



California ISO

Market Performance and Planning Forum

April 19, 2018

ISO PUBLIC

Objective: Enable dialogue on implementation planning and market performance issues

- Review key market performance topics
- Share updates to 2017 release plans, resulting from stakeholders inputs
- Provide information on specific initiatives
 - to support Market Participants in budget and resource planning
- Focus on implementation planning; not on policy
- Clarify implementation timelines
- Discuss external impacts of implementation plans
- Launch joint implementation planning process



Market Performance and Planning Forum

Agenda – April 19, 2018

| Time: | Topic: | Presenter: |
|---------------|--|--|
| 10:00 – 10:05 | Introduction, Agenda | James Bishara |
| 10:05 – 12:00 | Update on Southern California Import Transmission Nomogram Retirement Credible Multiple Contingency Change Market Performance and Quality Update | Dede Subakti Guillermo Bautista Anna Mckenna Amber Motley |
| 12:00 – 1:00 | Lunch | |
| 1:00 – 1:30 | DMM - Flexible Ramping Product Uncertainty Calculation and Implementation Issues | Kyle Westendorf |
| 1:30 – 2:00 | Policy Update | Brad Cooper John Goodin |
| 2:00 – 3:00 | Release Update | Adrian Chiosea Janet Morris |

Update on Southern California Import Transmission (SCIT)

Historical Background

- The Southern California Import Transmission (SCIT) nomogram was put in place after two significant blackouts in the early 1980s.
- SCIT nomogram measure flow into Southern California
- Definition of SCIT nomogram is posted in CMRI
- Transmission infrastructure improvements have significantly increased SCIT over the years
- Transient system stability issue originally related with development of SCIT has not been observed for the past few years

Summary of Change

- SCIT joint studies concludes that existing SCIT nomogram is no longer required.
- The California ISO has scheduled to retire SCIT nomogram effective June 1, 2018

Other Operational Update on Transmission Enforcement

Upcoming change

- Internal Path ATC calculation for Path 15 and Path 26
 - In May 2015, CAISO posted a market notice that it no longer enforces internal Path Branch Group.
 - Reliability flow has been managed through nomograms
 - CAISO is still posting on its OASIS ATC for Path 15 and Path 26 because Appendix L requirement. This creates confusion
 - Because CAISO is no longer enforcing the internal Path Branch Group, CAISO will be proposing to eliminate the tariff requirement and stop calculating and posting TTC and ATC for both Path 15 and Path 26
 - CAISO will continue to post nomogram definition, enforcement, and transmission outage as it currently does.

Update on Credible Multiple Contingency

Historical Background

- Peak RC SOL methodology was updated on April 1, 2017
- Two types of Credible Multiple Contingency:
 - Always Credible
 - Conditionally Credible
- TOP should determine which of these, if any, are designated as Always Credible MCs for operations:
 - Bus Fault Contingencies
 - Stuck breaker Contingencies
 - Relay failure Contingencies where there is no redundant relaying
 - Common structure Contingencies
 - Any of the MCs that have been determined by its PC to result in stability limits

Historical Background

- Contingencies more severe than bus Fault Contingencies, stuck breaker Contingencies, relay failure Contingencies and common structure Contingencies are considered to be extreme events and are generally not under consideration as Always Credible MCs for the Operations Horizon; however, exceptions may exist due to the severe and widespread adverse consequences of the MC. If there are any extreme Contingencies that the TOP or the RC determines to be Always Credible for operations, Peak and the impacted TOPs are expected to collaborate to determine how those extreme events are to be addressed in operations planning and in Real-time operations.

Conditionally Credible Multiple Contingency

- Conditionally Credible MCs become credible when the Conditionally Credible MC poses a risk to reliability due to a known, foreseeable or observable threat. The TOP in whose TOP Area the MC Facilities reside is responsible for determining when a Conditionally Credible MC becomes credible and when it ceases to be credible.
- When a Conditionally Credible MC becomes credible, the TOP in whose TOP Area the MC Facilities reside must notify the RC and other TOPs known or expected to be impacted by the MC. The TOP in whose TOP Area the MC Facilities reside must collaborate with the RC and impacted TOPs to create and implement an Operating Plan (or to implement a pre-determined Operating Plan) to address the known and observable risk associated with the Conditionally Credible MC.

Update on the Credible Multiple Contingency

- Effective operating day 4/2/18, all 500kV common corridor double line outages in the PG&E service area were treated as conditionally credible.
- Work is still on going for other service area:
 - This may impact Path 26 as well as Southern California Edison area
 - There is no current path/interface limited by common corridor in SDG&E area

CRR Track 0 Status

CRR auction efficiency initiative has three tracks

- Track 0 is for enhancements and improvements that can be done within our current tariff authority.
- Track 1a was brought to the BOG on March 2018 and targets outage reporting changes and reduction to delivery-only CRRs.
- Track 1b is currently under discussion and targeted for completion in June.

Track 0 Improvements

| Item | Action | Status |
|------|---|--|
| 1 | Notify each PTO of its historical outage submittal performance and ISO expectations of PTO compliance with current tariff requirements. | Complete. CAISO held discussions with PTOs and got feedback for future reporting |
| 2 | Regular reporting in market performance reports of PTO outage submittal performance. | On-going. Will align report with new outage reporting rules from Track 1A. Will be engaging PTOs in development of the business rules for the report. |
| 3 | Continue review of default enforced constraints list and potentially expand to more facilities. | Complete. Expanded list of monitored elements. Determined that the CRR market should monitor all ISO-controlled facilities. |
| 4 | Formalize a process to update the CRR default enforced constraints list based on day-ahead market results. | Complete. Determined that the CRR market should monitor all ISO-controlled facilities, therefore this process is not necessary. |
| 5 | Enhance CRR outage process to identify and define nomogram constraints in the monthly CRR auction timeframe. | Complete. Long-range outage team reviews all known outages and defines nomograms for the CRR market. Risk still exists as it relates to outages received after the CRR outage study. |

Track 0 Improvements

| Item | Action | Status |
|------|---|--|
| 6 | Incorporate changed procedure-based constraint enforcement within the monthly CRR auction timeframe. | Complete. Long-range outage team reviews all known outages and defines nomograms for the CRR market. Risk still exists as it relates to outages received after the CRR outage study. |
| 7 | Review outage coordination practices and operating agreements with neighboring balancing authorities. | Complete. The ISO reviewed Adjacent Balancing Authority Operating Agreement (ABAOA), Interconnected Balancing Authority Area Operating Agreement (IBAAOA), and Interconnected Control Area Operating Agreement (ICAOA) as filed with FERC. |
| 8 | Enhance operating procedures related to external outage information and the CRR process. | Based on the current Agreements, there is currently no avenue to enforce/require external outage to be in alignment with CRR needs. |
| 9 | Identify where external outage information is available in advance and utilize this information to appropriately enforce interface constraints in the CRR auction. | Complete. The ISO has reviewed its process and confirmed that the CAISO webOMS has automatic process that download all external BA/TOP outages from Peak RC COS as soon as they are reported. |
| 10 | Review and expand the default contingency enforcement list for the CRR auction. | Complete. Expanded contingency list to 600 elements. Planning to enforce 2,200 contingencies in June Auction. |
| 11 | Stress test the CRR auction model to determine if there is a higher maximum number of enforceable contingencies. Pursue technology enhancements to increase the contingency capability, if necessary. | Complete. See Task 10 status. |
| 12 | Review and expand contingency enforcement criteria related individual outages. | Complete. Special criteria not needed. Will enforce all contingencies. See Task 10 status. |
| 13 | Review and enhance CRR outage modeling criteria. | In progress |

Onboarding of Idaho and Powerex

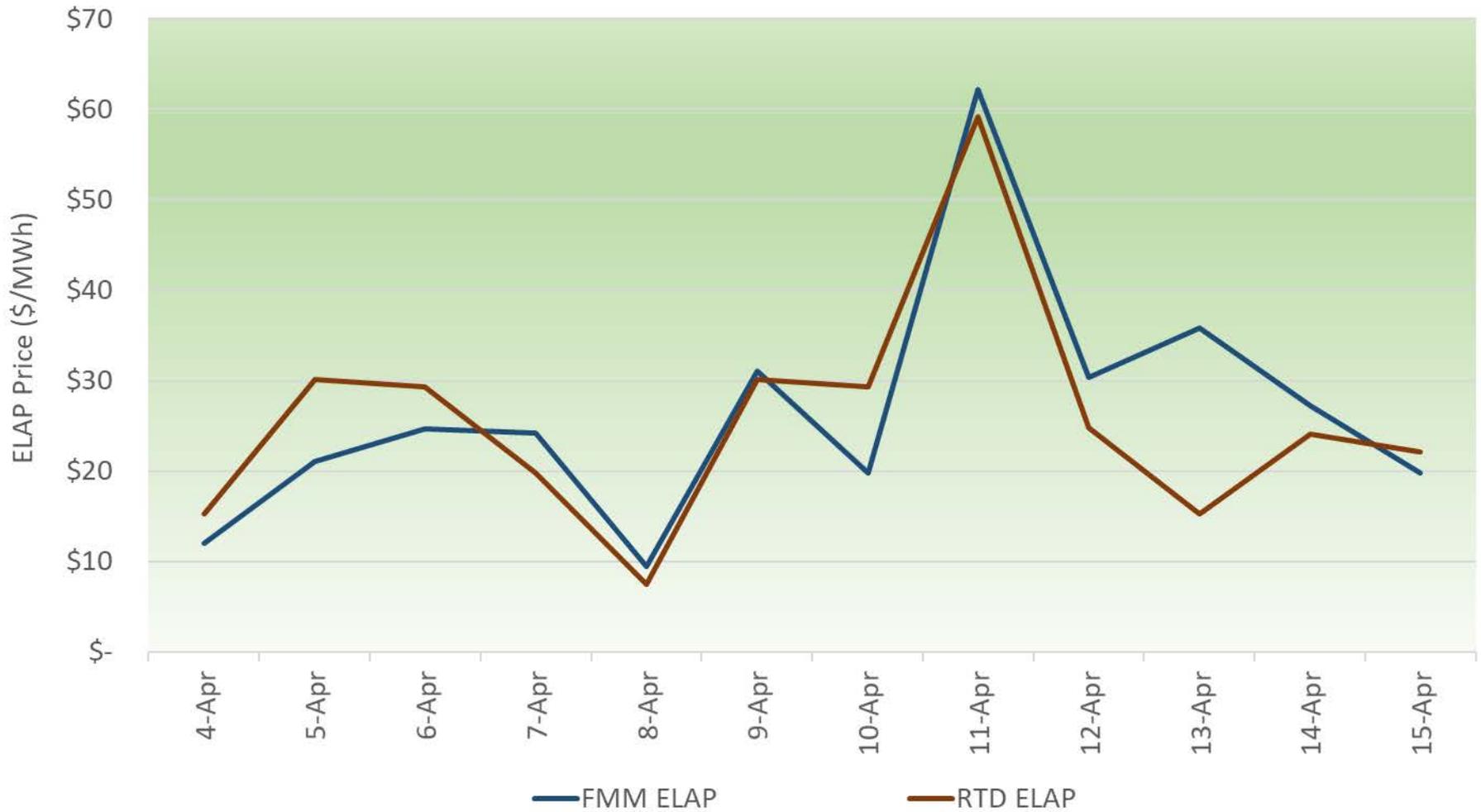
Idaho and Powerex went live on April 4, 2018

- Both entities performed parallel operations during February and March 2018.
- Idaho has passed 95.2 % of the balancing test, and 96.6% of the Flex sufficiency test.
- Powerex is no subject to the balancing test and has passed 99.6% of the flex sufficiency test
- Idaho has observed power balance undersupply infeasibilities in 1.5% and 1.4% of the intervals for the 15- and 5-minute markets
- Powerex has observed no power balance undersupply infeasibilities in the 15- and 5-minute markets

Powerex Prices have been stable in the first days of operations



Idaho Prices have been stable in the first days of operations





Powerex Flow Reversal Issue

FERC Briefing

Anna McKenna, Assistant General Counsel

April 19, 2018

Issue

- Powerex parallel operations indicate that application of the market power mitigation (MPM) to Powerex's aggregate participating resource (APR) is leading to unintended adverse outcomes in certain situations; and frequency of mitigation has been higher than expected
- Sometimes mitigation applies when Powerex's bids are economic to *purchase* energy and there is no market power in fact, as opposed to only when Powerex's supply bids face limited structural competition
- Powerex has informed the CAISO that if left unaddressed their energy-limited APR will be depleted inefficiently, making energy unavailable when it is more valuable to the EIM
- Powerex has the right to manage this risk through the amount of transmission service it voluntarily makes available to the EIM, and they expect to limit EIM transfers in intervals where the issue is likely to occur
- CAISO seeks a narrow waiver to make a limited change to its MPM process, which it believes will offer a more targeted solution

Background

- CAISO must apply MPM to Canadian EIM entity's APR when the shadow price of its power balance constraint (PBC) is positive – *i.e.*, binding constraints limit energy transfers from the CAISO balancing authority area (BAA) to the BC Hydro BAA (or to a BAA group that includes the BC Hydro BAA, *e.g.*, BC Hydro and Puget Sound Energy)
- MPM of the fifteen minute market (FMM) or the advisory interval of the real-time dispatch (RTD) identifies this condition and triggers mitigation
- CAISO systems then mitigates the bid price of Powerex's APR in the market pass of the FMM or the next RTD binding interval, which can be down to the negotiated default energy bid (NDEB)
- With the mitigated bid, flows of energy transfers for the BC Hydro balancing authority area reverse from EIM transfers in to EIM transfers out forcing sales ad NDEB
- Powerex has informed the CAISO that the NDEB does not estimate the opportunity costs associated with the multi-facility long-term storage hydro system in Canada that supports Powerex's APR

Solution: Limit EIM Transfers by limiting net exports and flexible ramping up from BC Hydro BAA under specific scenarios instead of limiting total transfers

- If MPM mitigates the APR with a negative schedule in the binding interval, then in the subsequent FMM pass of same binding interval limit net EIM transfer from the BC Hydro BAA in the North-to-South direction across the BC-US border to the base transfer
- If in MPM pass in the advisory interval the schedule of the APR is negative, then limit the flexible ramping up (FRU) procurement from the APR for the subsequent FMM pass to not exceed the FRU requirement for the BC Hydro BAA plus the net EIM transfer to the BC Hydro BAA in the South-to-North direction across the BC-US border in the advisory interval
- If MPM does not mitigate the APR, but the MPM process is triggered for the advisory interval of RTD mitigating the Powerex's participating resource with a negative dispatch, then in the next RTD binding interval limit the net EIM transfer from the BC Hydro BAA in the North-to-South direction across the BC-US border to the corresponding FMM schedule
- If in the RTD the schedule of the APR in the second advisory interval is negative, the CAISO will limit the FRU procurement from the APR in the subsequent RTD run to not exceed the FRU requirement for the BC Hydro BAA plus the net EIM transfer to the BC Hydro BAA in the South-to-North direction across the BC-US border in the advisory interval of the current RTD run
- If MPM mitigates the APR with a zero or positive schedule, then do not restrict the net EIM transfer from the BC Hydro BAA across the BC-US border in subsequent market runs, other than the applicable scheduling limits

Implementation of Transfer limitations

- Section 29.17 (f) authorizes EIM entity scheduling coordinators to limit the EIM transfer made available for use in the Real-Time Market so long as it is communicated prior to the start of the next Dispatch Interval in accordance with the procedures and timelines for submission and acceptance in the Business Practice Manual for the Energy Imbalance Market
- No need to waive this provision
- Powerex instructs the ISO to automate the export limitations as described above, the CAISO will put the detail in the BPM

Implementation of Flexible Ramp Up Procurement

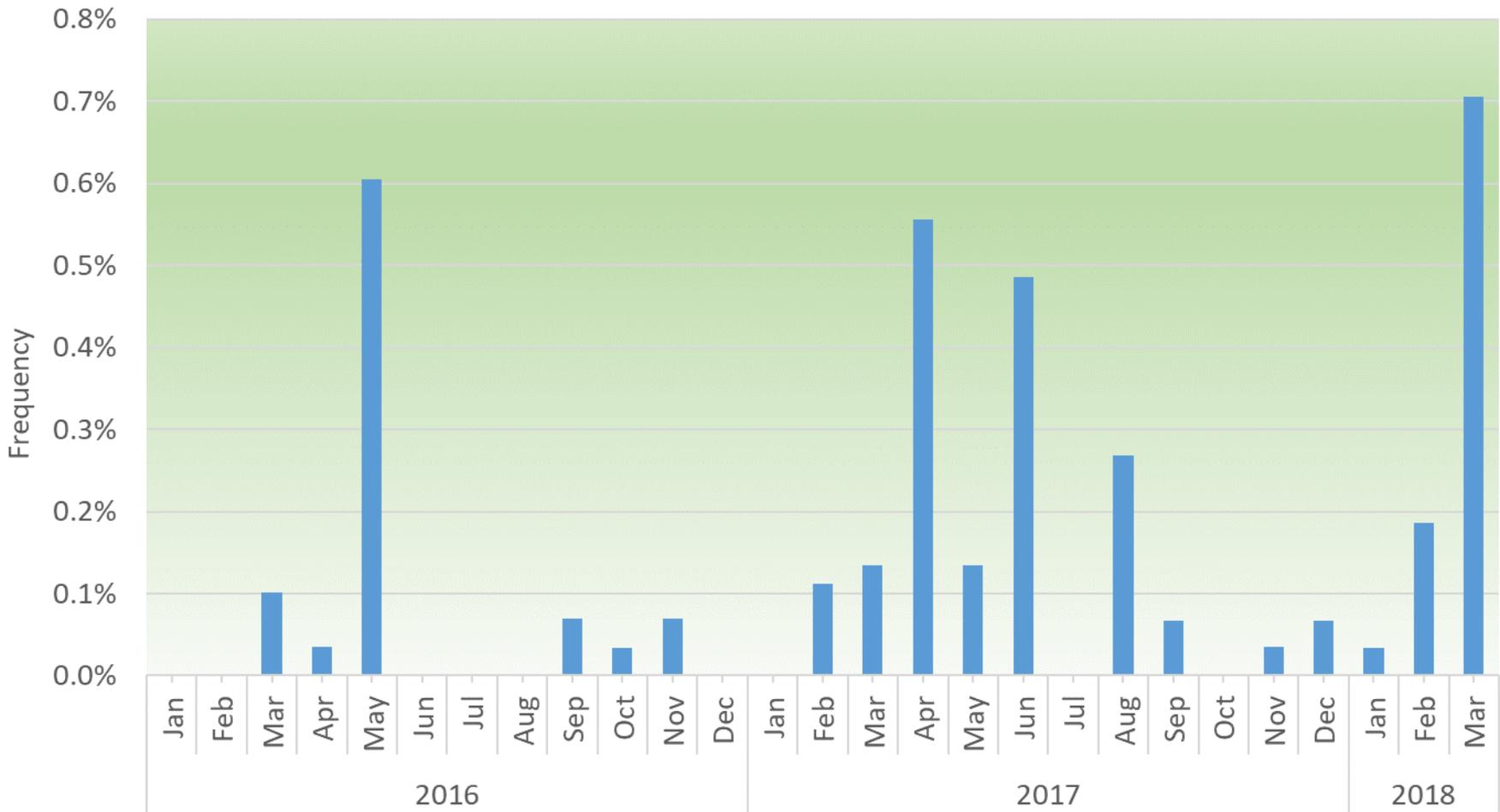
- Section 44.2.4.1 of the tariff states that the CAISO will determine the Uncertainty Requirement for each Real-Time Market run, by each BAA and for the EIM Area overall
- No need to waive this provision
- The CAISO will set the requirements consistent with 44.2.4.1 and the CAISO will specify in the BPM how sets the requirements under these circumstances for this APR

Limit Transfer Freeze to Fifteen Minute Interval in 15-Minute and 5-Minute Intervals – Need waiver

- To get the maximum benefit of the transfers that can occur, must relax rules in the tariff Section 34.1.5.2 (FMM)
 - “[i]f a Bid is mitigated in the MPM process for the first fifteen (15) minute interval for a Trading Hour, the mitigated Bid will be utilized for all market applications for that first fifteen (15) minute interval.”
 - “For each Trading Hour, any Bid mitigated in a prior fifteen (15) minute interval of that Trading Hour will continue to be mitigated in subsequent intervals of that Trading Hour and may be further mitigated as determined in the MPM runs for any subsequent fifteen (15) minute interval.”
- And must relax rule in Section 34.1.5.4 (RTD)
 - “If a Bid is mitigated in the MPM process for the first five (5) minute interval for an applicable fifteen-minute (15) RTUC interval, the mitigated Bid will be utilized for all the corresponding RTD intervals in that fifteen-minute (15) RTUC interval.”
- No unintended consequences because provision is targeted towards resources with intertemporal constraints –
 - Not applicable to Powerex’s APR, which is modeled as “always on” and with no intertemporal constraints

Real-Time Scarcity events

Ancillary Service Scarcities have recently increased in the real-time market



Scarcities are sporadic in nature and short in duration

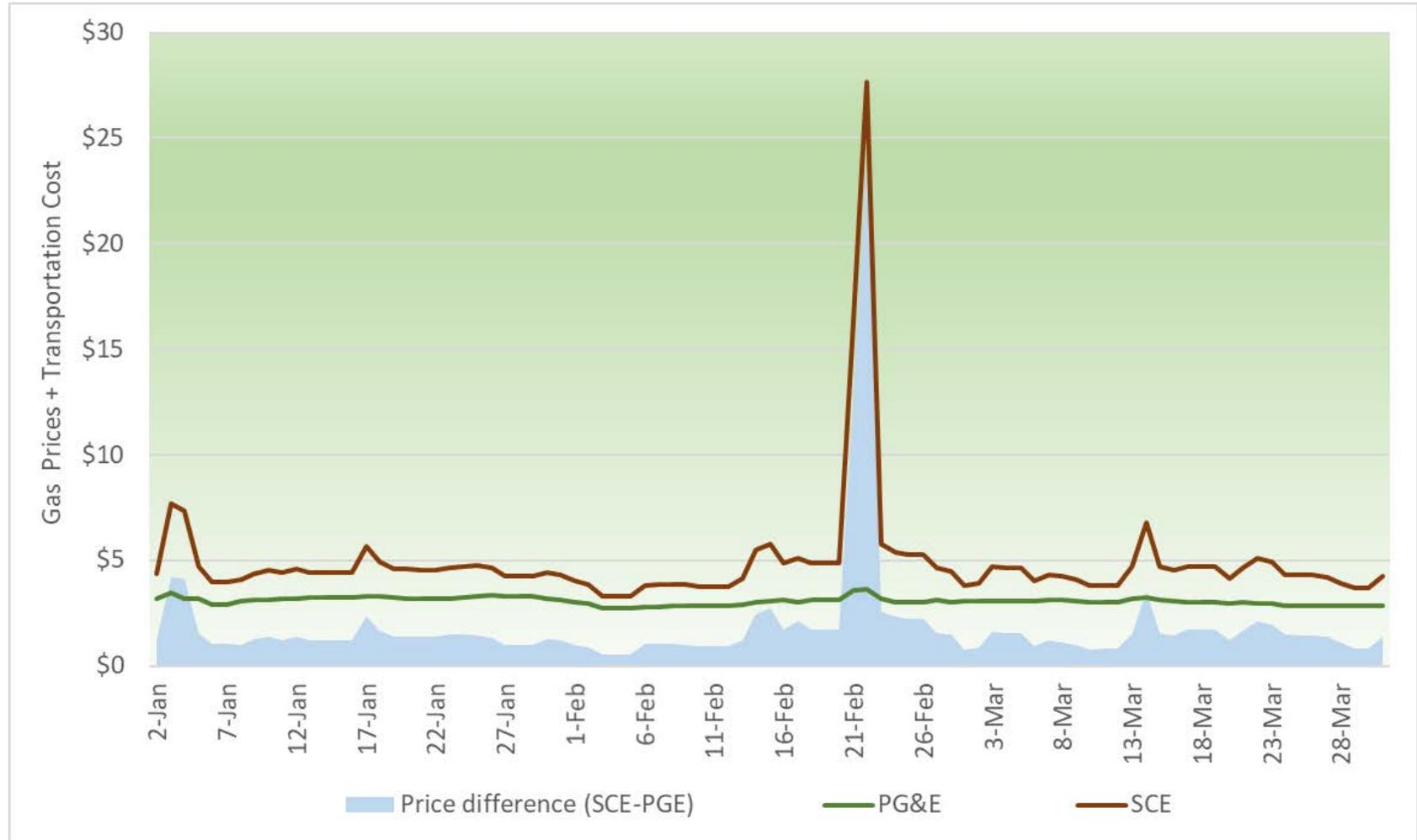
- Higher requirements for AS compounded with split requirements between NP26 and SP26
- Pmin re-rates on hydro and gas-fired units
- Forced outages in real-time
- Optimality of solution
- A few instances were impacted by a software defect and, therefore, were price corrected.

Aliso Canyon

Gas supply conditions concerns arose in late February

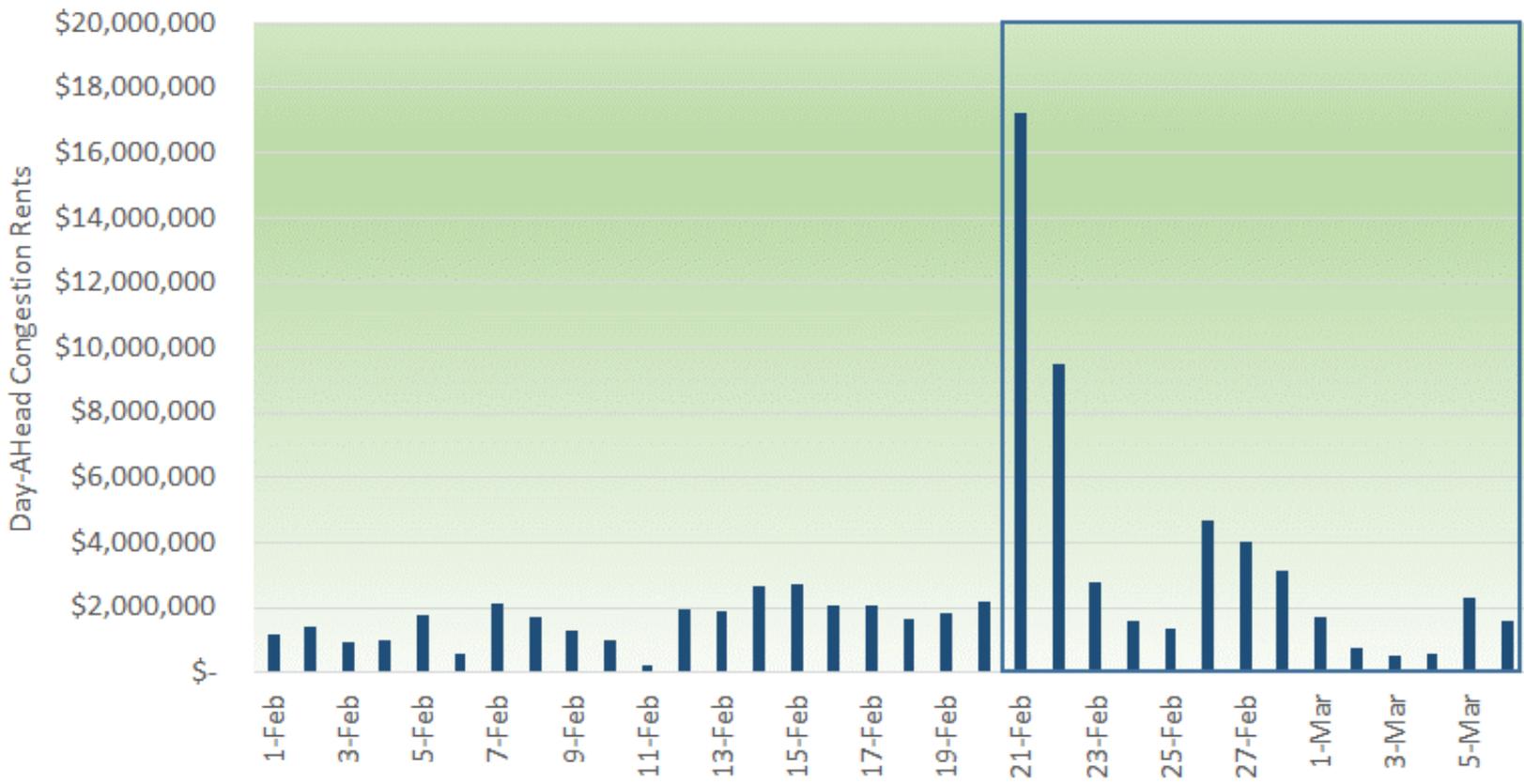
- On the afternoon of February 19, the ISO was informed about gas supply concerns in Southern California
- Cold weather, gas pipeline limitations and storage availability were factors leading to gas conditions
- ISO implemented mitigation measures in the electric system, including
 - Activation of gas nomograms
 - Activation of gas scalars
- These measures were intended to reduce the gas utilization by electric generators in gas constrained area
- Mitigation measures were lifted by March 7, 2018

Gas price volatility during gas conditions in Southern California area

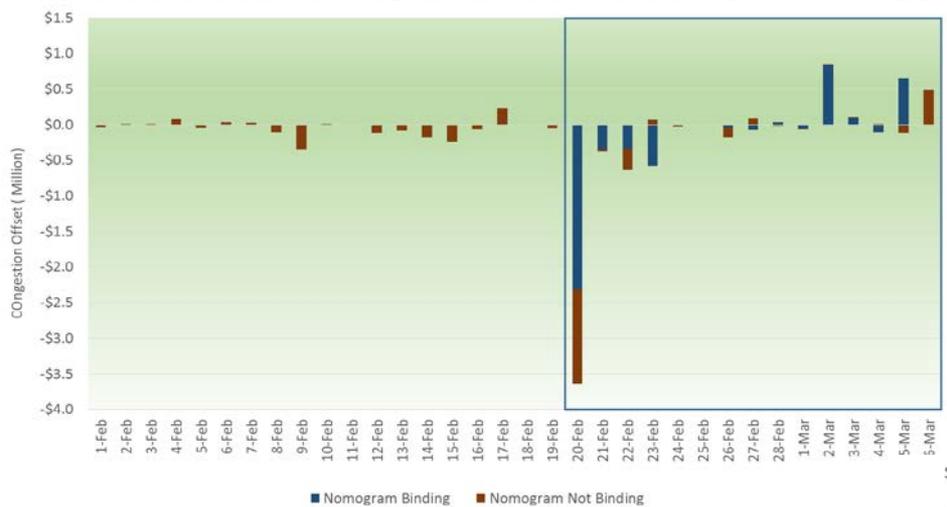


Gas conditions and associated mitigation measures coupled with other on-going transmission constraints manifested in different CAISO market results

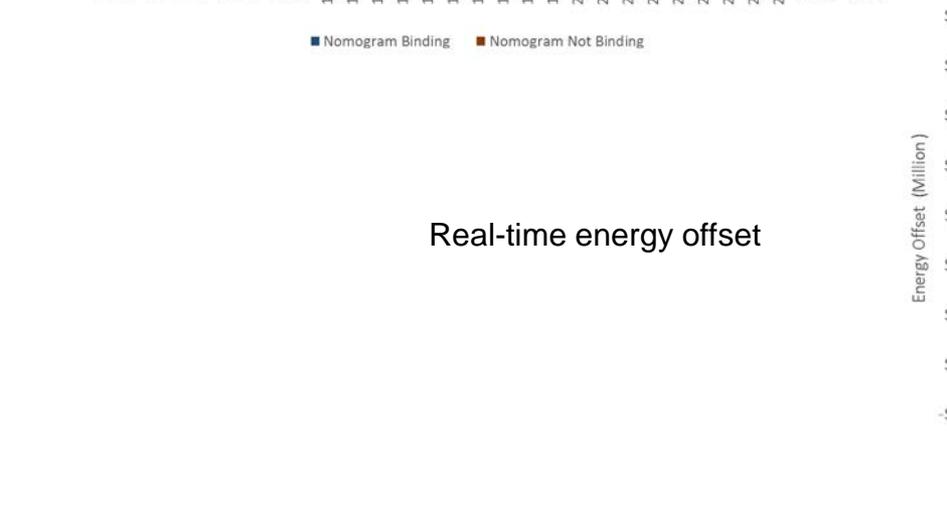
Day-ahead congestion rents



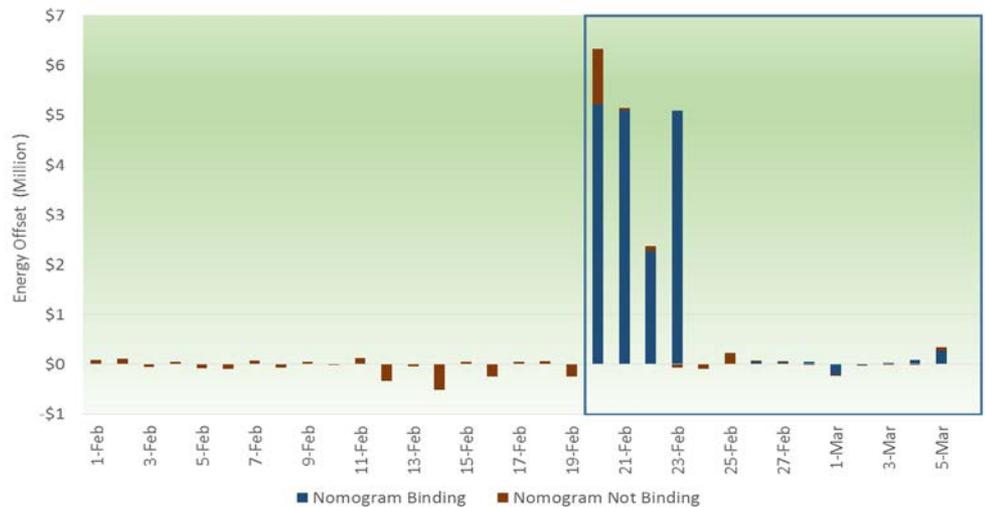
Gas conditions and associated mitigation measures coupled with other on-going transmission constraints manifested in different CAISO market results



Real-time congestion offset

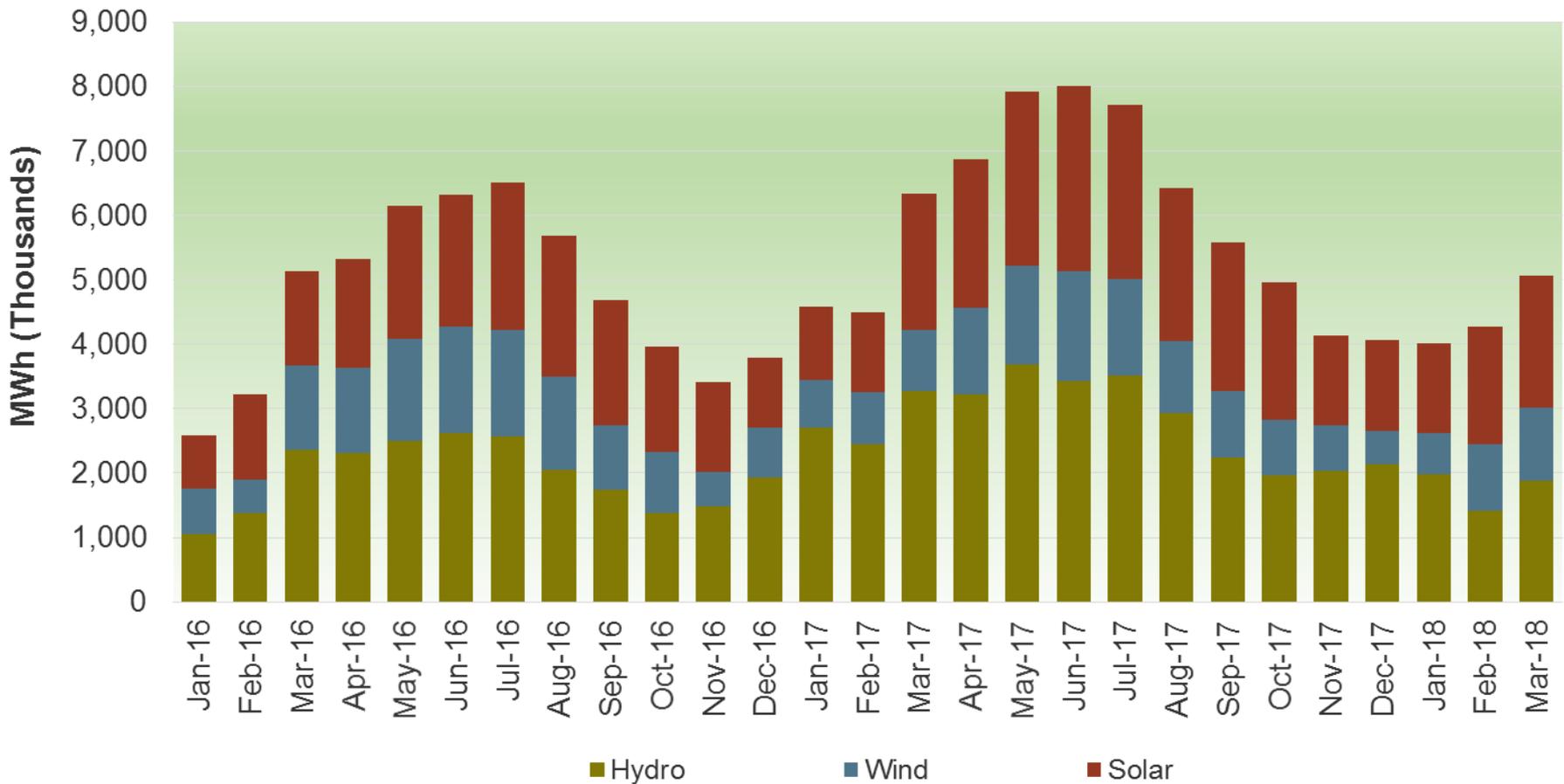


Real-time energy offset

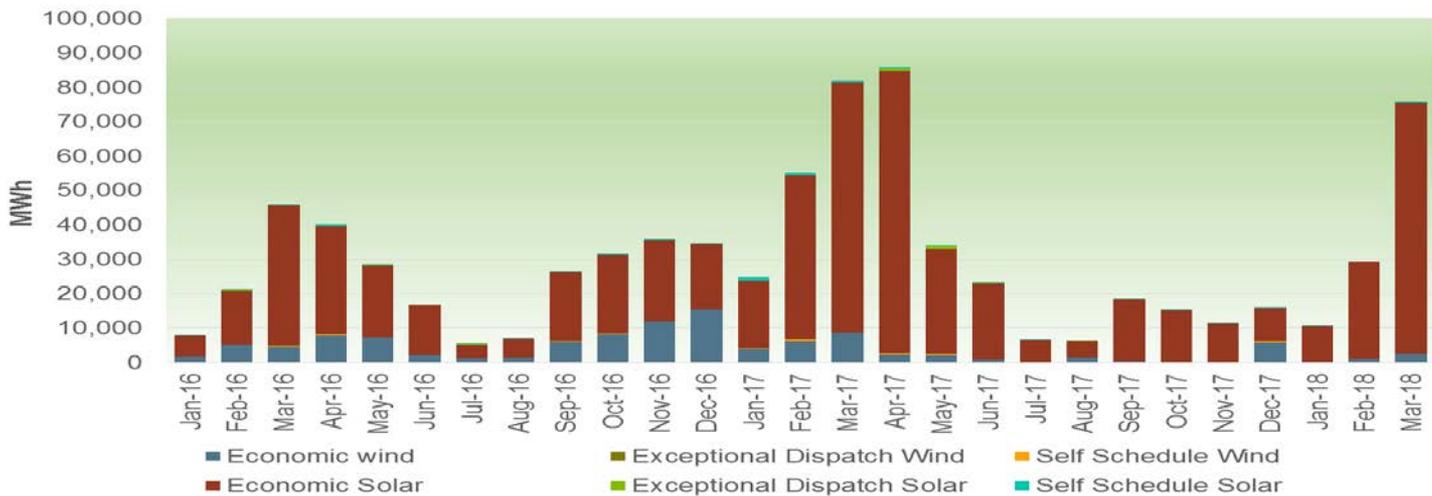
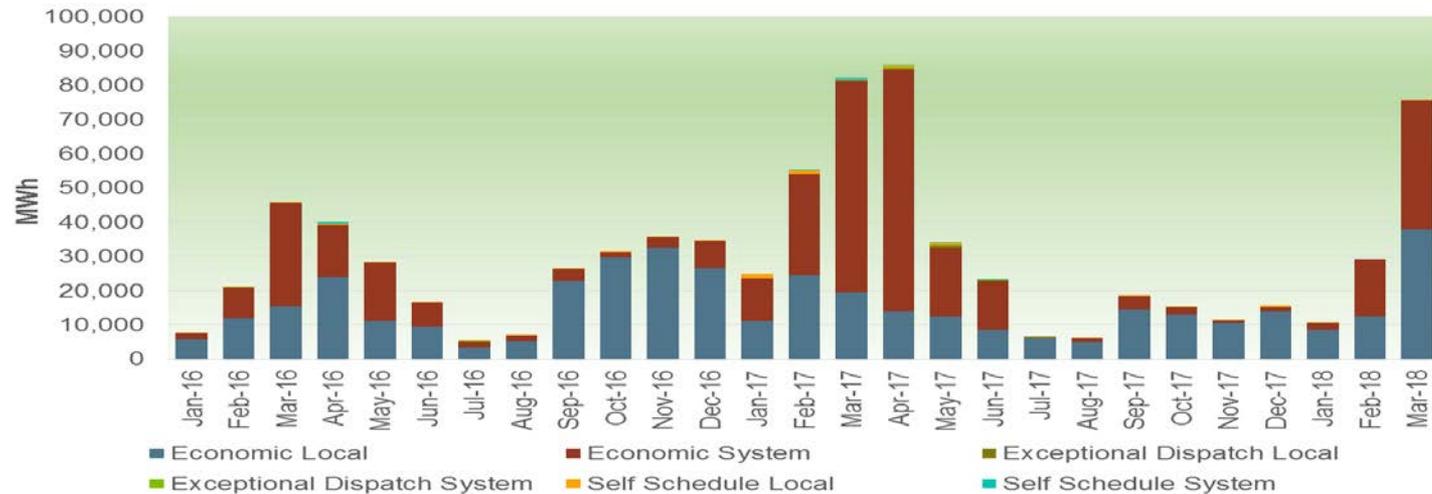


Oversupply conditions

Hydro production started to rise in March but still lower than previous year



RTD renewable (VERs) curtailment increased in March following seasonal trends



FLEXIBLE RAMP PRODUCT UPDATE

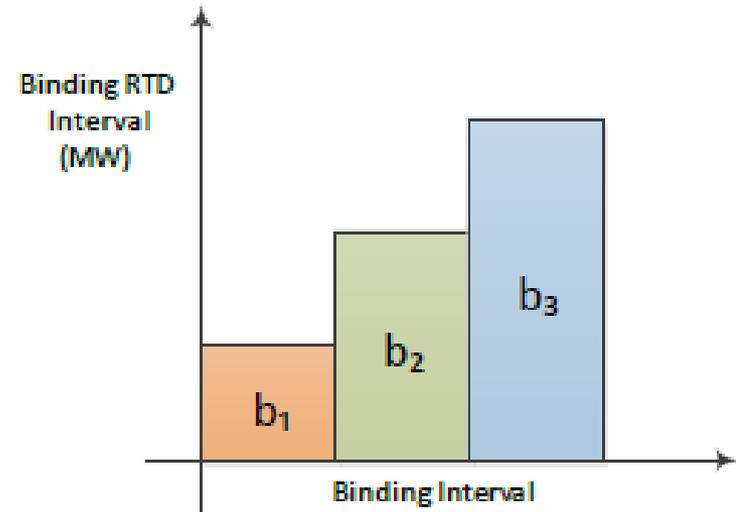
FRP Uncertainty calculation

- The uncertainty requirements are hourly values calculated every day using the BARR tool
- Uncertainty requirements are based on net load forecast differences
 - Net Load = Load – Wind – Solar
 - RTD Uncertainty: Forecast difference between advisory and binding intervals.

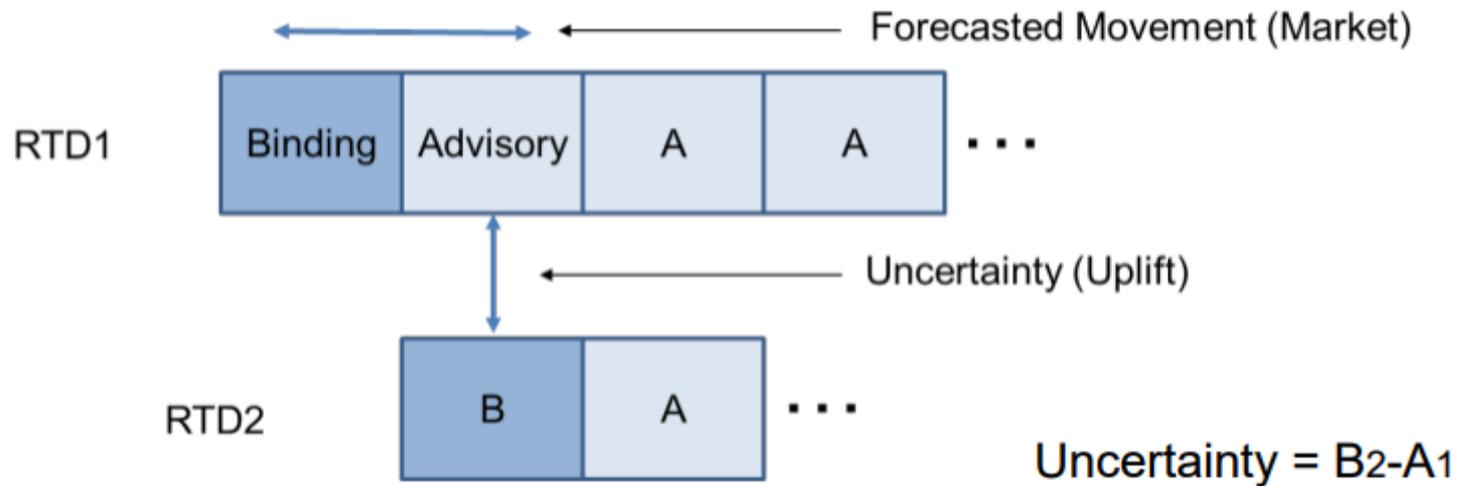
FRP Uncertainty requirement calculation for FMM

| | | | | |
|------------------|---|----------------|----------------|----------------|
| RTUC | B | A | | |
| RTD ₁ | | b ₁ | | |
| RTD ₂ | | | b ₂ | |
| RTD ₃ | | | | b ₃ |

$b_3 - A$



FRP Uncertainty requirement calculation for RTD



RTD Net Load Forecast Error is difference between the binding interval net load forecast and the prior market run first advisory net load forecast

Summary of Recent Updates for the Flexible Ramping Requirement.

- Item 1:
 - Uncertainty Requirement Calculation
 - Presented at February 20th, 2018 MPPF
 - <http://www.caiso.com/Documents/AgendaandPresentation-MarketPerformanceandPlanningForum-Feb202018.pdf>
 - Fix Deployed 2/20/2018 for operating date 2/21/2018

Summary of Recent Updates for the Flexible Ramping Requirement Continued

- Item 2:
 - Renewable Resources Time Interval
 - Summary of Change:
 - Prior to 3/23/2018 the BARR tool was using starting interval instead of ending interval in the calculation.
 - Fix Deployed 3/22/2018 for operating date 3/23/2018

Summary of Recent Updates for the Flexible Ramping Requirement Continued

- Item 3:
 - Treatment of RTPD time frames in the uncertainty calculation (averaging vs. no averaging)
 - Summary of Change:
 - BARR was previously using one interval within the RTPD time frame instead of performing an average of the 3-5 minute intervals for the renewable resources inputs into the net load calculation. Following the change the 3-5 minute intervals were averaged for the renewable resources.
 - Fix Deployed 3/30/2018 for operating date 3/31/2018

Summary of Recent Updates for the Flexible Ramping Requirement Continued

- Item 4: FRP Requirement Threshold Documentation
 - PRRs Created for Business Practice Manual Changes:
 - Energy Imbalance Market
 - Resource Sufficiency Evaluation
 - » Section 11.3.2
 - Market Operations
 - Flexible Ramping Product
 - » Section 7.1.3

You can follow these BPM changes at the following links:

<https://bpmcm.caiso.com/Pages/default.aspx>

<https://bpmcm.caiso.com/Pages/ViewPRR.aspx?PRRID=1051&IsDlg=0>

PRR 1051 – Flexible ramping clarification

- **Reason for revision**

- This is to clarify the flexible ramping requirements for the new EIM entities joining the Energy Imbalance Market.

- **Language Proposed**

- *CAISO shall set the histogram values described in Section 7.1.3 of the Market BPM to ensure the flexible ramp requirements stay within a reasonable level for a transitional period following implementation. This histogram value will be used until the ISO is able to collect sufficient production-quality data to accurately calculate the flexible requirements based on the historical information gathered from Production. These initial thresholds may be adjusted according to each balancing authority area's conditions including factors and data observed during market simulation and parallel operations. These thresholds will allow the Flexible Ramping Requirements to stay within a reasonable band during the transitional period until an accurate histogram can be calculated from Production data for the balancing authority area.*

- **Initial comments**

- No comments submitted

- **Initial comment period expired**

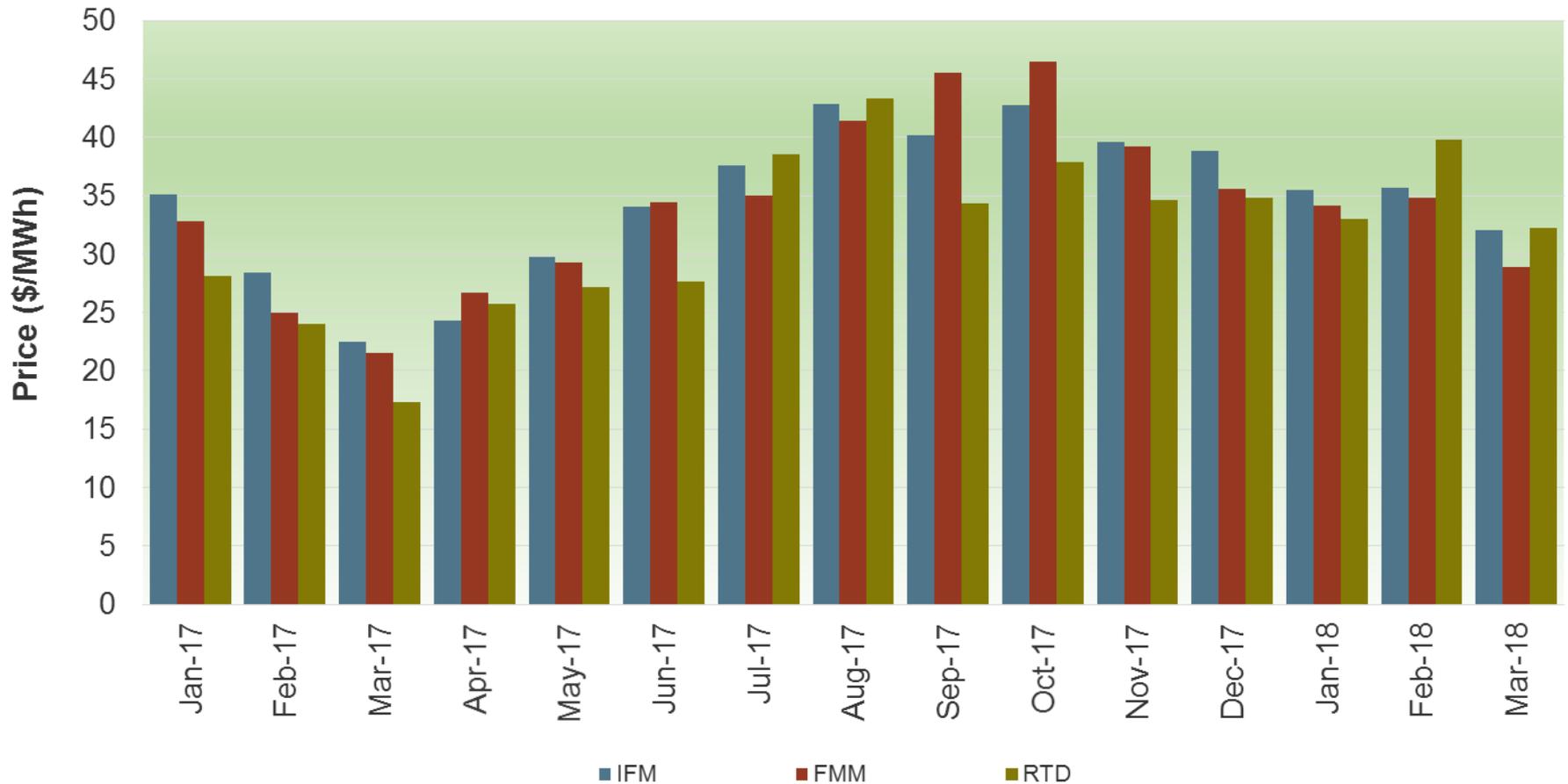
- April 18, 2018

- **Next step**

- Post ISO recommendation

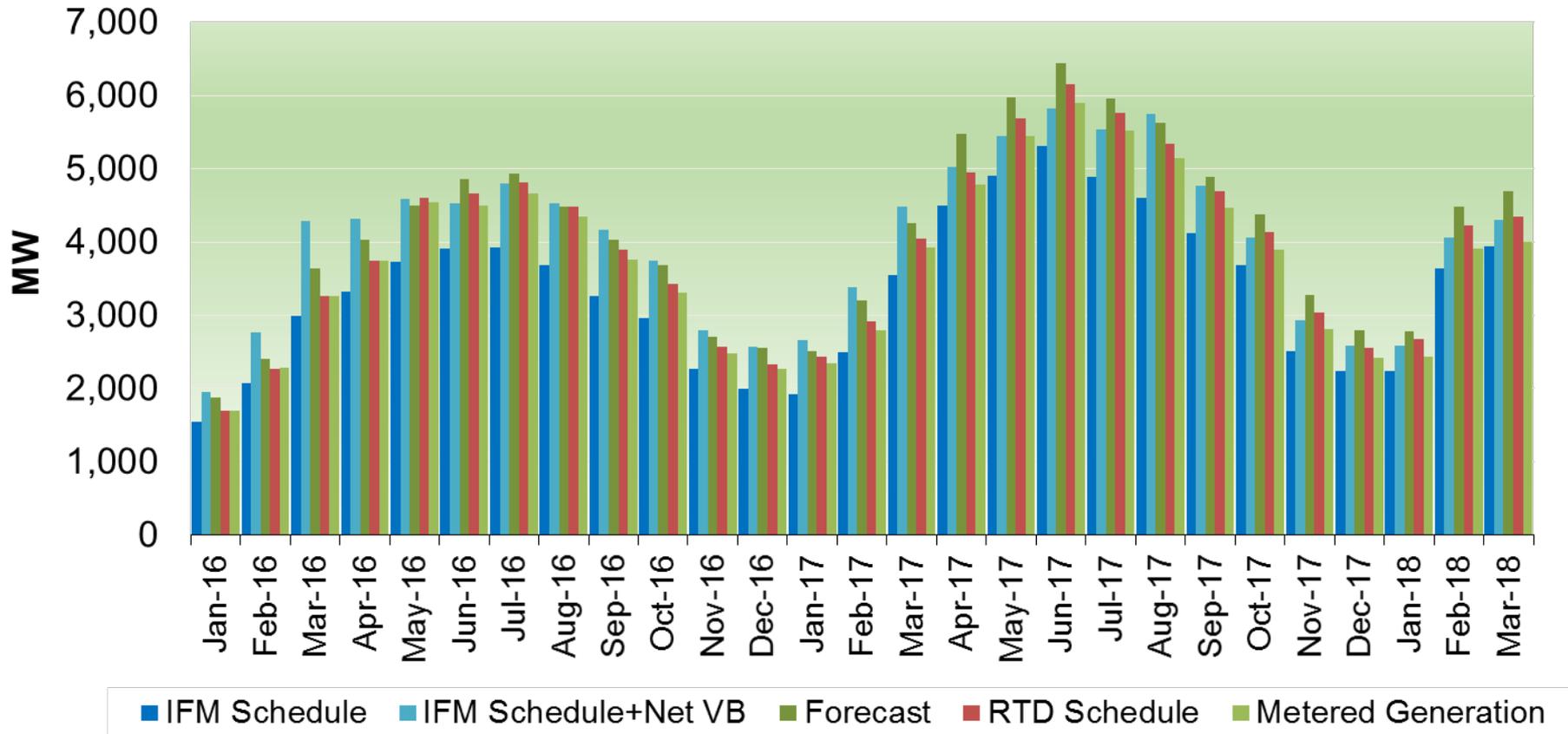
Market Update

Modest convergence was observed in March

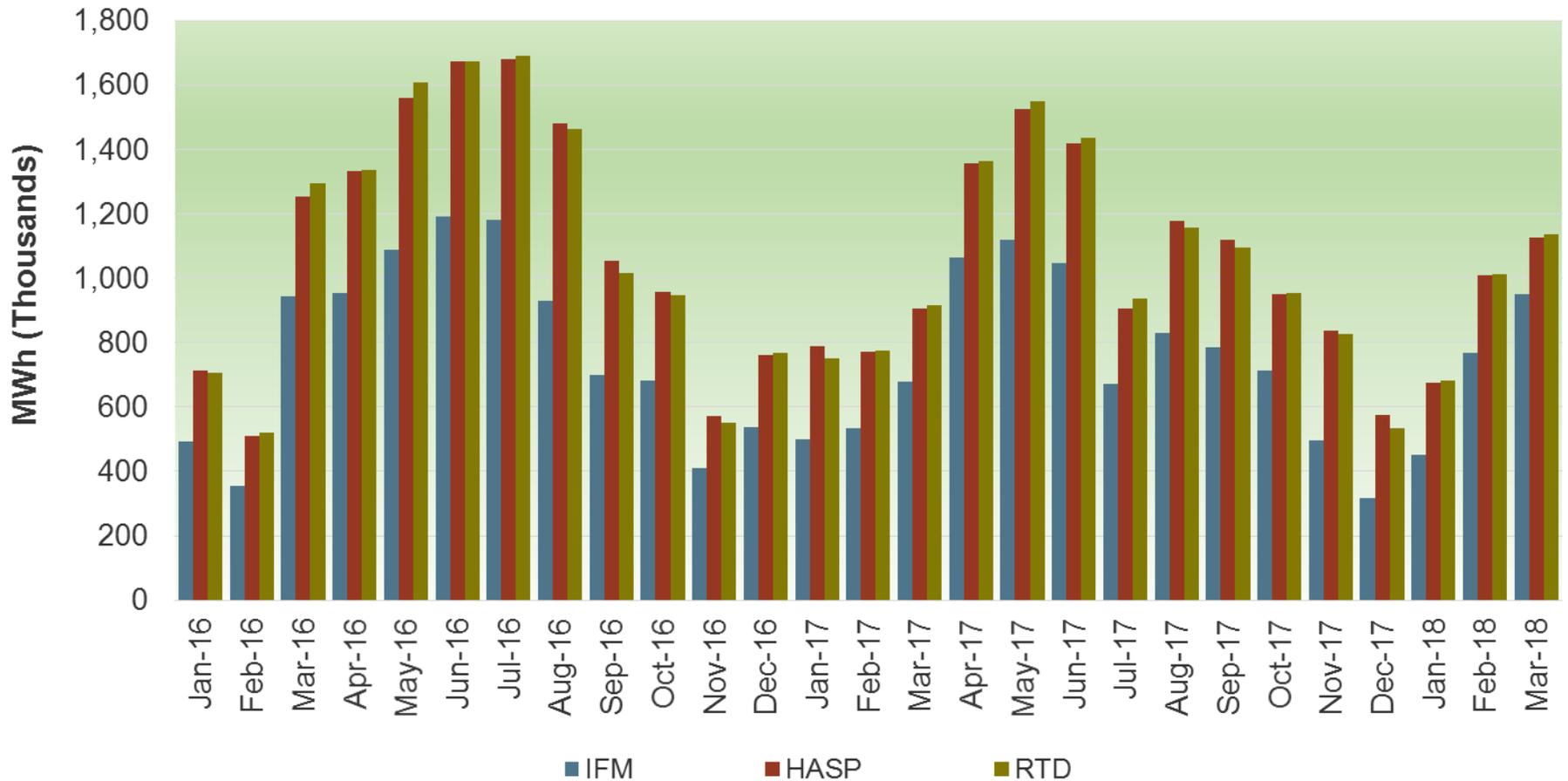


Note: Metric Based on System Marginal Energy Component (SMEC)

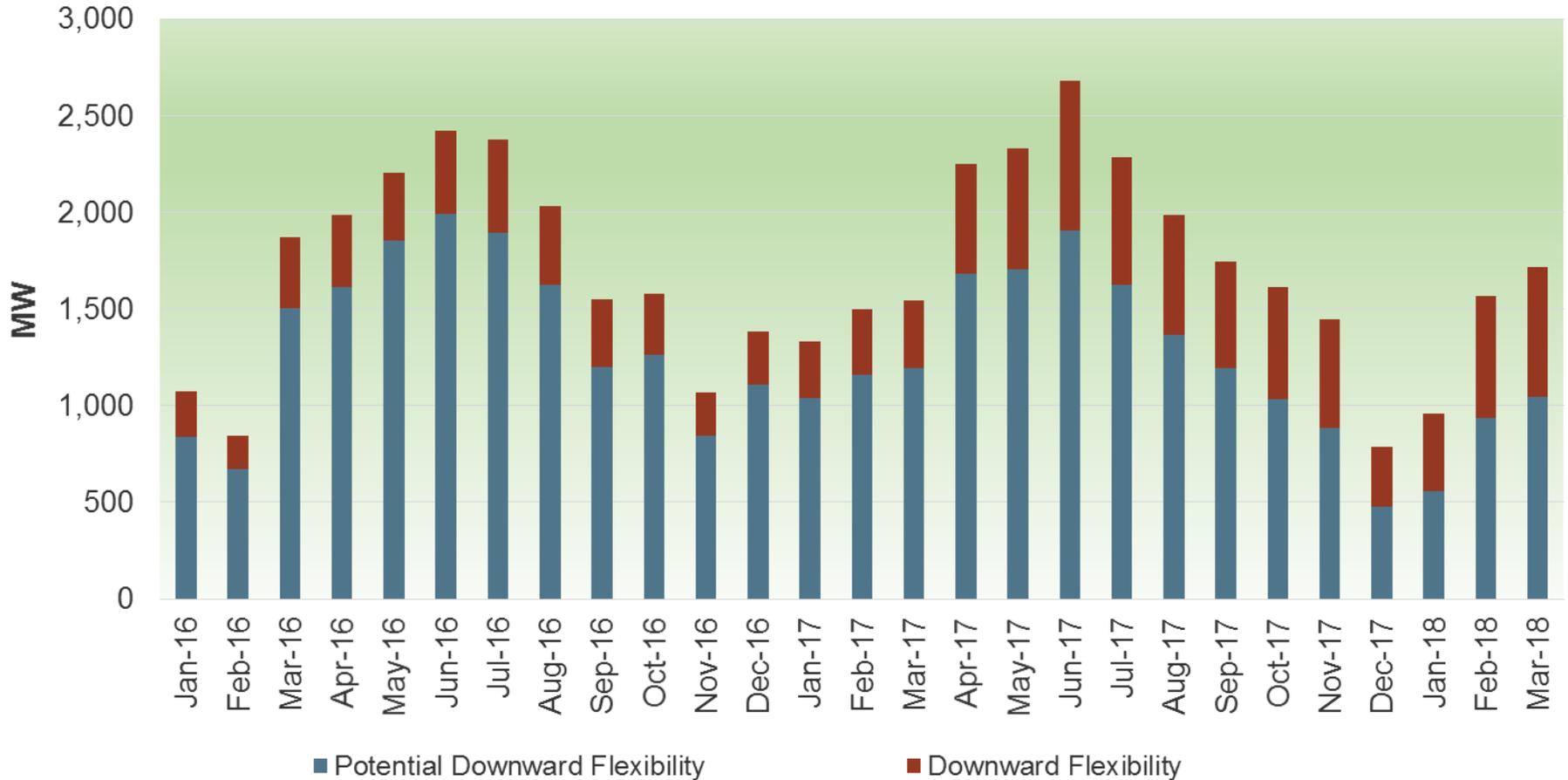
ISO total monthly VERS schedules and forecasts



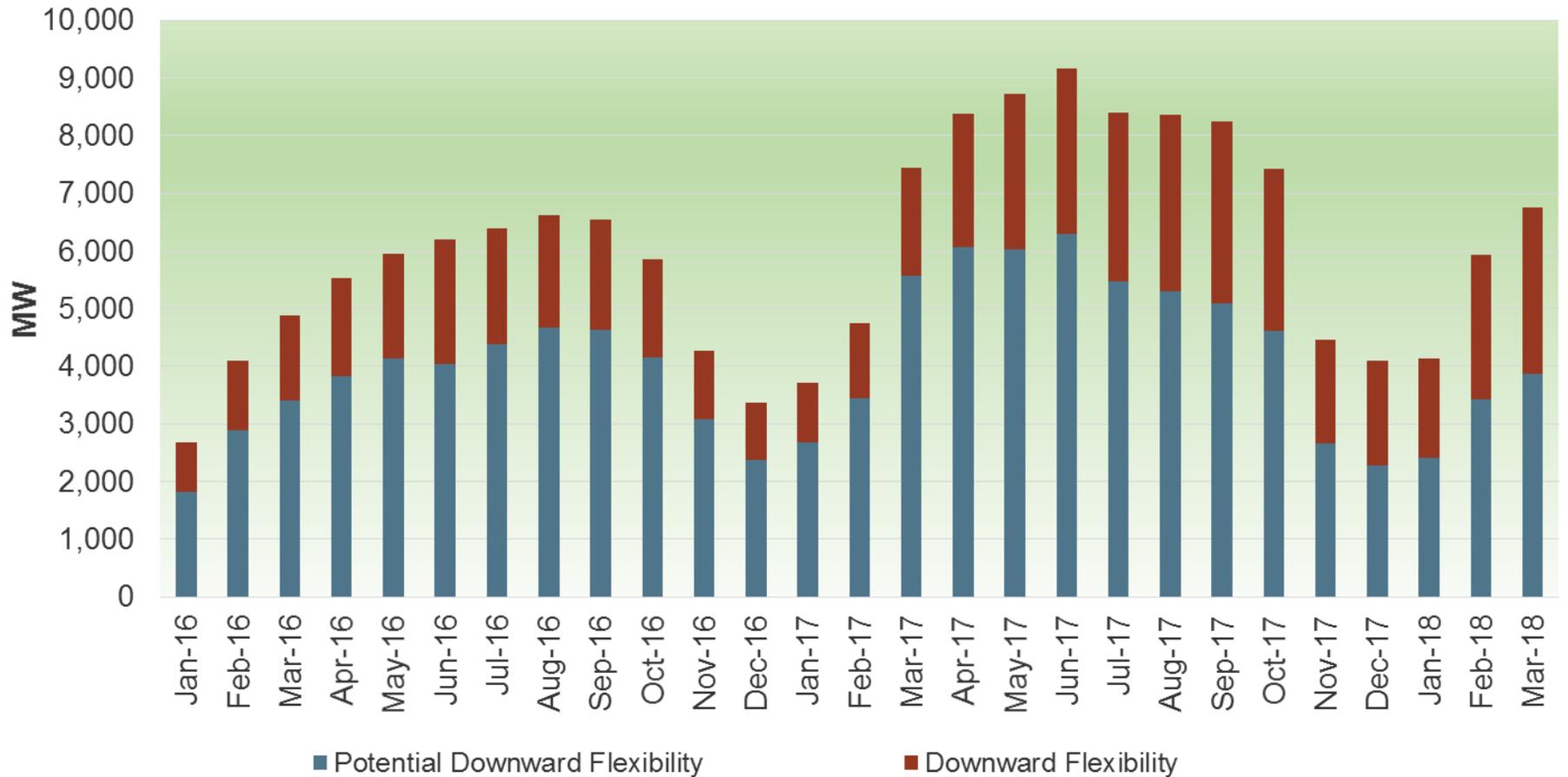
IFM under-scheduling of wind generation



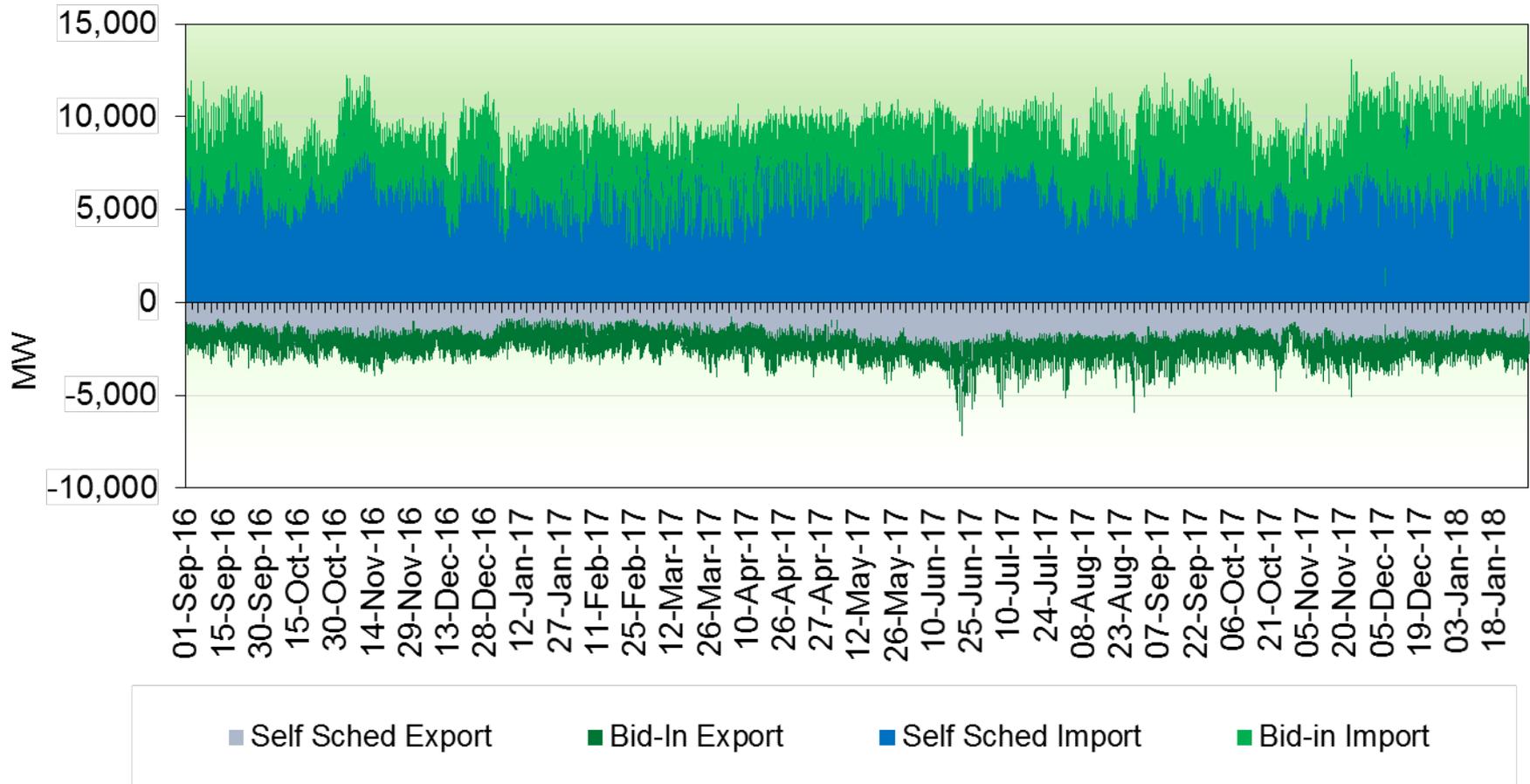
Monthly wind (VERS) downward flexibility in FMM



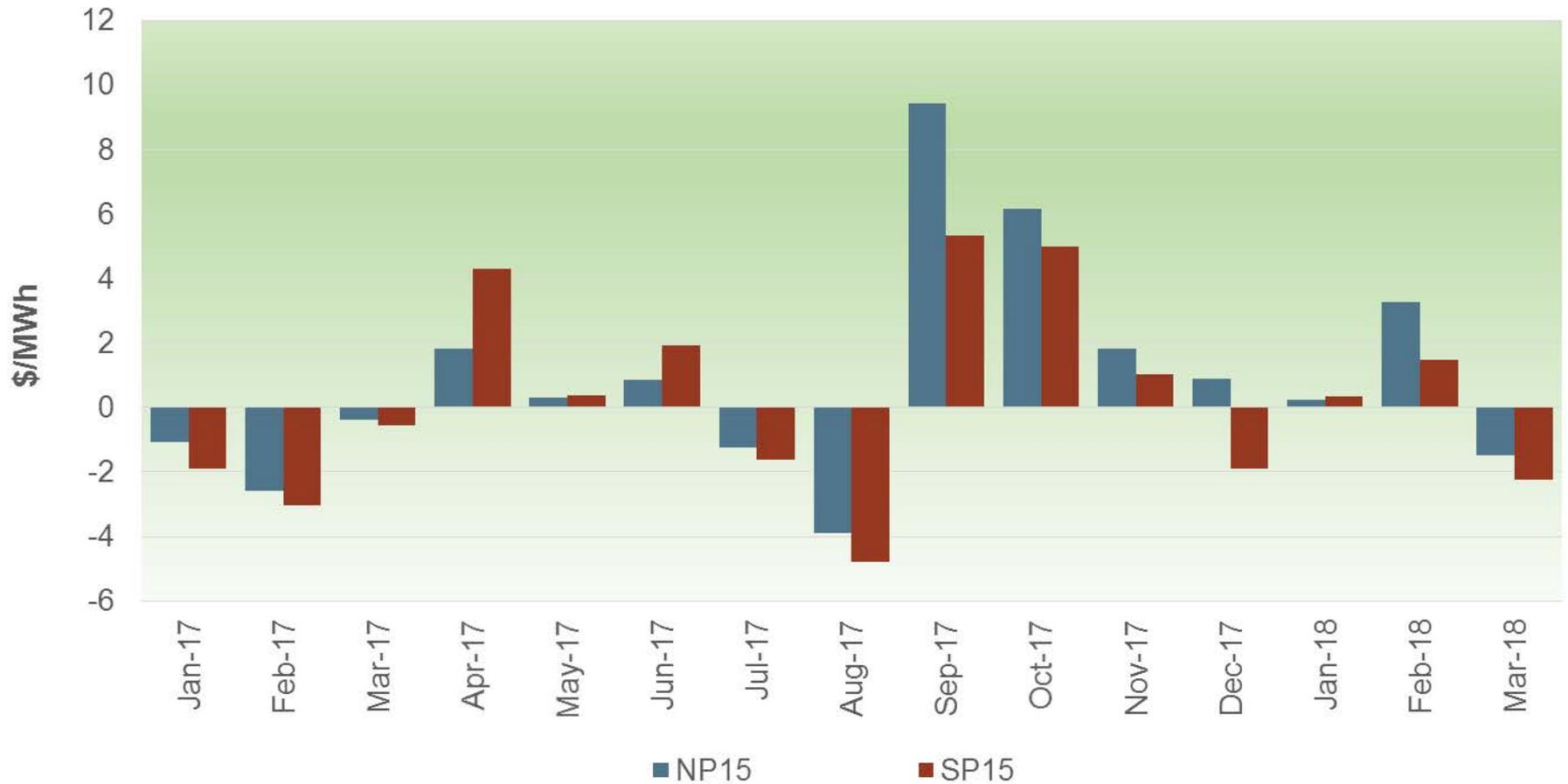
Monthly solar (VERs) downward flexibility in FMM from 11 AM to 5 PM



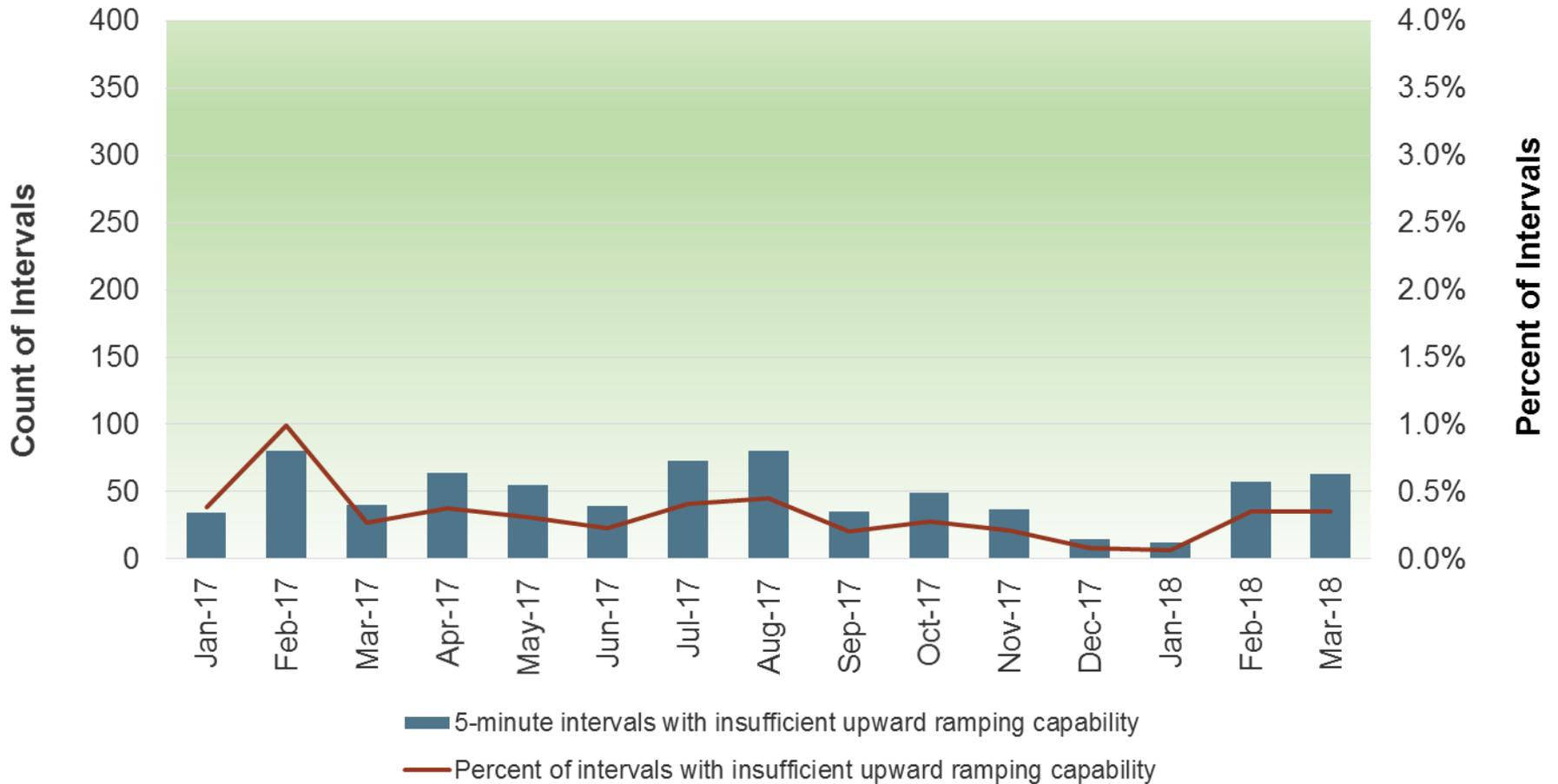
Self scheduled interties in the real-time market stayed high



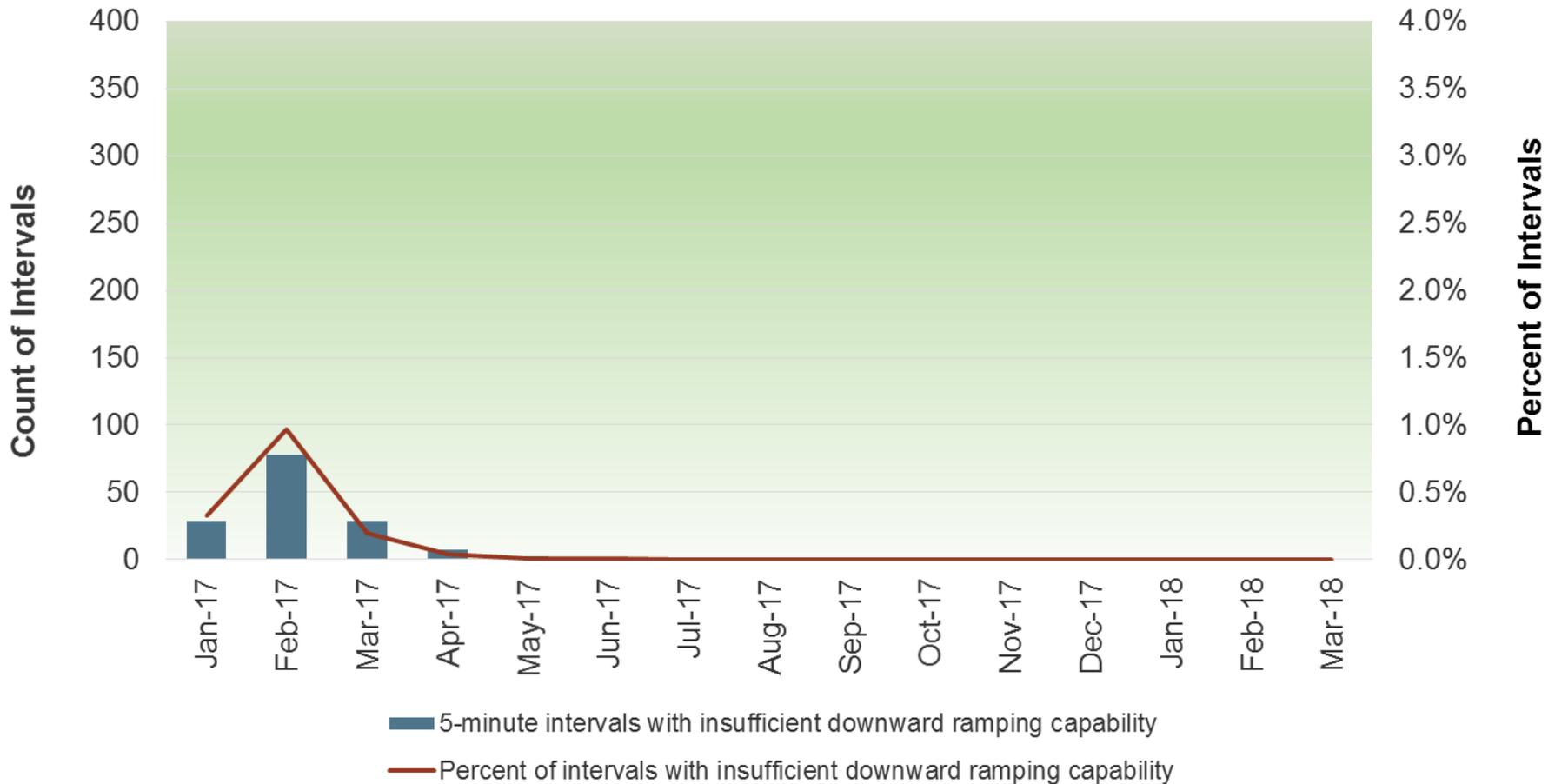
RT prices lower than DA prices for both NP15 and SP15 in March



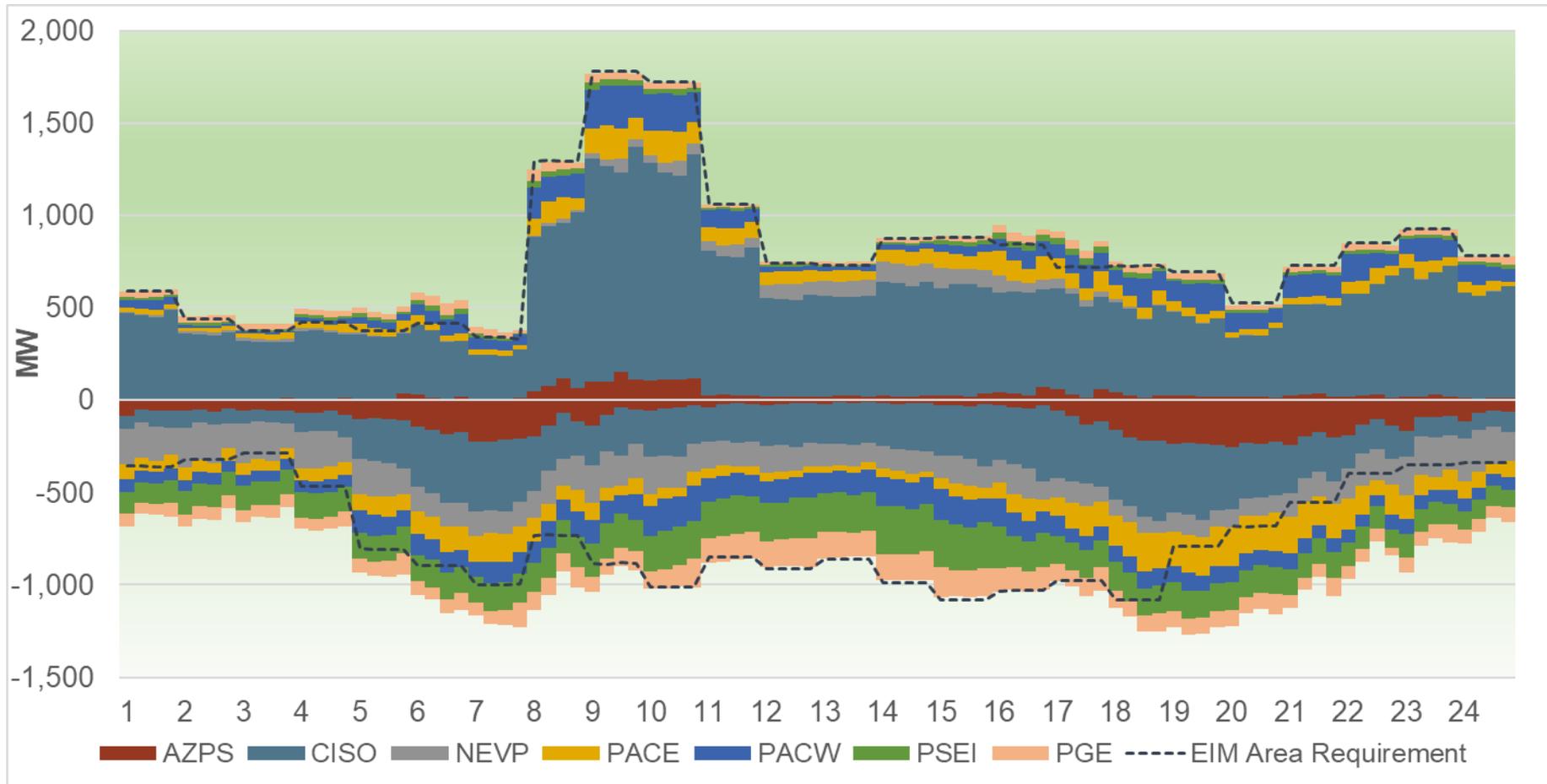
Insufficient upward ramping capacity in ISO stayed low in February and March



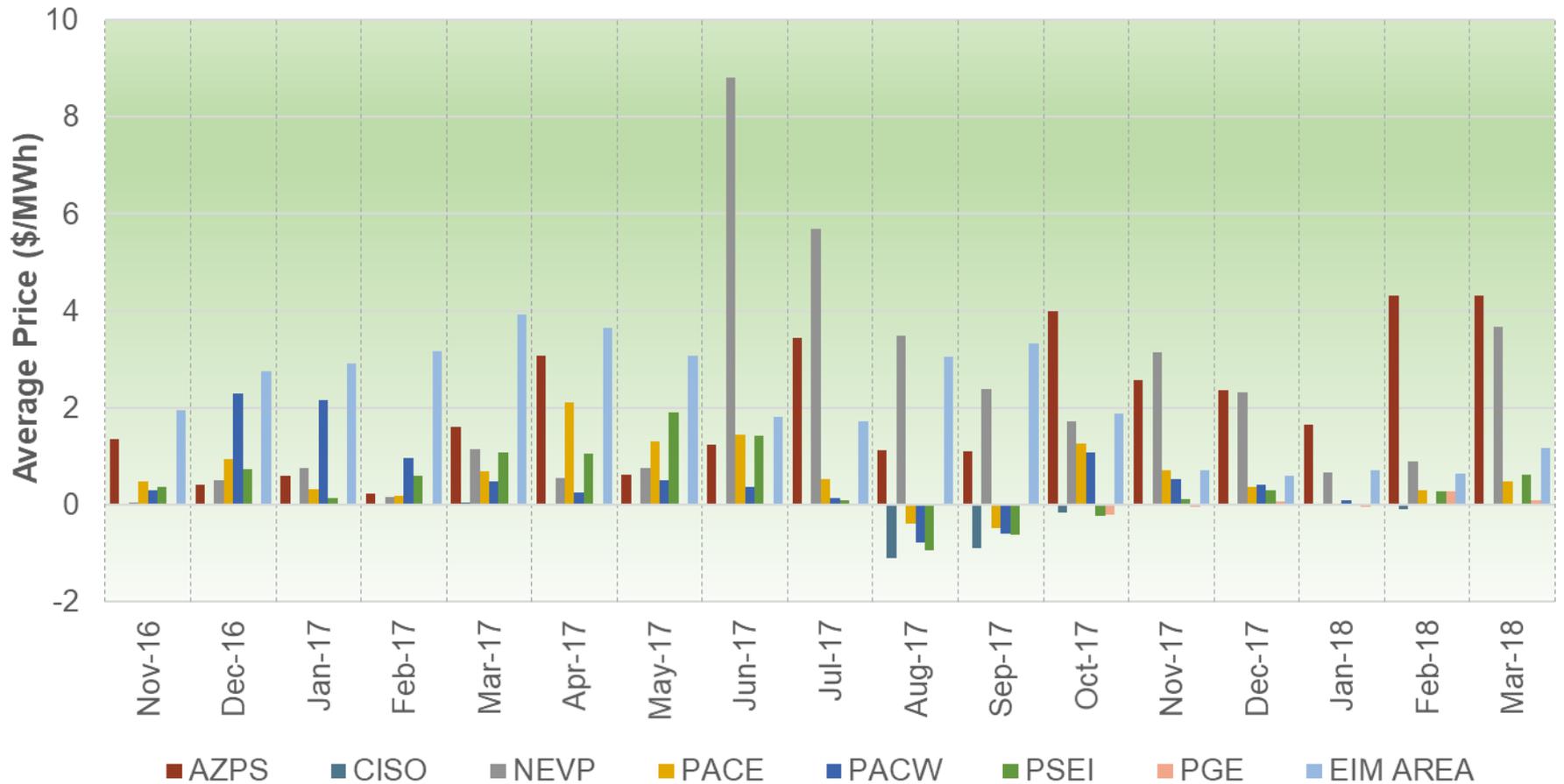
Insufficient downward ramping capacity declined since last February.



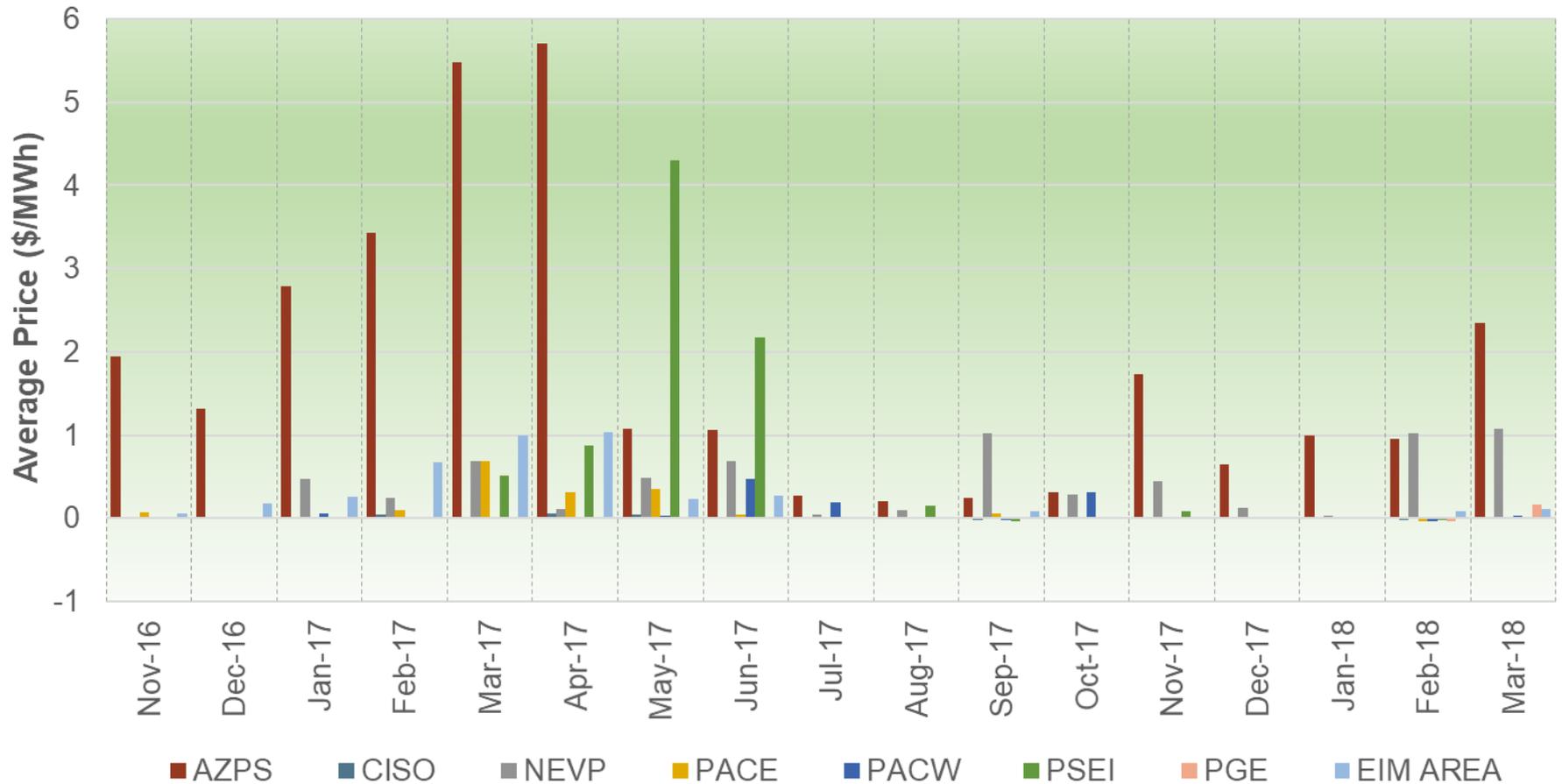
Average Flexible Ramp Product Cleared Awards for each area with EIM Area Requirement - From Jan - Mar 2018



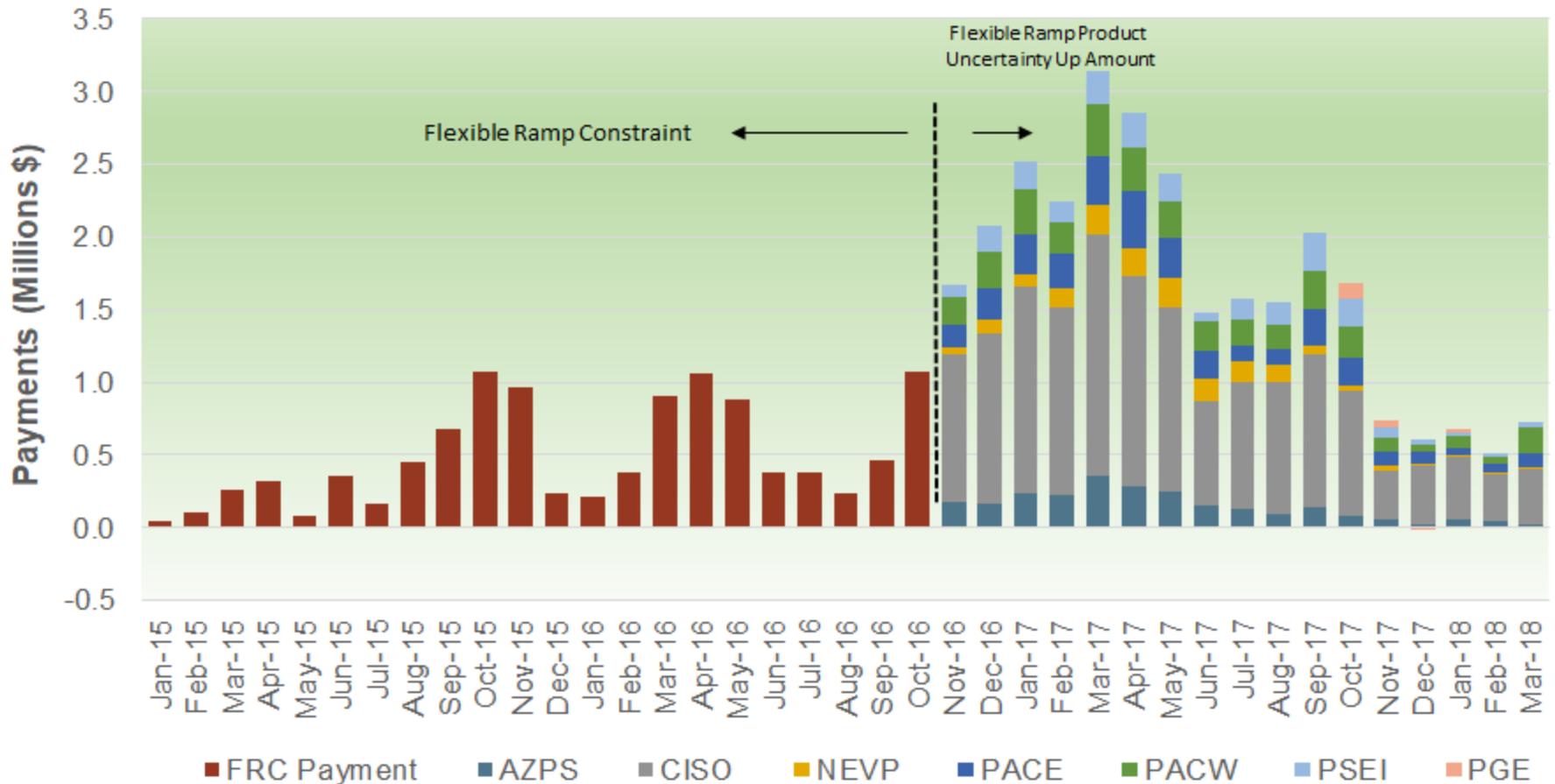
Average Flexible Ramp Up Price (\$/MWh)



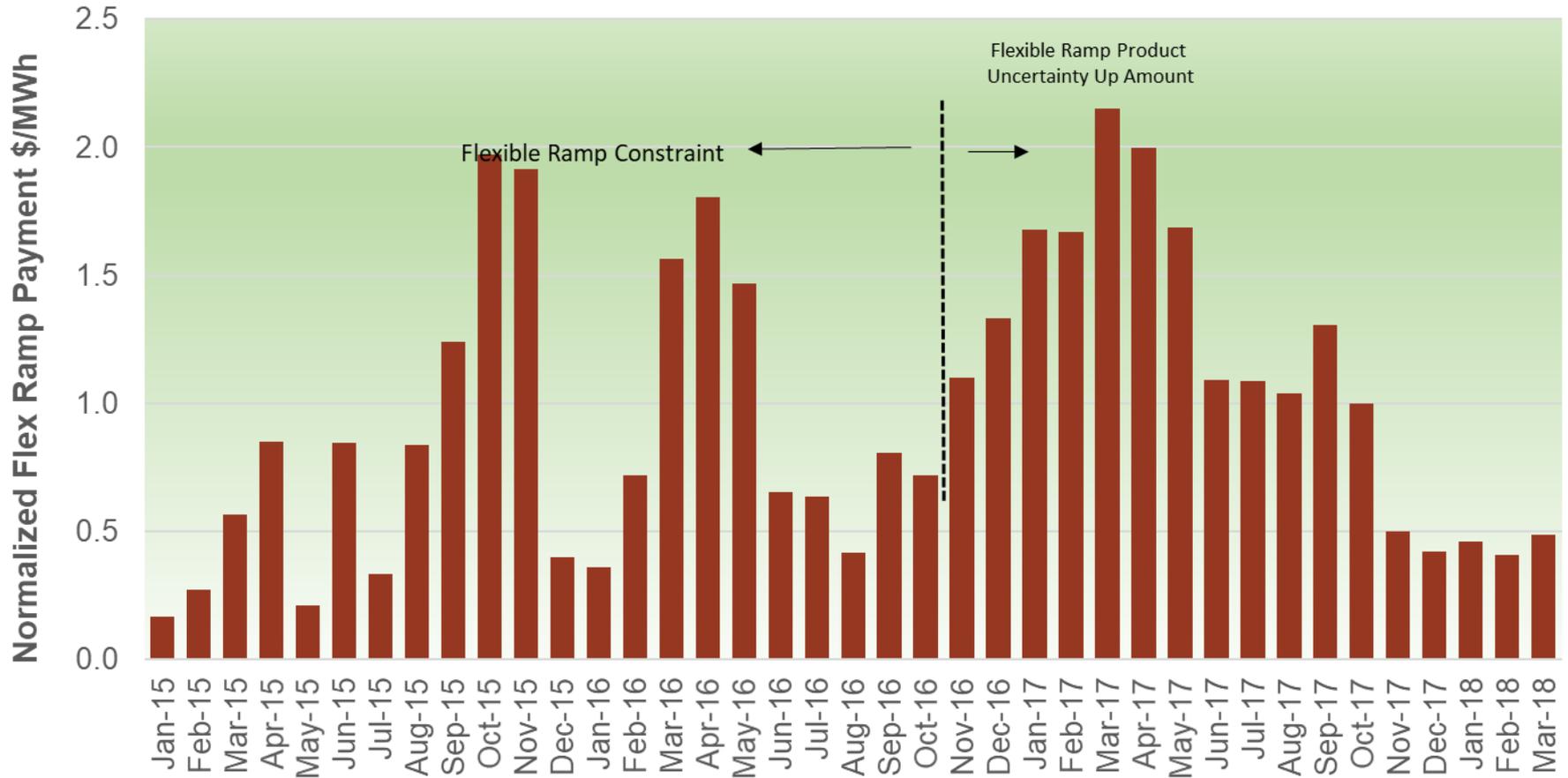
Average Flexible Ramp Down Price (\$/MWh)



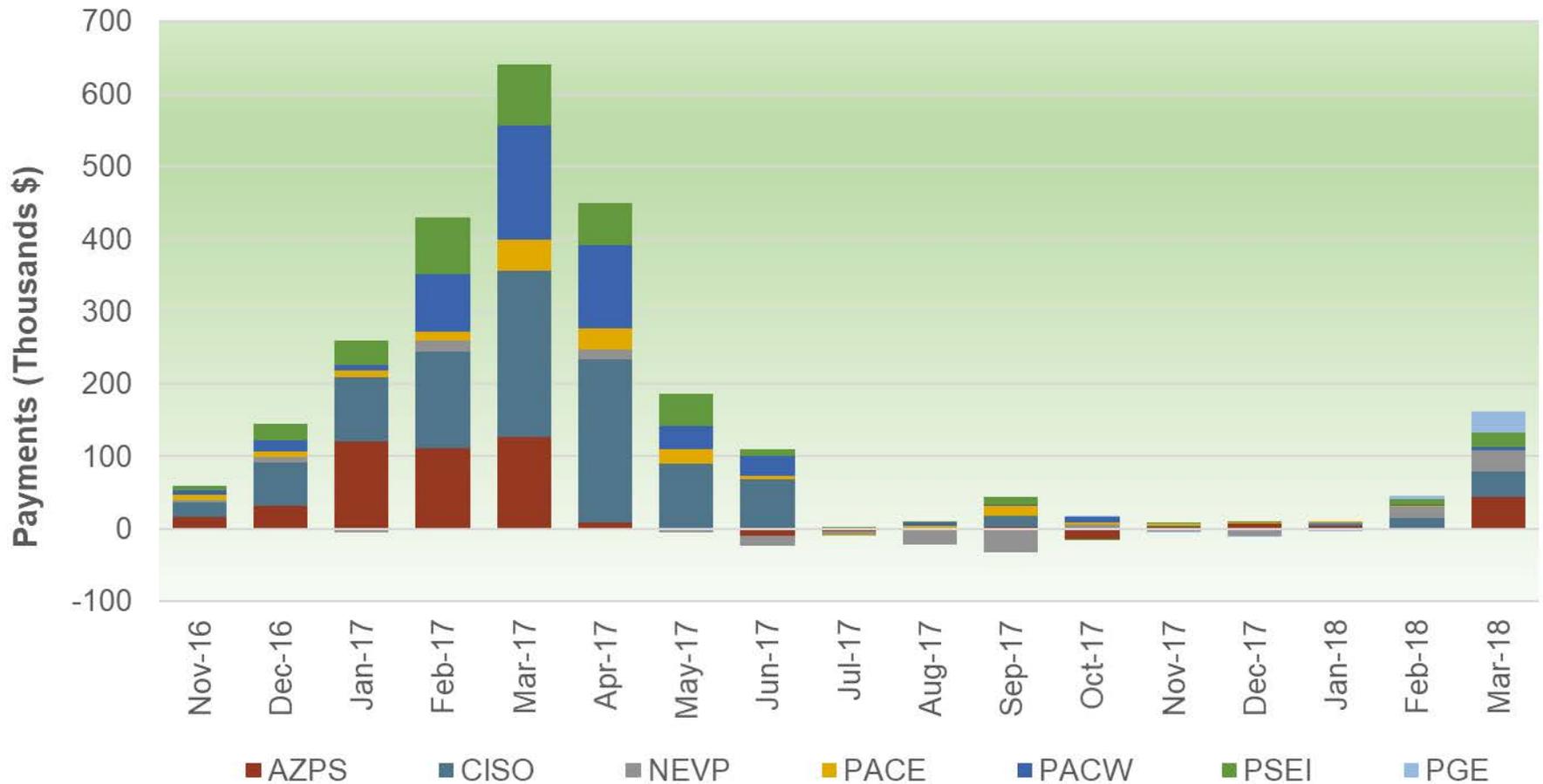
Uncertainty Up Settlement Amount



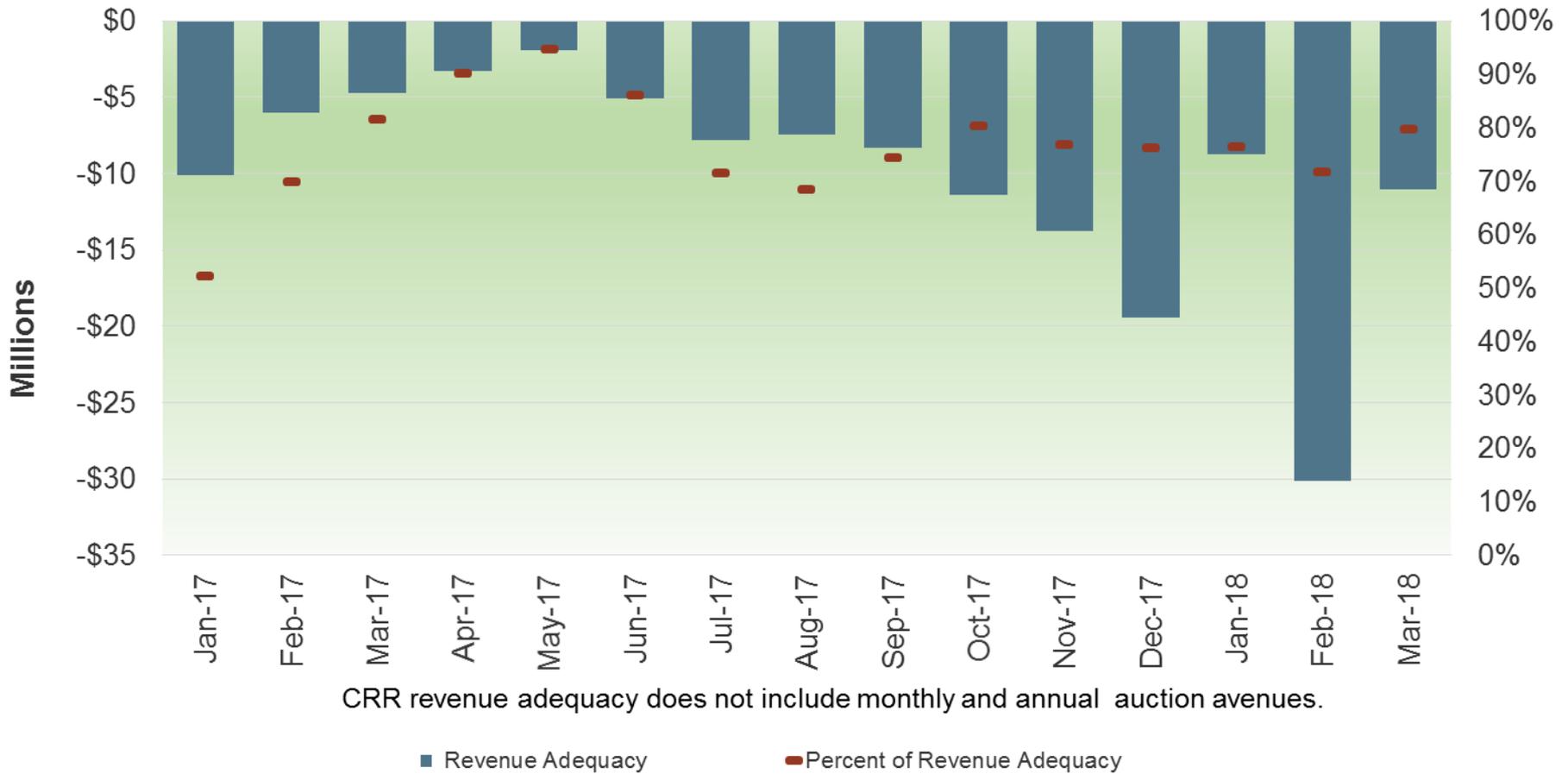
Normalized Flex Ramp Up Payment



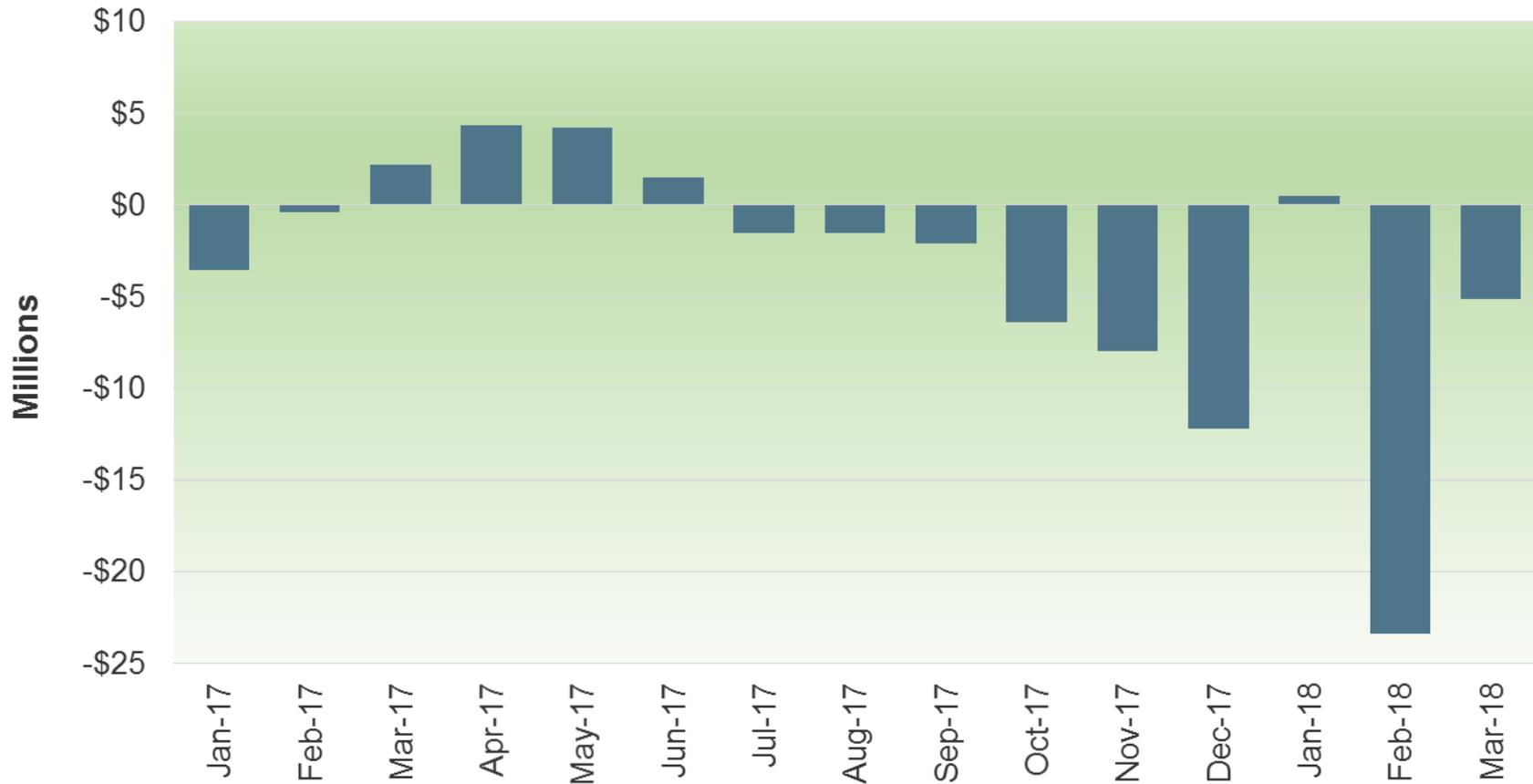
Uncertainty Movement Down Settlement



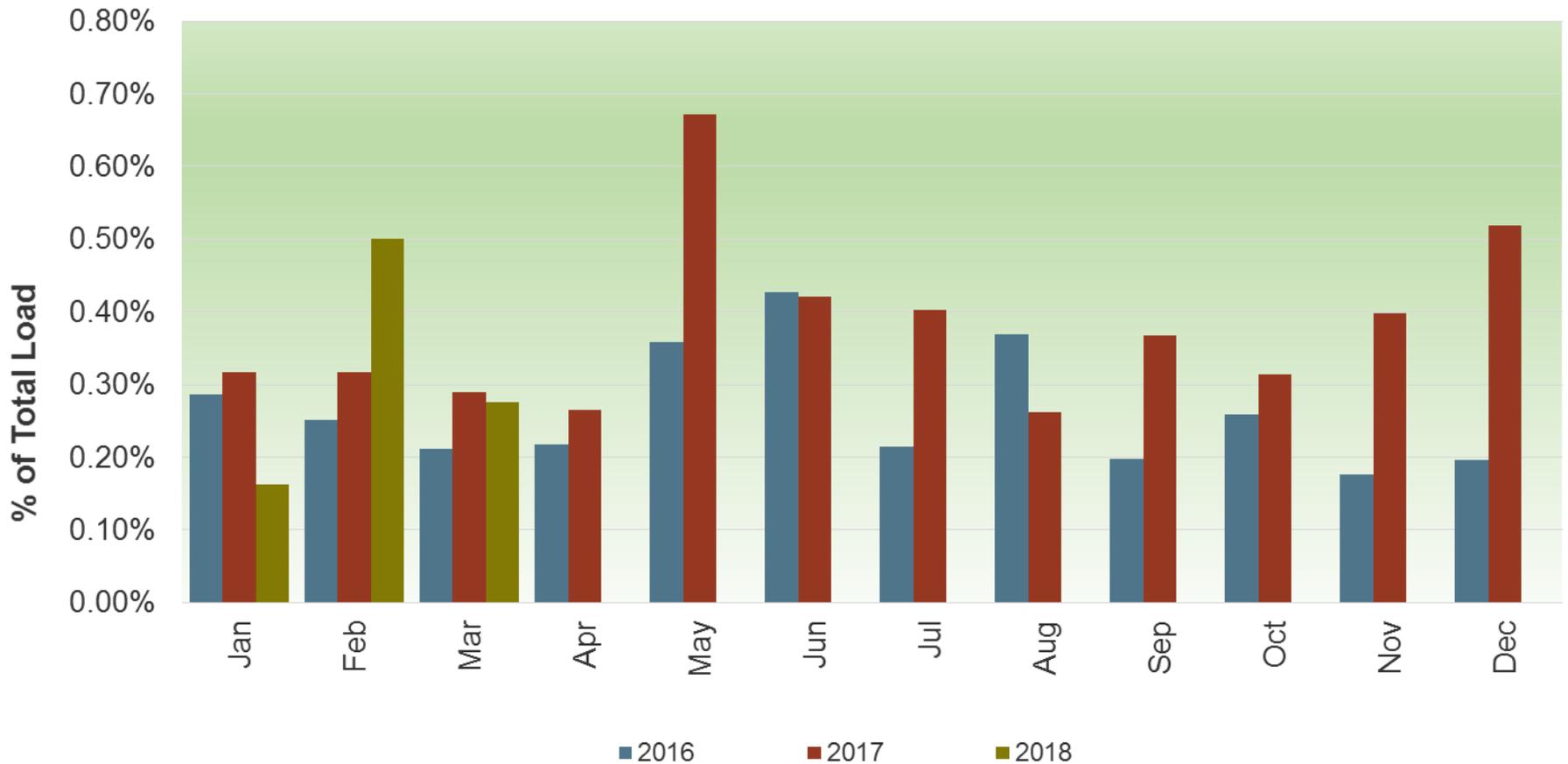
Congestion revenue rights market revenue inadequacy without auction revenues.



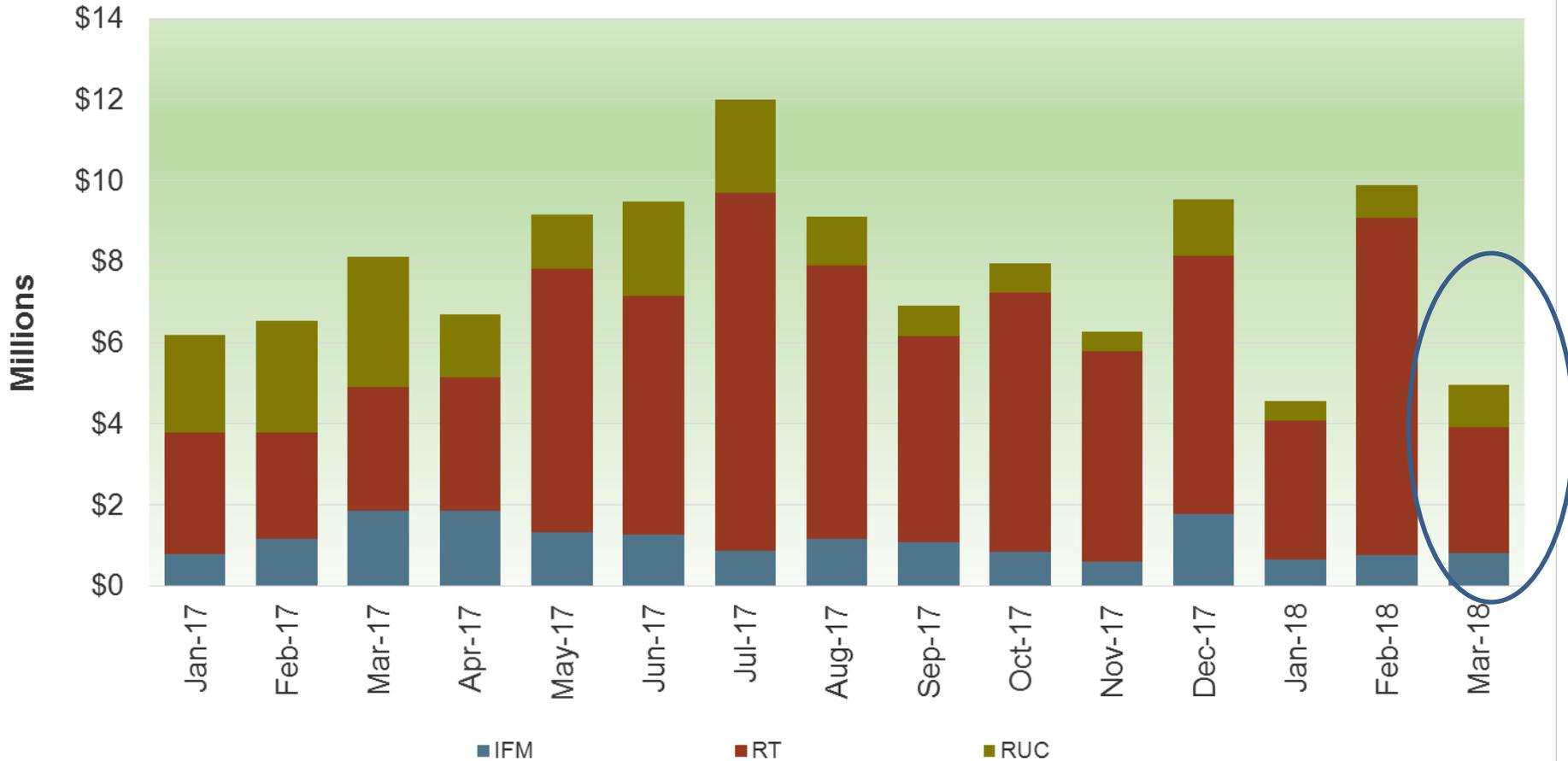
Congestion revenue rights market revenue sufficiency including auction revenues.



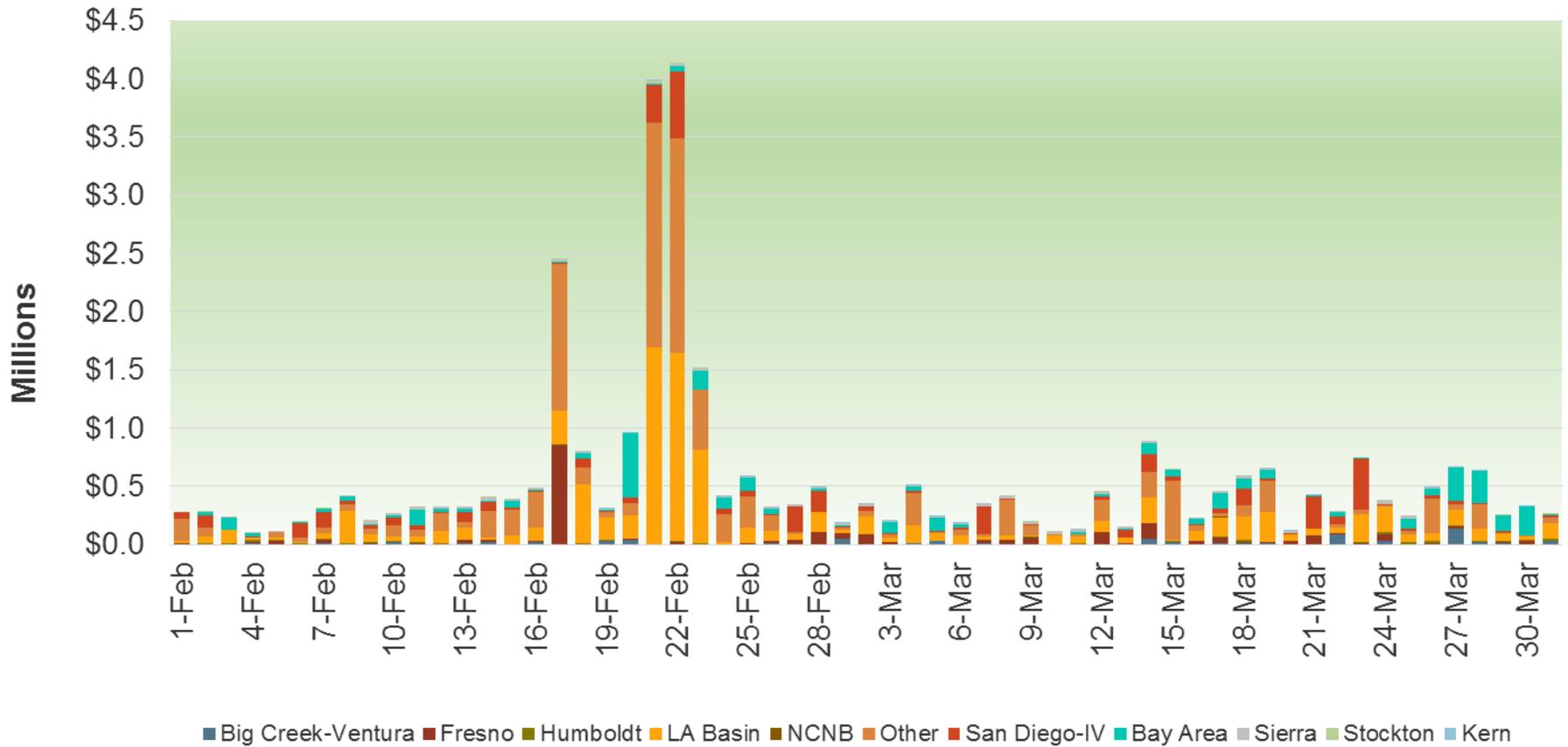
Exceptional dispatch volume in the ISO area remain at low levels in February and March



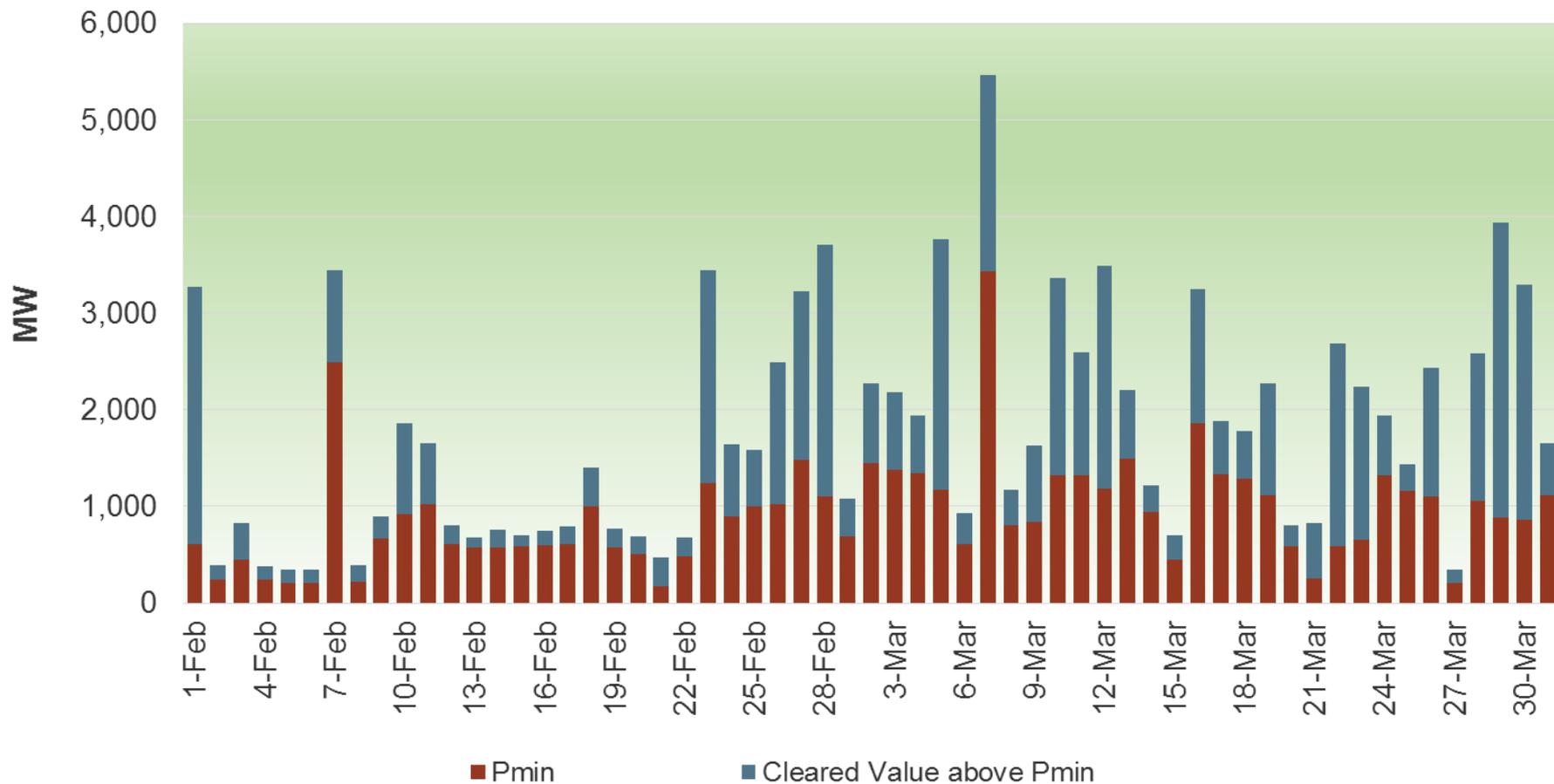
Real-time Bid cost recovery decreased in March



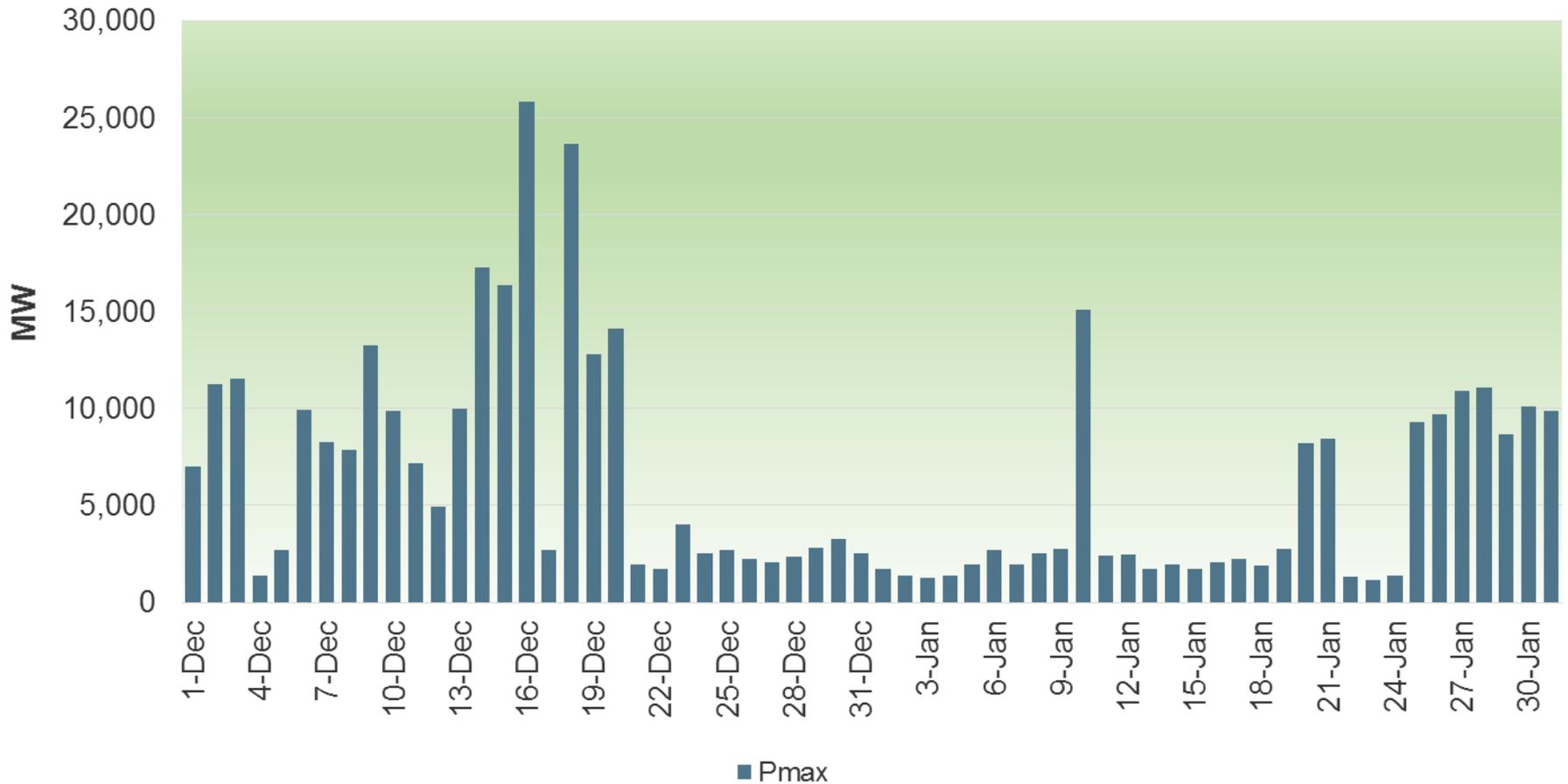
Bid cost recovery (BCR) by Local Capacity Requirement area



Minimum online commitment (MOC)



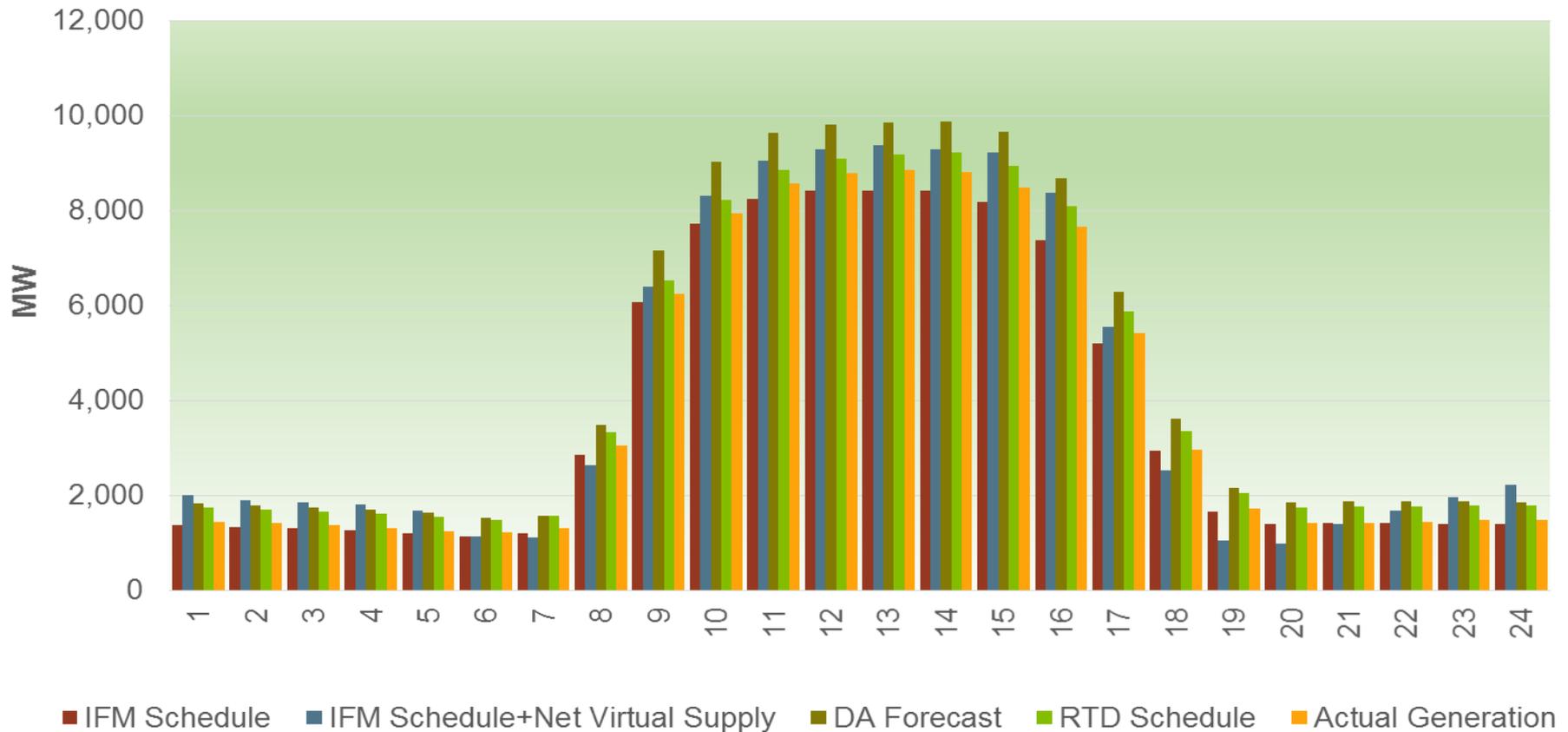
Pmax of MOC Cleared Units



Enforcement of minimum online commitments in February and March

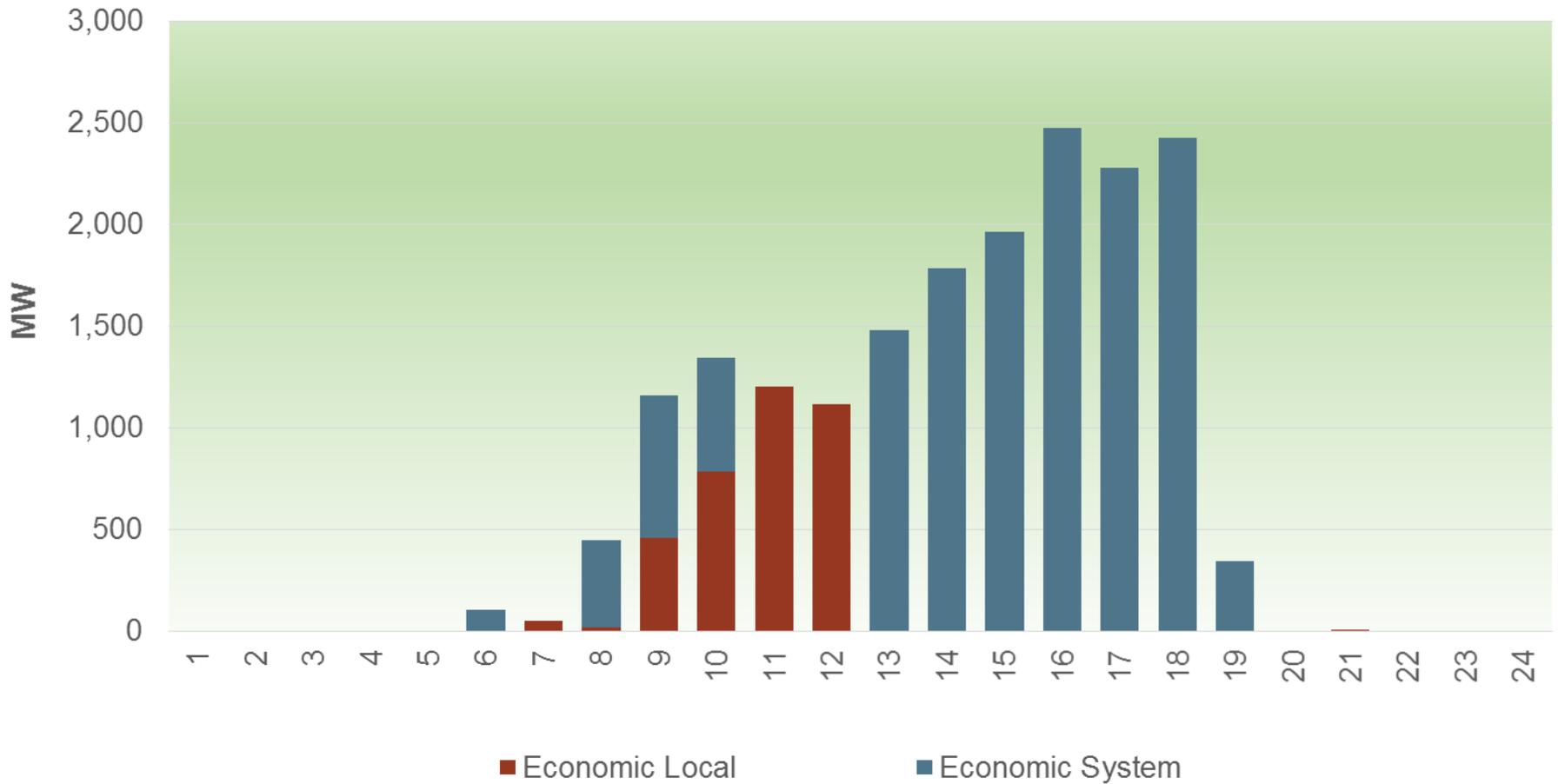
| MOC Name | Number (frequency) of hours in February and March |
|-------------------------------|---|
| Humboldt 7110 SVC In | 1221 |
| Orange County 7630 | 689 |
| MOC Caribou 5348538 | 600 |
| MOC Palermo 5443153 | 503 |
| MOC Mesa-Redondo 5506738 | 456 |
| MOC Bay Area 1 Winter No TBC | 80 |
| MOC Palermo 5736662 | 39 |
| MOC Narows 5509865 | 37 |
| MOC Palermo 5731394 | 25 |
| SDGE 7820 | 20 |
| MOC SAN ONOFRE BUS | 20 |
| OMS 5623163 Palermo MOC | 13 |
| OMS 5689058 Center Olinda SCE | 4 |

Renewable (VERs) schedules including net virtual supply aligns with VER forecast in February and March

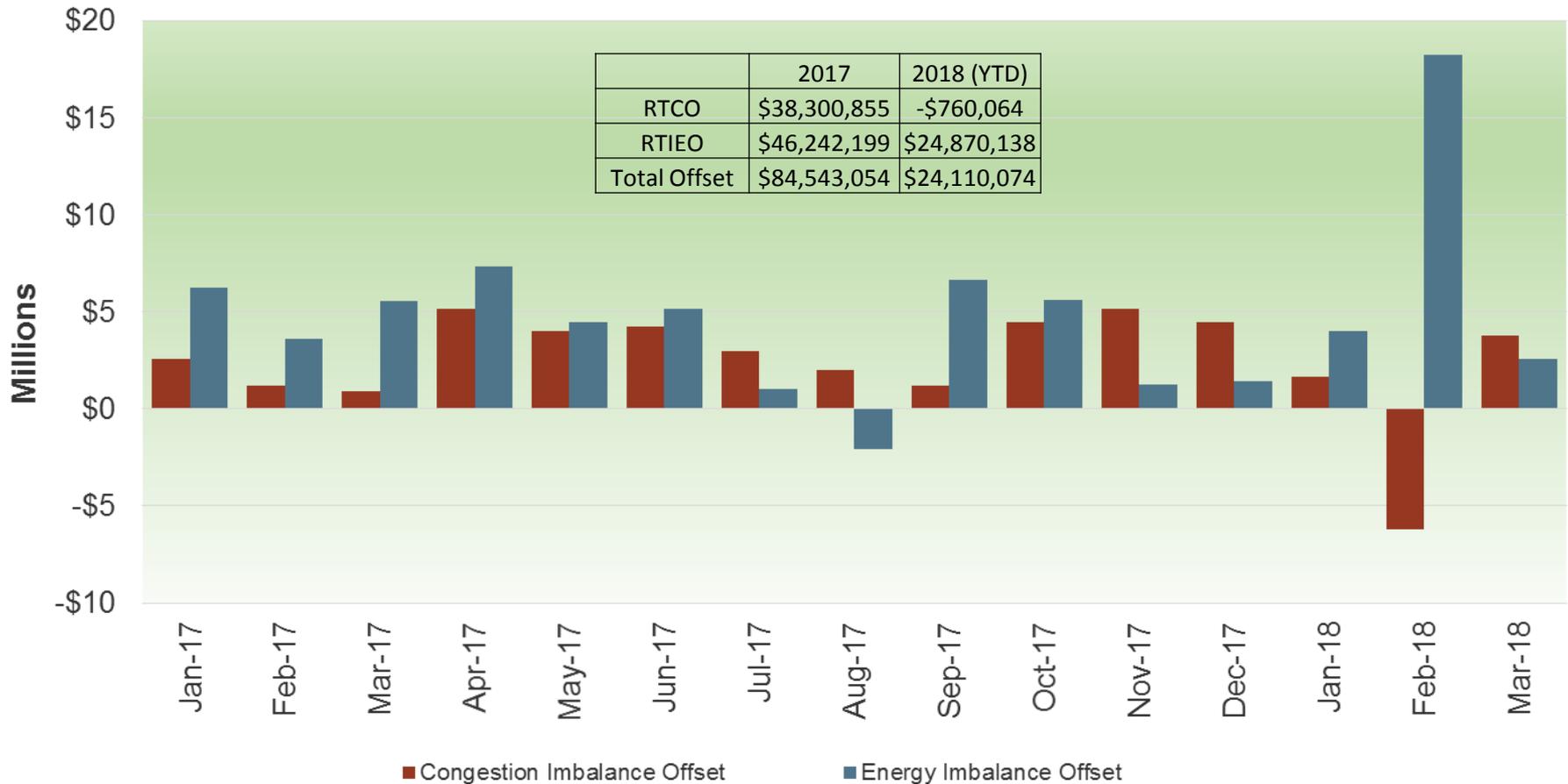


<http://www.caiso.com/Pages/documentsbygroup.aspx?GroupID=EFF75C2E-F28E-4087-B88B-8DFFAED828F8>

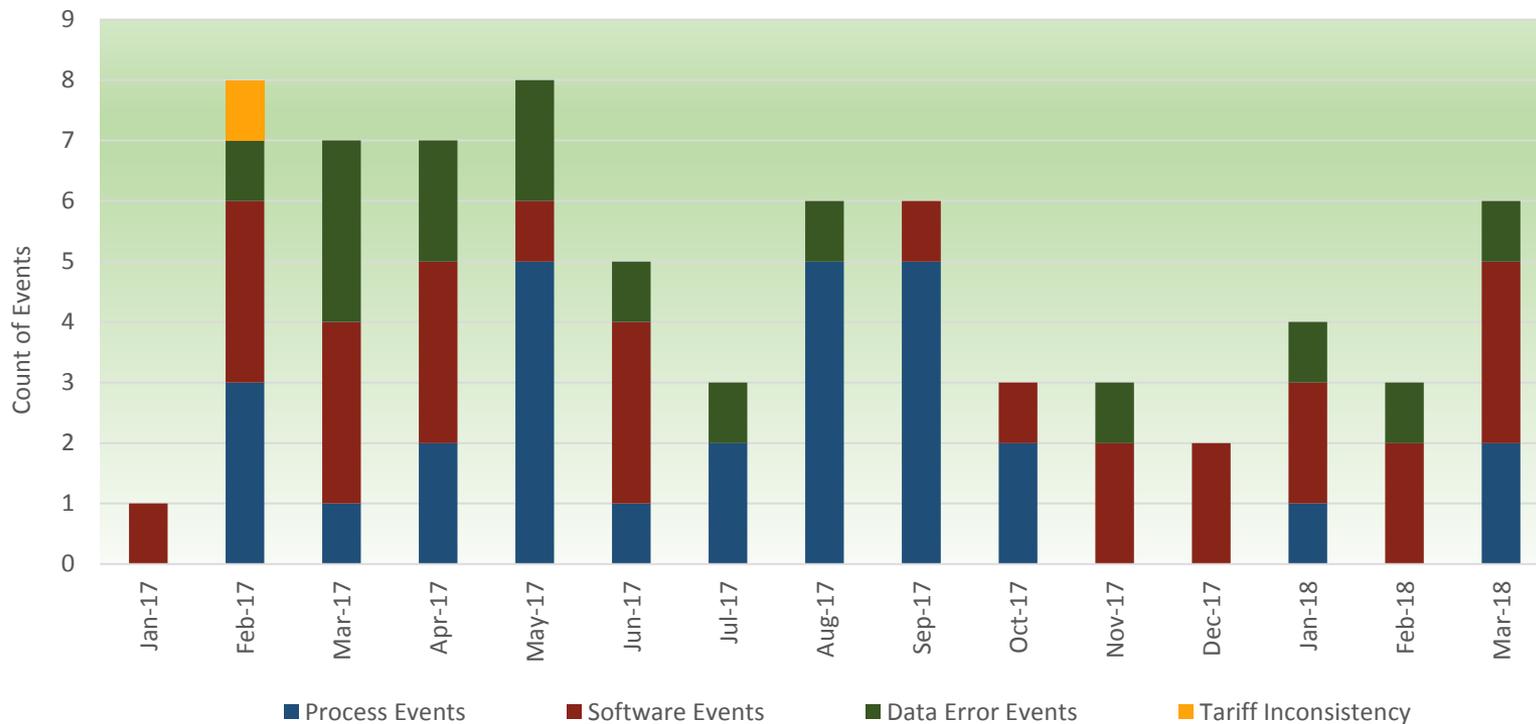
Hourly distribution of **maximum** RTD renewable (VERS) curtailment in March



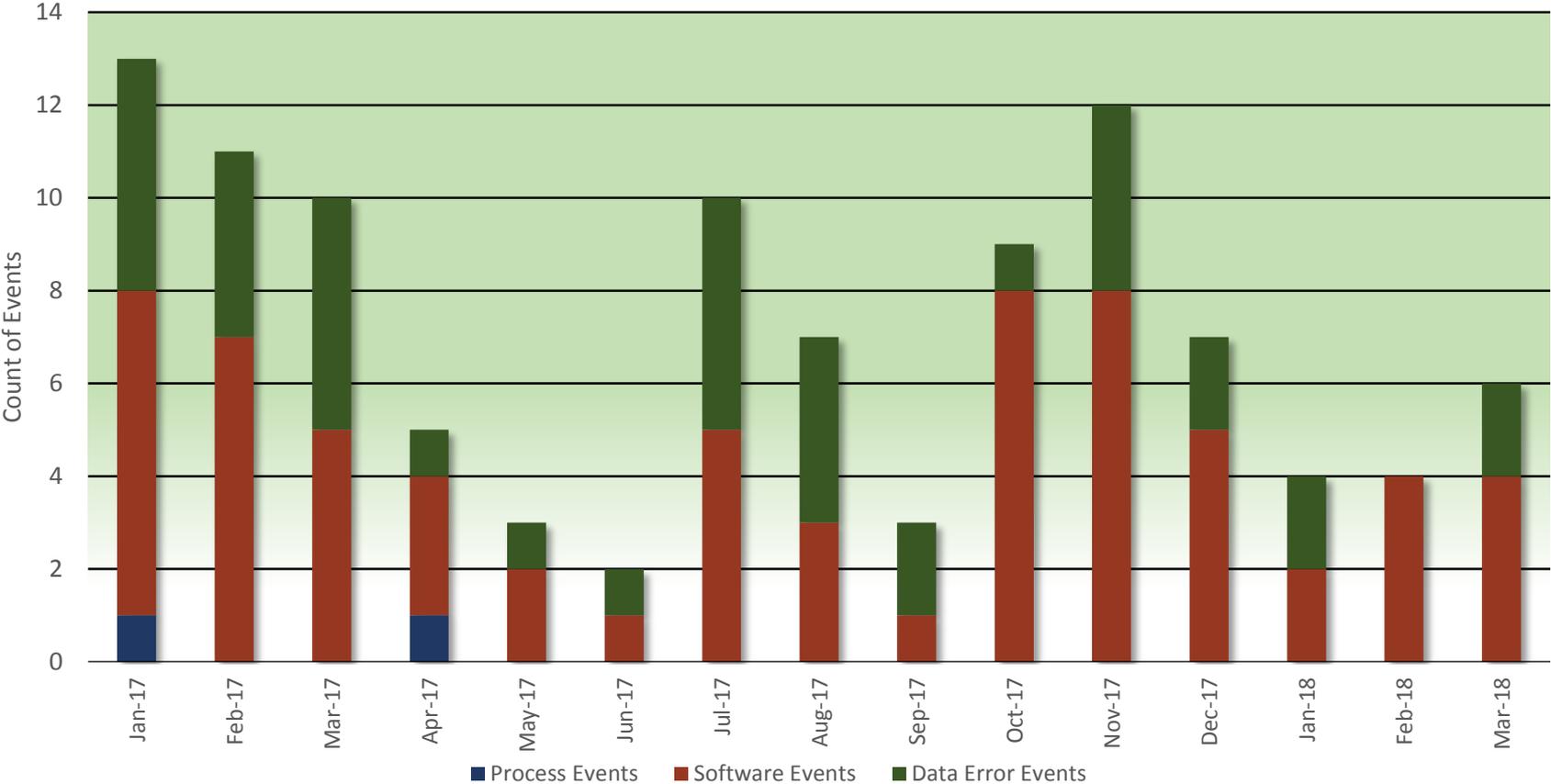
ISO area RTIEO rose in February.



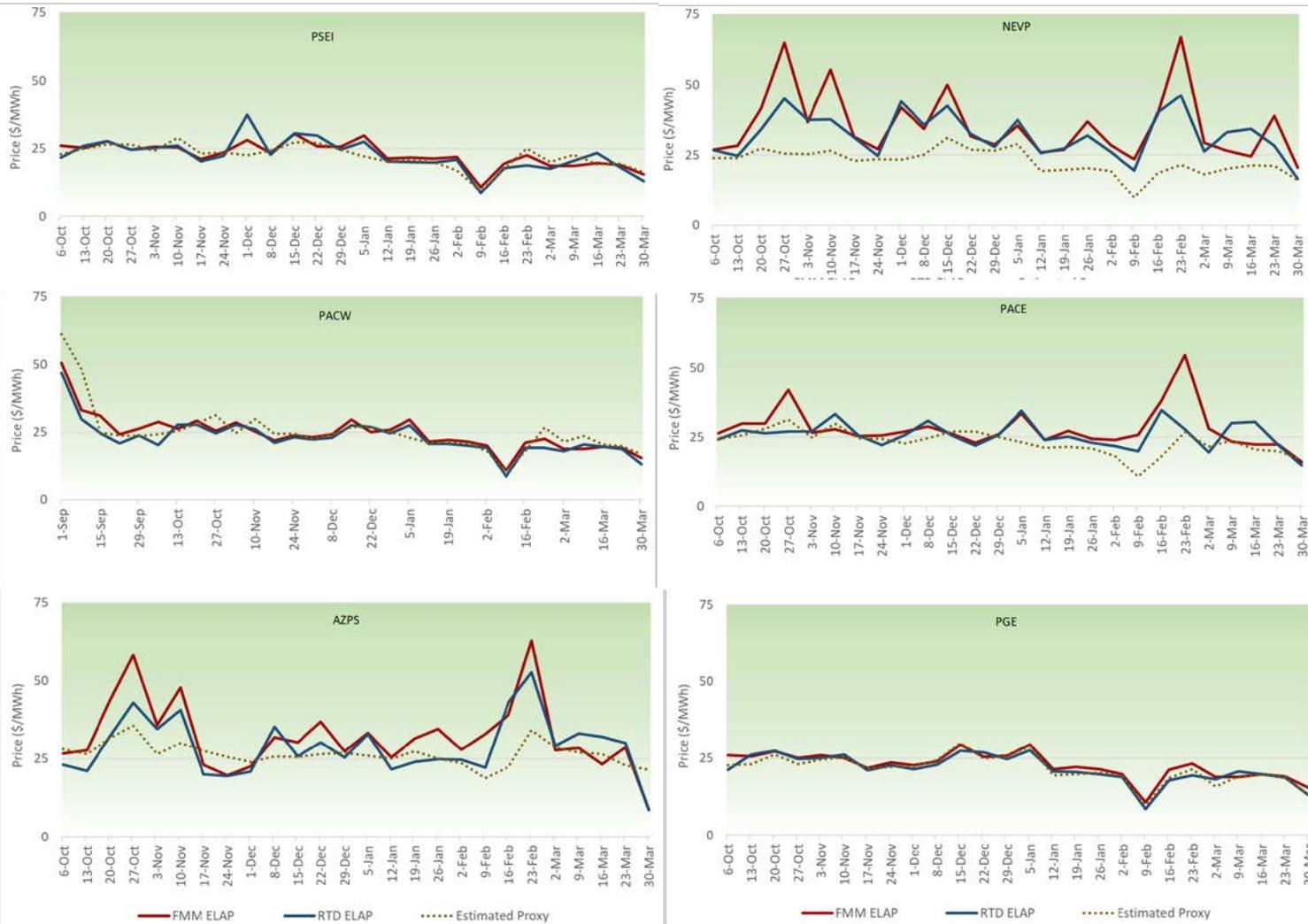
CAISO Price correction events increased in March



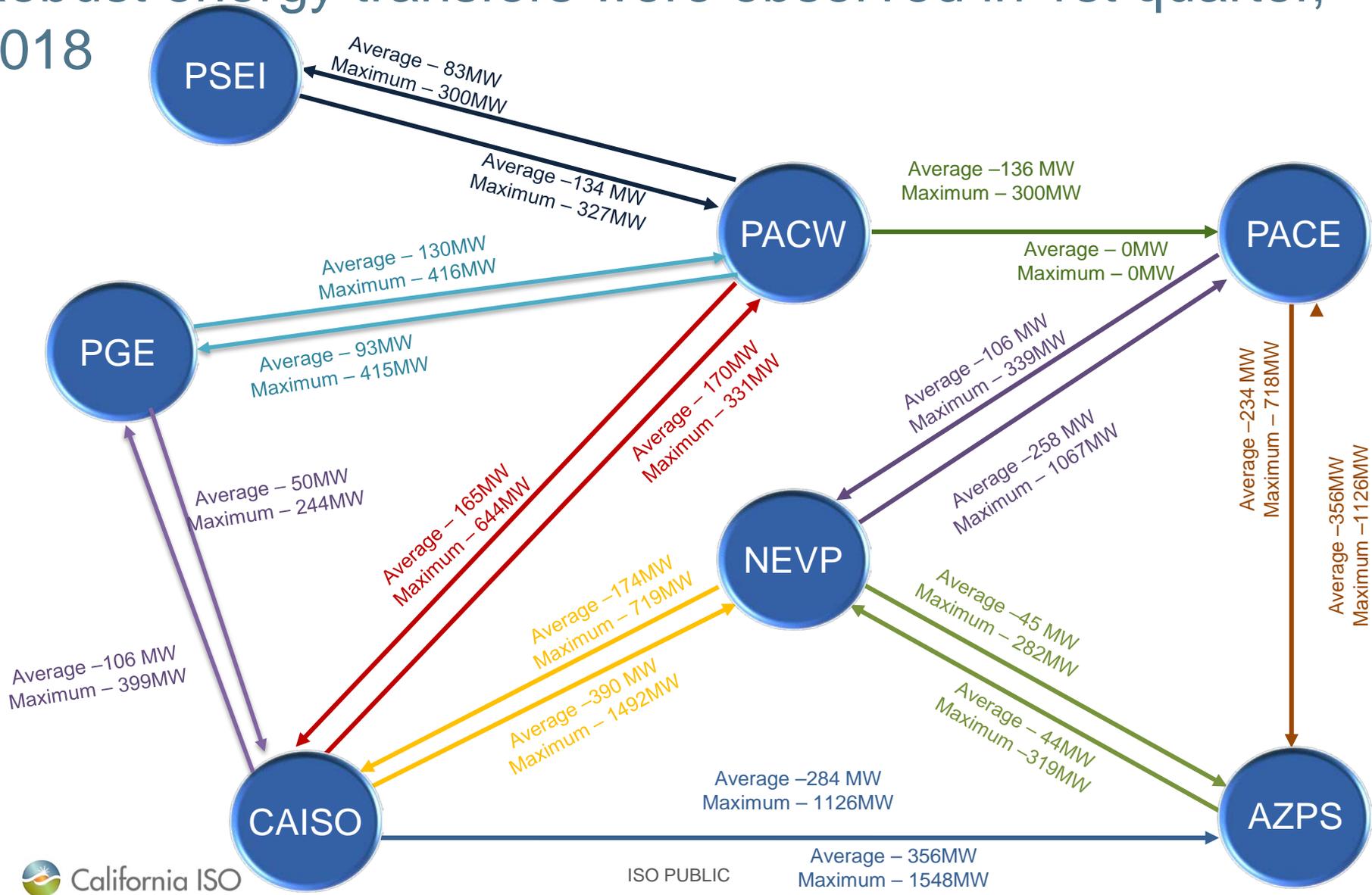
EIM-Related Price correction events increased in March



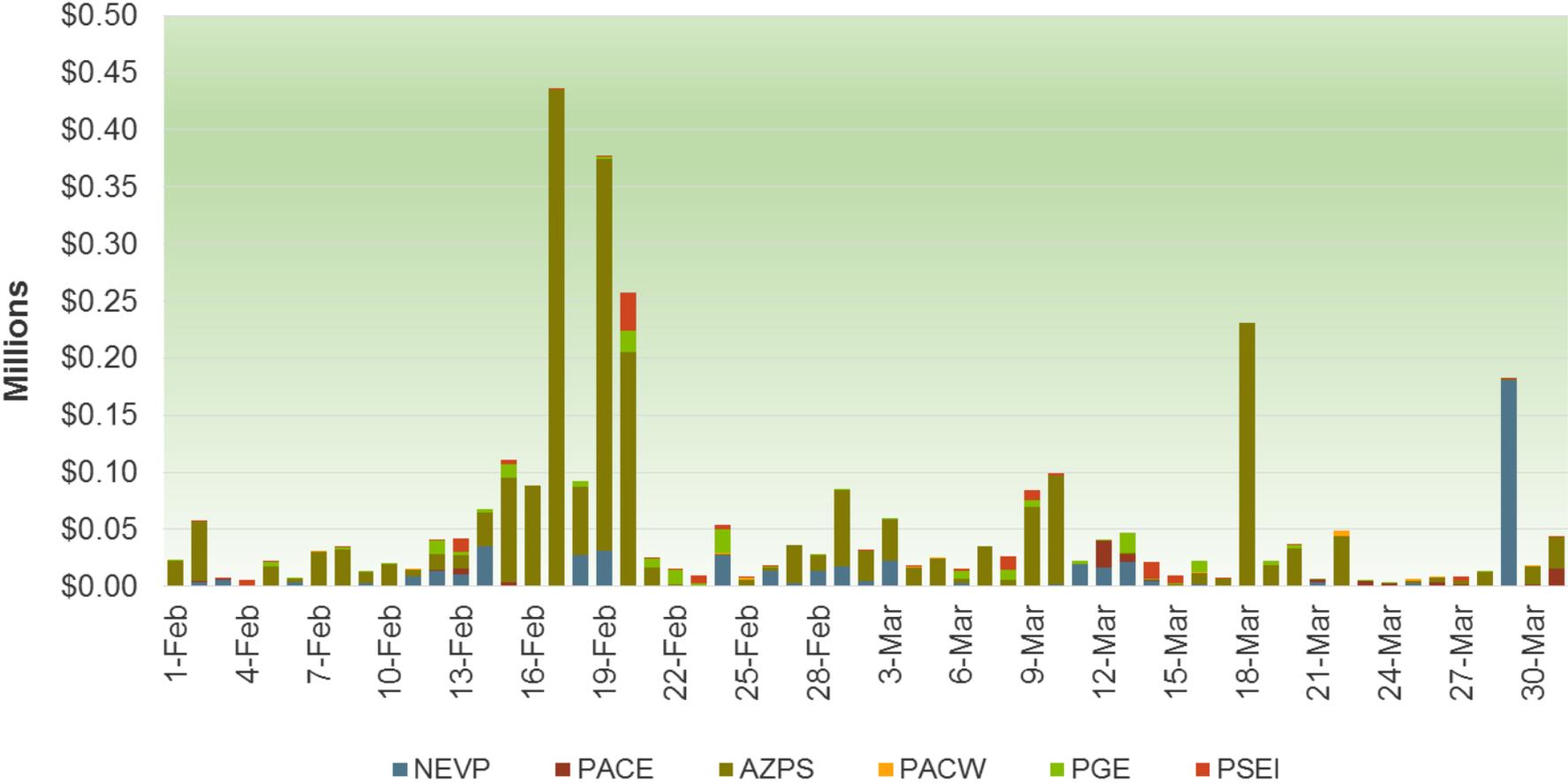
EIM prices observed some volatility during days of tight gas conditions



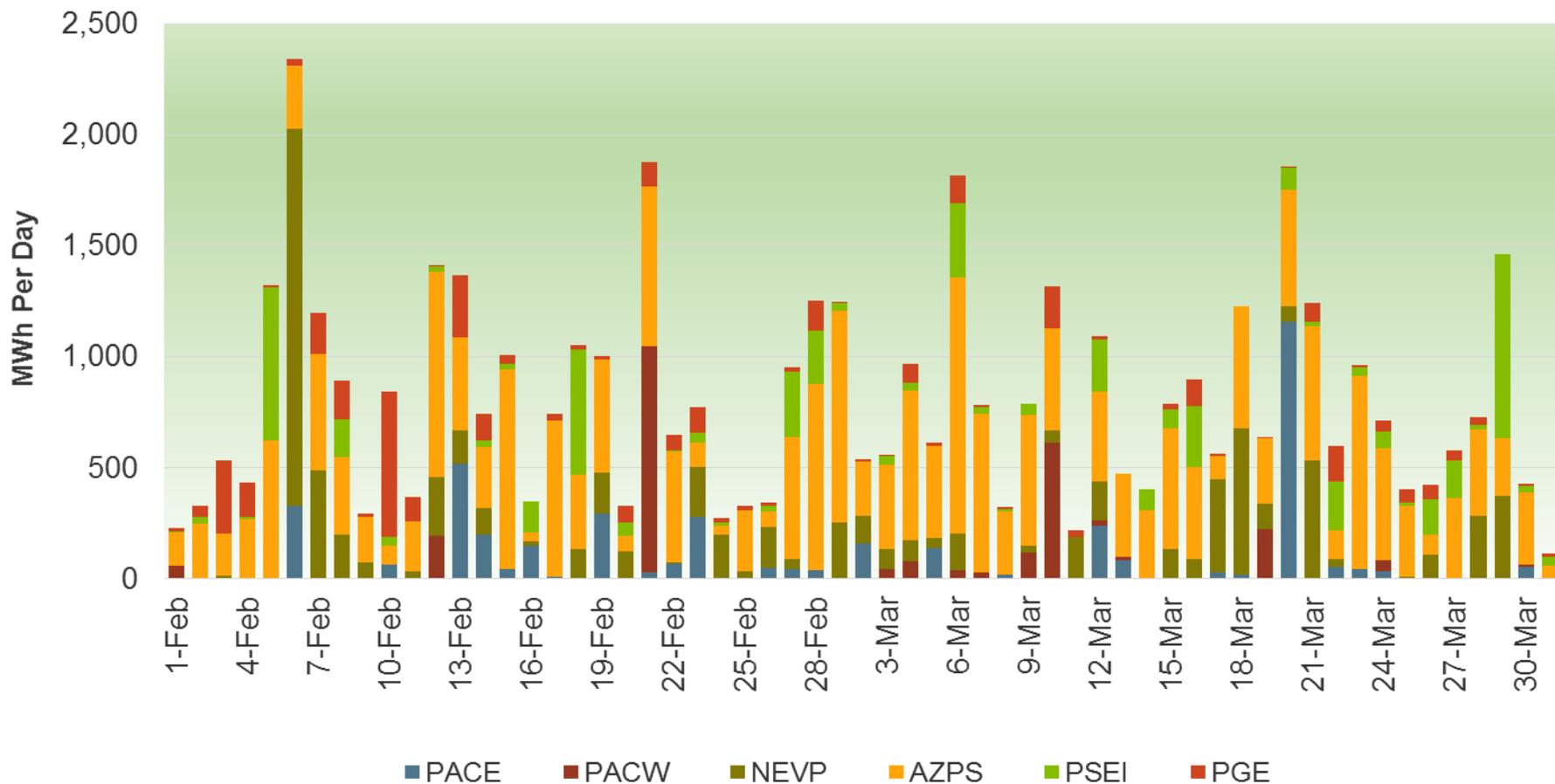
Robust energy transfers were observed in 1st quarter, 2018



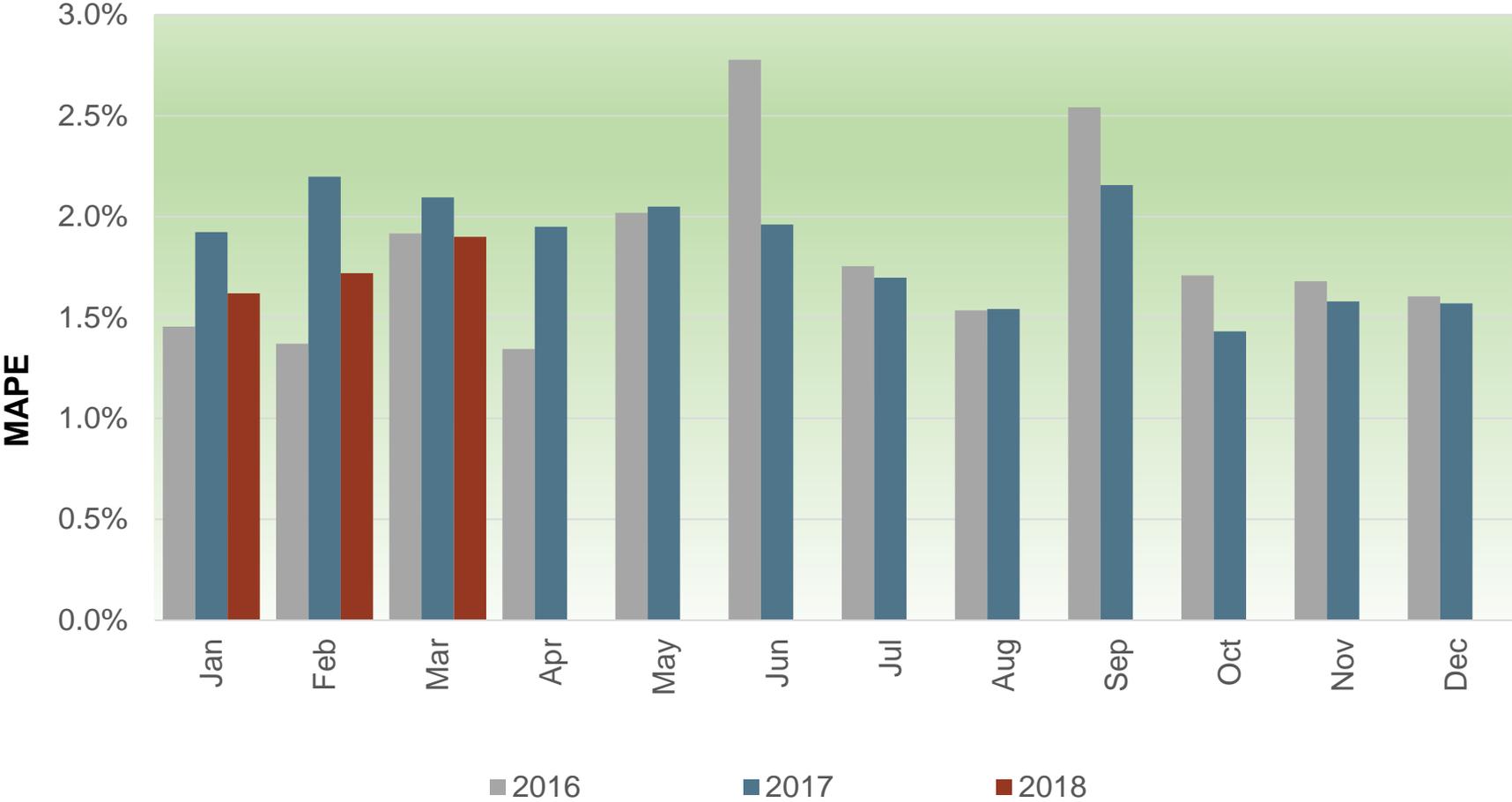
EIM BCR decreased in March compared with February



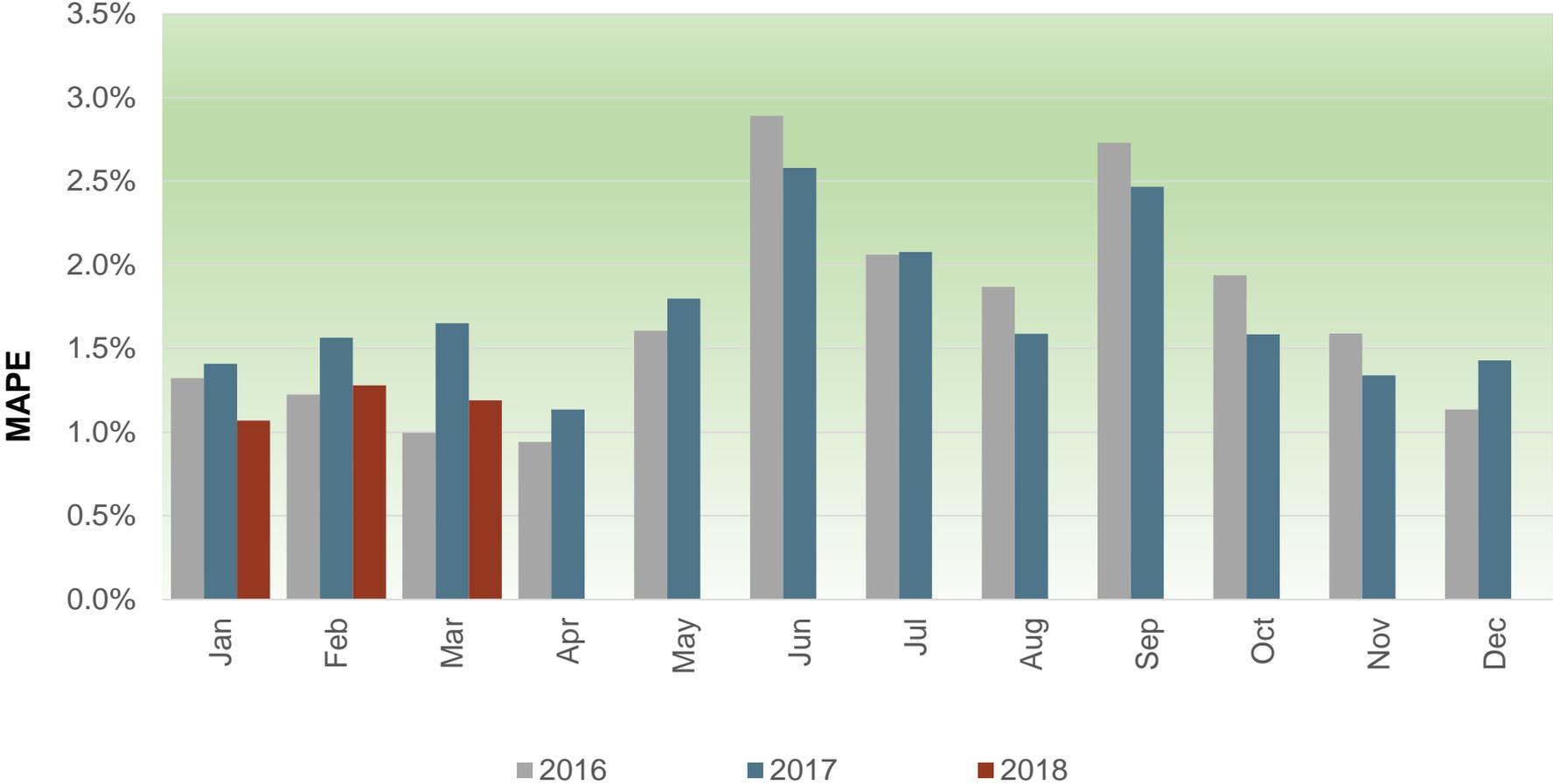
EIM Manual Dispatch relatively stable and mostly concentrated in APS area



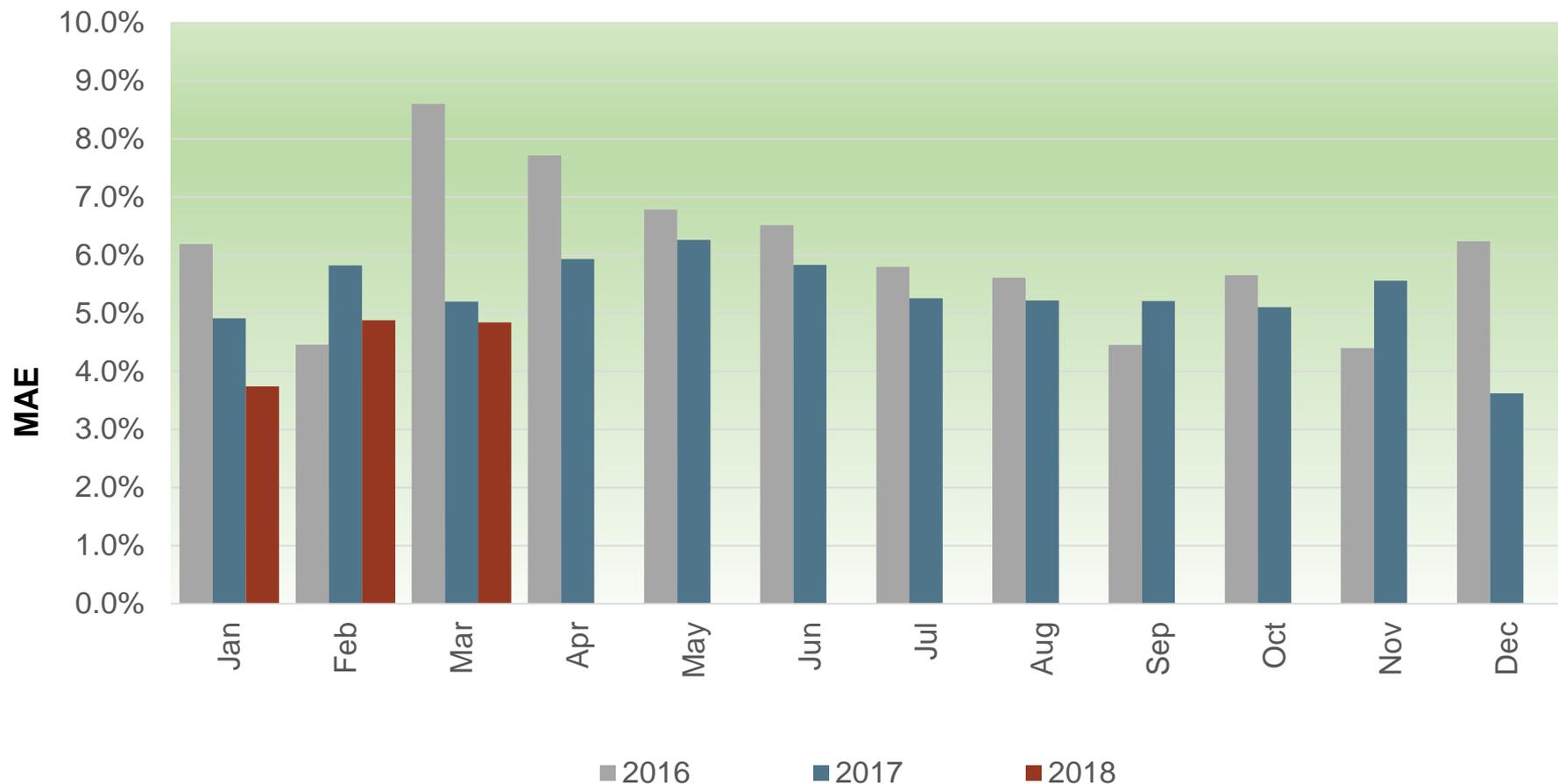
Day-ahead load forecast



Day-ahead peak to peak forecast accuracy



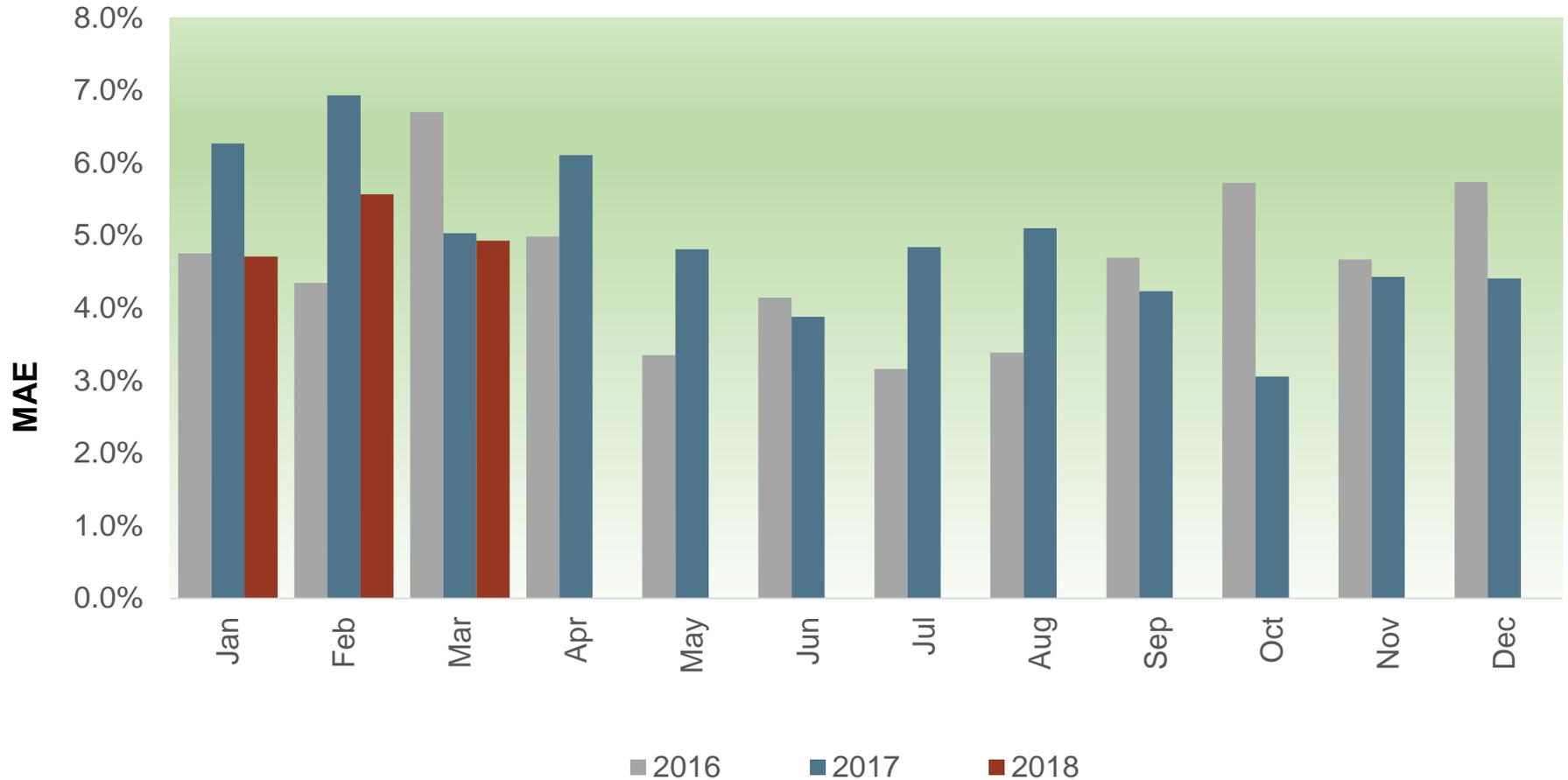
Day-ahead wind forecast



**In 2015-2016, Economic dispatches are not added back in to the generation data.

**The 2017 generation data used for accuracy calculation contains the economically dispatched MW.

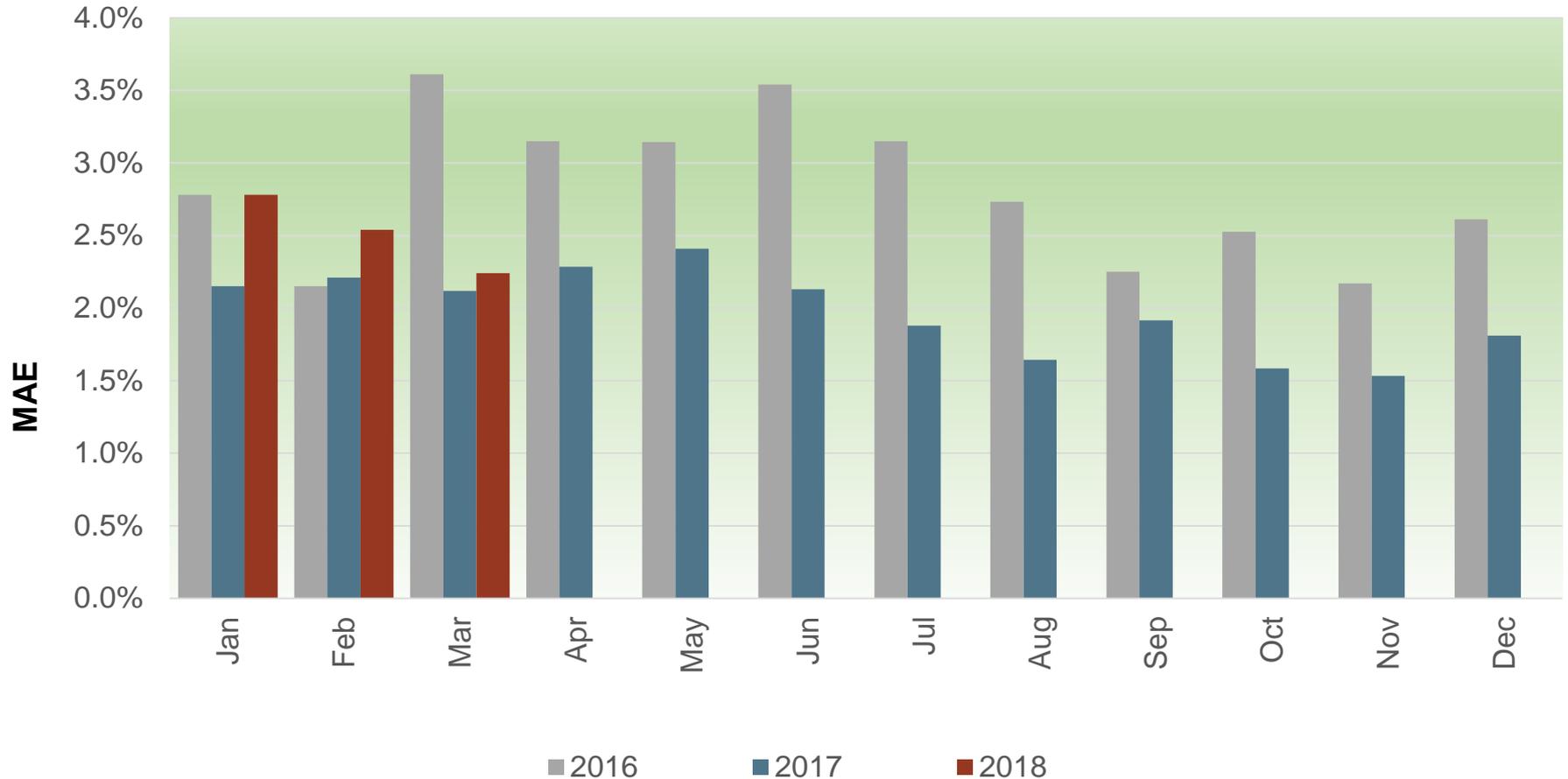
Day-ahead solar forecast



**In 2015-2016, Economic dispatches are not added back in to the generation data.

**The 2017 generation data used for accuracy calculation contains the economically dispatched MW.

Real-time wind forecast

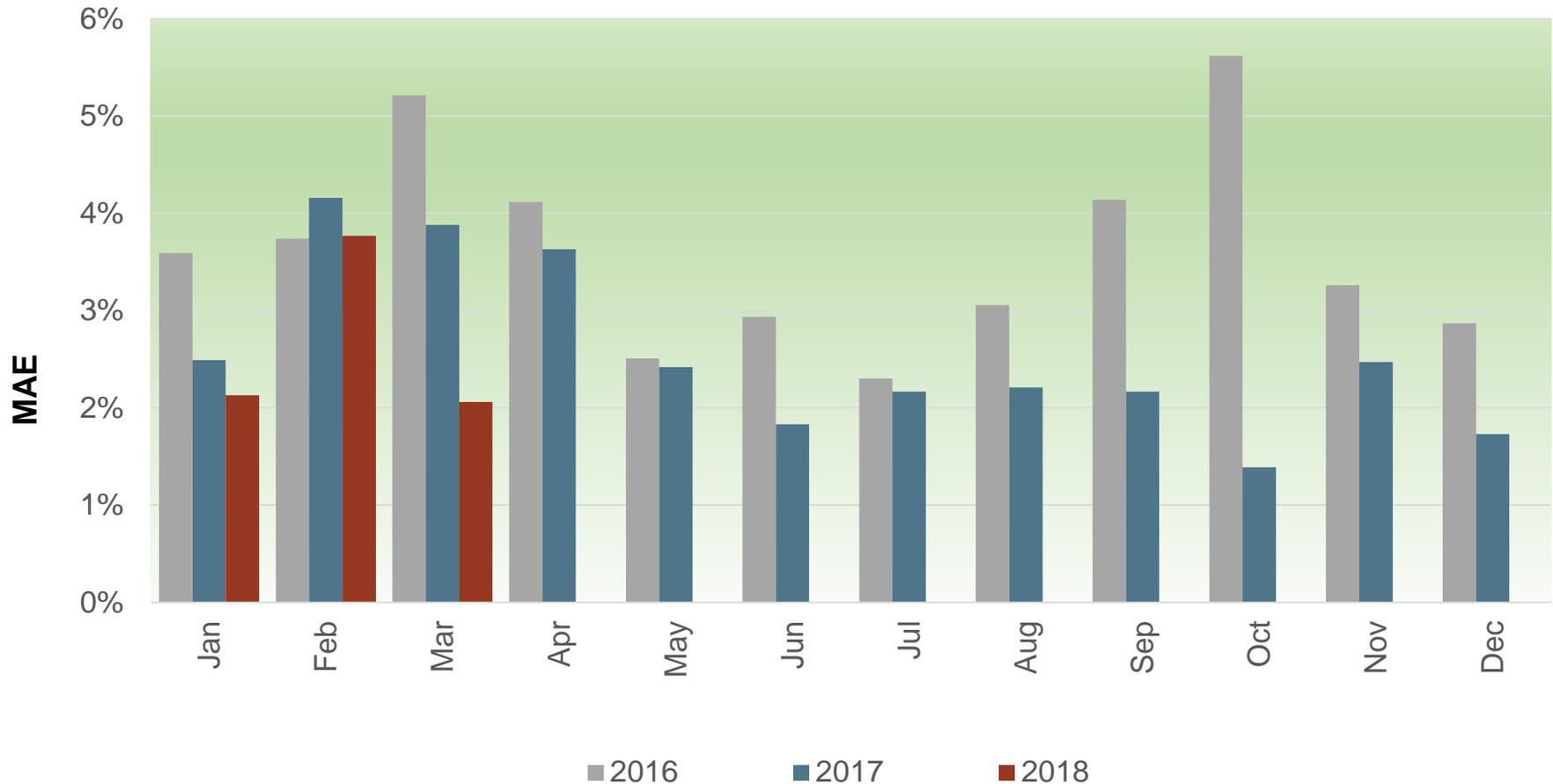


**2015-2016 represent the accuracy of the forecast made each hour at xx:55 for the following hour, i.e. the 5-65 minute ahead forecast. Economic dispatches are not added back in to the generation data.

**2017 has been changed to track the RTD accuracy, i.e. the forecast made 7.5 minutes before the binding interval. The 2017 generation data used for accuracy calculation contains the economically dispatched MW.

**This forecast accuracy is pulled directly from the CAISO Forecasting System.

Real-time solar forecast



**2015-2016 represent the accuracy of the forecast made each hour at xx:55 for the following hour, i.e. the 5-65 minute ahead forecast. Economic dispatches are not added back in to the generation data.

**2017 has been changed to track the RTD accuracy, i.e. the forecast made 7.5 minutes before the binding interval. The 2017 generation data used for accuracy calculation contains the economically dispatched MW.

**This forecast accuracy is pulled directly from the CAISO Forecasting System.

Department of Market Monitoring Update

Flexible Ramping Product Uncertainty Calculation and Implementation Issues

Kyle Westendorf

Market Monitoring Analyst, Monitoring and Reporting

Department of Market Monitoring

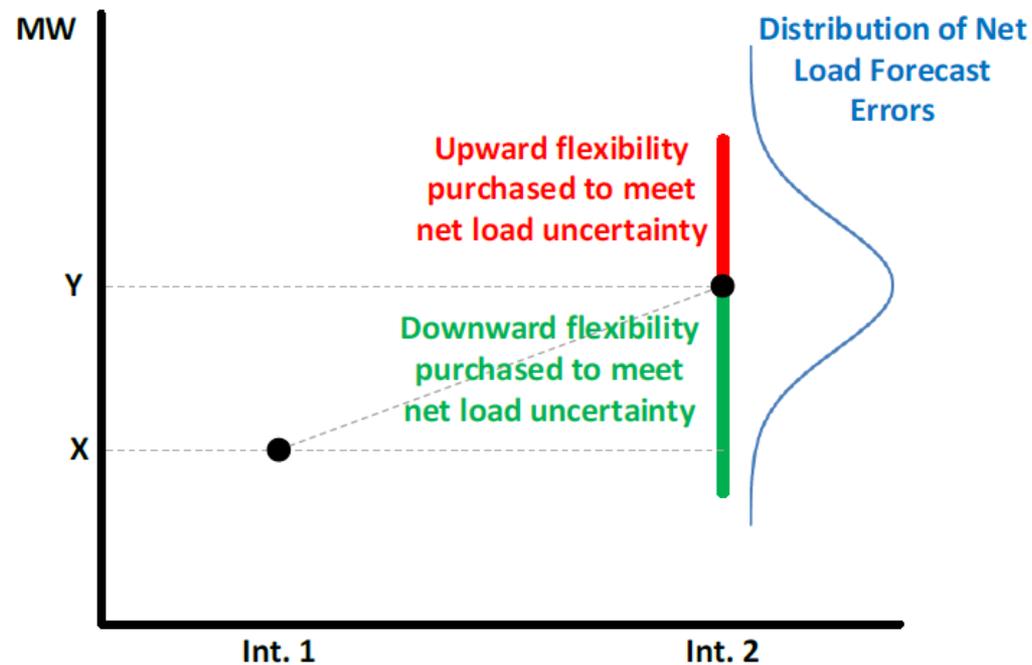
Special report:

<http://www.caiso.com/market/Pages/MarketMonitoring/MarketMonitoringReportsPresentations/Default.aspx>

April 19, 2018

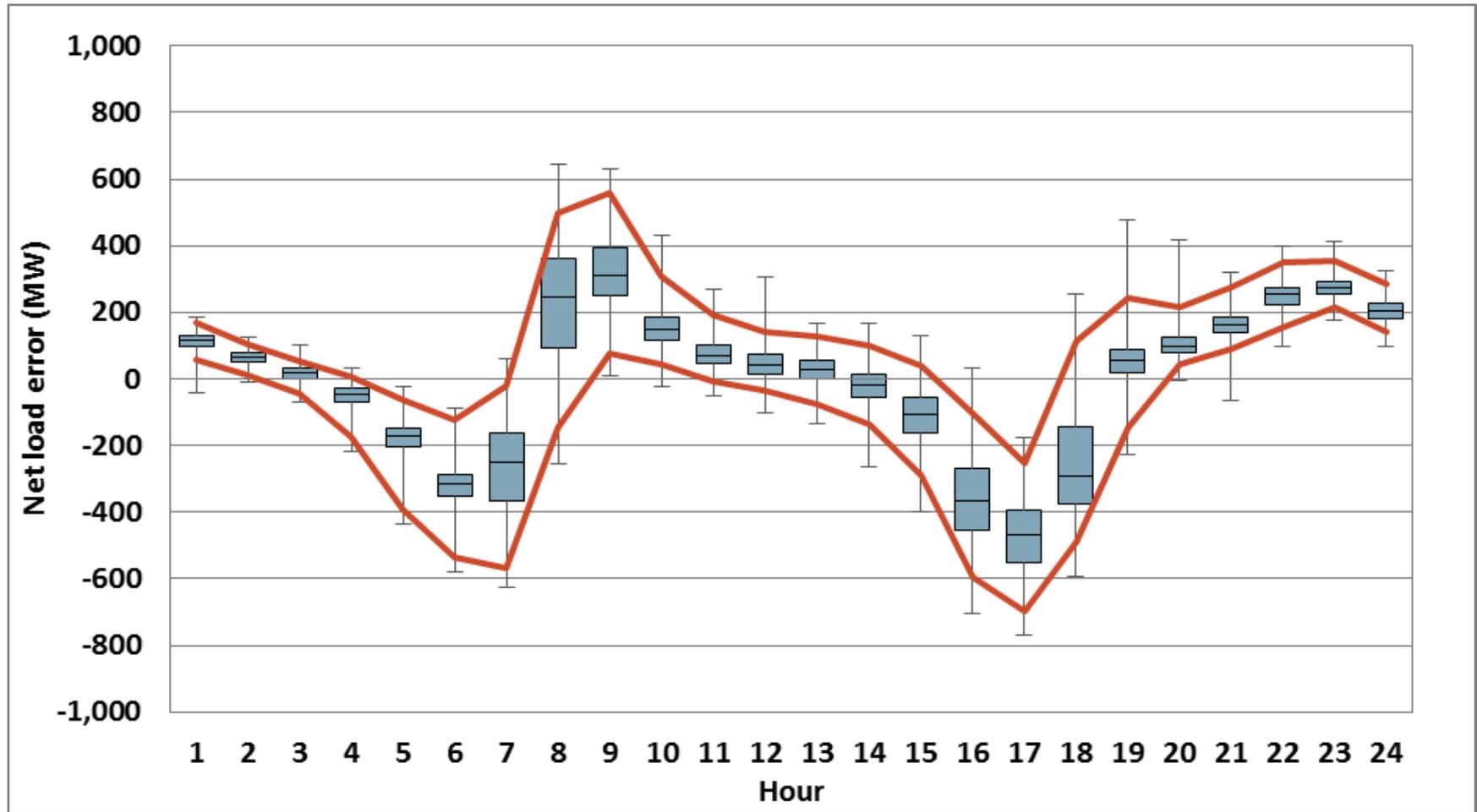
Purpose of FRP

- The flexible ramping product is designed to ensure sufficient flexible ramping capacity is available to address uncertainty surrounding net load forecasts.
 - Net Load = Load – Wind – Solar



Uncertainty requirements as implemented

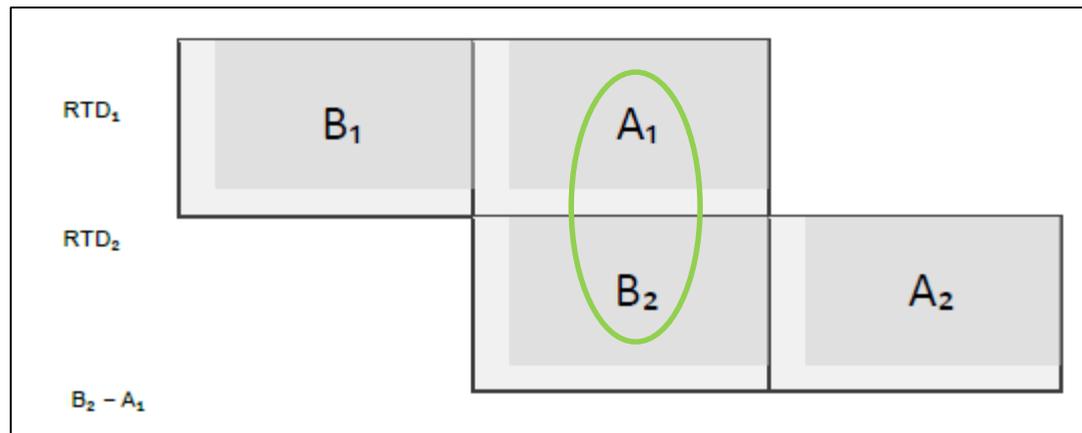
Example: Hourly distribution of 5-minute market system net load error (February 20, 2018)



Net load forecast error (uncertainty) calculation

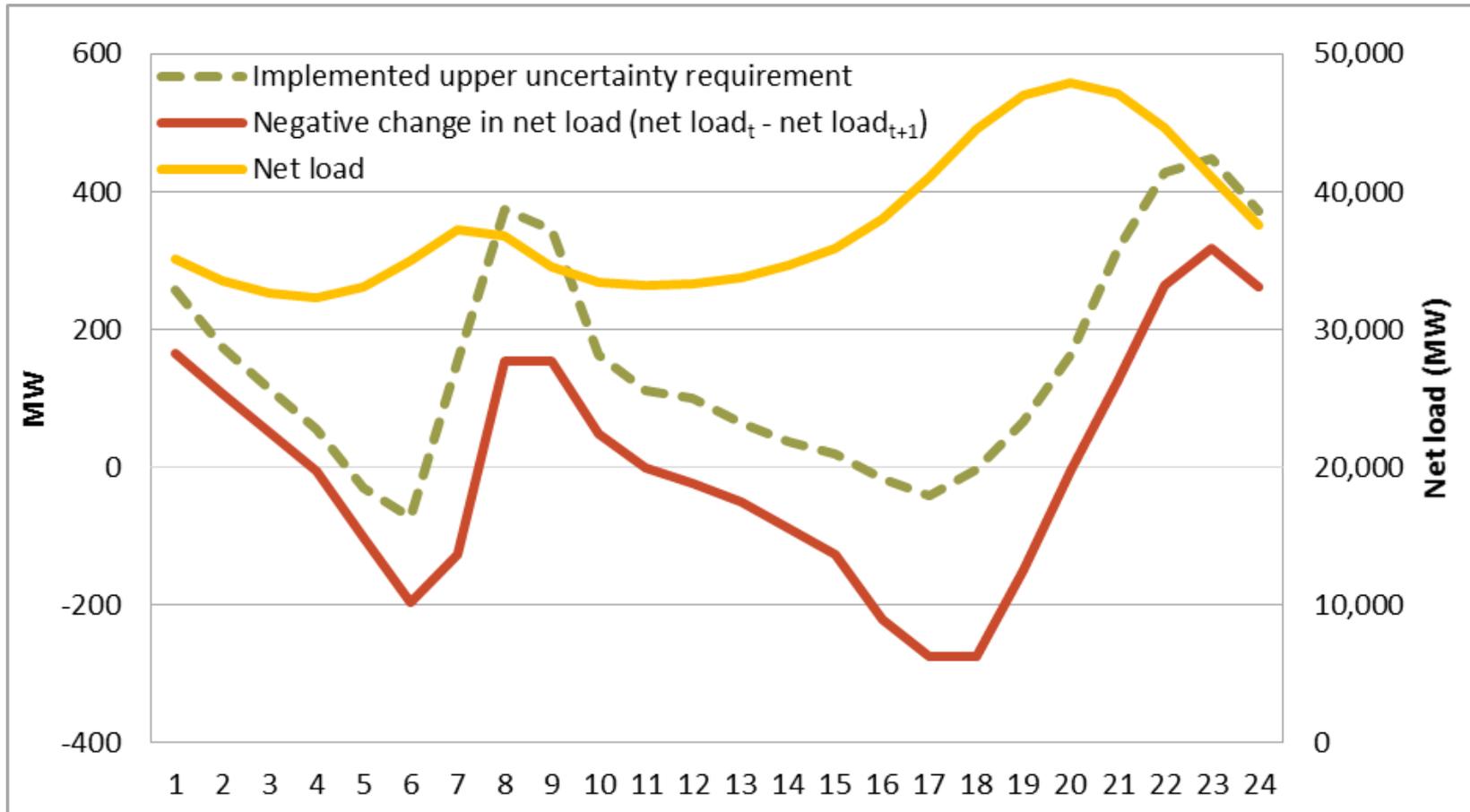
5-minute market

- In the 5-minute market, this is intended to be the binding net load in the next market run minus the first advisory interval of the current market run ($B_2 - A_1$)
- Implementation based on binding net load in the current market run minus the first advisory interval of the current market run ($B_1 - A_1$)



Flex ramp procurement and prices biased in the direction opposite of the net load ramp

Average system net load and upward uncertainty requirements (5-minute market)

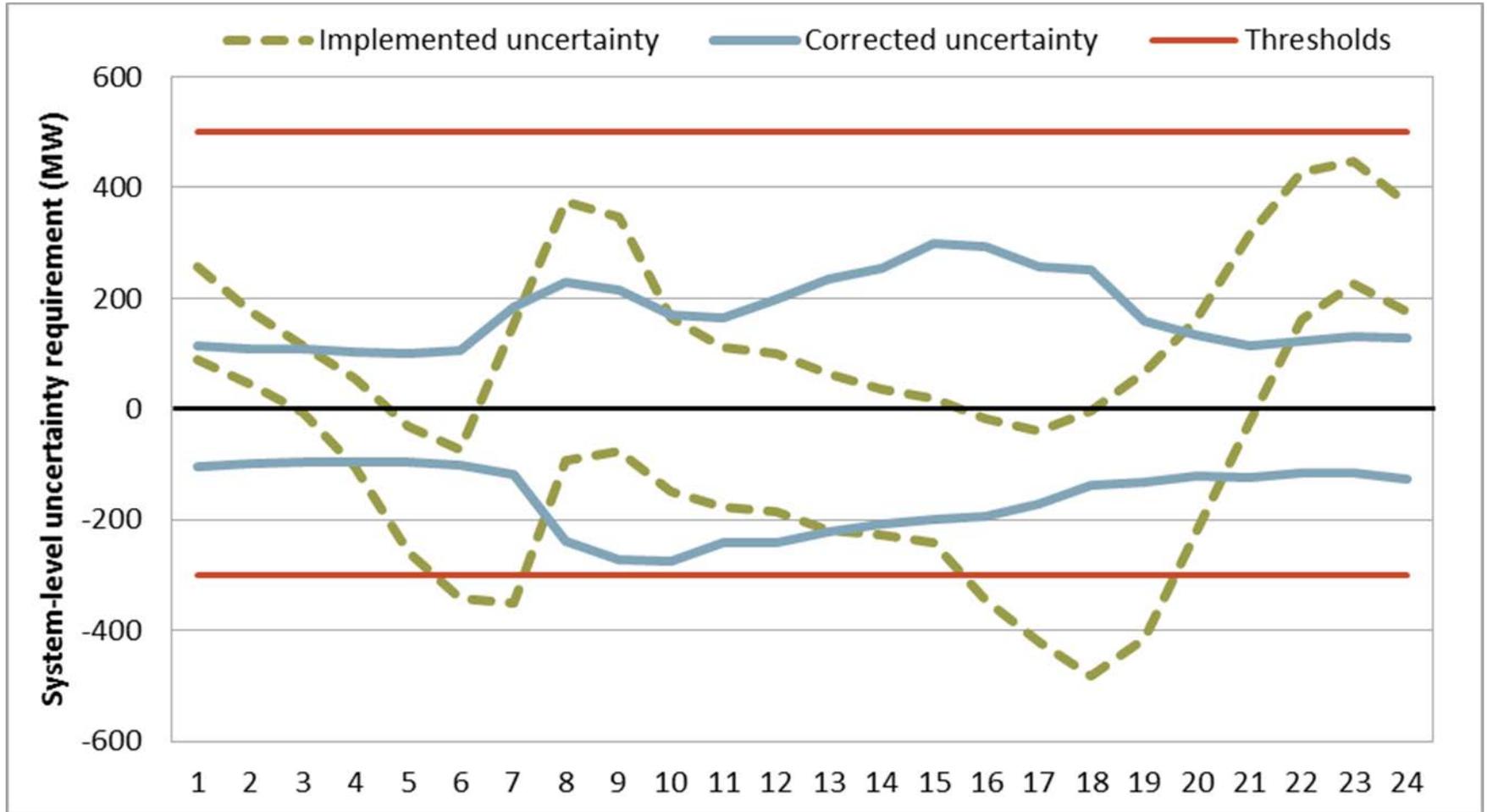


Summary of implementation issues

- Net load error calculation based on the difference between a binding and advisory interval between two sequential time intervals. Resolved February 22, 2018.
- Additional issues identified
 - Wind and solar values pulled from the interval prior to the load values in the net load calculations. Resolved March 23, 2018.
 - Net load errors in the distribution based on current interval rather than uncertainty in the next interval.
 - 15-minute market wind and solar values used in the net load calculations pulled from 5-minute level output. Resolved March 31, 2018.
 - Uncertainty requirements capped by uncertainty thresholds that are binding more frequently than expected and are based on outdated flexibility needs.

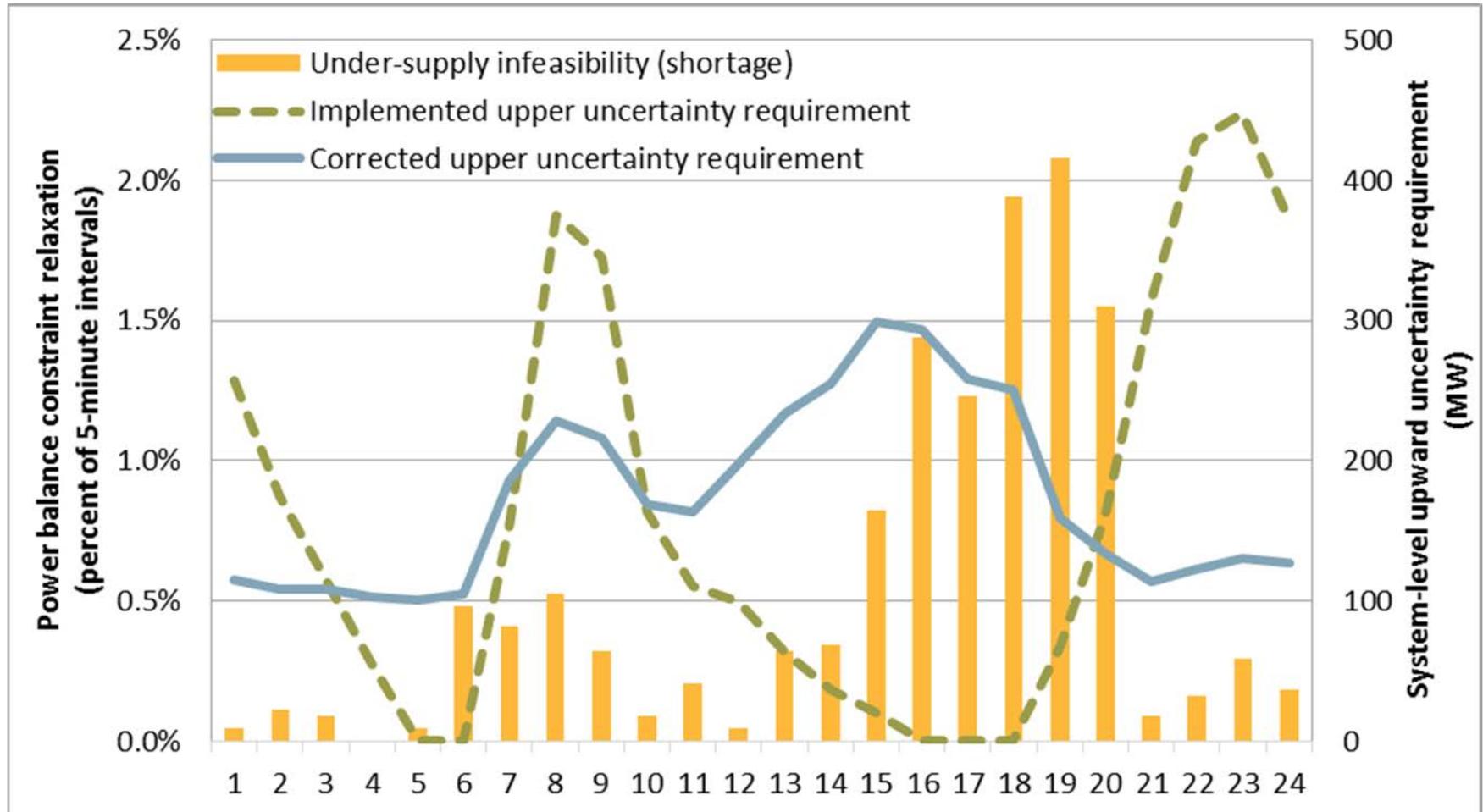
Corrected versus implemented uncertainty requirements

5-minute market, 2017



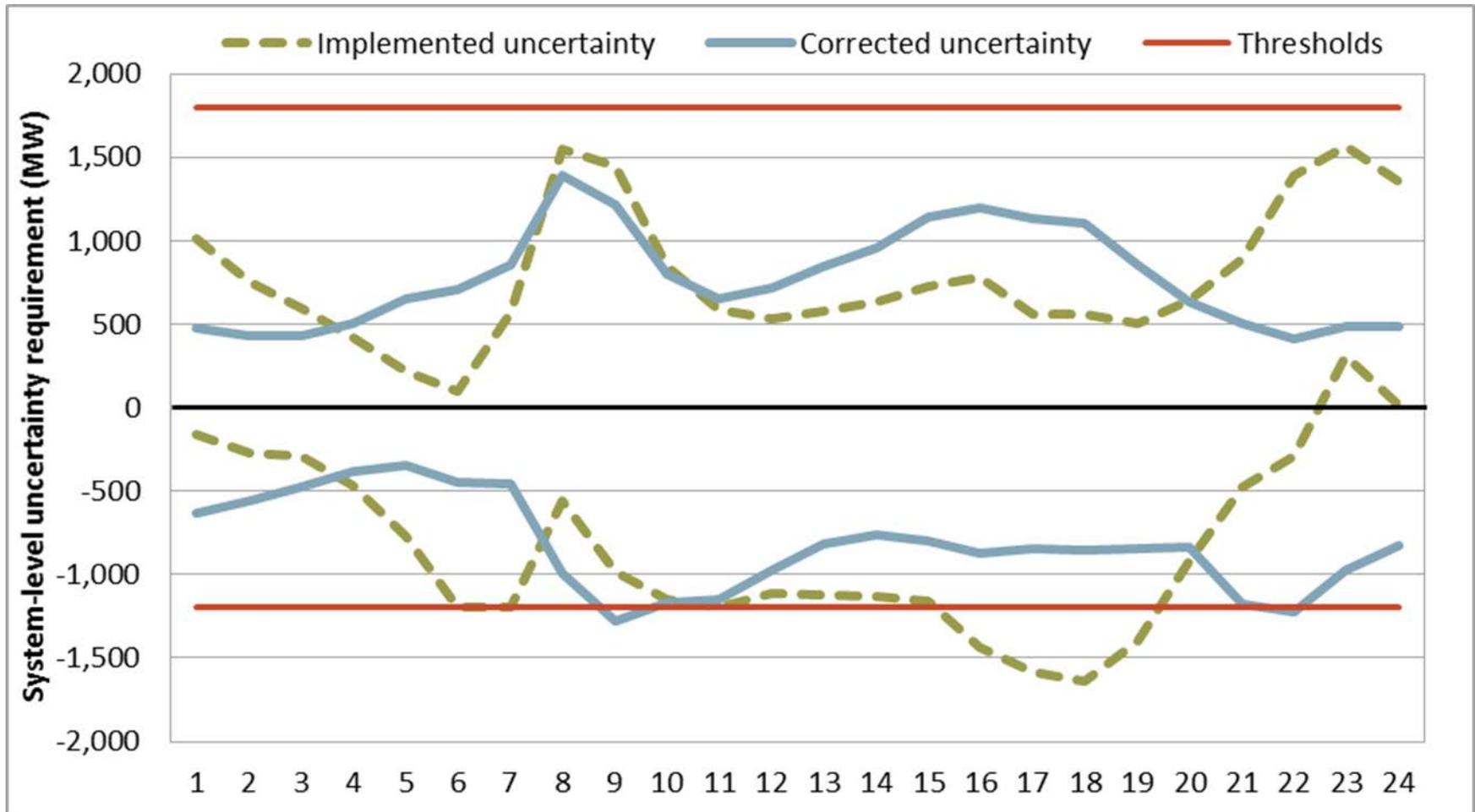
Under-supply power balance constraint relaxations

5-minute market, 2017



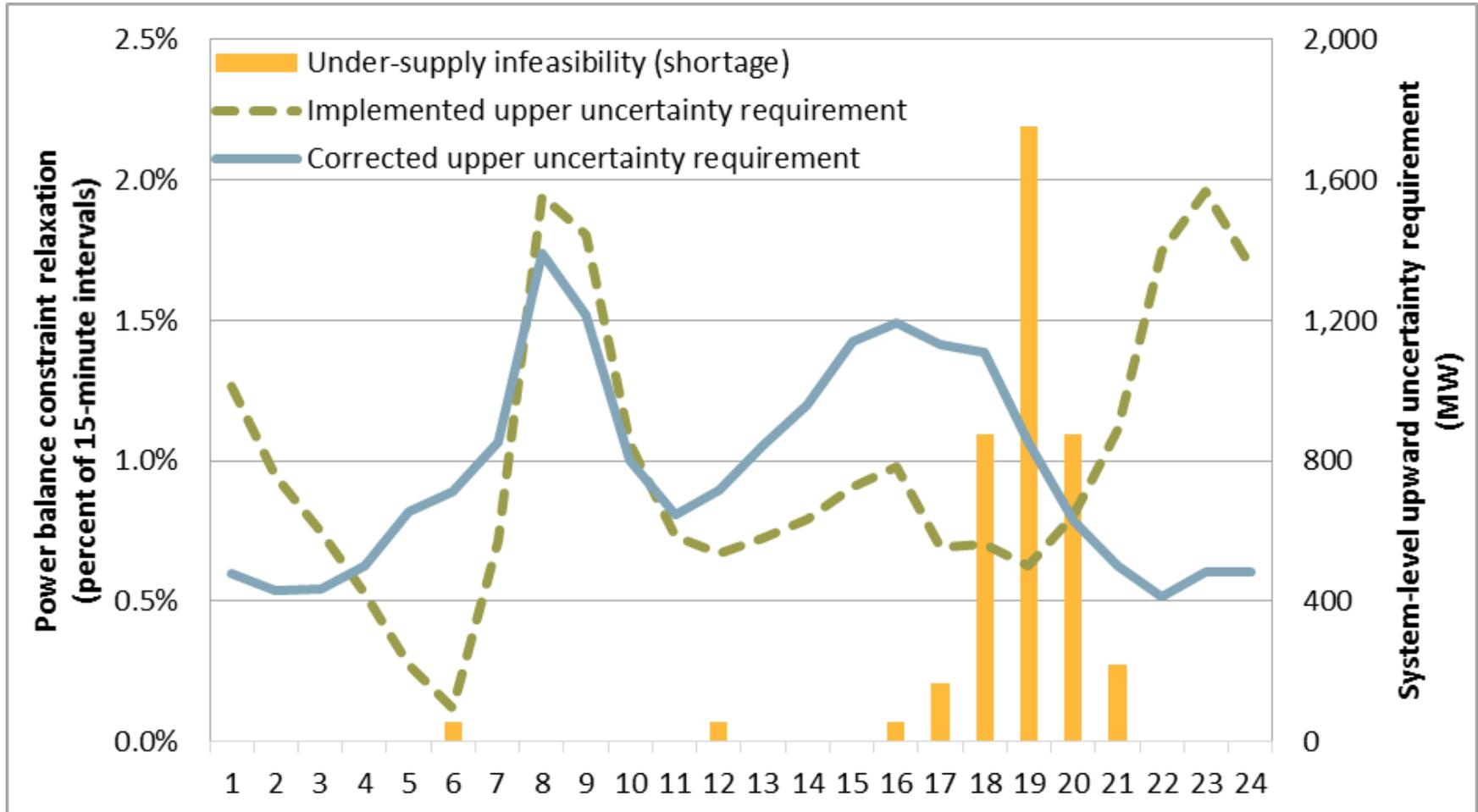
Corrected versus implemented uncertainty requirements

15-minute market, 2017



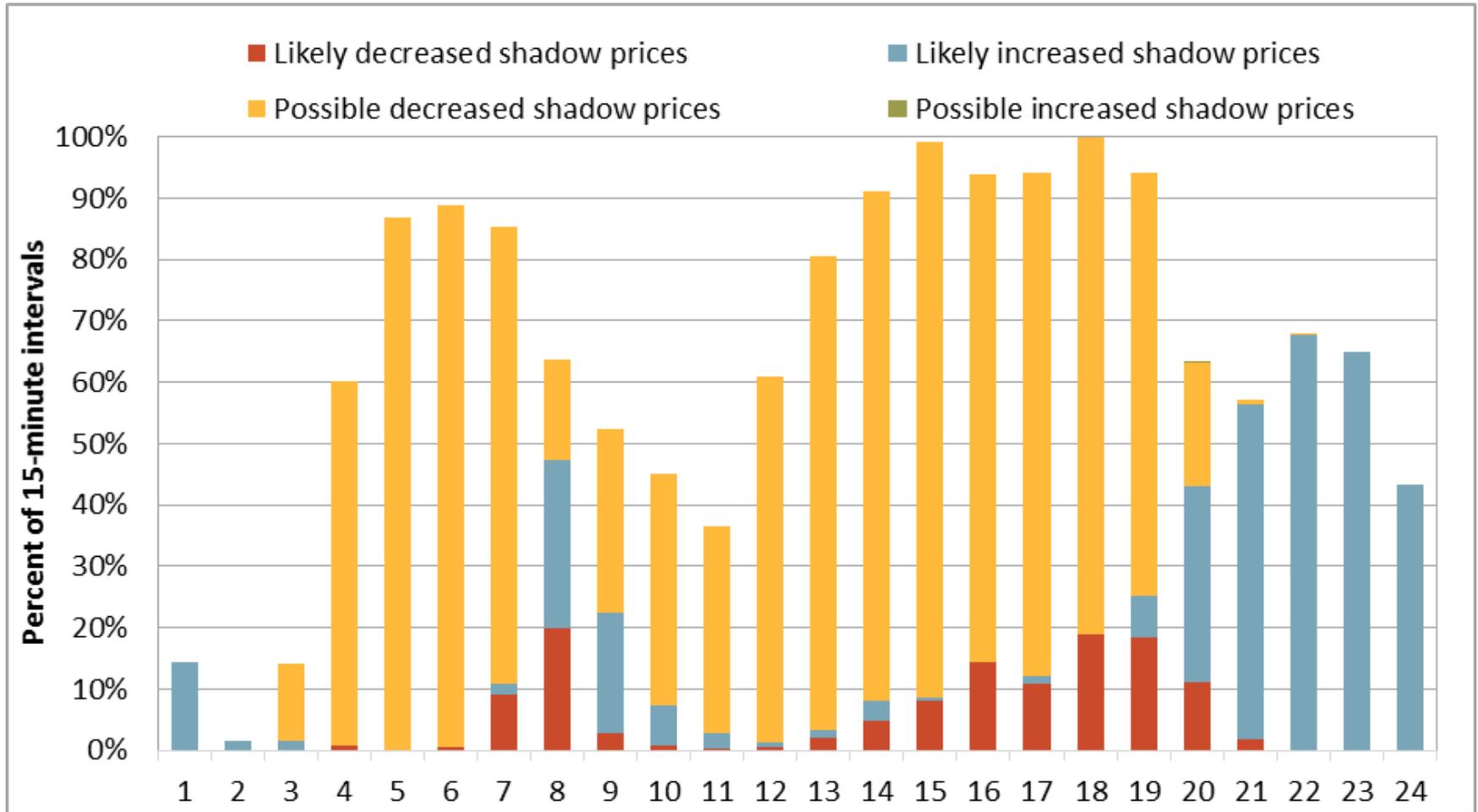
Under-supply power balance constraint relaxations

15-minute market, 2017



Impact of incorrect uncertainty calculation on upward ramping shadow prices

System-level, 15-minute market



Policy Update

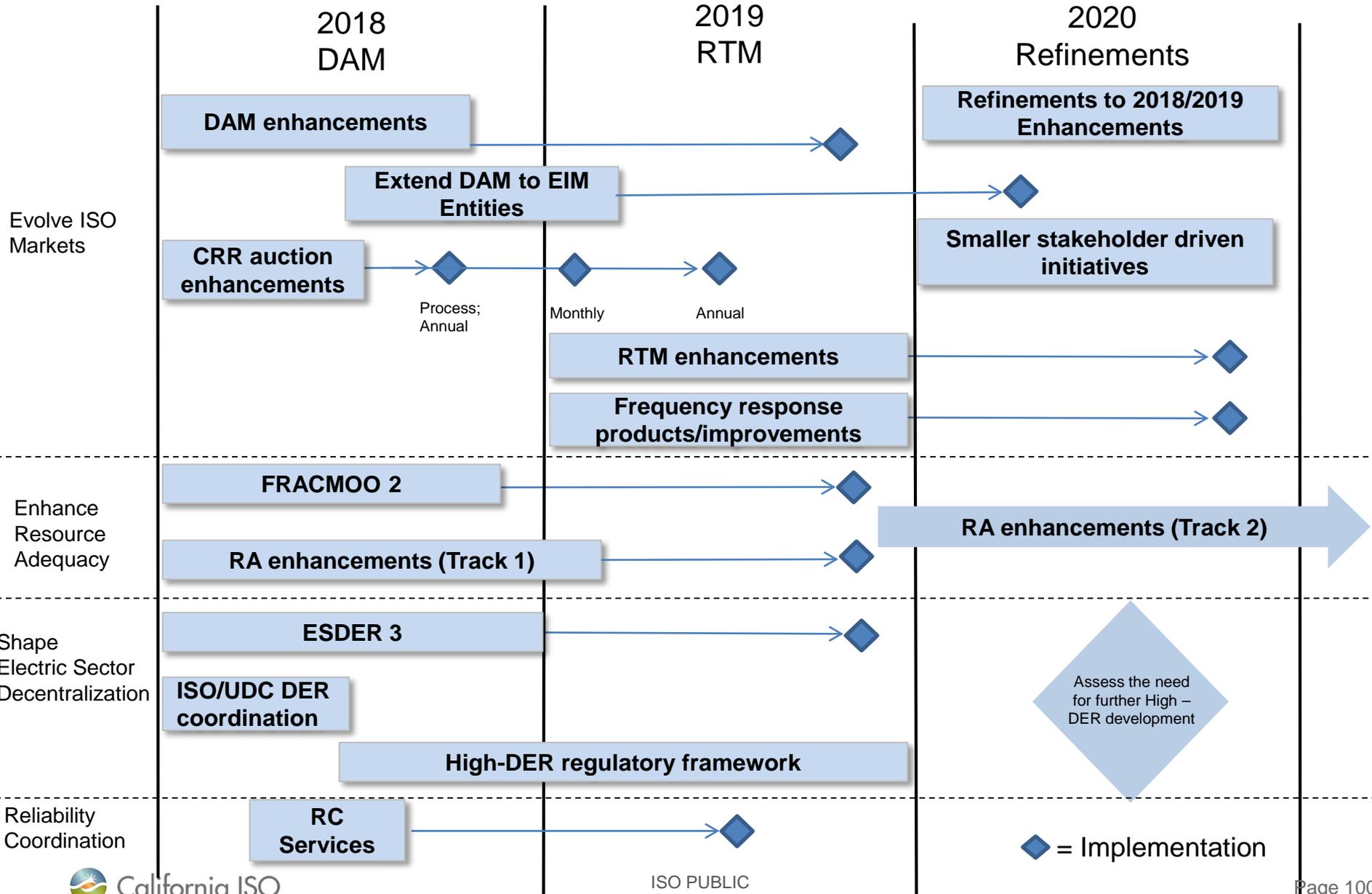
Brad Cooper

Manager, Market Design Policy

John Goodin

Manager, Infrastructure & Regulatory Policy

Three-year Policy Roadmap of Major New Initiatives



Ongoing policy stakeholder initiatives

- Imbalance conformance enhancements
 - EIM Governing Body advisory role
 - April 2018 EIM Governing Body meeting
 - May 2018 CAISO Board meeting

- Congestion revenue right auction efficiency
 - Track 1A filed with FERC on April 11
 - Track 1B straw proposal posted on April 18
 - June 2018 CAISO Board Meeting for Track 1B proposal
 - Track 2 schedule TBD

Ongoing policy stakeholder initiatives (continued)

- Clarification of tariff rules regarding following DOT
 - Draft tariff language posted March 2018
 - EIM Governing Body and ISO Board of Governors briefings, date TBD

- Day ahead market enhancements
 - EIM Governing Body hybrid approval role
 - Posted straw proposal on April 11
 - August EIM Governing Body and September ISO Board meetings

Ongoing policy stakeholder initiatives (continued)

- EIM greenhouse gas attribution enhancements
 - EIM Governing Body primary approval role
 - Third revised draft final proposal to be posted April 25
 - June EIM Governing Body meeting
- Review Transmission Access Charge (TAC) structure
 - Stakeholder meeting held April 11 to discuss straw proposal
 - Post Draft Final Proposal June 2018
 - CAISO Board Meeting Q3 2018 (tentative)

Ongoing policy stakeholder initiatives (continued)

- Flexible Resource Adequacy Criteria and Must-Offer Obligation (Phase 2)
 - Aligning with DA market Enhancements- Imbalance Reserve
 - Post second revised draft flexible capacity framework on April 26
 - May 3rd stakeholder meeting to discuss second revised flexible capacity framework
 - Draft final flexible capacity framework submitted into CPUC's RA proceeding
 - CAISO Board meeting Q4 2018 (tentative)

Ongoing policy stakeholder initiatives (continued)

- Energy Storage and Distributed Energy Resources (ESDER) (Phase 3)
 - EIM Governing Body advisory role
 - Revised Straw Proposal by end of April followed by stakeholder call approximately one week later
 - June 2018 Draft Final Proposal
 - August 2018 EIM Governing Body Meeting
 - September 2018 CAISO Board Meeting

Ongoing policy stakeholder initiatives (continued)

- Review of RMR and CPM
 - May 2018 CAISO Board meeting to approve phase 1 items
 - Tentative Phase 2 schedule:
 - May 30 working group meeting
 - June 26 post straw proposal
 - July 11 hold stakeholder meeting
- Storage as a Transmission Facility (SATA)
 - April 6 held stakeholder call on issue paper
 - April 20 Stakeholder comments due on Issue Paper
 - Post straw proposal in early May
 - November 2018 CAISO Board meeting

Upcoming policy stakeholder initiatives

- Intertie Deviation Settlement
 - Issue paper to be posted May 2018
 - September 2018 CAISO Board Meeting
- EIM Offer Rules
 - Workshop on April 30
 - Final schedule TBD

Release Plan Update

Adrian Chiosea

Manager, Strategic Initiative Management

Janet Morris

Director, Program Office

The ISO offers innovative training programs

| Date | Training <small>All classes are offered at our Folsom, CA campus unless noted otherwise</small> |
|----------|--|
| April 19 | Welcome to the ISO (recorded webinar to be posted) |
| May 8-9 | Get to Know the ISO |
| May 10 | Settlements 101 |
| May 11 | Settlements 201 |



The ISO's External Training & Readiness team provides quality training and readiness programs that successfully prepare Stakeholders to effectively engage with the ISO

| New Release Training materials currently posted |
|--|
| Resource Interconnection Management System Generation Module |
| Scheduling Infrastructure Business Rules (SIBR) User Interface (UI) Update |
| RSI: Outage Substitution and RAAIM Pre-Calc |
| Energy Imbalance Market Winter Release 2017 |
| Reliability Services Initiative (RSI) Training Phase 1B & 2 |

Visit our **Learning Center** web page to access our training calendar, register for courses and find other useful resources, including computer based training courses, recorded webinars and new release training materials at:

<http://www.caiso.com/participate/Pages/LearningCenter/default.aspx>

Contact us: CustomerTraining@caiso.com

Release Plan Summary: 2018

Independent 2018

- Resource Interconnection Management System (RIMS) Functional Enhancements
- Deactivation of Transport Layer Security (TLS) 1.0 & 1.1
- Commitment Cost Enhancement (CCE) Phase 3

Spring 2018

- Resource Adequacy Availability Incentive Mechanism (RAAIM) Calculation Modifications
- Reliability Services Initiative (RSI) 2017
- Scheduling Infrastructure and Business Rules (SIBR) User Interface (UI) Upgrade

Fall 2018

- Green House Gas (GHG) Enhancements for EIM
- Contingency Modeling Enhancements - Transmissions
- Commitment Costs and Default Energy Bid Enhancements (CCDEBE)
- Settlements Performance Improvements
- Energy Storage and Distributed Energy Resources (ESDER) Phase 2
- Generator Contingency and Remedial Action Scheme (RAS) Modeling
- Automated Dispatch System (ADS) User Interface (UI) Replacement
- Congestion Revenue Right (CRR) Auction Efficiency 1A
- **EIM 2018 Enhancements**

Release Plan Summary: Spring 2019 – Spring 2020

Spring 2019

- Energy Imbalance Market (EIM) 2019 Balancing Authority of Northern California (BANC) / Sacramento Municipal Utility District (SMUD)

Fall 2019 – tentative, subject to impact assessment

- Day-Ahead Market Enhancements
- Flexible Resource Adequacy Criteria and Must-offer Obligation (FRACMOO) Phase 2
- Energy Storage and Distributed Energy Resources (ESDER) Phase 3
- Review of Transmission Access Charge (TAC) Billing Structure

Spring 2020

- Energy Imbalance Market (EIM) 2020 Salt River Project
- Energy Imbalance Market (EIM) 2020 Seattle City Light
- Energy Imbalance Market (EIM) 2020 Los Angeles Dept. of Water and Power

TBD – tentative, subject to impact assessment

- Imbalance Conformance Enhancements (ICE)
- Intertie Deviation Settlement
- Variable Energy Resource Dispatch Operating Point (VER DOT)
- Review of Reliability Must Run and Capacity Procurement Mechanism
- EIM Offer Rules
- Storage as a Transmission Asset
- RA Enhancements (Track 1 and Track 2)
- **Capacity Procurement Mechanism (CPM) – Risk-of-Retirement**

Release Schedule - 2018

Date of Data Refresh: 4/5/18 4:23 PM



| Legend | |
|-------------------|------------|
| Market Simulation | Orange |
| CA ISO Holiday | Light Blue |
| Deployment Week | Dark Blue |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------|------------------|-------------------|-------------------|------------------|------------------|-------------------|-------------------|------------------|------------------|-------------------|-------------------|------------------|-----------------|------------------|-------------------|-------------------|------------------|------------------|-------------------|-------------------|------------------|-----------------|-------------------|-------------------|-------------------|-------------------|--------------------|---------------------|---------------------|-------------------|------------------|-------------------|
| 4/2/18 - 4/8/18 | 4/9/18 - 4/15/18 | 4/16/18 - 4/22/18 | 4/23/18 - 4/29/18 | 4/30/18 - 5/6/18 | 5/7/18 - 5/13/18 | 5/14/18 - 5/20/18 | 5/21/18 - 5/27/18 | 5/28/18 - 6/3/18 | 6/4/18 - 6/10/18 | 6/11/18 - 6/17/18 | 6/18/18 - 6/24/18 | 6/25/18 - 7/1/18 | 7/2/18 - 7/8/18 | 7/9/18 - 7/15/18 | 7/16/18 - 7/22/18 | 7/23/18 - 7/29/18 | 7/30/18 - 8/5/18 | 8/6/18 - 8/12/18 | 8/13/18 - 8/19/18 | 8/20/18 - 8/26/18 | 8/27/18 - 9/2/18 | 9/3/18 - 9/9/18 | 9/10/18 - 9/16/18 | 9/17/18 - 9/23/18 | 9/24/18 - 9/30/18 | 10/1/18 - 10/7/18 | 10/8/18 - 10/14/18 | 10/15/18 - 10/21/18 | 10/22/18 - 10/28/18 | 10/29/18 - 1/4/18 | 1/5/18 - 1/11/18 | 1/12/18 - 1/18/18 |
|-----------------|------------------|-------------------|-------------------|------------------|------------------|-------------------|-------------------|------------------|------------------|-------------------|-------------------|------------------|-----------------|------------------|-------------------|-------------------|------------------|------------------|-------------------|-------------------|------------------|-----------------|-------------------|-------------------|-------------------|-------------------|--------------------|---------------------|---------------------|-------------------|------------------|-------------------|

Map Stage Environment Window

| | |
|--|--|
| SIBR WebSDK Upgrade | SIBR WebSDK Upgrade (02/16-04/27) |
| SIBR WebSDK Upgrade - Market Sim | SIBR WebSDK Upgrade - Market Sim (02/27-04/27) |
| TLS Deactivation | TLS Deactivation (02/26-04/23) |
| CCE 3 | CCE 3 (03/26-04/27) |
| CCE3: March Master File Market Simulation Testing - Market Sim | CCE3: March Master File Market Simulation Testing - Market Sim (03/26-04/13) |
| FNM Promotion 2018Q2 | FNM Promotion 2018Q2 (06/20-06/21) |
| Contingency Modeling Enhancements | Contingency Modeling Enhancements (07/17-08/31) |
| Contingency Modeling Enhancements - Market Sim | Contingency Modeling Enhancements - Market Sim (07/17-08/31) |
| Generator Contingency and RAS Modeling | Generator Contingency and RAS Modeling (07/17-08/27) |
| Generator Contingency and RAS Modeling - Market Sim | Generator Contingency and RAS Modeling - Market Sim (07/17-08/27) |
| ADS Replacement | ADS Replacement (07/17-08/31) |
| ADS Replacement - Market Sim | ADS Replacement - Market Sim (07/17-08/31) |
| Settlements Performance Improvements | Settlements Performance Improvements (07/17-08/31) |
| Settlements Performance Improvements - Market Sim | Settlements Performance Improvements - Market Sim (07/17-08/31) |
| CPM Risk-of-Retirement Process Enhancements | CPM Risk-of-Retirement Process Enhancements (07/17-08/31) |
| CPM Risk-of-Retirement Process Enhancements - Market Sim | CPM Risk-of-Retirement Process Enhancements - Market Sim (07/17-08/31) |
| ESDER Phase 2 | ESDER Phase 2 (07/16-08/31) |
| ESDER Phase 2 - Market Sim | ESDER Phase 2 - Market Sim (07/17-08/31) |
| CRR Auction Efficiency | CRR Auction Efficiency (07/17-08/31) |
| CRR Auction Efficiency - Market Sim | CRR Auction Efficiency - Market Sim (07/17-08/31) |
| EIM Enhancements 2018 | EIM Enhancements 2018 (07/17-08/31) |
| EIM Enhancements 2018 - Market Sim | EIM Enhancements 2018 - Market Sim (07/17-08/31) |
| CCDBE | CCDBE (07/17-08/31) |
| CCDBE - Market Sim | CCDBE - Market Sim (07/17-08/31) |
| CCE 3 | CCE 3 (08/30-10/04) |
| CCE3: September Full Market Simulation - Market Sim | CCE3: September Full Market Simulation - Market Sim (08/30-10/04) |
| FNM Promotion 2018Q3 | FNM Promotion 2018Q3 (09/19-09/20) |

Parallel PROD Environment Window

| | |
|-------------------|---------------------------------|
| EIM - Idaho Power | EIM - Idaho Power (01/03-04/16) |
| EIM - Powerex | EIM - Powerex (01/03-04/06) |

PROD Environment Window

| | |
|---|---|
| TLS Deactivation | TLS Deactivation (04/23-04/23) |
| Back-end and ECIC UI drop | Back-end and ECIC UI drop (04/26-04/27) |
| RIMS 5 -Gen/Trans/QM | RIMS 5 -Gen/Trans/QM (04/30-04/30) |
| SIBR WebSDK Upgrade | SIBR WebSDK Upgrade (05/01-05/01) |
| FNM Promotion 2018Q2 | FNM Promotion 2018Q2 (05/22-05/24) |
| RAAIM Implementation Update | RAAIM Implementation Update (06/01-06/01) |
| FNM Promotion 2018Q3 | FNM Promotion 2018Q3 (08/21-08/23) |
| ADS Replacement | ADS Replacement (08/31-08/31) |
| Contingency Modeling Enhancements | Contingency Modeling Enhancements (10/01-10/01) |
| Black Start 2 - Settlements Implementation | Black Start 2 - Settlements Implementation (10/01-10/01) |
| CPM Risk-of-Retirement Process Enhancements | CPM Risk-of-Retirement Process Enhancements (10/01-10/01) |
| Green House Gas Enhancements for EIM | Green House Gas Enhancements for EIM (10/01-10/01) |
| Master File GRDT Clarifications | Master File GRDT Clarifications (10/01-10/01) |
| Discontinue Min/Worst Ramp Rate | Discontinue Min/Worst Ramp Rate (10/01-10/01) |
| EIM Enhancements 2018 | EIM Enhancements 2018 (10/01-10/01) |
| Generator Contingency and RAS Modeling | Generator Contingency and RAS Modeling (10/01-10/01) |
| Settlements Performance Improvements | Settlements Performance Improvements (10/01-10/01) |
| ESDER Phase 2 | ESDER Phase 2 (10/01-10/01) |
| CCDEBE | CCDEBE (10/01-10/01) |
| CRR Auction Efficiency | CRR Auction Efficiency (10/01-10/01) |
| CCE 3 | CCE 3 (11/01-11/01) |
| Black Start 2 - First Settlements Cycle | Black Start 2 - First Settlements Cycle (12/03-12/03) |

<http://www.caiso.com/Documents/ReleaseSchedule.pdf>



ISO PUBLIC

UI and API Changes

Product View - CMRI UI and API changes

| Release | Project | Change Type | External Impact | MP Action | UI Change | Service Name & Major Version | Minor Version | MAP Stage | Production Activation | Artifacts Package | Tech Spec Version |
|-------------|-------------|-------------|--------------------|------------------|--|--|---------------|----------------|-----------------------|-------------------------------|-----------------------|
| 2017 | Enhancement | New | CAISO Market | Adopt when ready | Tab: Post-Market New Report: Regulation Pay for Performance | N/A | N/A | 2/23/2018 | 4/4/2018 | N/A | N/A |
| Winter 2017 | EIM 2017 | New | CAISO & EIM Market | Adopt when ready | Tab: EIM New Report: Resource Ramp Capacity | retrieveResourceRampCapacity_v1 retrieveResourceRampCapacity_v1_DocAttach | 20180201 | 2/23/2018 | 4/1/2018 | v1.0 (Winter) (released 11/6) | 3.7.0 (released 11/6) |
| Fall 2018 | CCE3 | New | CAISO Market | Adopt when ready | Tab: Default Bids New Report: Actual Limitation Values | retrieveActualLimitationValues_v1 retrieveActualLimitationValues_v1_DocAttach | 20171001 | September 2018 | 11/1/2018 | v1.0 (Fall) | 3.6.3 |
| Fall 2018 | CCE3 | New | CAISO Market | Adopt when ready | Tab: Default Bids New Report: Resource Opportunity Costs | retrieveResourceOpportunityCost_v1 retrieveResourceOpportunityCost_v1_DocAttach | 20171001 | September 2018 | 11/1/2018 | v1.0 (Fall) | 3.6.3 |

Application access: <http://www.caiso.com/participate/Pages/ApplicationAccess/Default.aspx>

CAISO new developer site: <https://developer.caiso.com>

Product View - OASIS UI and API changes

| Release | Project | Change Type | External Impact | MP Action | UI Change | Web Service | MAP Stage | Production Activation | Artifacts Package | Tech Spec Version |
|-------------|----------|-------------|--------------------|------------------|--|-------------------|-----------|-----------------------|-------------------|-------------------|
| Winter 2017 | EIM 2017 | New | CAISO & EIM Market | Adopt when ready | Tab: Prices New Report: Hourly RTM LAP Prices | PRC_RTM_LAP | 1/19/2018 | 4/1/2018 | V1.2 | 5.1.1 |
| Winter 2017 | RSI | New | CAISO Market | Adopt when ready | Tab: Public Bids New Report: CSP Offer | PUB_CSP_OFFER_SET | 12/5/2017 | 5/1/2018 | V1.2 | 5.1.1 |

Application access: <http://www.aiso.com/participate/Pages/ApplicationAccess/Default.aspx>

CAISO new developer site: <https://developer.aiso.com>

Product View - Master File changes

| Release | Project | Change Type | External Impact | MP Action | UI Change | Web Service | Major Version | Minor Version | MAP Stage | Product on Activation | Artifacts Package | Tech Spec Version |
|-------------|----------------|-------------|--------------------|------------------------------------|-----------------------------------|----------------------|---------------|---------------|------------|-----------------------|-------------------|-------------------|
| Winter 2017 | EIM 2017 | Modify | EIM Market | Required for Generic NGR | N/A | retrieveGeneratorRDT | 4 | 20180201 | 12/1/2017 | 4/4/2018 | v4.0.1 | V3.6 |
| Winter 2017 | EIM 2017 | Modify | EIM Market | Required for Generic NGR | N/A | submitGeneratorRDT | 4 | 20180201 | 12/1/2017 | 4/4/2018 | v4.0.1 | V3.6 |
| Spring 2018 | BRE-B CCE3 RSI | Modify | CAISO & EIM Market | Required to provide CCE3 values | | retrieveGeneratorRDT | 4 | 20180501 | March 2018 | 5/1/2018 | v4.1.2 | V4.1.1 |
| Spring 2018 | BRE-B CCE3 RSI | Modify | CAISO & EIM Market | Required to provide CCE3 values | | submitGeneratorRDT | 4 | 20180501 | March 2018 | 5/1/2018 | V4.1.2 | V4.1.1 |
| Spring 2018 | CCE3 | Modify | CAISO Market | Required for ULPDT at Config Level | Upload Tab: ULPDT similar to RDT | N/A | N/A | N/A | March 2018 | 5/1/2018 | N/A | N/A |
| Spring 2018 | CCE3 | Modify | CAISO Market | Required for ULPDT at Config Level | Reports Tab: ULPDT similar to RDT | N/A | N/A | N/A | March 2018 | 5/1/2018 | N/A | N/A |

Application access: <http://www.caiso.com/participate/Pages/ApplicationAccess/Default.aspx>

CAISO new developer site: <https://developer.caiso.com>

Master File Updates & Clarifications

Winter Release includes a new Fuel Type enumeration (GNRC) to identify generic NGRs

- There will be no structural changes to the RDT
 - GRDT spreadsheet version 11 will continue to be the production version
- An updated Tech Spec will be posted by 10/10
 - The Tech Spec will only be updated to include the new Fuel Type enumeration.

Spring Release of MF GRDT includes CCE3, BREB, and RSI attributes

- GRDT version 12 and Tech Spec 4.1.1 have been posted since June
- The Spring RDT and Tech Spec was updated in December to include recent changes (e.g. ICE Hub)
- GRDT Highlights (Following slide has the time lines)
 - RESOURCE tab – Add Electric Region (R/O), Market Max Daily Starts (R/W), COM MW (R/O), Power Price Hub (R/O)
 - Ramp Tabs (Resource & Configuration : Operational, Regulation, and Op Reserve) – Add Market Ramp Rate (R/W); ~~discontinue supporting Min/Worst Ramp Rate (submitted values will be ignored)~~
 - CONFIGURATION tab – Add Implied Starts (previously documented as CT Starts) (R/W)
 - TRANSITION tab – Add Market Max Daily Transitions (R/W), Implied Starts (R/O)
- ULPDT Highlights
 - Add Configuration ID
 - ULPDT will be loaded via Batch Process with automated Batch Status notification
 - Compare Report available
 - Validation Rules will continue to appear on UI, not in a separate Validation Report

Master File GRDT Clarifications

| | Active in Master File | Active in Market |
|--|--|------------------------|
| Electric Region | Fall 2017 (BREB) | Fall 2017 |
| COM MW | Fall 2017 (RSI) | Fall 2017 |
| Market Max Daily Starts | Spring 2018 SC may update value via the GRDT/Master File UI, but no market impact until Fall 2018 | Fall 2018 |
| Power Price Hub | Spring 2018 CAISO will populate | Fall 2018 |
| Market Ramp Rate (Operational, Operating Reserve, Regulation) | Spring 2018 SC may update value via the GRDT/Master File UI, but no market impact until Fall 2018 | Fall 2018 |
| Min/Worst Ramp Rate to be discontinued | Values remain active in market until Fall 2018 | Discontinued Fall 2018 |
| Configuration: Implied Starts | Spring 2018 SC may update value via the GRDT/Master File UI, but no market impact until Fall 2018 | Fall 2018 |
| Transition: Market Max Transitions | Spring 2018 SC may update value via the GRDT/Master File UI, but no market impact until Fall 2018 | Fall 2018 |
| Transition: Implied Starts | Spring 2018 Value is derived from Configuration Implied Starts. No market impact until Fall 2018 | Fall 2018 |

2018 Independent Projects

2018 – RIMS 5 Functional Enhancements

| Project Info | | Details/Date | Status |
|-------------------------------|---|--|--------|
| Application Software Changes | | Functional enhancements resulting from the Customer Partnership Group CPG. More details to be provided in the future. | |
| BPM Changes | | Generator Interconnection and Deliverability Allocation Procedures Generator Interconnection Procedures Managing Full Network Model Metering Generator Management Transmission Planning Process | |
| Customer Partnership Group | | 10/16/15 | ✓ |
| Application and Study Webinar | | 3/31/16 | ✓ |
| Milestone Type | Milestone Name | Dates | Status |
| Board Approval | Board approval not required | N/A | |
| External BRS | External BRS not Required | N/A | |
| Tariff | No Tariff Required | N/A | |
| Config Guides | Configuration Guides not required | N/A | |
| BPMs | Generator Interconnection and Delivery Allocation | Apr 29, 2016 | ✓ |
| Tech Spec | No Tech Specifications Required | N/A | |
| Training | Train the PTOs | Feb 13, 2018 | ✓ |
| | WebEx Training on Generation Module | Apr 18, 2018 | |
| Production Activation | RIMS5 | Apr 30, 2018 | |
| | RIMS5 App & Study | Mar 21, 2016 | ✓ |

2018 – Deactivation of TLS 1.0 & 1.1

| Info | Details/Date |
|----------------------|---|
| Summary | The California ISO will deactivate Transport Layer Security (TLS) 1.0 and 1.1 in the market and performance (MAP) stage environment on February 20, 2018 , in the production environment on April 23, 2018 , and only TLS 1.2 will remain active. It is necessary for market participants to enable TLS 1.2 as soon as possible in browsers and APIs. |
| Details | <p>It is necessary for market participants to enable TLS 1.2 in browsers and application programming interfaces (APIs) as soon as possible in order to continue to access the MAP stage environment from February 20, 2018 onwards, and to continue to access the production environment from April 23 onwards, as only TLS 1.2 will remain active. Market participants can enable TLS 1.2 immediately; the MAP stage and production environments currently allow TLS 1.2. Note: There is no need to <i>disable</i> TLS 1.0 and 1.1 in browsers and APIs because the versions are backward compatible.</p> <p>Once TLS 1.0 and 1.1 are deactivated in the MAP stage environment, the ISO encourages market participants to confirm successful connectivity to the MAP stage portal, portal application's user interfaces (UIs) and APIs prior to the production environment deactivation, which will be the same on April 23, 2018. The deactivation of TLS 1.0 and 1.1 is in order to align with industry best practices for security and data integrity.</p> <p>The <i>Systems Access Information for Market Participants</i> document contains the information to access the MAP stage and production environments. This document is available on the ISO website at http://www.caiso.com/Documents/SystemAccessInformation_MarketParticipants.pdf.</p> <p>Note: Automated Dispatch System (ADS) users on versions older than 6.1.0.0 will need to upgrade to the current version, as older versions are not compatible with TLS 1.2. Update the ADS client through the production Market Participant Portal (MPP) installation package download at https://mpp.caiso.com/ads_install. Find more information and the mandatory ADS upgrade market notice announcement here.</p> <p>This market notice reflects the updated deactivation dates from the previous market notice announcement.</p> |
| Market Notice | http://www.caiso.com/Documents/UpdateDeactivation-TransportLayerSecurityTLS10_11.html |

| Milestone Type | Milestone Name | Dates | Status |
|----------------|--|--------------|--------|
| MAP-Stage | Deactivate TLS 1.0 & 1.1 in MAP-Stage | Feb 26, 2018 | |
| Production | Deactivate TLS 1.0 & 1.1 in Production | Apr 23, 2018 | |

2018 - Commitment Cost Enhancements Phase 3

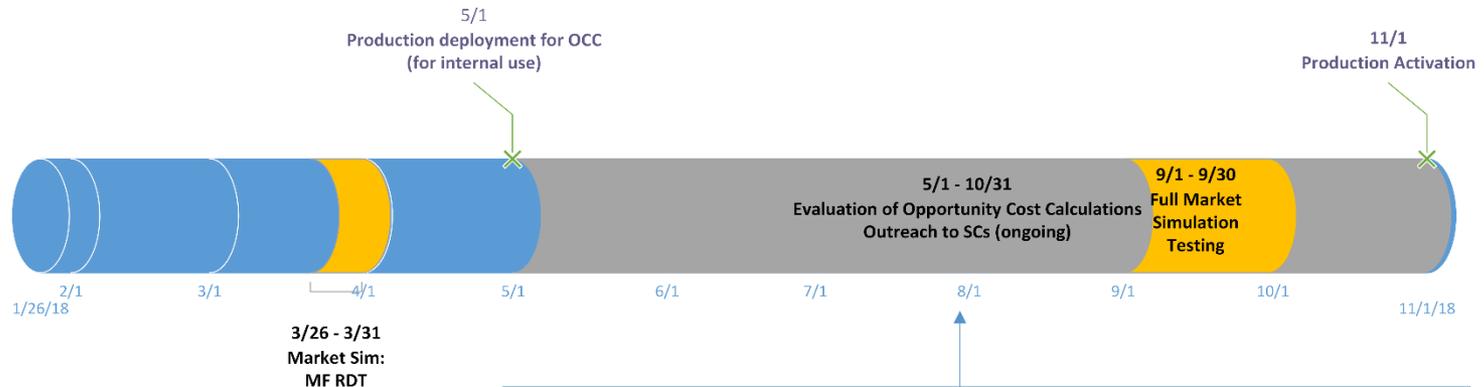
| Project Info | Details/Date |
|------------------------------|---|
| Application Software Changes | <p>Scope:</p> <ol style="list-style-type: none"> 1. Clarify use-limited registration process and documentation to determine opportunity costs 2. Determine if the ISO can calculate opportunity costs <ul style="list-style-type: none"> • ISO calculated; Modeled limitation Start/run hour/energy output • Market Participant calculated; Negotiated limitation 3. Clarify definition of “use-limited”; <i>add MSG Configuration ID to ULPDT</i> 4. Change Nature of Work attributes (Outage cards) <ul style="list-style-type: none"> • Modify use-limited reached for RAAIM Treatment • Allow PDR to submit use-limit outage card for fatigue break. 5. Market Characteristics (<i>to be added to GRDT</i>) <ul style="list-style-type: none"> • Maximum Daily Starts • Maximum MSG transitions • Ramp rates <p>Impacted Systems:</p> <ol style="list-style-type: none"> 1. Master File: Set use-limited resource types and limits; Set market-based values 2. ECIC: Process use limited resource input values for and Receive opportunity cost adders from opportunity cost tool 3. CIRA: RAAIM exempt rule for “use-limited reached” 4. CMRI: Publish opportunity cost 5. IFM/RTN: Use market-based values MDS, MDMT and RR 6. SIBR: Add Opportunity cost adders on bid caps, remove daily bid RR 7. OMS: “Use-Limited Reached” nature of work attribute for Generation Outage Card 8. Settlements: Publish the actual start up, run hour and energy output for the use-limited resources 9. Opportunity cost calculator (OCC): Calculate and publish opportunity costs for start-up, MLC and DEB |
| BPM Changes | Market Instruments, Outage Management, Reliability Requirement, Market Operations |
| Business Process Changes | <ul style="list-style-type: none"> • Manage Market & Reliability Data & Modeling • Manage Markets & Grid |

2018 - Commitment Cost Enhancements Phase 3 (cont.)

| Milestone Type | Milestone Name | Dates | Status |
|-----------------------|---|-----------------------------|--------|
| Board Approval | Board of Governors (BOG) Approval | Mar 25, 2016 | ✓ |
| External BRS | Post Updated External BRS | Aug 21, 2017 | ✓ |
| Tech Spec | Publish Updated Technical Specifications | Nov 30, 2017 | ✓ |
| Tariff | File Tariff | Mar 23, 2018 | ✓ |
| Config Guides | Config Guide | May 17, 2018 | |
| BPMs | Post Draft BPM changes | Aug 17, 2018 | |
| External Training | Deliver External Training | Aug 31, 2018 | |
| Market Simulation | March Master File Market Simulation Testing | Mar 26, 2018 - Apr 13, 2018 | |
| | September Full Market Simulation | Aug 30, 2018 - Oct 04, 2018 | |
| Production Activation | Deploy to Production | Nov 01, 2018 | |

2018 - Commitment Cost Enhancements Phase 3 (cont.)

CCE3: Project Timeline, Deployment Dates, Major Milestones



Discovery/Evaluation Timeframe: Expectations

- New process to be defined; primarily an internal CAISO effort
- CAISO will identify resources impacted, type of constraints they have, and what time of eligibility period they will declare (monthly, annual, rolling)
- CAISO will then identify the formulation for calculation of opportunity costs (i.e. types of constraints that fit into model)
- CAISO can then validate the type of constraint declared and how constraints are translated into any of the three defined model constraints in the system
- CAISO will also be able to separate the resources that go into formula-based calculation versus resources that fall into negotiated opportunity costs.
 - For the negotiated option, CAISO will identify how to determine negotiated opportunity costs, which will be tailored to each resource.
- Planning for simulation of OCC in September, including integration of the OCC so that MPs can see adders flowing into SIBR and available in CMRI.
- Prior to November 1st, data will not be flowing downstream (publication explicitly blocked). During this period CAISO will interact with each MP depending on the specifics of their resources. This will be tracked via CIDI tickets.

2018 Spring Release

Spring 2018 – RAIM Calculation Modifications

| Project Info | Details/Date |
|------------------------------|---|
| Application Software Changes | <p>RAAIM (Resource Adequacy Availability Incentive Mechanism) – California ISO intends to release a new RAIM Calculation Modifications within the Settlements system.</p> <p>The fix properly weights flexible capacity for both relative (in percent) and absolute (in MW) availability, as compared to generic capacity in a resource's total availability.</p> <p>For Configuration Guides, please refer to CG PC RA Availability Incentive Mechanism v5.4, CC 8830 v5.2, and CC 8831 v5.1.</p> |

| Milestone Type | Milestone Name | Dates | Status |
|---------------------------|---|----------------------|--------|
| Configuration Guide | Draft Technical Documents (Draft Settlements BPM) | Nov 8, 2017 | ✓ |
| Configuration Output File | Draft Configuration Output File (updated version will be provided prior to Market Sim) | Nov 22, 2017 | ✓ |
| BPMs | Post BPM Changes - Settlements & Billing | Feb 7, 2018 | ✓ |
| External Validation | New calculation will be deployed into Production as advisory beginning 5/1/2018 | May 1, 2018 | |
| Market Sim | Market Simulation (Additional trade date 3/7 and 3/8 Includes mini-monthly) | Jan 16 – Mar 8, 2018 | ✓ |
| Production Deployment | Implement and deploy into Production revised charge codes per Winter release deployment plan. | May 1 – Jun 30, 2018 | |
| Production Activation | Revised RAIM penalties and incentives become financially binding on 7/1/2018 going forward. | July 1, 2018 | |

Spring 2018 - Reliability Services Initiative 2017

| Project Info | Details/Date |
|--|---|
| <p>Application Software Changes</p> | <p><u>Scope:</u> Redesign of Replacement Rule for System RA and Monthly RA Process.</p> <ul style="list-style-type: none"> • RA Process and Outage Rules for implementation for 2017 RA year. • CSP Offer Publication (RSI 1A scope) • Local and system RA capacity designation • RA showing requirements for small load serving entities (LSEs) • RA showing tracking and notification <p><u>Impacted Systems:</u></p> <ul style="list-style-type: none"> • OASIS • Settlements • CIRA <p>CIRA:</p> <ul style="list-style-type: none"> • Modifications to the RA and Supply Plan to show breakdown of local and system. Validation rules need to be updated. • Update planned/forced outage substitution rules • Allow market participants to select how much system/local MWs to substitute. • Modification of UI screens to accommodate system/local MW split. • Enhance system to allow exemption from submission of RA Plans for LSE that have a RA obligation < 1 MW for a given capacity product. <p>Settlements:</p> <ul style="list-style-type: none"> • Splitting local from system in upstream RA system impacts the RAIM Pre calculation. |
| <p>BPM Changes</p> | <ul style="list-style-type: none"> • Reliability Requirements: Changes to the monthly RA process • Settlements and Billing |
| <p>Business Process Changes</p> | <p>Manage Market & Reliability Data & Modeling</p> <ul style="list-style-type: none"> • Manage Monthly & Intra-Monthly Reliability Requirements • Manage Yearly Reliability Requirements |

Spring 2018 - Reliability Services Initiative 2017

| Milestone Type | Milestone Name | Dates | Status |
|-----------------------|---|-----------------------------|--------|
| Board Approval | Board Approval | May 12, 2015 | ✓ |
| External BRS | Post Updated External BRS v1.1 (RSI 2) | Apr 07, 2017 | ✓ |
| | Post RSI 2017 External BRS v2.0 | Apr 19, 2017 | ✓ |
| | Post Updated External BRS v1.3 (RSI 1B) | Mar 03, 2017 | ✓ |
| Tariff | File Tariff | Sep 29, 2017 | ✓ |
| | Receive FERC order | Jan 18, 2018 | ✓ |
| | Receive FERC Approval tor Delay/Waiver | Mar 01, 2018 | ✓ |
| | Waiver Filing to Delay Implementation | Feb 14, 2018 | ✓ |
| Config Guides | Config Guide | Jun 23, 2017 | ✓ |
| BPMs | Post Draft BPM Changes - Reliability Requirements | Dec 05, 2017 | ✓ |
| | Post Draft BPM Changes - Settlements & Billing | Aug 30, 2017 | ✓ |
| | Post Final BPM - Settlements & Billing | Feb 07, 2018 | ✓ |
| | Post Final BPM - Reliability Requirements | Apr 20, 2018 | |
| Tech Spec | Publish Technical Specifications | Apr 03, 2017 | ✓ |
| Training | External Training - Session 1 | Jan 10, 2018 | ✓ |
| | External Training - Session 2 | Jan 17, 2018 | ✓ |
| Market Sim | Market Simulation | Dec 05, 2017 - Jan 31, 2018 | ✓ |
| Production Deployment | Production Deployment | Mar 05, 2018 | ✓ |
| Production Activation | Production Activation | May 01, 2018 | |

Spring 2018 – SIBR UI Upgrade

| Project Info | Details/Date |
|------------------------------|--|
| Application Software Changes | <p>SIBR – The CASIO will be upgrading the underlying SDK platform utilized for displaying the user interface. This latest SDK version will strengthen the security of the SIBR application and will improve compatibility with the latest version of Internet Explorer.</p> <p>It is anticipated no functional changes or API will be impacted by this upgrade.</p> |

| Milestone Type | Milestone Name | Dates | Status |
|-----------------------|---|-----------------------------|--------|
| Board Approval | Board Approval | N/A | |
| External BRS | Post Draft BRS | N/A | |
| Config Guides | Configuration Guide | N/A | |
| BPMs | Publish Final Business Practice Manuals | N/A | |
| Tech Spec | Publish Tech Specs | N/A | |
| Training | Conduct External Training | Feb 21, 2018 | ✓ |
| User Guide | SIBR User Guide “Draft” | Dec 14, 2017 | ✓ |
| Market Sim | Market Sim Window | Feb 27, 2018 – May 11, 2018 | |
| Production Activation | SIBR WebSDK Upgrade | May 15, 2018 | |

2018 Fall Release

Fall 2018 Release – Overview

| | Board Approval | External BRS | Config Guide | Tech Spec | Tariff | Draft BPMs | External Training | Market Sim | Activation |
|--|-----------------|-----------------------|-----------------|-----------------|-----------------|-----------------|-------------------|------------------------------------|-----------------|
| Fall 2018 Release - Overview | 01/01/18 | 04/06/18 | 05/18/18 | 05/18/18 | 06/15/18 | 07/02/18 | 07/13/18 | Jul 17, 2018 - Aug 31, 2018 | 10/01/18 |
| Green House Gas Enhancements for EIM | 12/14/17 | TBD | TBD | TBD | TBD | TBD | TBD | TBD | 10/01/18 |
| Contingency Modeling Enhancements | 12/14/17 | 04/27/18 | TBD | TBD | 06/15/18 | TBD | 07/13/18 | Jul 17, 2018 - Aug 31, 2018 | 10/01/18 |
| CCDEBE | 03/22/18 | 04/27/18 ¹ | 05/18/18 | 05/18/18 | TBD | TBD | TBD | Jul 17, 2018 - Aug 31, 2018 | 10/01/18 |
| Settlements Performance Improvements | N/A | 02/20/18 | N/A | N/A | N/A | N/A | TBD | Jul 17, 2018 - Aug 31, 2018 | 10/01/18 |
| ESDER Phase 2 | 07/26/17 | 03/01/18 | 05/18/18 | 04/26/18 | 04/09/18 | 6/4/2018 | 07/11/18 | Jul 17, 2018 - Aug 31, 2018 | 10/01/18 |
| Generator Contingency and RAS Modeling | 09/19/17 | 03/16/18 | TBD | N/A | 05/25/18 | 6/12/2018 | TBD | Jul 17, 2018 - Aug 27, 2018 | 10/01/18 |
| ADS Replacement | N/A | 05/02/18 | N/A | TBD | N/A | TBD | TBD | Jul 17, 2018 - Aug 31, 2018 | 10/01/18 |
| CRR Auction Efficiency | 03/22/18 | 04/26/18 | TBD | TBD | 04/09/18 | 5/25/2018 | TBD | Jul 17, 2018 - Aug 31, 2018 | 10/01/18 |
| EIM Enhancements 2018 | N/A | 04/27/18 | TBD | 05/18/18 | TBD | TBD | TBD | Jul 17, 2018 - Aug 31, 2018 | 10/01/18 |

Notes:

1. ISO published the business rules for CCDEBE on Jan 31. Find document under stakeholder processes – Current meeting page <http://www.caiso.com/Documents/BusinessRules-CommitmentCosts-DefaultEnergyBidEnhancements.pdf>

*TBD items may be inapplicable, or they may have undetermined dates

Fall 2018 - Green House Gas Enhancements for EIM

| Project Info | Details/Date |
|------------------------------|--|
| Application Software Changes | We are seeking additional stakeholder input given the concerns with the two pass solution that have been identified. At this time, application software changes are not yet known. |
| BPM Changes | Market Instruments Energy Imbalance Market (EIM) |

| Milestone Type | Milestone Name | Dates | Status |
|-----------------------|---|--------------|--------|
| Board Approval | Present report to BOG | Dec 14, 2017 | ✓ |
| External BRS | Complete External BRS & Post for MPs | TBD | |
| Config Guides | Post Configuration Guides | TBD | |
| Tech Spec | Publish Technical Specifications | TBD | |
| Tariff | Receive FERC order | TBD | |
| BPMs | Publish Final Business Practice Manuals | TBD | |
| External Training | Deliver external training | TBD | |
| Market Sim | Market Sim Window | TBD | |
| Production Activation | Green House Gas Enhancements for EIM | Oct 01, 2018 | |

Fall 2018 – Contingency Modeling Enhancements Transmissions

| Project Info | Details/Date |
|------------------------------|--|
| Application Software Changes | <ul style="list-style-type: none"> • Positions available resources so that the ISO has sufficient capability to respond to contingency events and return facilities to normal ratings within the emergency rating time frame • Enhances the LMP formulation to provide market price signal related to this reliability constraint • Creates a Locational Marginal Capacity Price (LMCP) which reflects: <ul style="list-style-type: none"> • A resource’s opportunity costs • Marginal congestion cost savings, and/or • The marginal capacity value to follow dispatch <p>Systems:</p> <ul style="list-style-type: none"> • ADS - Modified to display corrective capacity awards similar to AS • CMRI - New or modified reports to display LMCP prices and awards • IFM/RTM - Model new capacity awards and Locational Marginal Capacity Price (LMCP). • Integration • OASIS - New or modified reports to display LMCP prices and awards • PCA • Settlements |
| BPM Changes | Market Operations, Market Instruments, Definitions and Acronyms, Settlements and Billing |
| Business Process Changes | <ul style="list-style-type: none"> • Manage Operations Planning • Manage Day-Ahead Market • Manage Operations Engineering Support • Manage Real Time Operations - Transmission & Electric System • Manage Market Billings & Settlements |

Fall 2018 – Contingency Modeling Enhancements Transmissions

| Milestone Type | Milestone Name | Dates | Status |
|-----------------------|---|-----------------------------|--------|
| Board Approval | Obtain Board of Governors Approval (BOG - 12/04/17) | Dec 14, 2017 | ✓ |
| External BRS | Complete and Post External BRS | Apr 27, 2018 | |
| Tariff | File Tariff | Jun 15, 2018 | |
| Config Guides | Design review - BPM and Tariff SMEs | TBD | |
| BPMs | Post Draft BPM changes | TBD | |
| | Publish Final Business Practice Manuals | TBD | |
| Tech Spec | Create ISO Interface Spec (Tech spec) | TBD | |
| External Training | Training Complete | Jul 13, 2018 | |
| Market Sim | Market Sim Window | Jul 17, 2018 - Aug 31, 2018 | |
| Production Activation | Contingency Modeling Enhancements -Transmission | Oct 01, 2018 | |

Fall 2018 – Commitment Cost and Default Energy Bid Enhancements

| Project Info | Details/Date |
|------------------------------|--|
| Application Software Changes | <p><u>Scope:</u> Enhances the ability to submit market-based commitment cost bids in order to reflect unique costs and volatility:</p> <ul style="list-style-type: none"> • Support integration of renewable resources through incentivizing flexible resources participation during tight fuel supply • Account for costs of flexible resources (gas and non-gas) to reduce risk of insufficient cost recovery • Encourage participation of non-RA and voluntary EIM resources; compliance with FERC Order 831 • Raises energy bid cap from \$1,000/MWh to \$2,000/MWh: • Requires supporting verified costs of energy bids above \$1,000/MWh • Introduces market power mitigation (MPM) measures for commitment costs. <p><u>Impacted Systems:</u></p> <ul style="list-style-type: none"> • SIBR: Incorporate negotiated default commitment bids, allow the submittal of Ex Ante cost adjustments. Increase commitment cost caps, increase energy bid caps, incorporate soft energy bid cap. Allow for hourly submittal of minimum load bids into day-ahead market. • IFM/RTM: Add MPM tests for commitment costs. Mitigate commitment costs where tests indicate market power. Incorporate MPM (both energy and commitment) in short term unit commitment process. Recalibrate the penalty price parameters in response to raising energy bid cap to \$2,000/MWh. • CMRI: Provide resource-specific reporting on mitigation results for commitment costs. Provide additional source information for default bids. • MQS/PCA: Incorporate mitigation of commitment costs for specific exceptional dispatch (ED) types. Incorporate bid locking of commitment costs for ED instructions and for certain cases where resources are uneconomic to operating. • Master File: Allow submittal of resource-specific minimum load costs for costs that are independent of the Pmin level. Add the ability to indicate preference for new negotiated cost basis type. Provide a view of resource-specific scalars used for validating Ex-Ante cost adjustments. • CIDI: Incorporate templates for submitting request for manual consultation and ex-post default bid adjustments. |

Fall 2018 – Commitment Cost and Default Energy Bid Enhancements

| Project Info | Details/Date |
|--------------------------|---|
| BPM Changes | <ul style="list-style-type: none"> Market Instruments Market Operations |
| Business Process Changes | <ul style="list-style-type: none"> Maintain Major Maintenance Adders (MMG LIII) Maintain Negotiated Default Energy Bids (MMG LIII) Maintain Negotiated O_Ms (MMG LIII) Manage Day Ahead Market (MMG LII) Manage Market Billing Settlements (MOS LII) Manage Real Time Hourly Market (RTPD) (MMG LII) Manage Real Time Operations – Maintain Balance Area (MMG LII) |

| Milestone Type | Milestone Name | Dates | Status |
|-----------------------|---|-----------------------------|--------|
| Draft Policy | Publish Draft Business Rules externally | Jan 31, 2018 | ✓ |
| Board Approval | Obtain Board of Governors Approval | Mar 22, 2018 | ✓ |
| External BRS | Complete and Post External BRS | Apr 27, 2018 | |
| Config Guides | Post Draft Config Guides | May 18, 2018 | |
| Tech Spec | Publish Technical Specifications | May 18, 2018 | |
| Tariff | File Tariff | TBD | |
| | Receive FERC Order | TBD | |
| BPMs | Post Draft BPM changes | TBD | |
| External Training | Deliver external training | TBD | |
| Market Sim | Market Sim Window | Jul 17, 2018 - Aug 31, 2018 | |
| Production Activation | CCDEBE | Oct 01, 2018 | |

Fall 2018 – Settlement Performance Improvements

| Project Info | Details/Date |
|------------------------------|---|
| Application Software Changes | <p>The scope of the Settlements Performance Improvements include:</p> <ul style="list-style-type: none"> Performance improvements for Post Bill Determinant Mapping process - Non-production storage issue causing delays to the statement publication Performance improvements of Statement Generation (BD File Size issue): <ul style="list-style-type: none"> Daily Statements generation Monthly Statements and Invoice generation <p>Systems: Settlements</p> |
| BPM Changes | Settlements and Billing |
| Business Process Changes | Settlements & Billing: Application Flow should be reviewed for possible changes |

| Config Guides | Milestone Name | Dates | Status |
|-----------------------|--|-----------------------------|--------|
| External BRS | Complete and Post External BRS | Feb 20, 2018 | ✓ |
| Tariff | File Tariff | N/A | |
| Config Guides | Design review - BPM and Tariff SMEs | N/A | |
| BPMs | Publish Final Business Practice Manuals | N/A | |
| Tech Spec | Create ISO Interface Spec (Tech spec) | N/A | |
| OTHER | Settlement Interface Specification for Scheduling Coordinators | Mar 16, 2018 | ✓ |
| External Training | External Training Complete | Jul 13, 2018 | |
| Market Sim | Market Sim Window | Jul 17, 2018 - Aug 31, 2018 | |
| Production Activation | Settlements Performance Improvements | Oct 01, 2018 | |

Fall 2018 – ESDER Phase 2

| Project Info | Details/Date |
|------------------------------|---|
| Application Software Changes | <p>Settlements:</p> <ul style="list-style-type: none"> • Alternative Baselines: <ul style="list-style-type: none"> • Possible system changes to include addition of an automated monitoring tool for performance measurement data received from external participants. • Changes to the DRRS registration system for the selection of the new baselines and allowing for ISO approval prior to use in the market. • Settlement configuration will need to be evaluated and revised to assure PDRs that provide AS services can be calculated correctly based on the submitted SQMD. <p>ECIC:</p> <ul style="list-style-type: none"> • EIM Net Benefits Testing: <ul style="list-style-type: none"> • Code modification to calculation to accommodate addition of all applicable gas price indices. <p>MRI-S:</p> <ul style="list-style-type: none"> • Alternative Baselines: <ul style="list-style-type: none"> • The DRS Decommissioning project seeks to retire the current DRS system. Once this system is retired all current functionality will reside in the MRI-S (Market Results Interface – Settlements) system. It should be noted that all available customer load baseline calculations will be submitted into the MRI-S system once the DRS system is retired. |
| BPM Changes | <p>Market Instruments:</p> <ul style="list-style-type: none"> • EIM Net Benefits Testing: <ul style="list-style-type: none"> • Changes will include addition of all gas price indices used in calculation. <p>Metering:</p> <ul style="list-style-type: none"> • Alternative Baselines: <ul style="list-style-type: none"> • Need to revise the BPM to explain new baselines and changes to existing systems. • Station Power: <ul style="list-style-type: none"> • Need to revise BPM to provide examples of wholesale/retail uses for generation and storage • Need to revise BPM to clarify permitted/prohibited netting rules. <p>Definitions & Acronyms:</p> <ul style="list-style-type: none"> • Station Power: <ul style="list-style-type: none"> • Revision of Station Power definition to match Tariff language. <p>Settlements & Billing:</p> <ul style="list-style-type: none"> • Alternative Baselines: <ul style="list-style-type: none"> • Possible changes to reflect settlements configuration changes. |

Fall 2018 – ESDER Phase 2

| Project Info | Details/Date |
|--------------------------|---|
| Business Process Changes | <ul style="list-style-type: none"> • Develop Infrastructure (DI) (80001) • Manage Market & Reliability Data & Modeling (MMR) (80004) • Manage Operations Support & Settlements (MOS) (80007) • Support Business Services (SBS) (80009) • Other |

| Milestone Type | Milestone Name | Dates | Status |
|-----------------------|---|-----------------------------|--------|
| Board Approval | Obtain Board of Governors Approval | Jul 26, 2017 | ✓ |
| External BRS | Post External BRS | Oct 17, 2017 | ✓ |
| | Post Revised External BRS | Mar 01, 2018 | ✓ |
| Tariff | Post Draft Tariff | Nov 17, 2017 | ✓ |
| | Post Updated Draft Tariff (based on feedback) | Apr 09, 2018 | ✓ |
| CPG | Next CPG Meeting | Apr 24, 2018 | |
| Tech Spec | Publish ISO Interface Spec (Tech spec) | Apr 26, 2018 | |
| Config Guides | Settlements Config Guides | May 18, 2018 | |
| BPMs | Post Draft BPM changes | Jun 04, 2018 | |
| External Training | Deliver External Training | Jul 11, 2018 | |
| Market Sim | Market Sim Window | Jul 17, 2018 - Aug 31, 2018 | |
| Production Activation | ESDER Phase 2 | Oct 01, 2018 | |

Fall 2018 – Generator Contingency and Remedial Action Scheme Modeling

| Project Info | Details/Date |
|------------------------------|---|
| Application Software Changes | <ul style="list-style-type: none"> • Enhance the Security Constrained Economic Dispatch <ul style="list-style-type: none"> • Model generation/load loss in the dispatch • Model transmission loss along and generation/load loss due to RAS operation dispatch • Model transmission reconfiguration due to RAS operation in the dispatch • Update the congestion component of LMP so that it considers the cost of positioning the system to account for generator contingencies and RAS operations • Enhance DAM, RTM and EIM to support generator contingencies Impacted systems: <ul style="list-style-type: none"> • IFM/RTM, CRR, MF |
| BPM Changes | <ul style="list-style-type: none"> • Managing Full Network Model • CRR • Market Operations • EIM |
| Business Process Changes | <ul style="list-style-type: none"> • Manage Congestion Revenue Rights (MMR LII) • Manage Operations Planning • Manage Real Time Operations - Transmission & Electric System (MMG LII) |

Fall 2018 – Generator Contingency and Remedial Action Scheme Modeling

| Milestone Type | Milestone Name | Dates | Status |
|-----------------------|---|-----------------------------|--------|
| Board Approval | Obtain Board of Governors Approval | Sep 19, 2017 | ✓ |
| External BRS | Complete and Post External BRS | Mar 16, 2018 | ✓ |
| Tariff | File Tariff | May 25, 2018 | |
| Config Guides | Design review - BPM and Tariff SMEs | TBD | |
| BPMs | Post Draft BPM changes | Jun 12, 2018 | |
| | Publish Final Business Practice Manuals | Jul 02, 2018 | |
| Tech Spec | Create ISO Interface Spec (Tech spec) | N/A | |
| External Training | Deliver external business training | Jul 13, 2018 | |
| Market Sim | Market Sim Window | Jul 17, 2018 - Aug 27, 2018 | |
| Production Activation | Generator Contingency and RAS Modeling | Oct 01, 2018 | |

Fall 2018 – ADS Replacement

| Project Info | Details/Date |
|------------------------------|---|
| Application Software Changes | <ul style="list-style-type: none"> • Transition to web-based user interface to eliminate the need to install thick client • Transition ADS provisioning to the Access and Identity Management (AIM) application including Resource Level Access Controls (RACL) access • Move historical ADS data to CMRI adding query tool functionality to CMRI also • Move near-term transactions for FERC-764 15-minute awards to ADS; This will include user interface and a new B2B service; Historical transactions will stay in CMRI. • Various user interface enhancements adding content per Operation's request • Eliminate the ECN requirement for ADS B2B services (remove adsta.caiso.com) • ADS B2B services will not otherwise change. |
| BPM Changes | To Be Determined |
| Business Process Changes | To Be Determined |

| Milestone Type | Milestone Name | Dates | Status |
|-----------------------|---|--------------|--------|
| Board Approval | Obtain Board of Governors Approval | N/A | |
| External BRS | Post External BRS | May 02, 2018 | |
| Tariff | File Tariff | N/A | |
| Config Guides | Design review - BPM and Tariff SMEs | TBD | |
| BPMs | Publish Final Business Practice Manuals | TBD | |
| Tech Spec | Publish Technical Specifications | TBD | |
| External Training | Conduct External Training | TBD | |
| Market Sim | Market Sim Window | TBD | |
| Production Activation | ADS Replacement | Oct 01, 2018 | |

Fall 2018 - CRR Auction Efficiency 1A

| Project Info | Details/Date | |
|------------------------------|---|--|
| Application Software Changes | CRR Auction Efficiency 1A project is focused on enhancements to: <ul style="list-style-type: none"> Information received and used for the CRR allocations and auction CRR software to support a mechanism to allow market participants to sell previously acquired CRRs into subsequent auctions System Impacts: CRR, OMS, OASIS. | |
| BPM Changes | <ul style="list-style-type: none"> CRR Credit Management and Market Clearing Market Instruments | <ul style="list-style-type: none"> Outage Management Settlements & Billing |
| Business Process Changes | <ul style="list-style-type: none"> Manage Market & Reliability Data & Modeling (MMR) Manage Markets & Grid (MMG) | |

| Milestone Type | Milestone Name | Dates | Status |
|-----------------------|---|-----------------------------|--------|
| Board Approval | BOG Presentation and Approval | Mar 22, 2018 | ✓ |
| External BRS | Post External BRS | Apr 26, 2018 | |
| Tariff | File Tariff | Apr 09, 2018 | |
| Config Guides | Design review - BPM and Tariff SMEs | TBD | |
| BPMs | Post Draft BPM changes | May 25, 2018 | |
| | Publish Final Business Practice Manuals | Jul 02, 2018 | |
| Tech Spec | Create ISO Interface Spec (Tech spec) | TBD | |
| External Training | Deliver external training | Jul 13, 2018 | |
| Market Sim | Market Sim Window | Jul 17, 2018 - Aug 31, 2018 | |
| Production Activation | CRR Auction Efficiency | Oct 01, 2018 | |

Fall 2018 – EIM Enhancements 2018

| Project Info | Details/Date |
|------------------------------|--|
| Application Software Changes | <ul style="list-style-type: none"> • Markets to enforce new ETSR Ramp Rate constraints (both single and aggregate) • Markets to exclude Flex Ramp provision of EIM BAAs undergoing contingency • ISO Enhancement to BAAOP EIM operator screens to review active market data; all BAA operators receive notifications when ETSR limits enforced in real-time <p>Systems:</p> <ul style="list-style-type: none"> • BAAOP – New display screens presenting active market data for market data submissions; ETSR enforcements notification for all BAAs (includes constraint information) • Market Applications <ul style="list-style-type: none"> • Include ETSR ramping constraints at both Individual and Aggregate levels • Exclude Flex Ramp Product provision for EIM BAAs undergoing contingency (FRU/FRD awards and prices set to zero); EIM Area footprint's FRP requirements are reduced by a diversity benefit pro rata amount based on excluded EIM BAAs • Master File – Registration supported of single and aggregate ETSR ramping constraints by associated EIM BAAs • OASIS – new report displays real-time intervals where BAAs (ISO and EIM) are in contingency • Integration – No CMRI B2B API impacts; OASIS API will support new report |
| BPM Changes | Energy Imbalance Market (EIM), Market Instruments, Market Operations |
| Business Process Changes | <ul style="list-style-type: none"> • Manage Entity & Resource Maintenance Updates • Manage Real Time Interchange Scheduling • Manage Real Time Operations- Maintain Balancing Area • Perform Price Validation, Manage Price Corrections • Manage Market Billings & Settlements |

Fall Release – EIM Enhancements 2018

| Milestone Type | Milestone Name | Dates | Status |
|-----------------------|---|-----------------------------|--------|
| Board Approval | Board of Governors Approval | N/A | |
| External BRS | Post External BRS | Apr 27, 2018 | |
| Config Guides | Post Config Guides | TBD | |
| BPMs | Post Draft BPM changes | TBD | |
| | Publish Final Business Practice Manuals | TBD | |
| Tech Spec | Create ISO Interface Spec (Tech spec) | May 18, 2018 | |
| Market Sim | Market Sim Window | Jul 17, 2018 - Aug 31, 2018 | |
| External Training | Deliver external training | TBD | |
| Production Activation | EIM Enhancements 2018 | Oct 01, 2018 | |

2019 Spring Release

Spring 2019 – EIM BANC/SMUD

| Project Info | Details/Date |
|------------------------------|--|
| Application Software Changes | Implementation of SMUD as an EIM Entity |
| BPM Changes | EIM BPM will be updated if needed to reflect new modeling scenarios identified during implementation and feedback from SMUD. |
| Market Simulation | December 3, 2018 – January 31, 2019 |
| Parallel Operations | February 1, 2019 – March 30, 2019 |

| Config Guides | Milestone Name | Dates | Status |
|-----------------------|------------------------------|-----------------------------|--------|
| Tariff | File Readiness Certification | Mar 01, 2019 | |
| Market Sim | Market Sim Window | Dec 03, 2018 - Jan 30, 2019 | |
| Parallel Operations | Parallel Operations | Mar 30, 2019 | |
| Production Activation | EIM - BANC-SMUD | Apr 03, 2019 | |

2019 Fall Release

Fall 2019 – Day Ahead Market Enhancements

| Project Info | Details/Date |
|------------------------------|---|
| Application Software Changes | <p>This are preliminary impact assessments</p> <p>DAM Enhancements include change the day-ahead market from hourly to 15 minute granularity, combine IFM and RUC, procure imbalance reserves</p> <ul style="list-style-type: none"> • Calculate Imbalance Reserve (IR) Requirements in 15 minute interval (DAM) • EIM interface to submit Base schedule in 15 minute interval (BSAP) • EIM balance test, capacity test and sufficient test in 15 minute interval (RTM) • Report DAM market results in 15 minute Interval (CMRI) • MP can bid IRU and IRD price in SIBR • DAM co-optimize Energy, AS and IR in 15 minute intervals (DAM) • Remove RUC • Get as self-scheduled 15 minute DAM award of energy in RTM if no real time bids (RTM) • Calculate Settlement DAM Expected Energy in 15 minute interval (RTM) • Calculate Bid cost recovery (MQS) • Settle DAM based on 5 minute interval schedules (Settlement) • Settle CRR in DAM 15 minute intervals (Settlement) • Publish DAM energy and AS requirements and prices in 15 minute interval in OASIS |
| BPM Changes | Market Instruments, Market Operations, Settlements & Billing, Energy Imbalance markets |
| Business Process Changes | <ul style="list-style-type: none"> • Manage Day Ahead Market • Manage D+X analysis • Manage Real Time Operations- Maintain Balancing Area • Manage Market Billings & Settlements |

Fall 2019 – Day Ahead Market Enhancements

| Milestone Type | Milestone Name | Dates | Status |
|-----------------------|---|---------------------|--------|
| Board Approval | Board of Governors Approval | September 5-6, 2018 | |
| External BRS | Post External BRS | TBD | |
| Config Guides | Post Config Guides | TBD | |
| BPMs | Post Draft BPM changes | TBD | |
| | Publish Final Business Practice Manuals | TBD | |
| Tech Spec | Create ISO Interface Spec (Tech spec) | TBD | |
| Market Sim | Market Sim Window | TBD | |
| External Training | Deliver external training | TBD | |
| Production Activation | EIM Enhancements 2018 | Fall, 2019 | |

Stay Informed

Ways to participate in releases

- Visit the Release Planning page
 - <http://www.caiso.com/informed/Pages/ReleasePlanning/Default.aspx>
- Attend meetings
 - Release Users Group (RUG) bi-weekly meetings
 - Initiative status updates
 - System change updates on independent releases
 - Market Simulation calls
 - Visit the ISO calendar at www.caiso.com for meeting dates and times and add events to your calendar
 - Typically held on Mondays and Thursdays
 - Market sim calls for major releases will be market noticed
 - Market Performance and Planning Forum
 - Bi-monthly review of market performance issues
 - High level discussion of release planning, implementation and new market enhancements

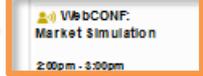
What to look for on the calendar...

Calendar of Meetings, Training and Events

Month: February Year: 2018 Calendar View List View Print View

| February 2018 | | | | | | |
|--|---|--|--|--|---|-----|
| Sun | Mon | Tue | Wed | Thu | Fri | Sat |
| | 5 WebCONF: Market Simulation 2:00pm - 3:00pm | 6 Training: Get to Know the ISO - Day 1 9:00am - 4:00pm WebCONF: Imbalance Conformance Enhancements 10:00am - 12:00pm WebCONF: Technical User Group 10:00am - 11:00am | 7 Deadline: Comments - Interconnection Process Enhancements 2018 - Issue Paper and Meeting Discussion Training: Get to Know the ISO - Day 2 9:00am - 4:00pm Meeting: Flexible Resource Adequacy Criteria Must Offer Obligation Phase 2 - Revised Draft Flexible Capacity Framework 10:00am - 4:00pm WebCONF: Market Settlement User Group 10:00am - 11:00am | 8 Meeting: Audit Committee Teleconference (Executive) 8:30am - 9:30am Training: Settlements 101 9:00am - 4:00pm Meeting: 2017-2018 Transmission Planning Process 10:00am - 4:00pm WebCONF: Market Simulation 2:00pm - 3:00pm | 9 Training: Settlements 201 9:00am - 4:00pm | 10 |
| 11 WebCONF: Participating Transmission Owner Per Unit Cost Guides 10:30am - 12:00pm WebCONF: Market Simulation 2:00pm - 3:00pm | 12 Meeting: Congestion Revenue Rights Auction Efficiency 10:00am - 4:00pm WebCONF: Release User Group 10:00am - 11:00am Call: Energy Imbalance Market Governing Body Teleconference (Executive) 11:30am - 12:30pm | 13 Deadline: Submissions - April 2018 Monthly Resource Adequacy and Supply Plans Call: Congestion Revenue Rights 11:00am - 11:30am WebCONF: Outage Management System Customer Partnership Group 2:00pm - 3:00pm | 14 Deadline: Comments - Review Transmission Access Charge Structure Straw Proposal and Meeting Discussion Call: Board of Governors Teleconference (General) 8:15am - 9:00am Call: Board of Governors Teleconference (Executive) 9:00am - 10:00am Call: Market Update 10:15am - 11:00am WebCONF: Market Simulation | 15 | 16 | 17 |

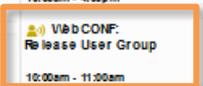
Market Sim



Market Sim



Release Users Group (RUG)



Stay connected

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