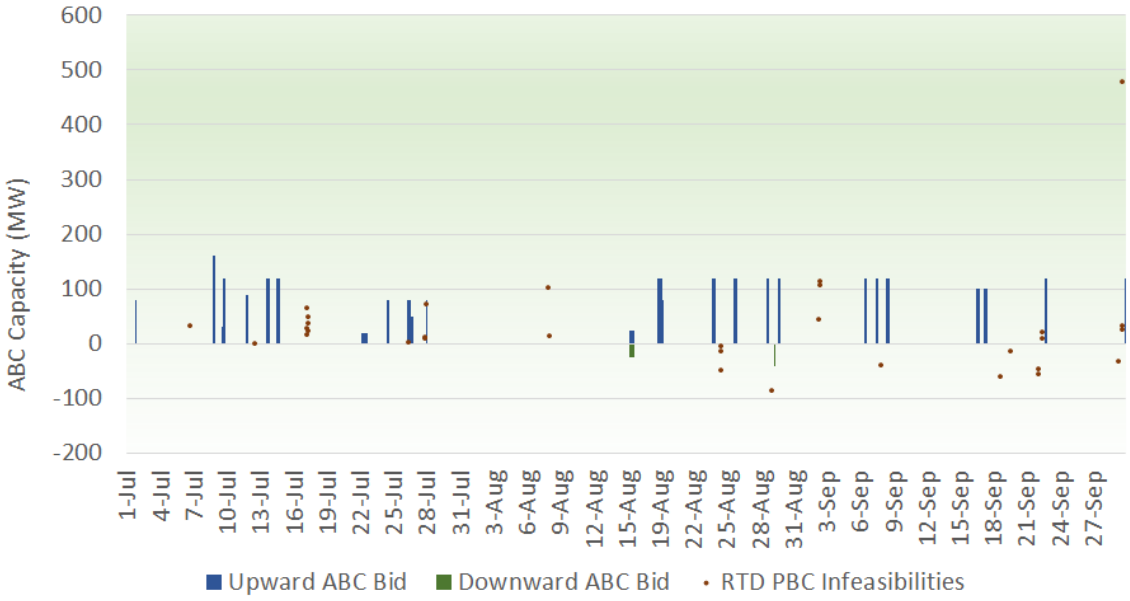


Figure 14: Submitted ABC and power balance constraint infeasibilities in the FMM in the NV Energy balancing authority area

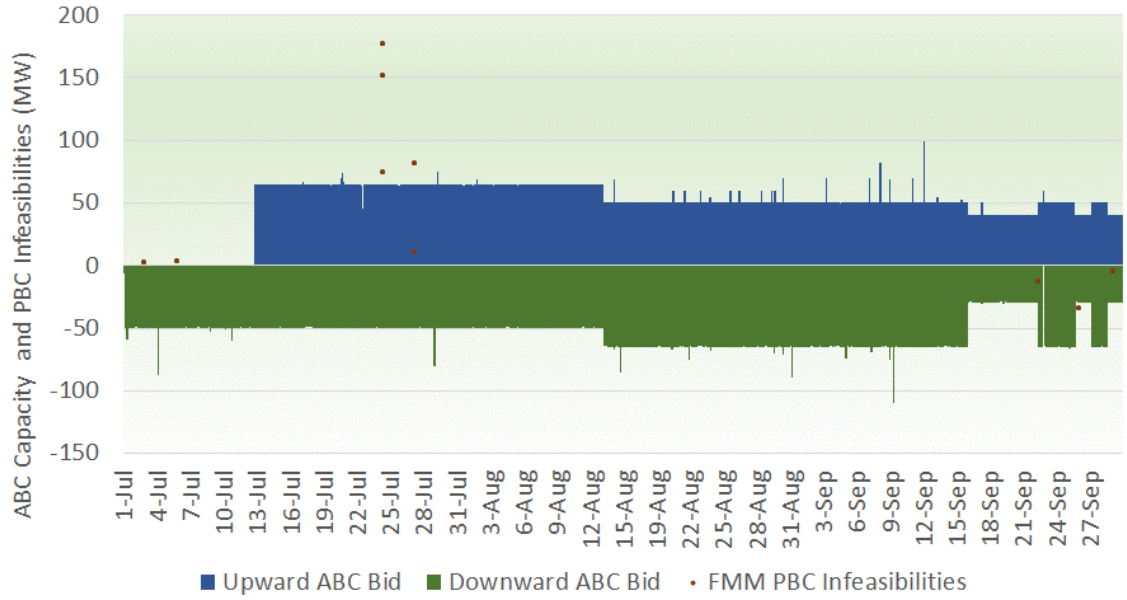
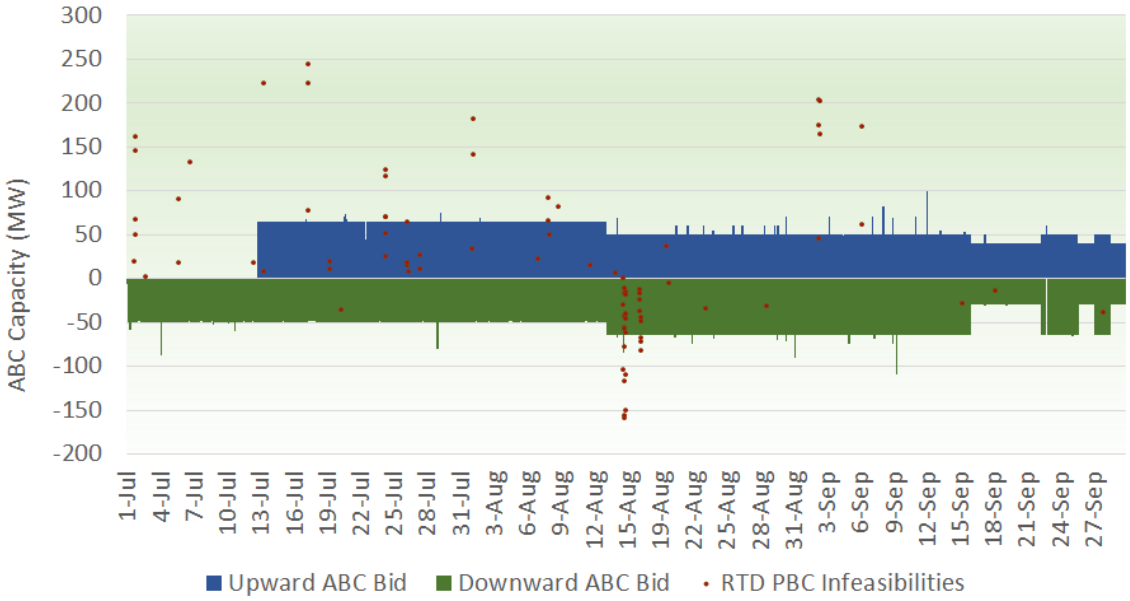


Figure 15: Submitted ABC and power balance constraint infeasibilities in the RTD in the NV Energy balancing authority area



Based on the data provided in the figures above, Table 3 shows the frequency of intervals in which there was no ABC made available in the market when the power balance constraint was relaxed. The data in Table 3 illustrates over-supply infeasibilities where downward ABC is needed and for under-supply infeasibilities where upward ABC is needed. For instance, for NV Energy, both the FMM and RTD are a 100% for under-supply infeasibilities, indicating that in

every interval when an under-supply infeasibility was observed, there was no upward ABC made available to the market.

Table 3: Frequency of power balance infeasibilities when no ABC was available in the market

	Over-supply		Under-supply	
	FMM	RTD	FMM	RTD
PAC West	100%	100%	100.0%	100%
PAC East	62.5%	74.1%	100%	98.3%
NV Energy	0%	0%	0%	4.7%

After implementation of the ABC enhancement, the CAISO has observed two additional scenarios that can occur.

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 releases 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 area, which is the combination of all balancing authority areas that participate in the EIM, including the CAISO's balancing authority area. 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 balancing authority area 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 area, the need to redispatch 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 balancing authority area 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 balancing authority area. While the CAISO is not able to isolate the electrons, the constraint ensures that EIM does not export the ABC to another balancing authority area to the detriment of the specific EIM balancing authority area by ensuring that the exports from the EIM balancing authority area are net of the ABC released in an EIM entity balancing authority area.

3) Software defect. There were a few instances impacted by a software defect regarding the reported amount of ABC. In these cases, some MW schedules were incorrectly reported as ABC. A fix for this reporting issue was implemented on October 1, 2016.

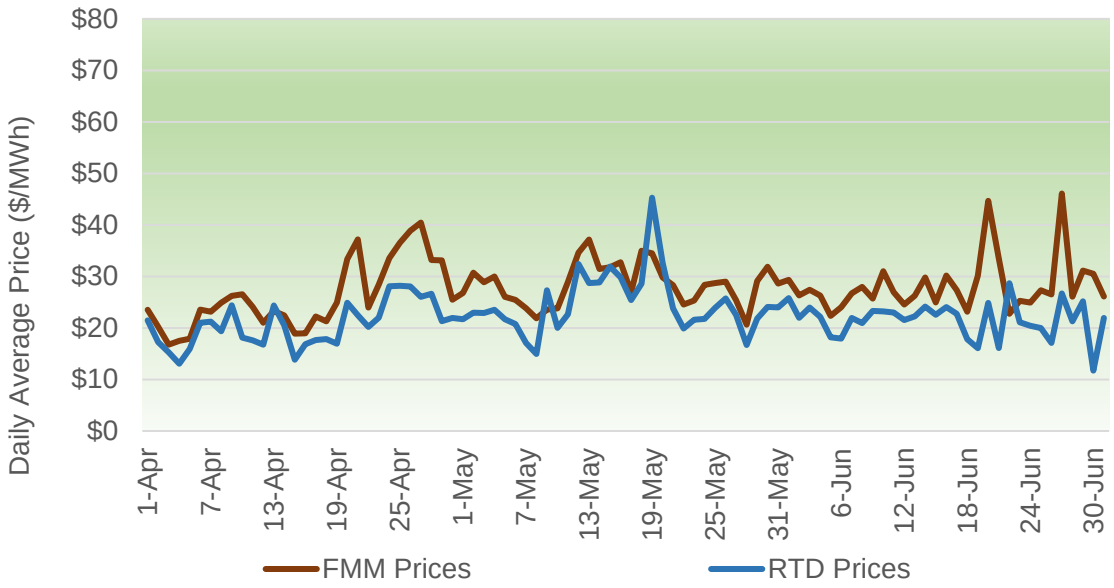
IV. EIM performance

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 16 through 19 show the ELAP prices[5] for the FMM and RTD in each EIM balancing authority area. 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.

Figure 16: Daily average price for the PAC West balancing authority area ELAP



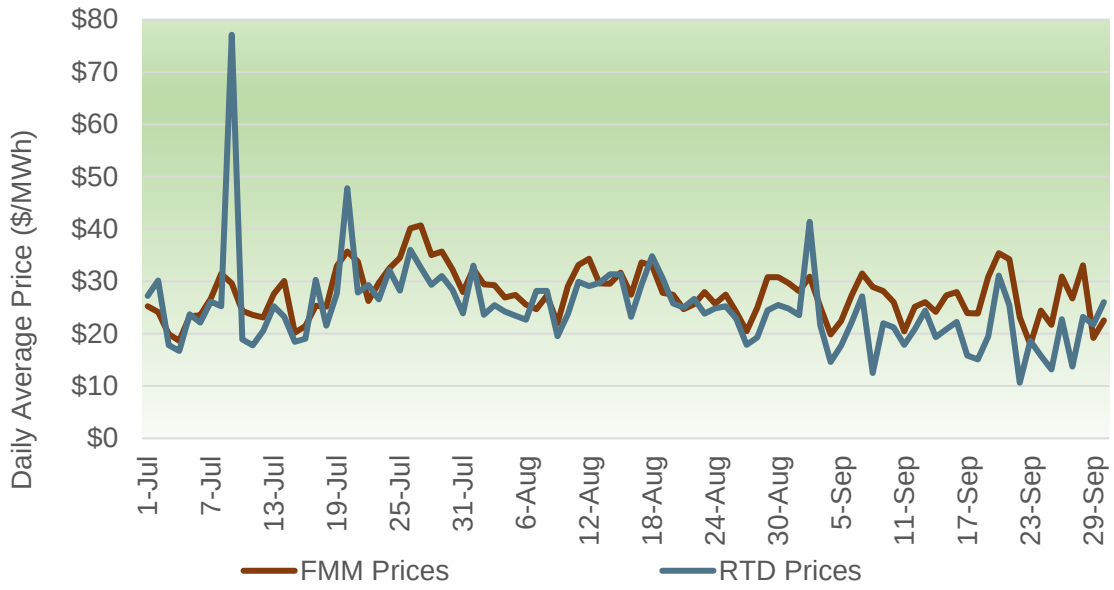
This comparison is no longer meaningful because PAC West and PAC East tariff waivers ended with the activation of the ABC feature on March 23, 2016, and the NV Energy transitional period expired at the end of May 2016.[6]

[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. For the NV Energy balancing authority

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; 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 16 through 19 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.

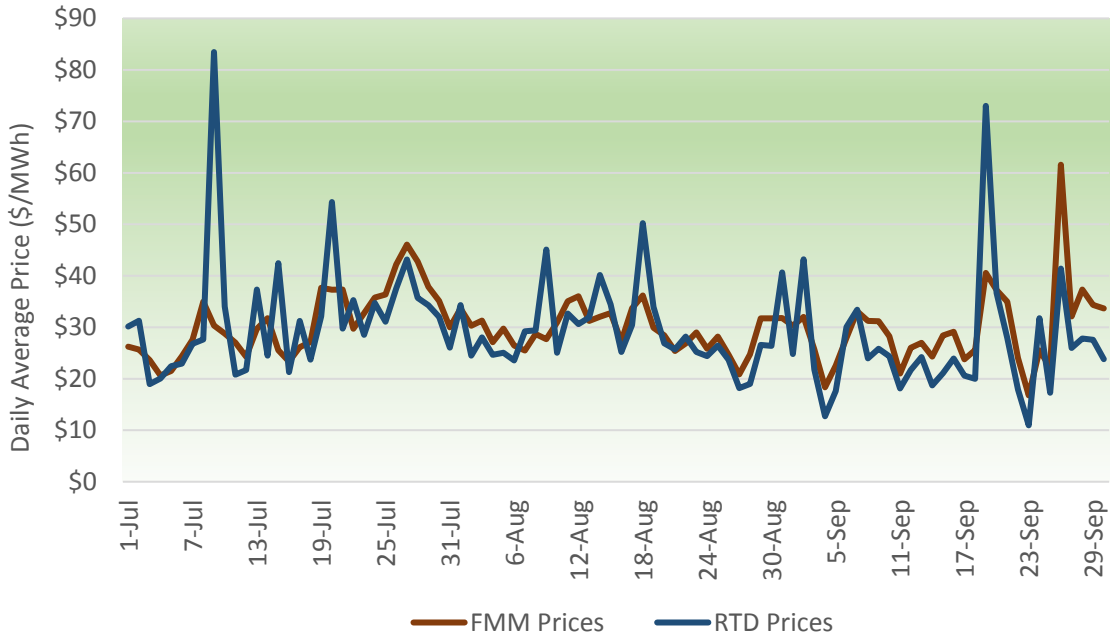
Figure 17: Daily average price for the PAC East balancing authority area ELAP



For the period of April 1 through June 30, 2016, ELAP prices in the NV Energy balancing authority area were on average $30/MWh in the FMM and $29.27/MWh in the RTD. Prices in the PAC West balancing authority area were on average $27.6/MWh in the FMM and $22.31/MWh in the RTD, while prices in the PAC East balancing authority area were on average $27.6/MWh in the FMM and $24.87/MWh in the RTD.

area, the comparison is still useful for the months of April and May 2016. However, the CAISO has already provided such comparison in the corresponding monthly EIM informational submitted previously to FERC.

Figure 18: Daily average price for the NV Energy balancing authority area ELAP



B. Frequency of Power Balance Constraint Relaxation

Figures 19 and 24 show the frequency of intervals in which the power balance constraint was relaxed for under-supply or over-supply conditions in each of the three EIM entity balancing authority areas for the FMM and RTD markets, respectively. A bar with positive frequency represents an under-supply power balance constraint relaxation, while a bar with negative frequency represents an over-supply power balance constraint relaxation. These frequencies reflect only actual infeasibilities; any power balance constraint relaxation for intervals that were subject to a price correction under the provisions of the CAISO tariff were excluded, as they would not reflect valid infeasibilities.

For the NV Energy balancing authority area, there were only seven (0.08 percent of the time) FMM under-supply infeasibilities in the reported three-month period. The RTD observed 38 (0.17 percent of the time) under-supply infeasibilities, with 21 (0.08 percent of the time) infeasibilities covered by the load conformance.

Figure 19: Frequency of FMM power balance in feasibilities in the NV Energy balancing authority area

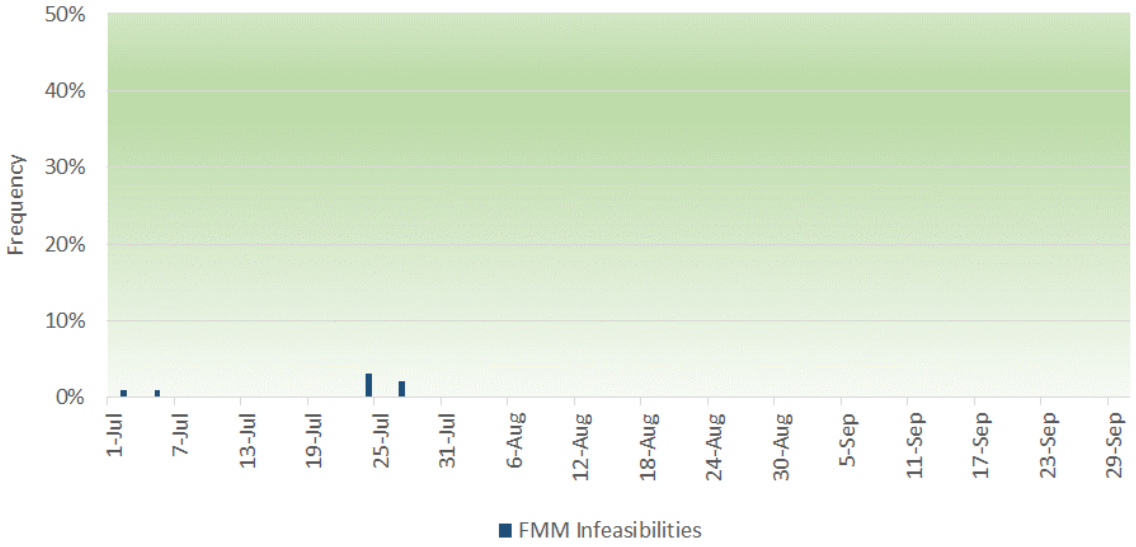
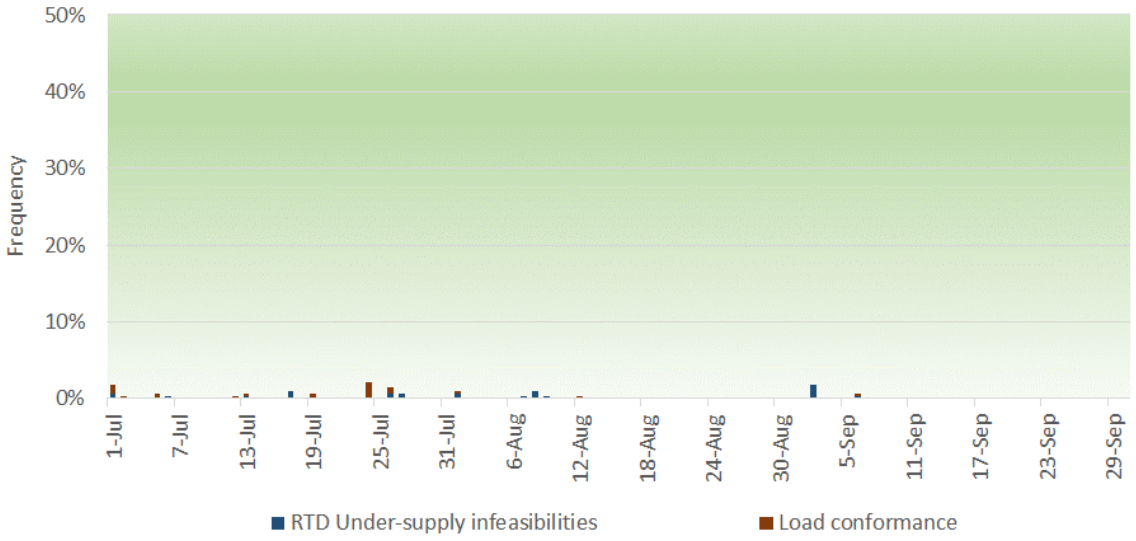


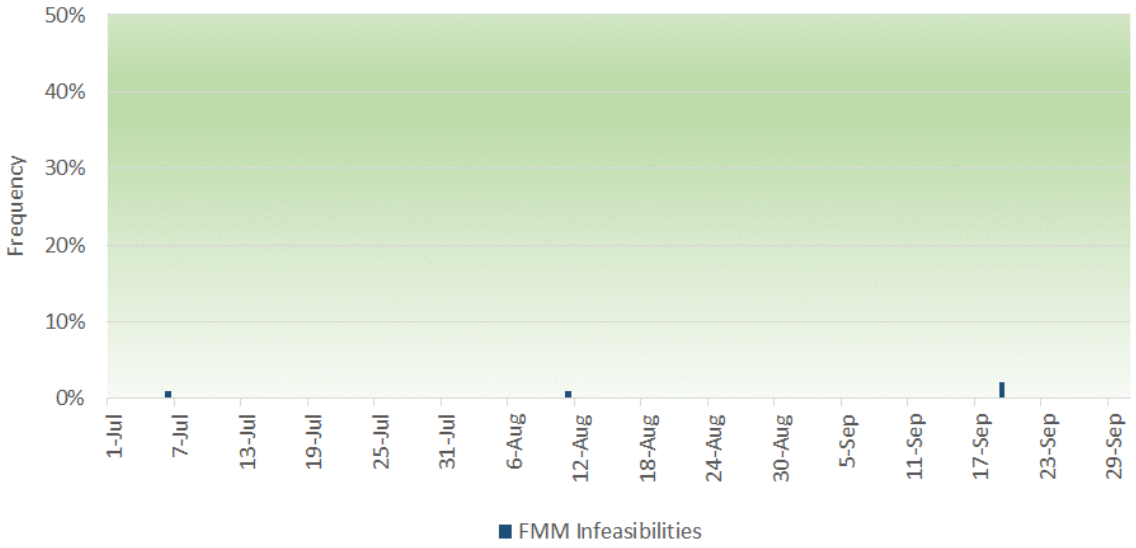
Figure 20: Frequency of RTD power balance in feasibilities in the NV Energy balancing authority area



The CAISO uses a load conformance limiter in the CAISO balancing authority area 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 in the CAISO

balancing authority area has avoided invalid constraints that arise through operations rather than because of real supply issues. This feature applies to either over- or under-supply infeasibilities. The red bars in Figures 19-24 show the instances of infeasibilities covered with the load conformance limiter.

Figure 21: Frequency of FMM power balance in feasibilities in the PAC West balancing authority area



For the PAC West balancing authority area, there were four (0.05 percent of the time) FMM under-supply infeasibilities in the reported three-month period. The RTD observed 32 (0.36 percent of the time) under-supply infeasibilities, with six infeasibilities covered by the load conformance limiter.

Figure 22: Frequency of RTD power balance in feasibilities in the PAC West balancing authority area

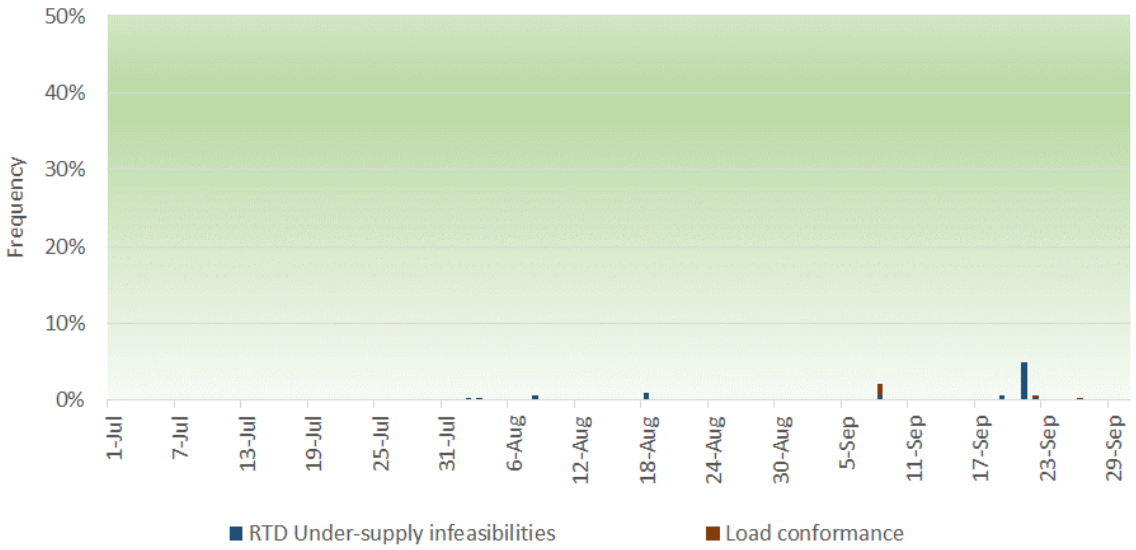
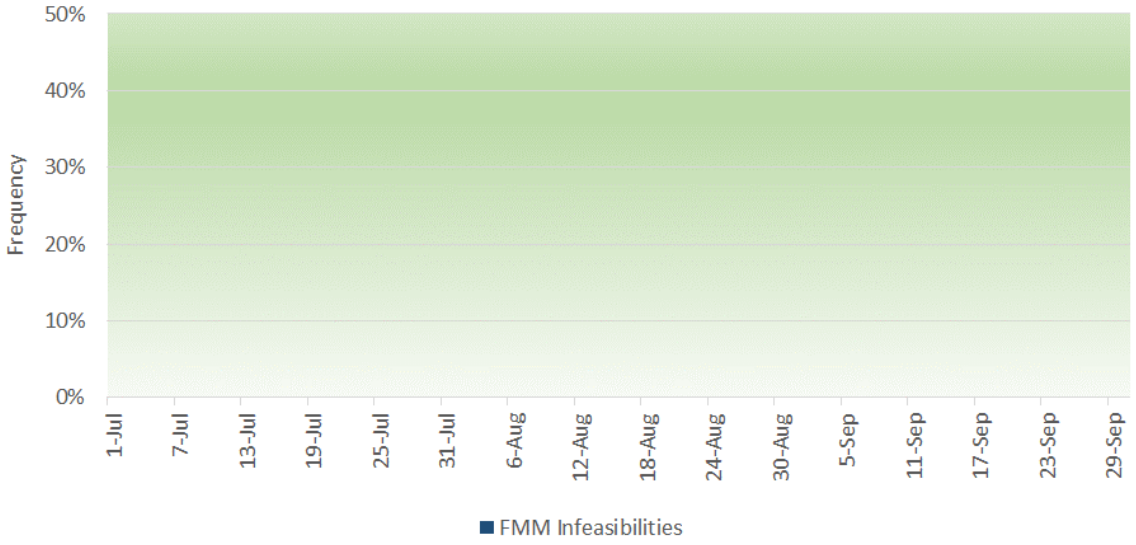
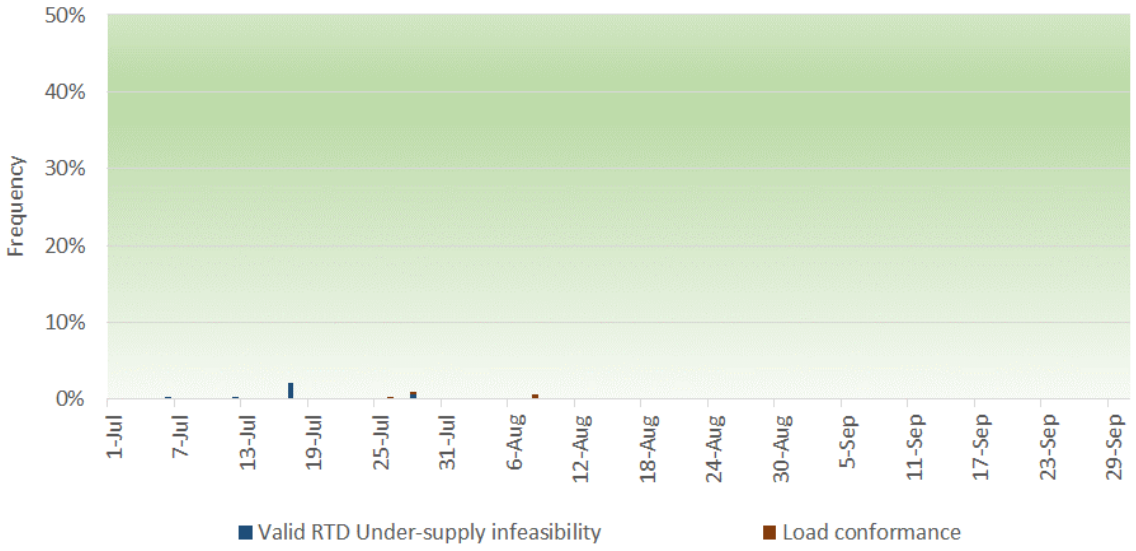


Figure 23: Frequency of FMM power balance in feasibilities in the PAC East balancing authority area



There were no valid undersupply infeasibilities in the FMM in the PAC East balancing authority area during the reported three-month period. For the RTD, there were 14 under-supply infeasibilities (0.16 percent of the time). About 30 percent of these instances were covered by the load conformance limiter.

Figure 24: Frequency of RTD power balance in feasibilities in PAC East balancing authority area

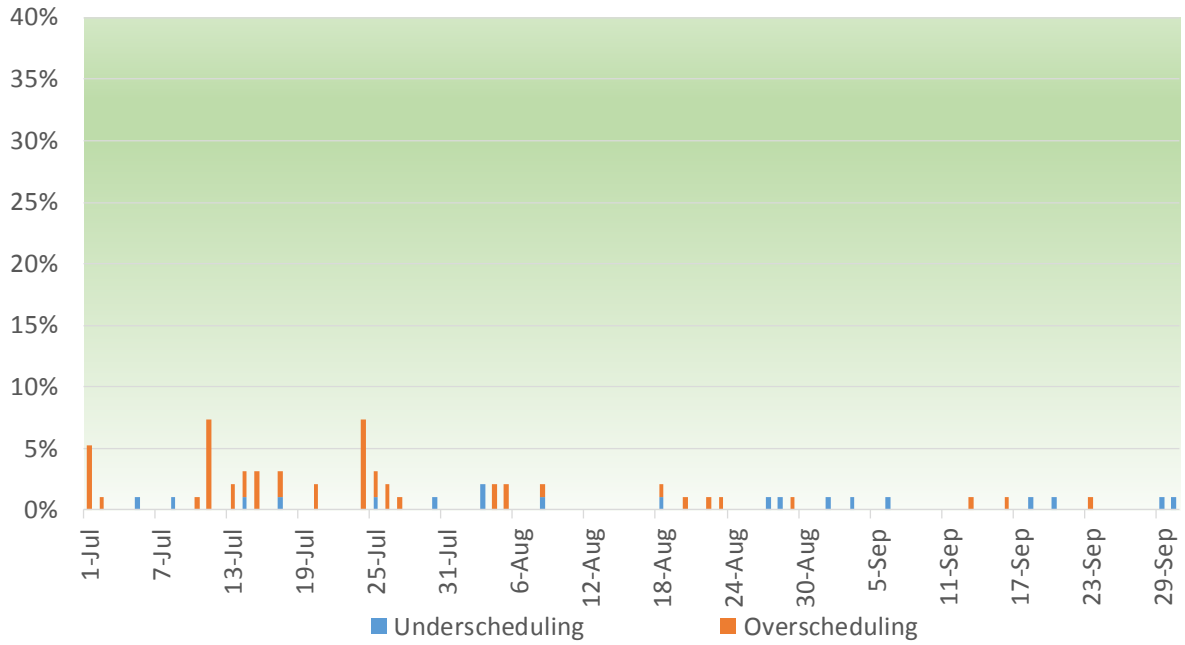


C. Balancing and Sufficiency Test Failures

Figure 2525 through 27 show the trend of balancing test failures for the period of July 1 through September 30, 2016 for each of the EIM entity balancing authority areas. This balancing test is performed pursuant to Section 29.34(k) of the CAISO tariff. The NV Energy balancing authority area passed the balancing

test 96.88 percent of the time, where about a quarter 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 25: Frequency of balancing test failures for the NV Energy balancing authority area



The PAC West balancing authority area passed the balancing test for the reported period about 98.6 percent of the time, with about a half of the failures reflecting under-scheduling. Similarly, the PAC East balancing authority area passed the balancing test about 98.46 percent of the time, with a about the half of the failures associated with under-scheduling.

Figure 26: Frequency of balancing test failures for the PAC West balancing authority area

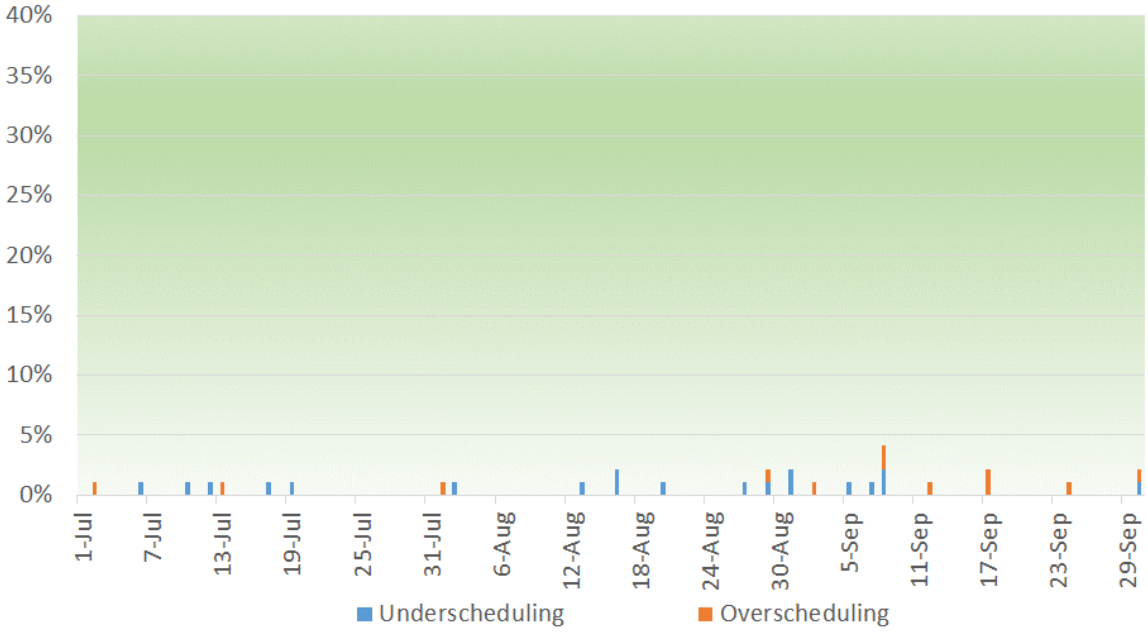
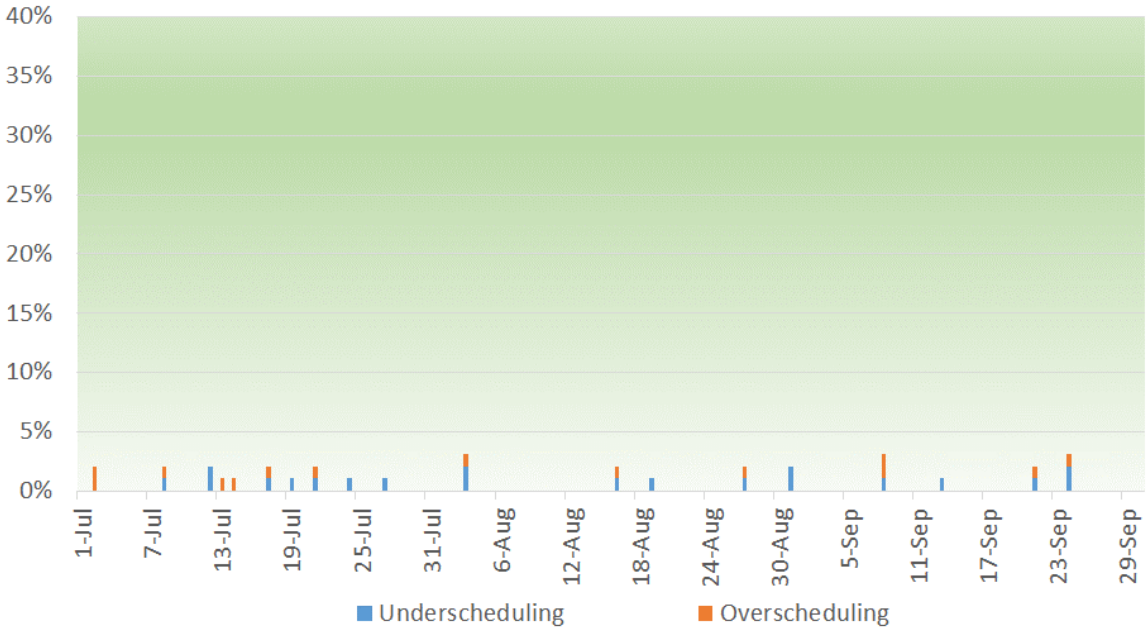


Figure 27: Frequency of balancing test failures for PAC East balancing authority area



Figures 28 through 30 show the trend of failures for the flexible ramping sufficiency test in each of the EIM entity balancing authority areas for the period of July 1 through September 30, 2016. For the reported period, the NV Energy balancing authority area passed the test about 99.68 percent of the hours, the PAC West balancing authority area passed the balancing test about 99.22

percent of the hours, while the PAC East balancing authority areas passed the test 99.3 percent of the hours.

Figure 28: Frequency of flexible ramping sufficiency test failures in the NV Energy balancing authority area

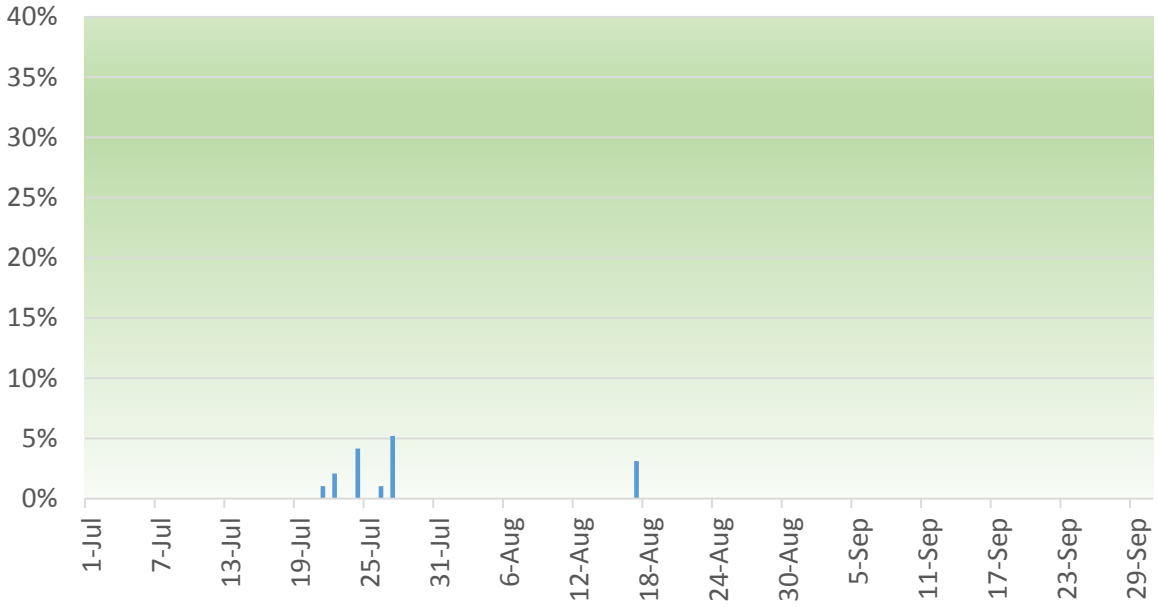


Figure 29: Frequency of flexible ramping sufficiency test failures in the PAC West balancing authority area

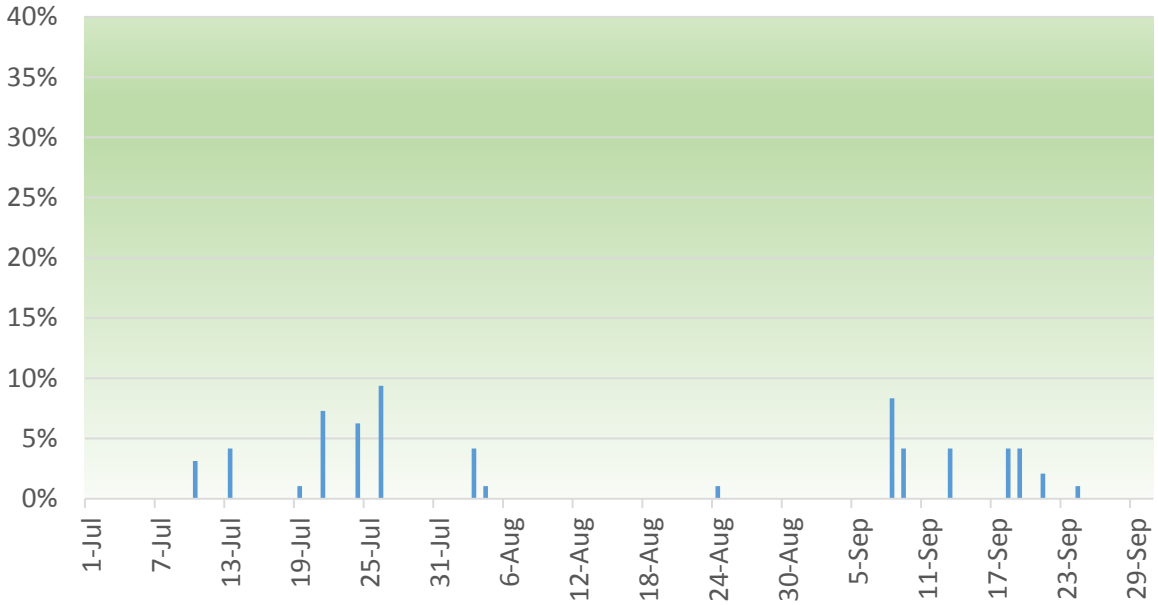
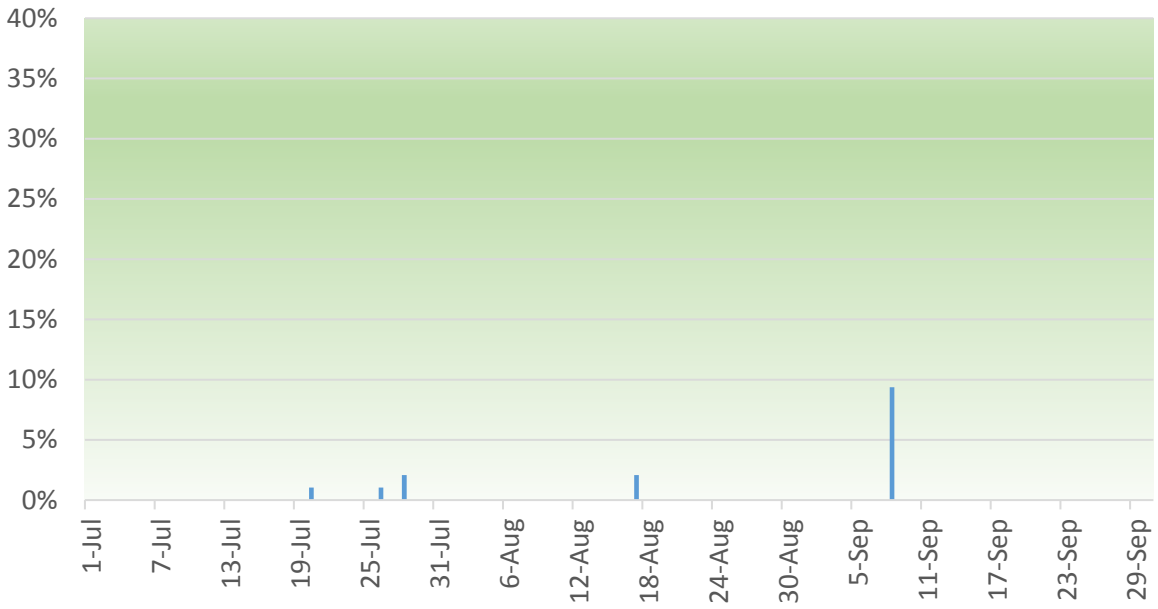


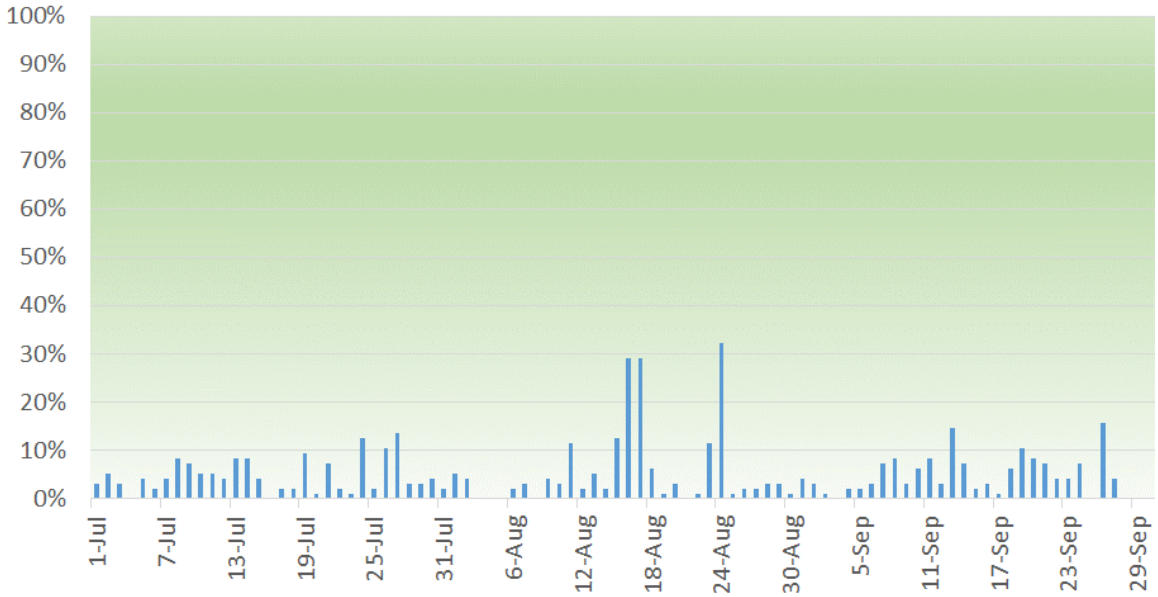
Figure 30: Frequency of flexible ramping sufficiency test failures in the PAC East balancing authority area



D. Flexible Ramping Constraint Infeasibilities

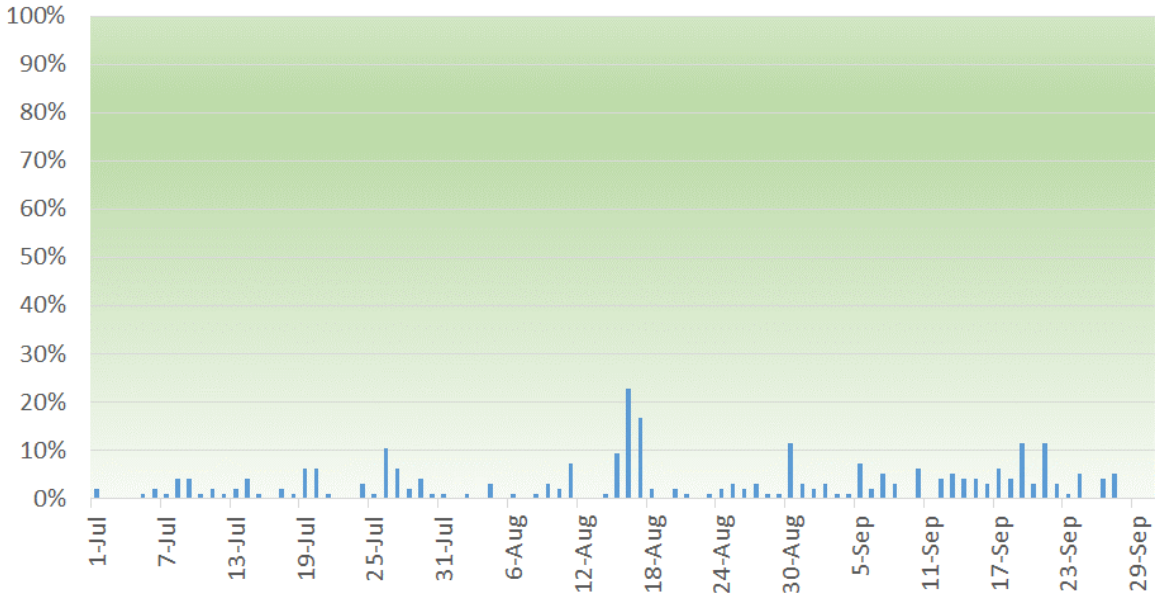
Figures 31 through 33 show the frequency of flexible ramping constraint infeasibilities. These do not include invalid infeasibilities.

Figure 31: Frequency of flexible ramping constraint infeasibilities in the NV Energy balancing authority area



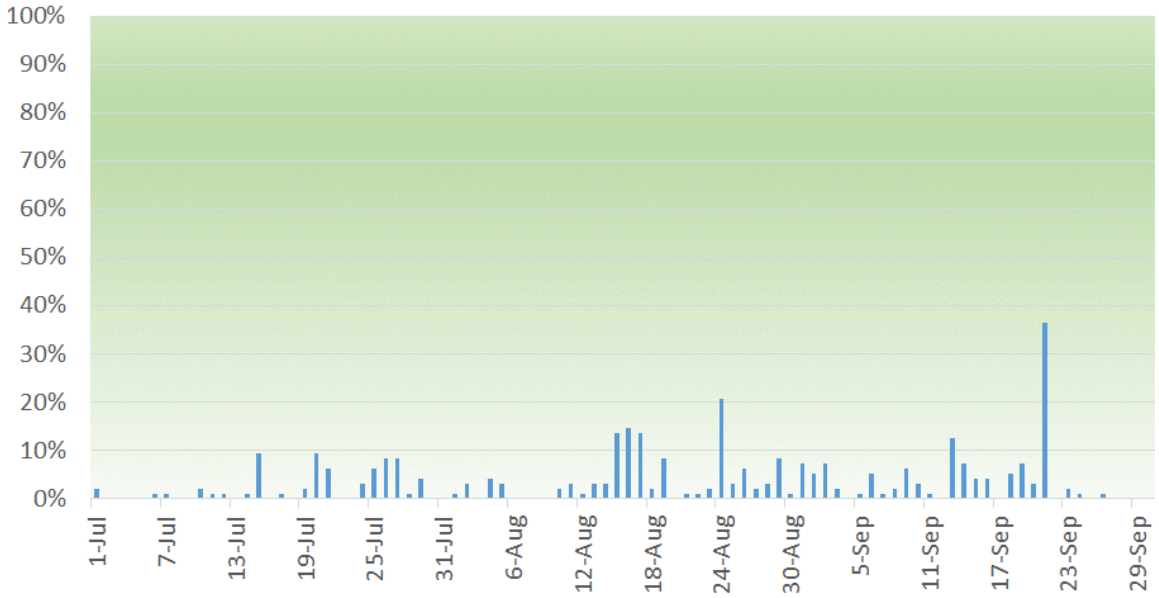
During the reported three-month period, the flexible ramping constraint in the NV Energy EIM balancing authority area was infeasible, on a daily average, in 4.96 percent of the FMM intervals. As in prior months, these infeasibilities are mainly driven by the economics of flexible ramping constraint and its opportunity cost. Because the market co-optimizes the procurement of energy and flexible ramping capacity, resources in the NV Energy balancing authority area may be incrementally dispatched to provide economic transfers to the CAISO balancing authority area rather than to provide flexible ramping capacity for the NV Energy balancing authority area. Consequently, these economics sometimes cause flexible ramping scarcity that causes the constraint to bind in the NV Energy balancing authority area. This circumstance is not unusual.

Figure 32: Frequency of flexible ramping constraint infeasibilities in the PAC East balancing authority area



For PAC East and PAC West balancing authority areas, the flexible ramping constraint was infeasible, on a daily average, in 2.97 percent and 3.42 percent of the intervals, respectively. Opportunity costs together with the limited capacity made available for flexible ramping played a large role in the frequency of infeasibilities.

Figure 33: Frequency of flexible ramping constraint infeasibilities in the PAC West balancing authority area



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 30th day of May 2017.

/s/ Grace Clark
Grace Clark