



California ISO

Market Performance and Planning Forum

February 20, 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 – February 20, 2018

Time:	Topic:	Presenter:
10:00 – 10:05	Introduction, Agenda	Jody Cross
10:05 – 12:00	BAL-002 Update Aliso Canyon Update Market Performance and Quality Update	John Phipps Amber Motley Guillermo Bautista Alderete
12:00 – 1:00	Lunch	
1:00 – 1:30	DMM Update	Sai Koppolu
1:30 – 2:00	Policy Update	Brad Cooper John Goodin
2:00 – 3:00	Release Update	Adrian Chiosea Janet Morris

BAL-002 Operating Reserve Requirements

New operating reserve requirements

- Starting on December 14, the ISO adjusted the distribution of operating reserves between the north and the south of Path26 areas to account for resource unavailability for AS.
- Effective January 1, 2018 the ISO started to define its operating reserve requirements based on a new BAL-002 standard

Background Information – Definition of BCE

Balancing Contingency Event (BCE)

Any single event described in Subsections (A), (B), or (C) below, or any series of such otherwise single events, with each separated from the next by one minute or less.

A. Sudden loss of generation:

a. Due to

- i. unit tripping, or
- ii. loss of generator Facility resulting in isolation of the generator from the Bulk Electric System or from the responsible entity's System, or
- iii. sudden unplanned outage of transmission Facility;

b. And, that causes an unexpected change to the responsible entity's ACE;

B. Sudden loss of an Import, due to forced outage of transmission equipment that causes an unexpected imbalance between generation and Demand on the Interconnection.

C. Sudden restoration of a Demand that was used as a resource that causes an unexpected change to the responsible entity's ACE.

Contingency Reserve Requirement Determination in the Day Ahead and Real-Time Markets

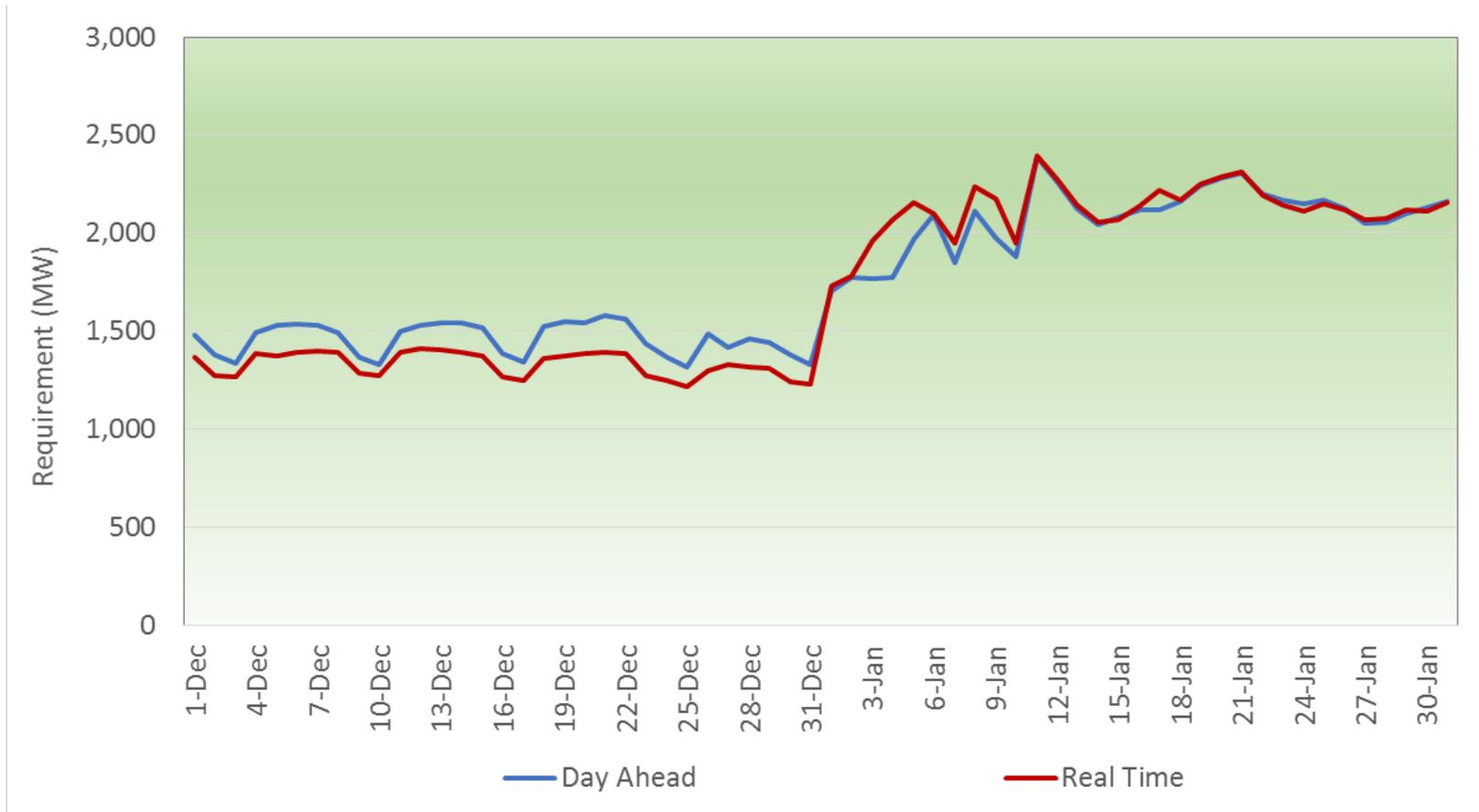
Day Ahead Market

- 30 days of data, values averaged per hour.
- Weight the weekly data, with Week 1 highest, Week 4 lowest.
- Begin with an adder to protect against RT PDCI awards.
- Cap the value at the OTC of the PDCI.

Real Time Market

- Real Time adjustments made for incremental PDCI awards

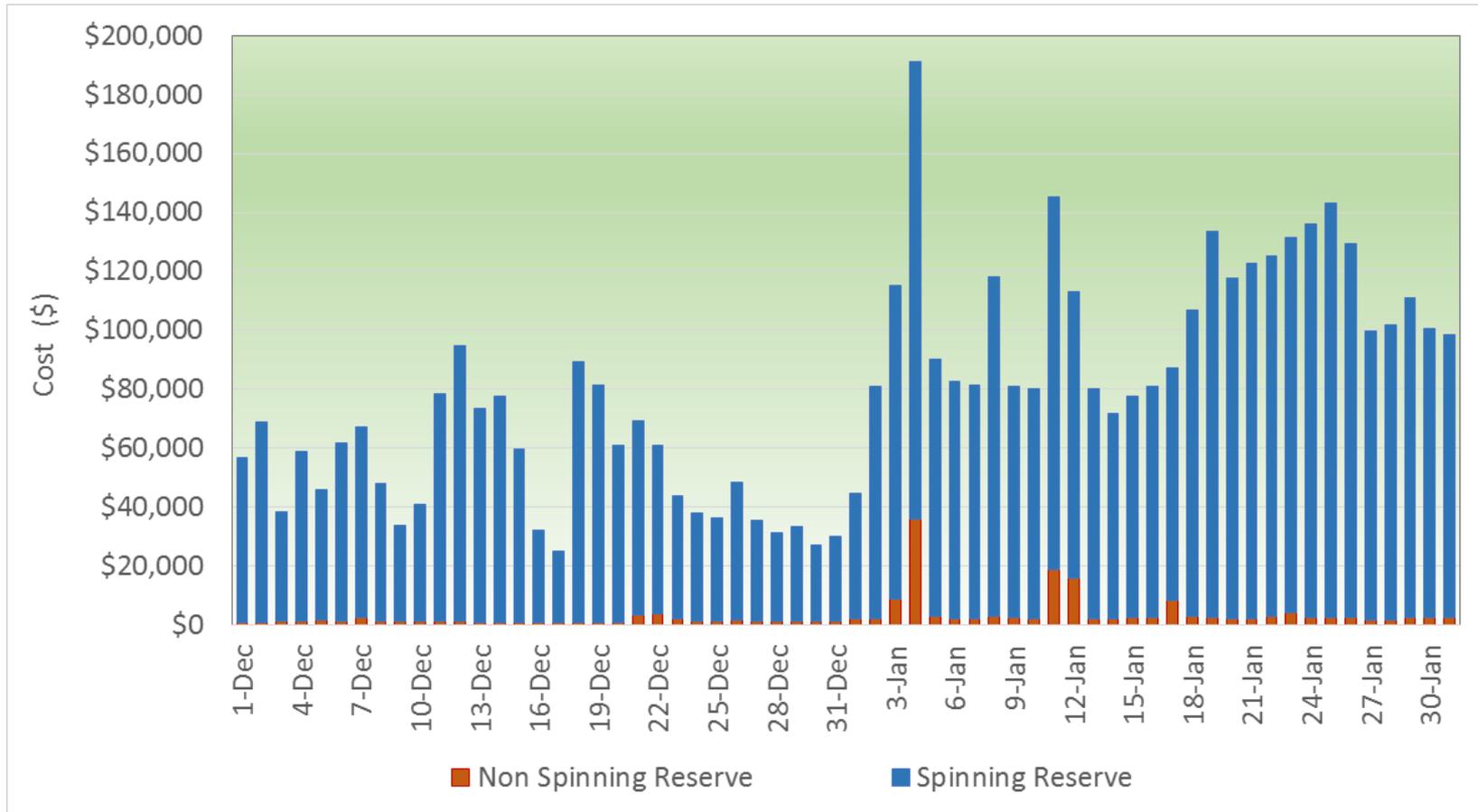
Operating reserves increase effectively with January 1, 2018 trading date



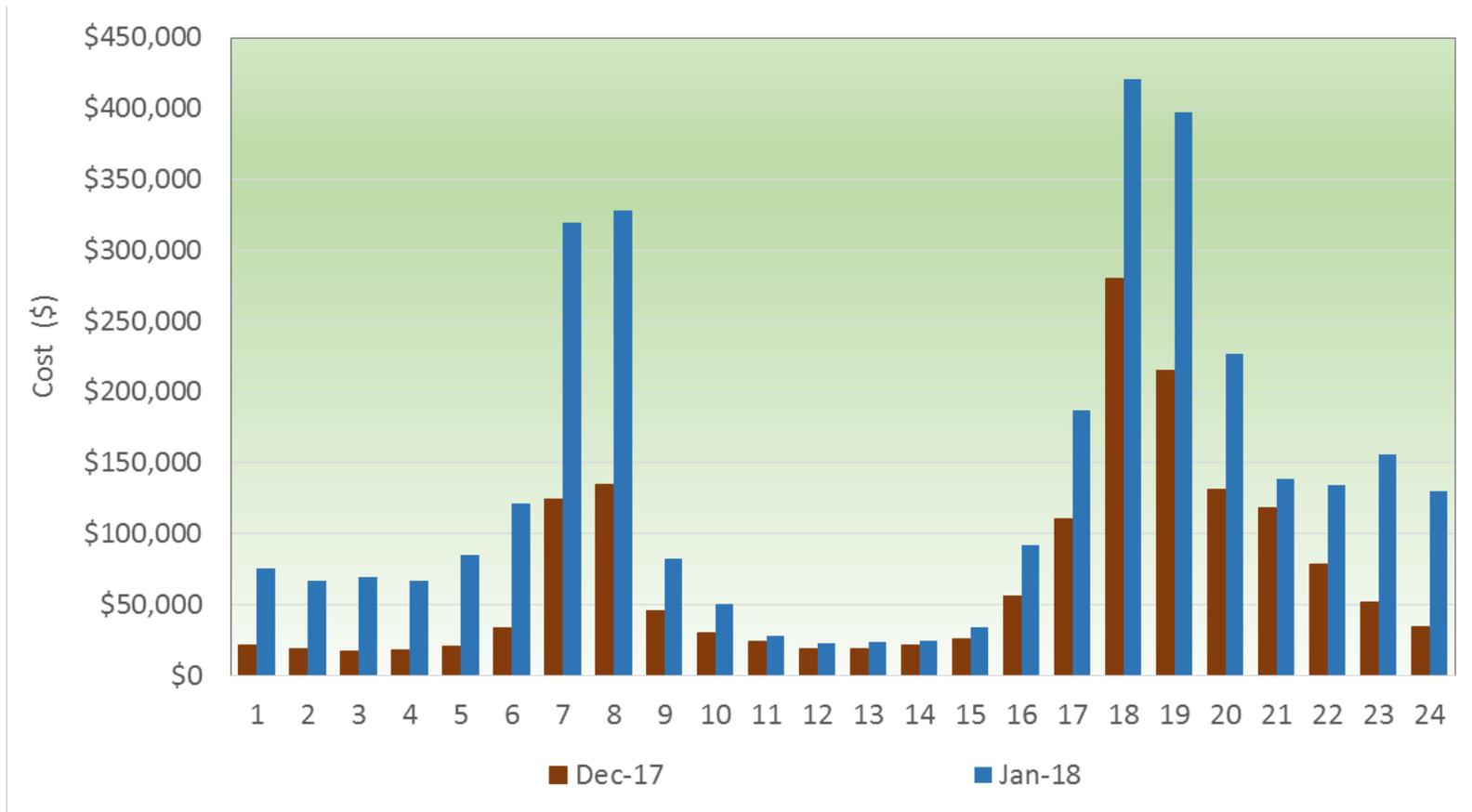
The profile of operating reserve has evolved with the new requirement



Operating reserves costs increased consistent with change in requirements since January 1, 2018



The majority of the cost for reserves accrued during the daily peaks

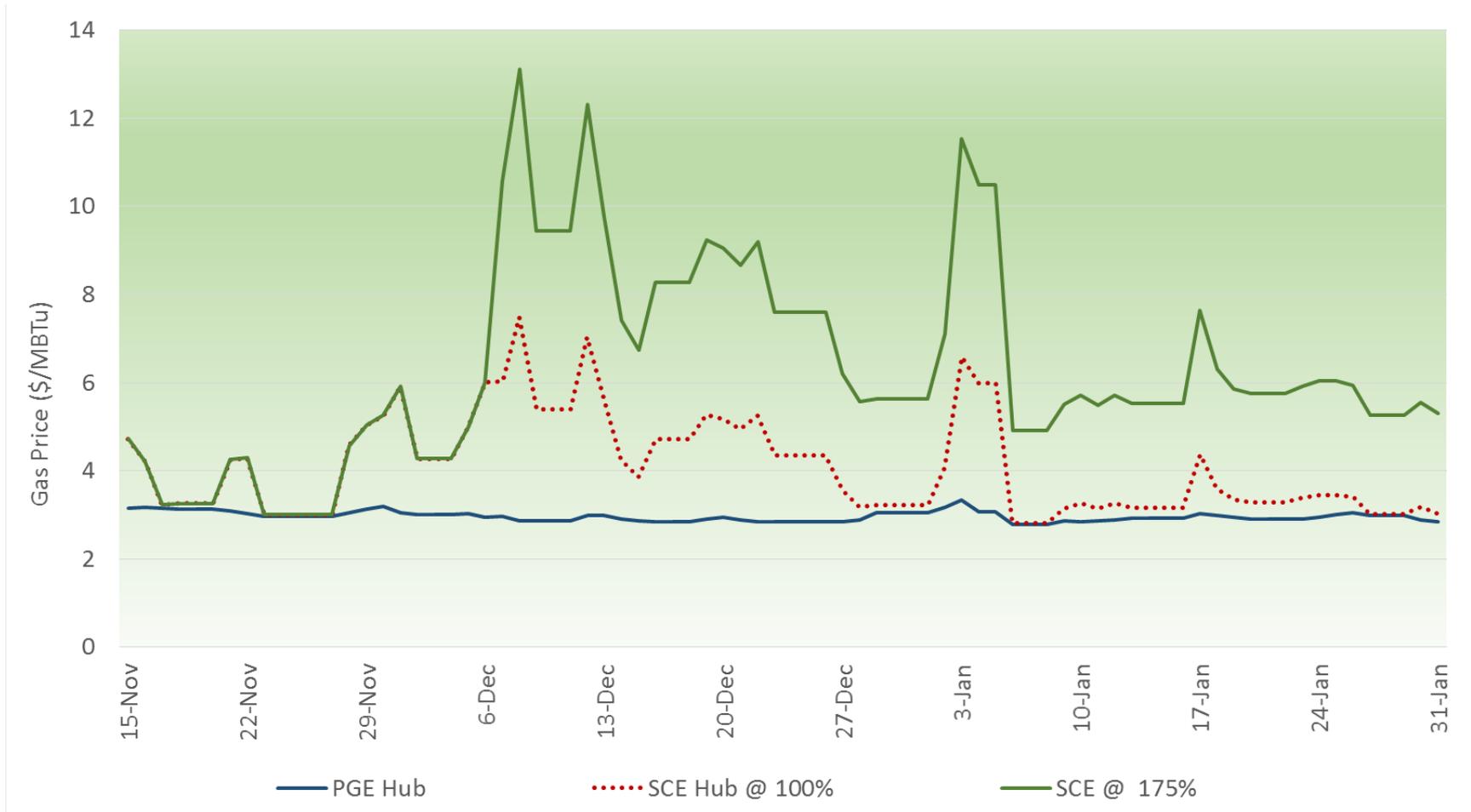


Aliso Canyon Update

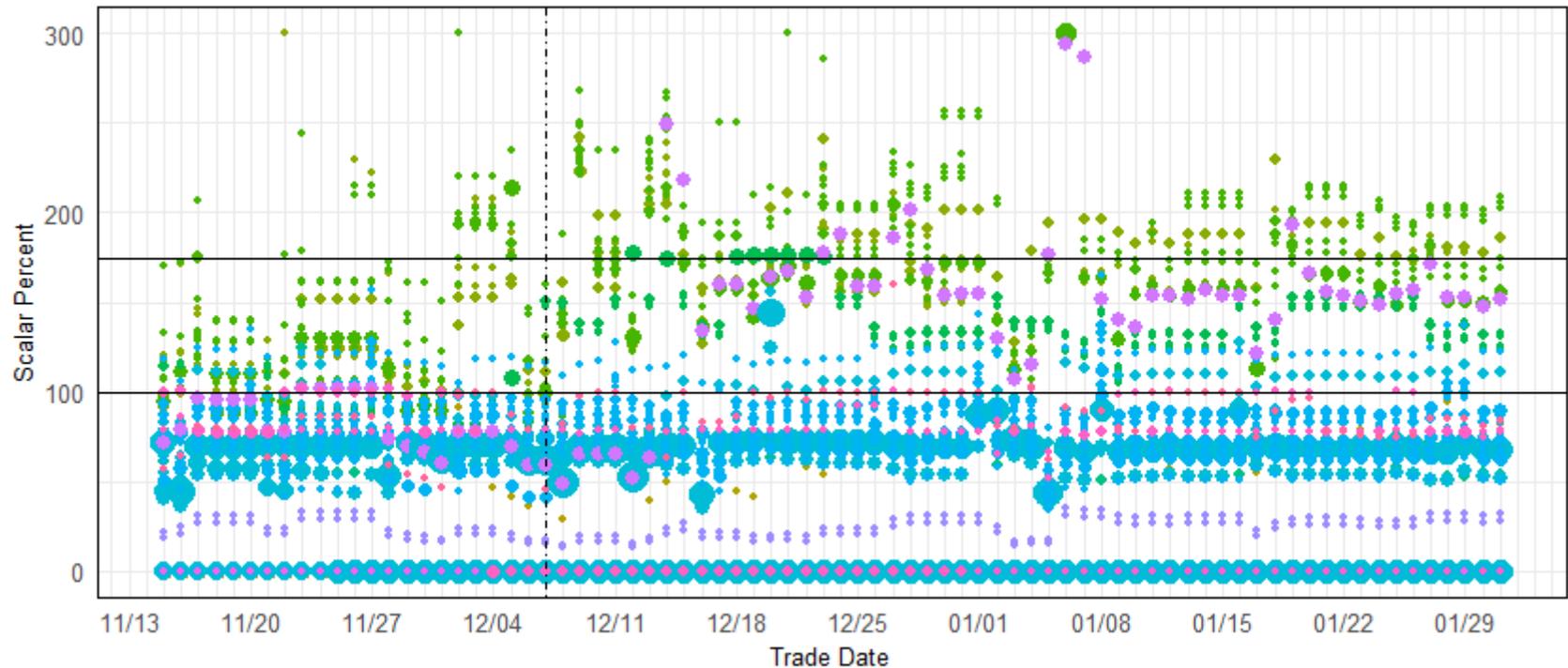
Use of gas scalars is currently one of the tools for the ISO to tackle gas concerns potentially impacting the electric system

- Based on system conditions, including cold weather, concerns about gas infrastructure outages affecting availability and fires, the ISO activated the scalars on December 7, 2017 through January 31, 2018.
- Gas scalars is a temporary measure and currently the ISO is undergoing a policy initiative to provide a permanent mechanism

December and January observed price separation between PGE and SCE gas hubs



The additional headroom has been used in the Minimum Load Costs



Each bubble color represents a Scheduling coordinator.

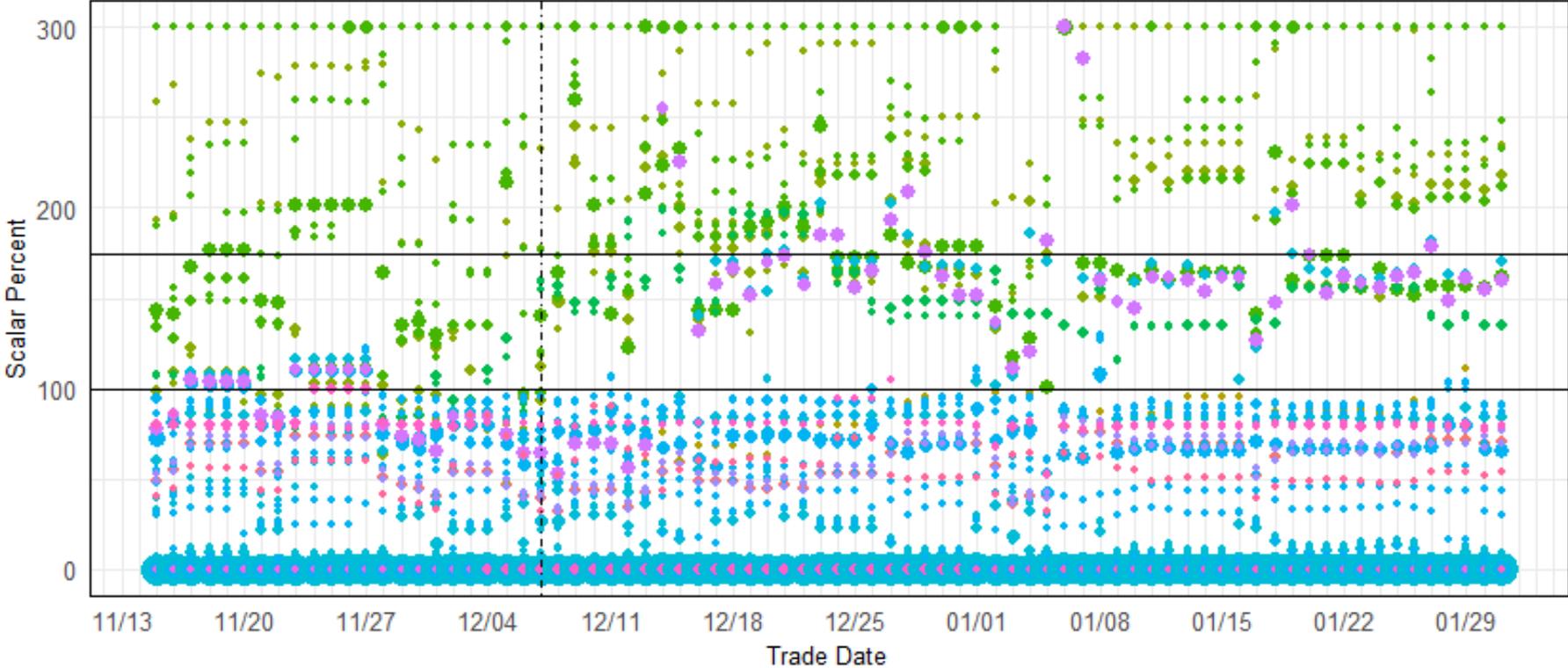
The size of the bubble is the relative number of hours with an MLC bid.

The horizontal lines stand for the reference of no scalars in place (100%) and scalars activated (175%)

The dotted vertical line represents splits the horizon with no scalars and with scalars

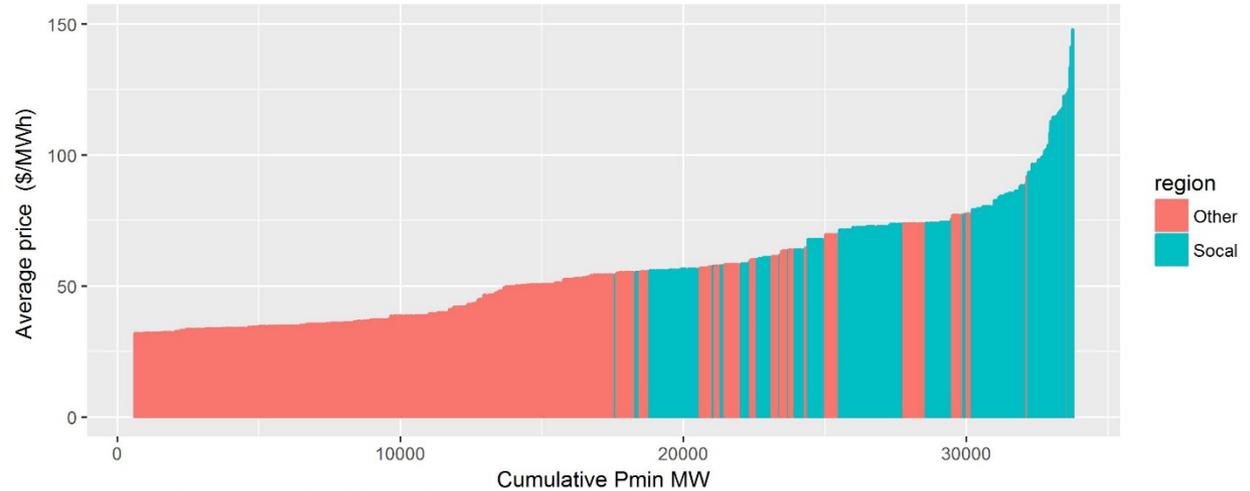
For visibility, any bubble greater than 300% is represented at 300%

Similarly, the additional head room has been used for Start-up costs

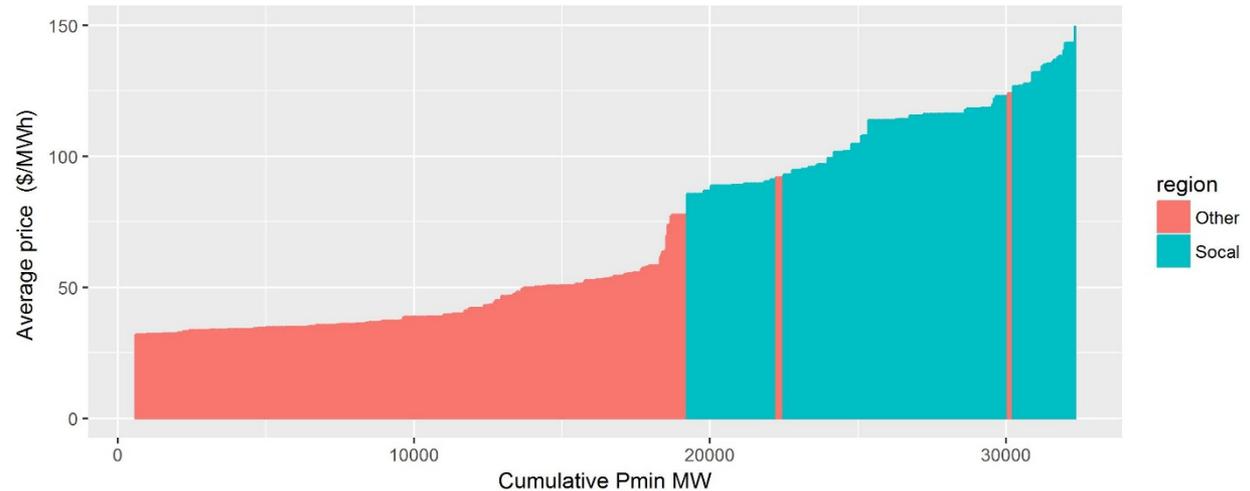


The scalar shifts generation from SCE to PGE areas

7 Dec - Average MLC Proxy Cost
No SoCal gas adder



7 Dec - Average MLC Proxy Cost
175% SoCal gas adder

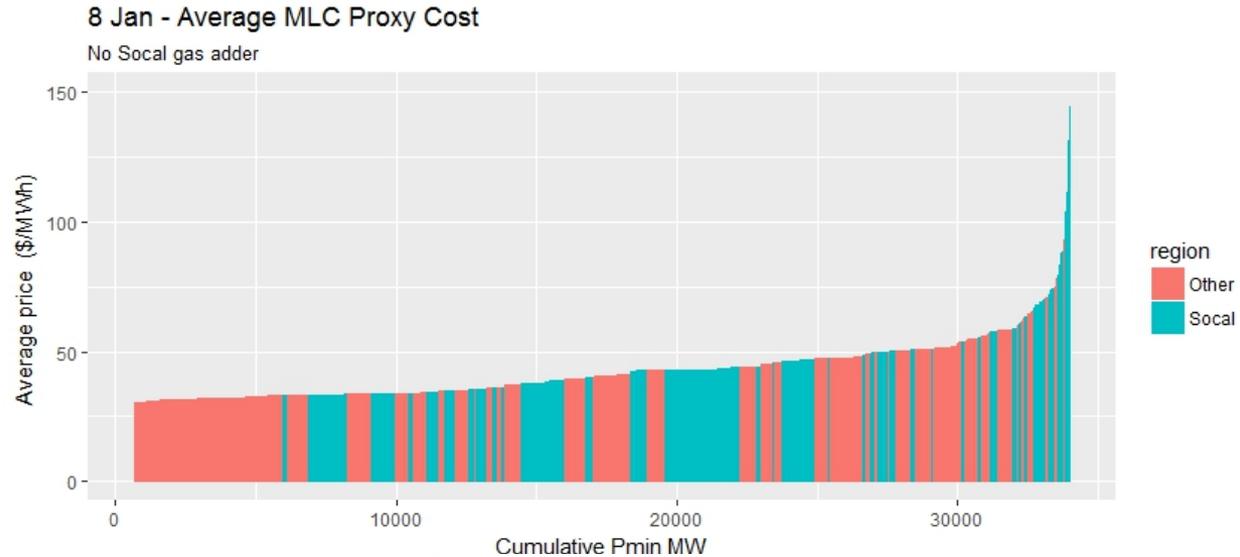


Natural price separation between SCE and PGE shifted generation

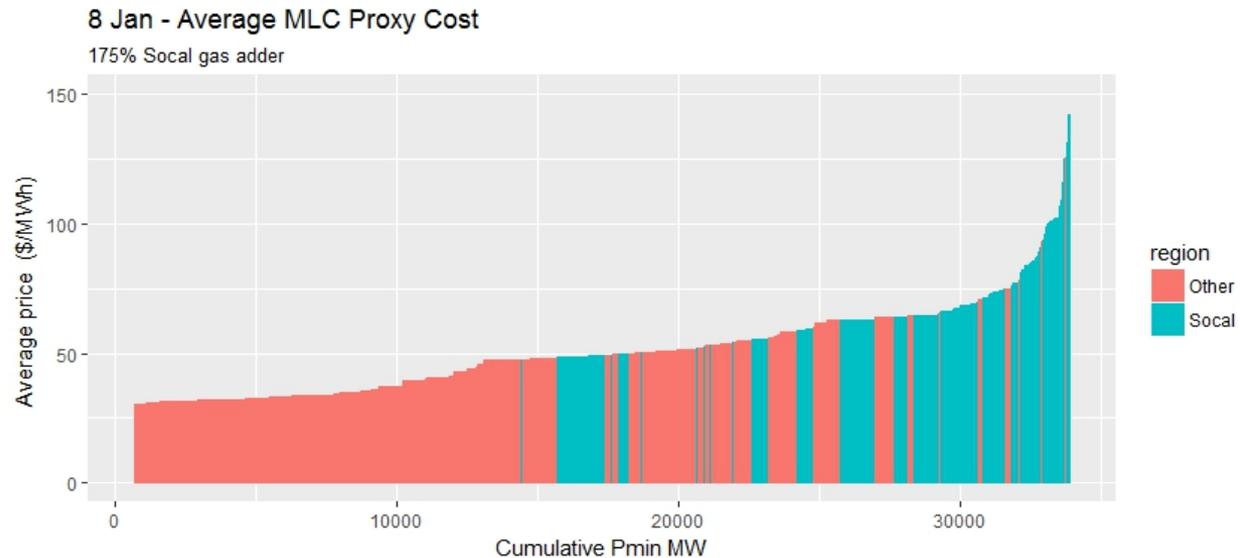
The 175% scalar shifted about 2,000MW more from SCE to PGE thus helping to position the system to rely on less gas demand in SoCal

The scalar shifts generation from SCE to PGE areas

When no natural price separation exist between Hubs about 13,500MW from PGE is cheaper than SCE average cost

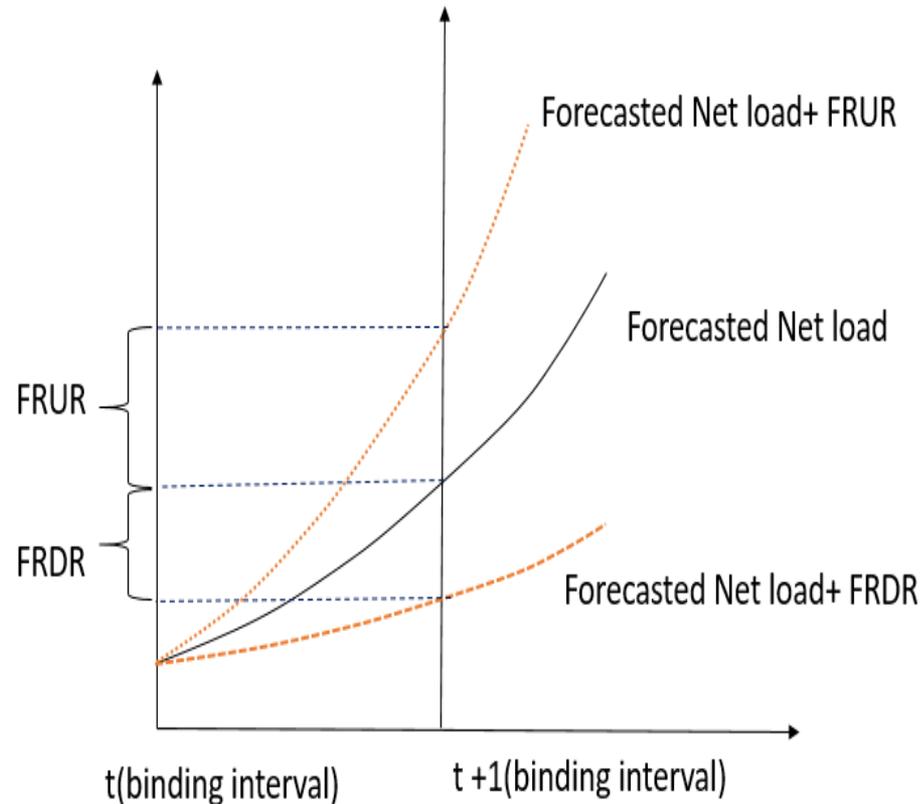


The 175% scalar shifts about 8,000MW from SCE to PGE thus helping to position the system to reduce gas demand in SoCal



Update on Flexible Ramp Requirement

Flexible Ramping Product-Market Design



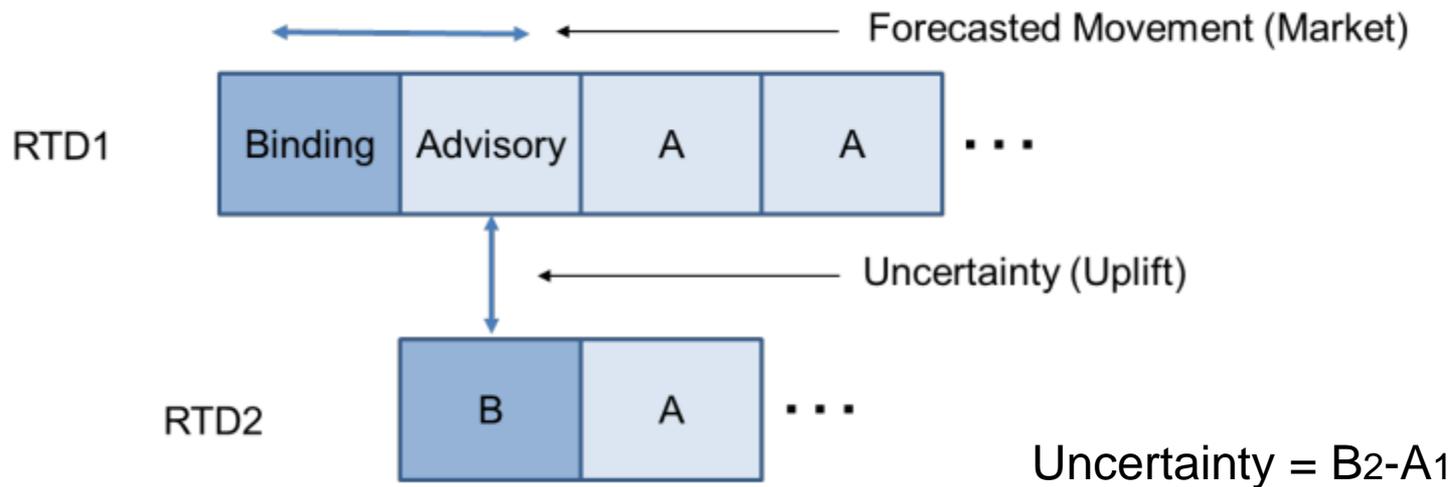
FRUR is procured to meet the expected net forecast error within a 95% confidence interval.

FRUR- Flexible Ramping Up Requirement
FRDR- Flexible Ramping Down Requirement

Flex Ramp Product Uncertainty Calculation Methodology

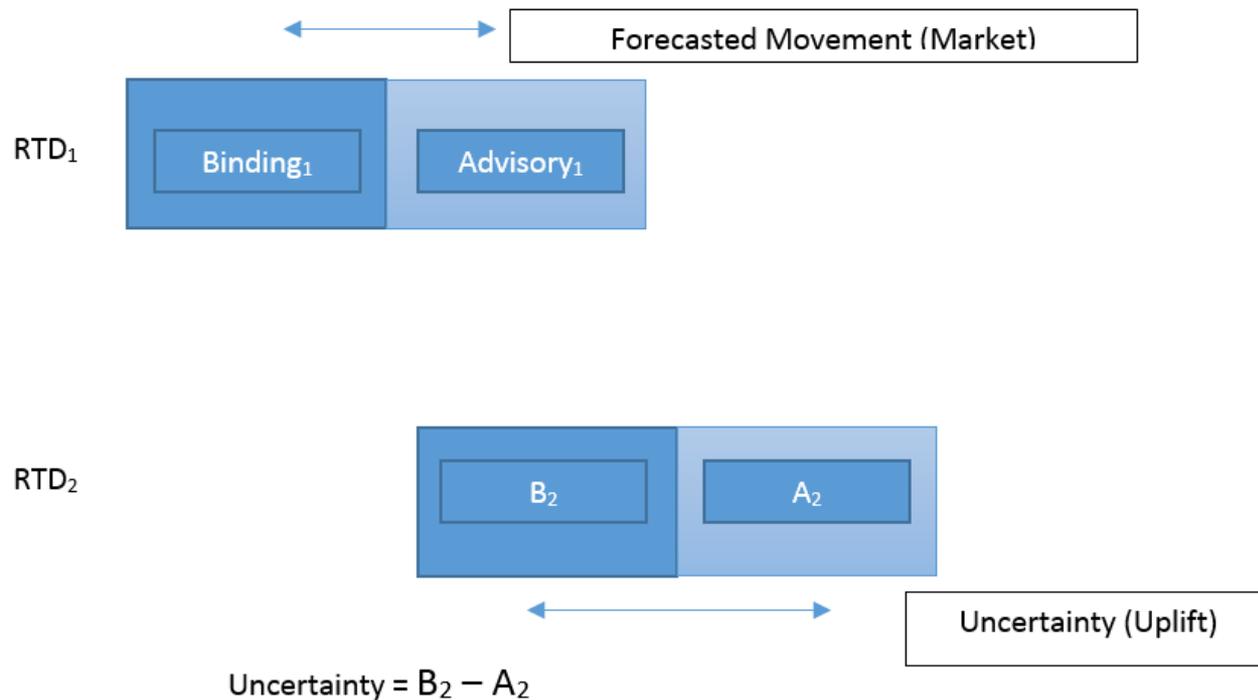
- The uncertainty requirements are hourly values calculated every day using the BARR tool
- Uncertainty requirements are based on net load forecast differences
 - Net Load = Load – Wind – Solar
 - RTD Uncertainty: Forecast difference between advisory and binding intervals.

Expected Flexible Ramping Uncertainty Requirement Five minute Real-Time Dispatch (RTD) Calculation

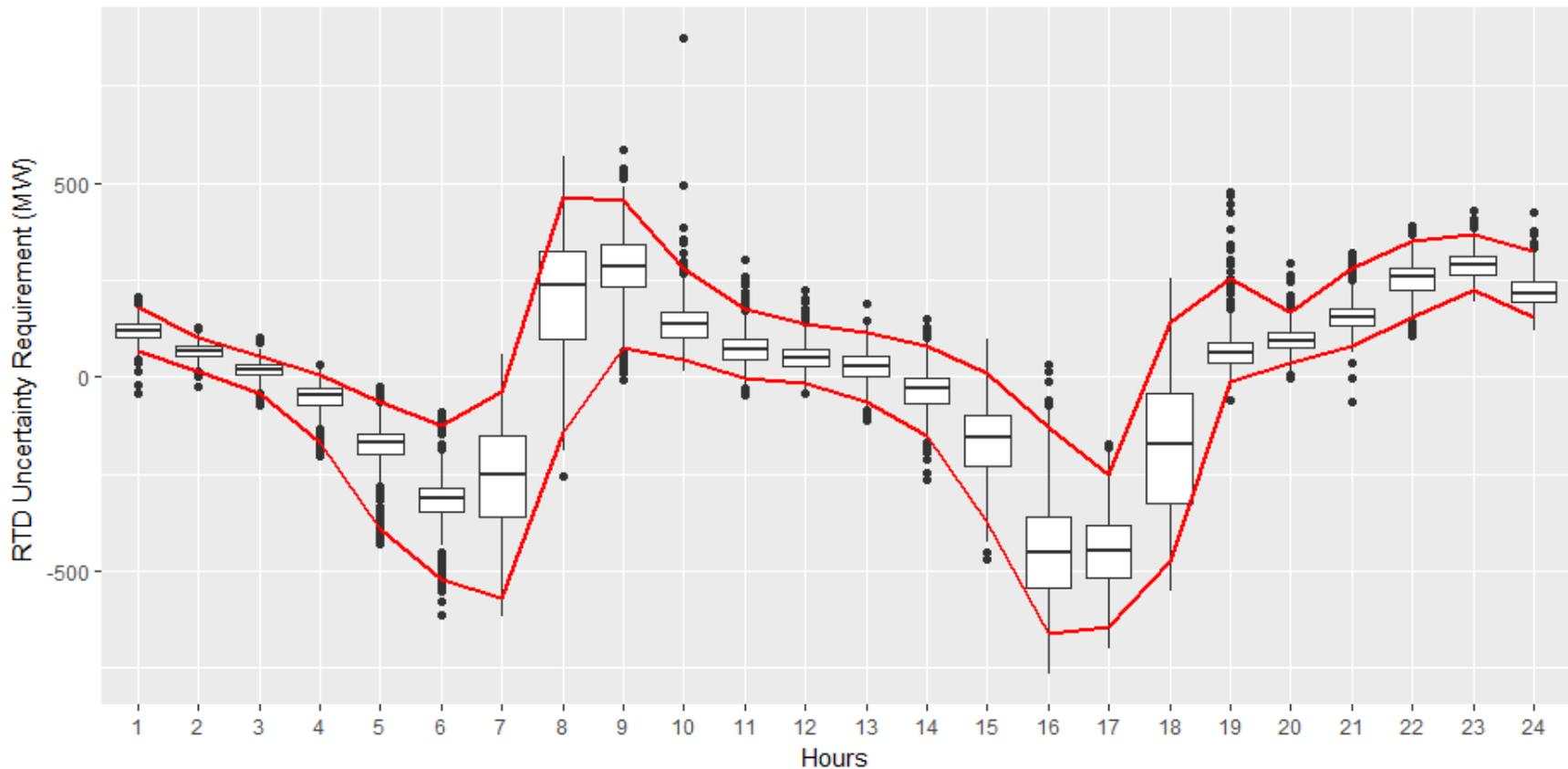


RTD Net Load Forecast Error is difference between the binding interval net load forecast and the prior market run first advisory net load forecast

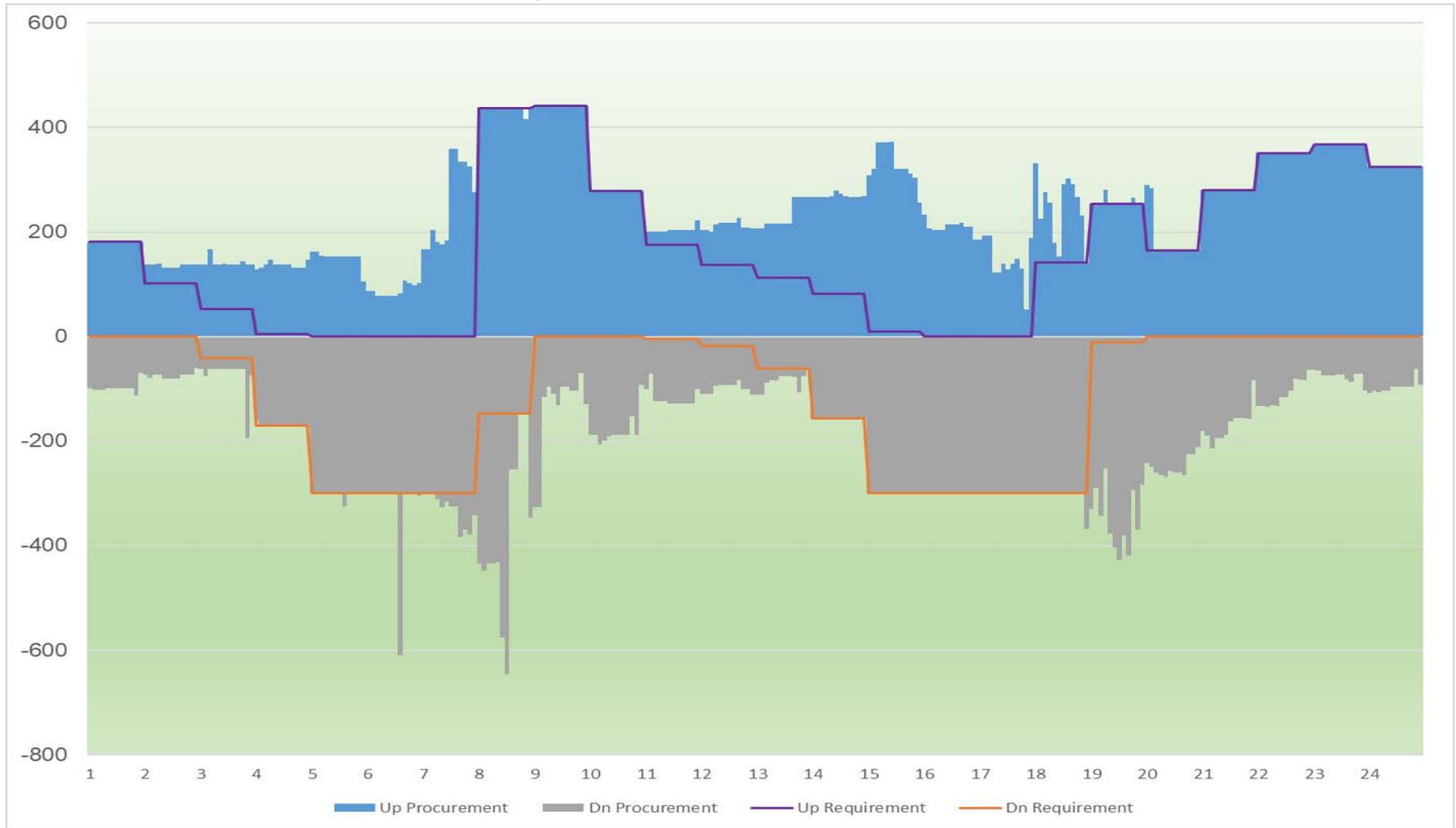
Current Flexible Ramping Uncertainty Requirement Five minute Real-Time Dispatch (RTD) Calculation



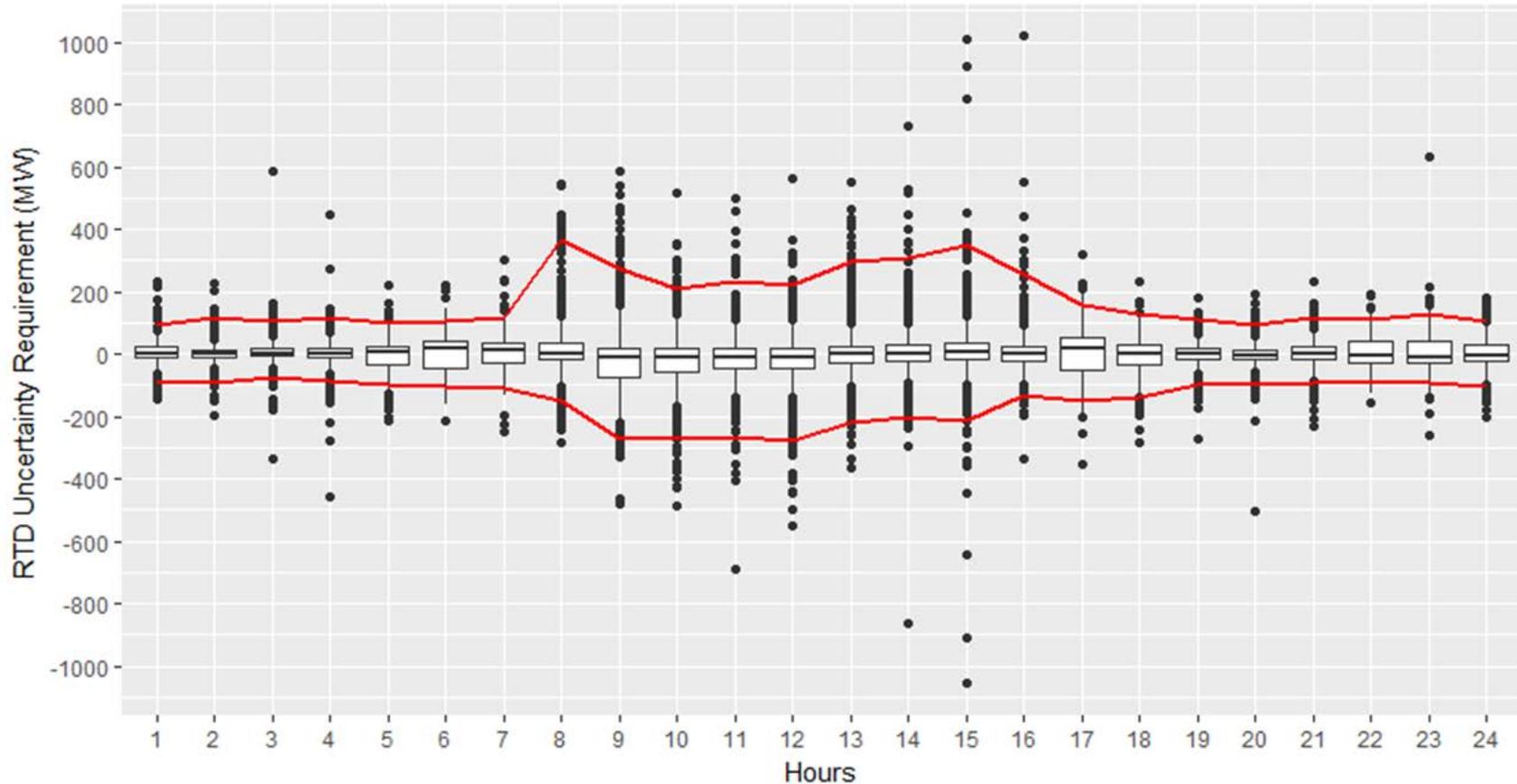
Current Implementation Histogram Sample used to Calculate Uncertainty Requirement for EIM Area -- January 25, 2018



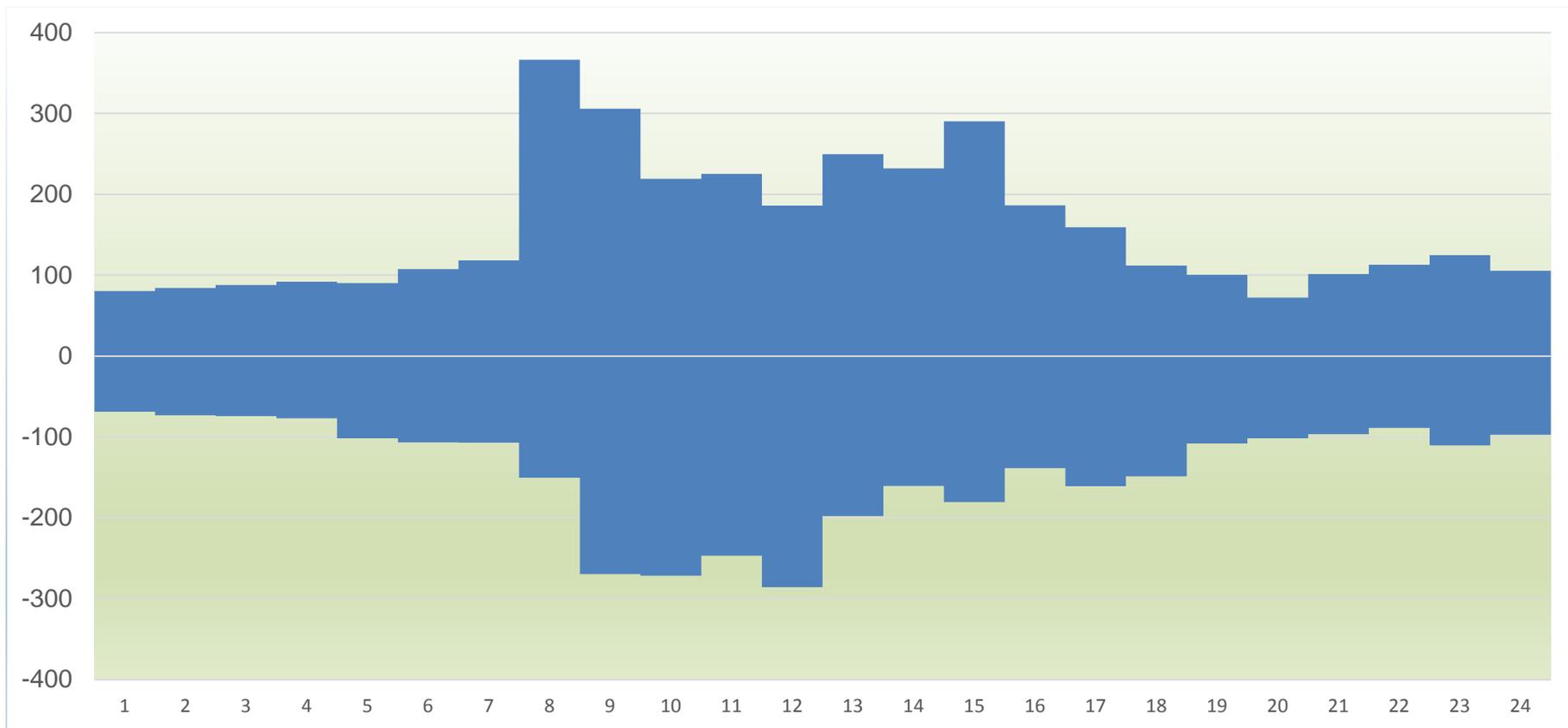
RTD Current Average Flexible Ramp Product Requirement for EIM Area – January 25, 2018



Expected Histogram Sample used to Calculate Uncertainty Requirement for EIM Area -- January 25, 2018

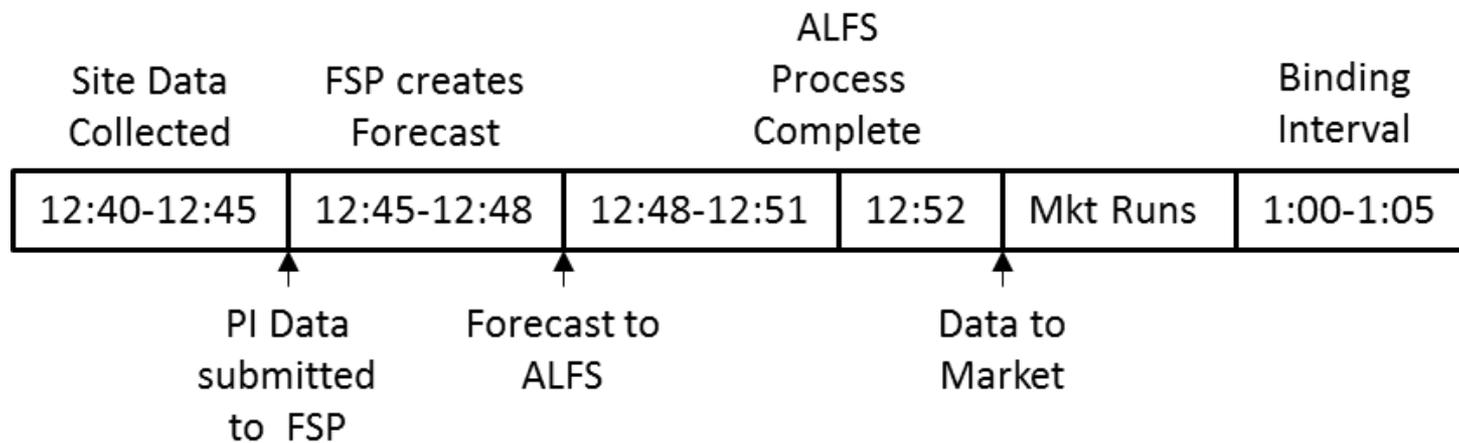


RTD Expected Average Flexible Ramp Product Requirement for EIM Area – January 25, 2018



Persistency Model Update

Current Data Transfer Time Needed for External Forecast Service Provider (FSP)

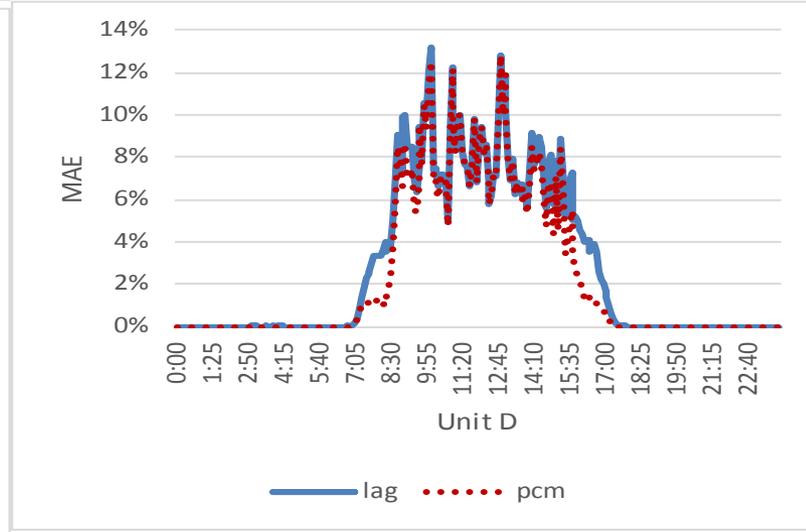
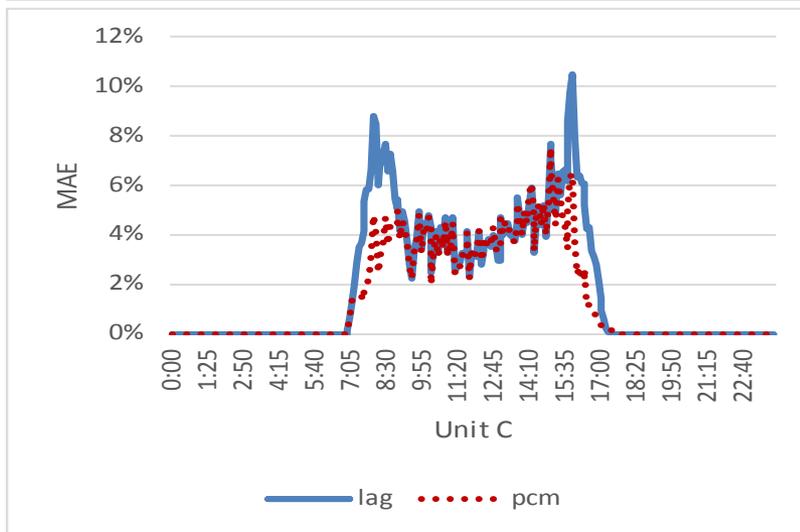
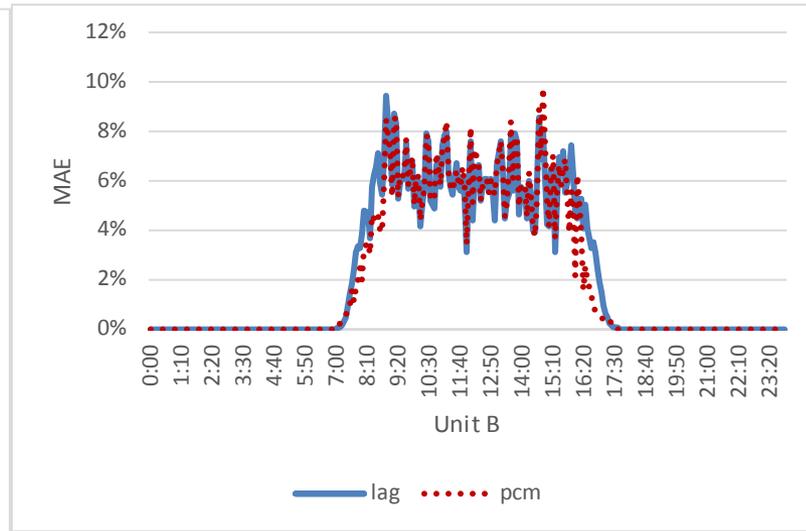
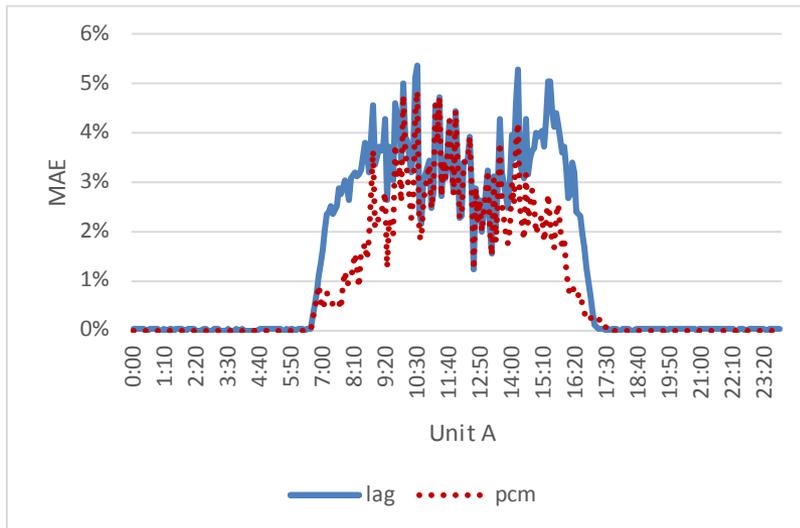


Mean Average Percent Error for January 2017

Forecast Type	RTD	
	Wind	Solar
External FSP	6.5%	8.5%
Lag	3.2%	5.9%
PCM	3.5%	4.9%

Persistence Calculation Method and Lag methods reduced External FSP MAPE by 50% for RTD

Total Mean Absolute Error Value for RTD Solar Forecast



Mean Average Percent Error: RTD Solar Resource Estimates - 2017

Month	External FSP	PCM
February	4.3%	2.7%
March	4.1%	2.5%
April	4.4%	2.7%
May	4.3%	2.1%
June	3.2%	1.0%

Questions and Answers

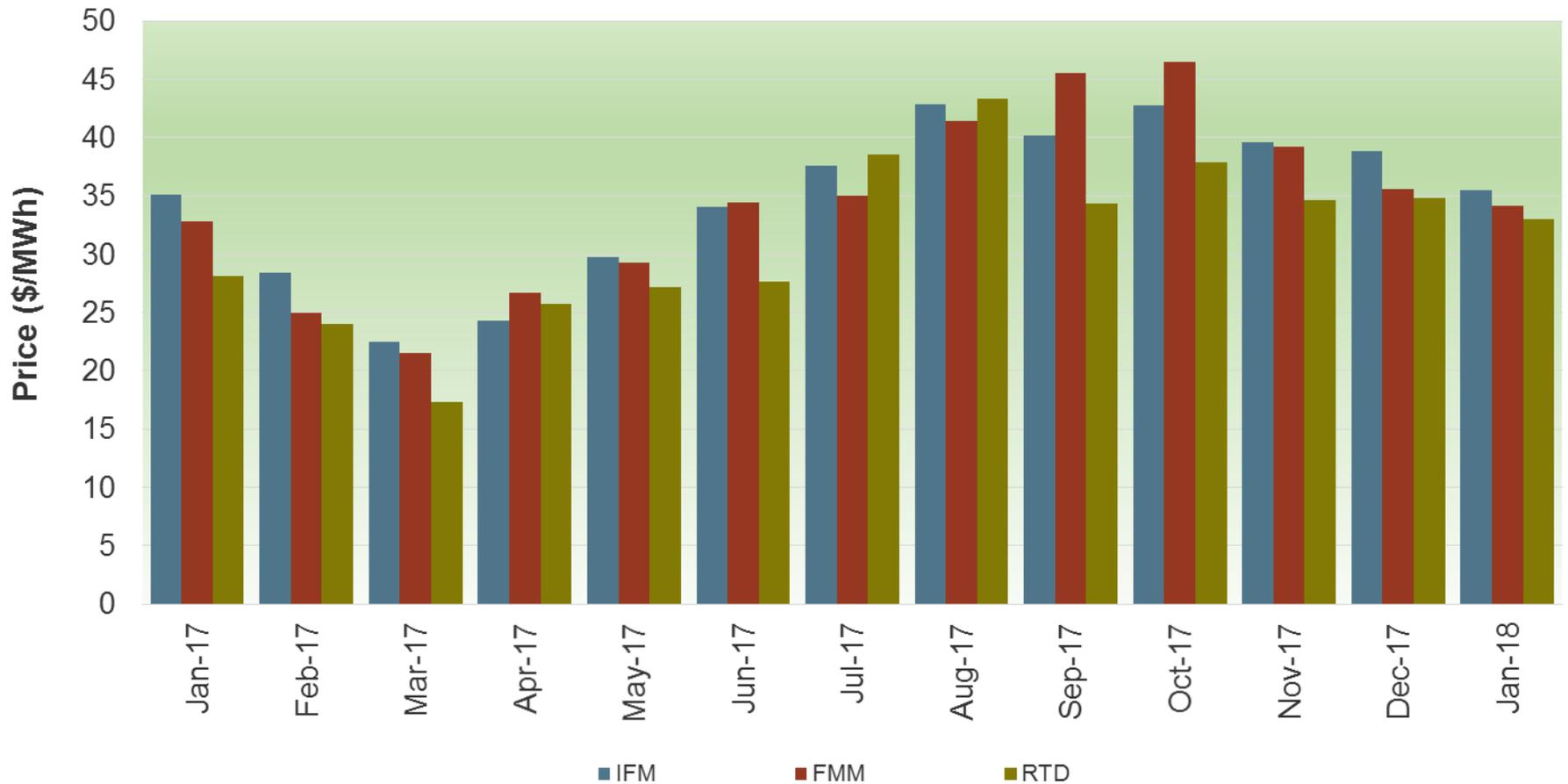
- Has the new model been deployed in the market?
 - At this time the functionality has not been deployed into the market, we will be sending out another Market Notice informing Market Participants of the deployment.
- What caused the delay in market deployment from the previous market notice provided in December?
 - During some of our final testing there were some complications associated with producing a full fuel forecast when supplemental dispatch is occurring.

Questions and Answers (continued)

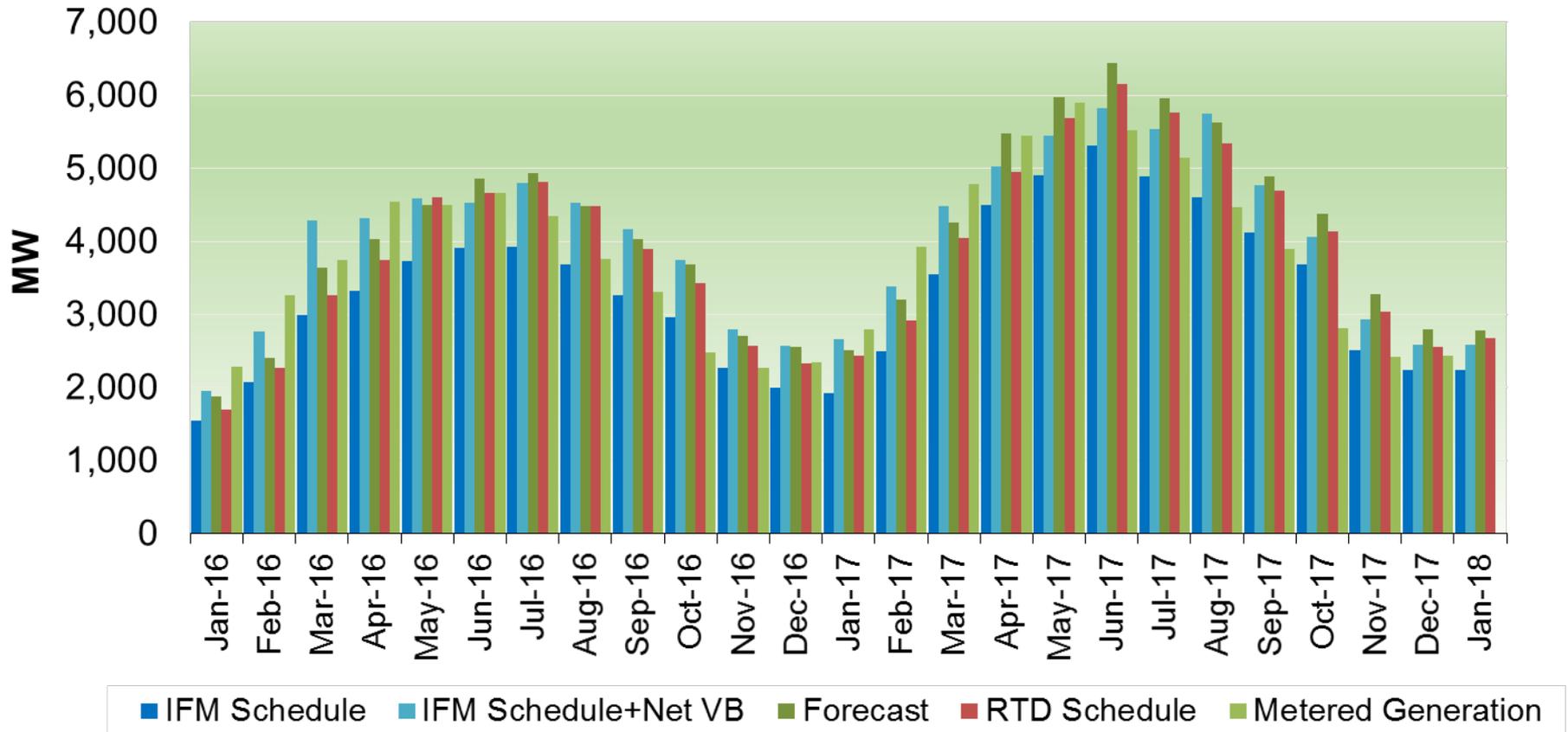
- How does the new forecasting model correct for curtailments and negative SUPP instructions?
 - The enhanced methodology is taking into consideration supplemental dispatches to ensure we continue to get the “full production capability” forecast for the renewable resources.

Market Update

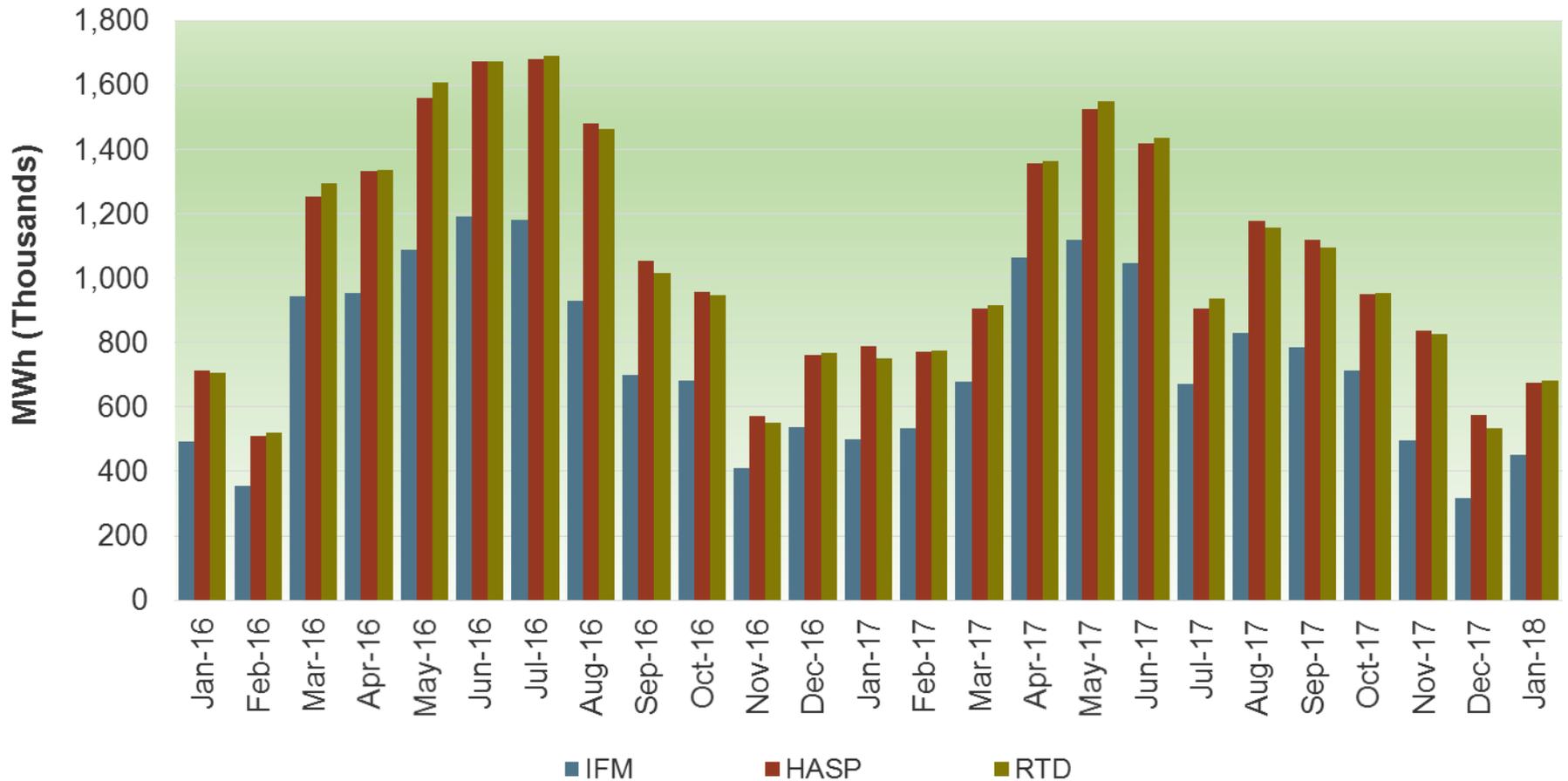
Good price convergence between FMM and RTD in December and January



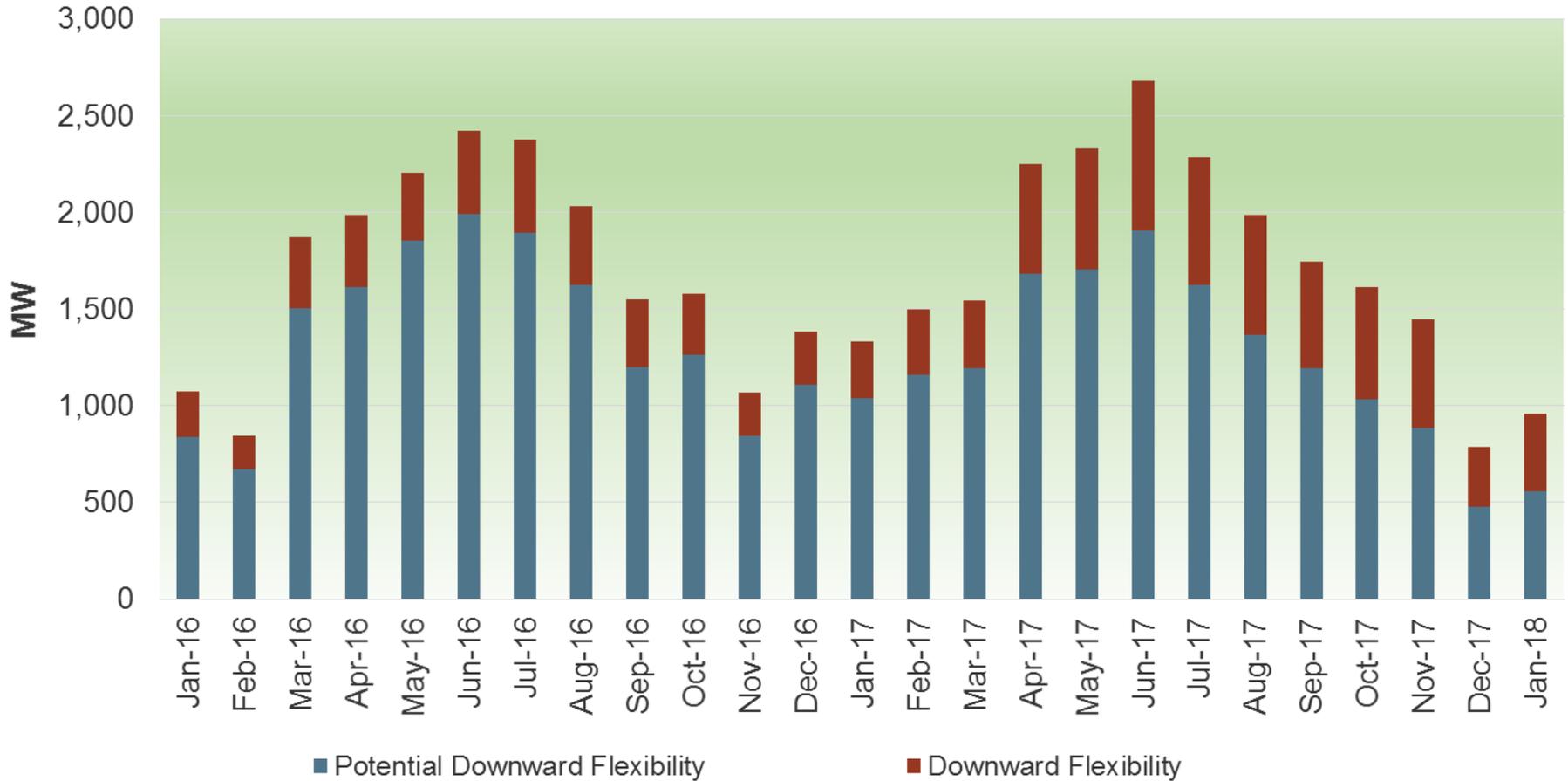
ISO total monthly VERS schedules and forecasts



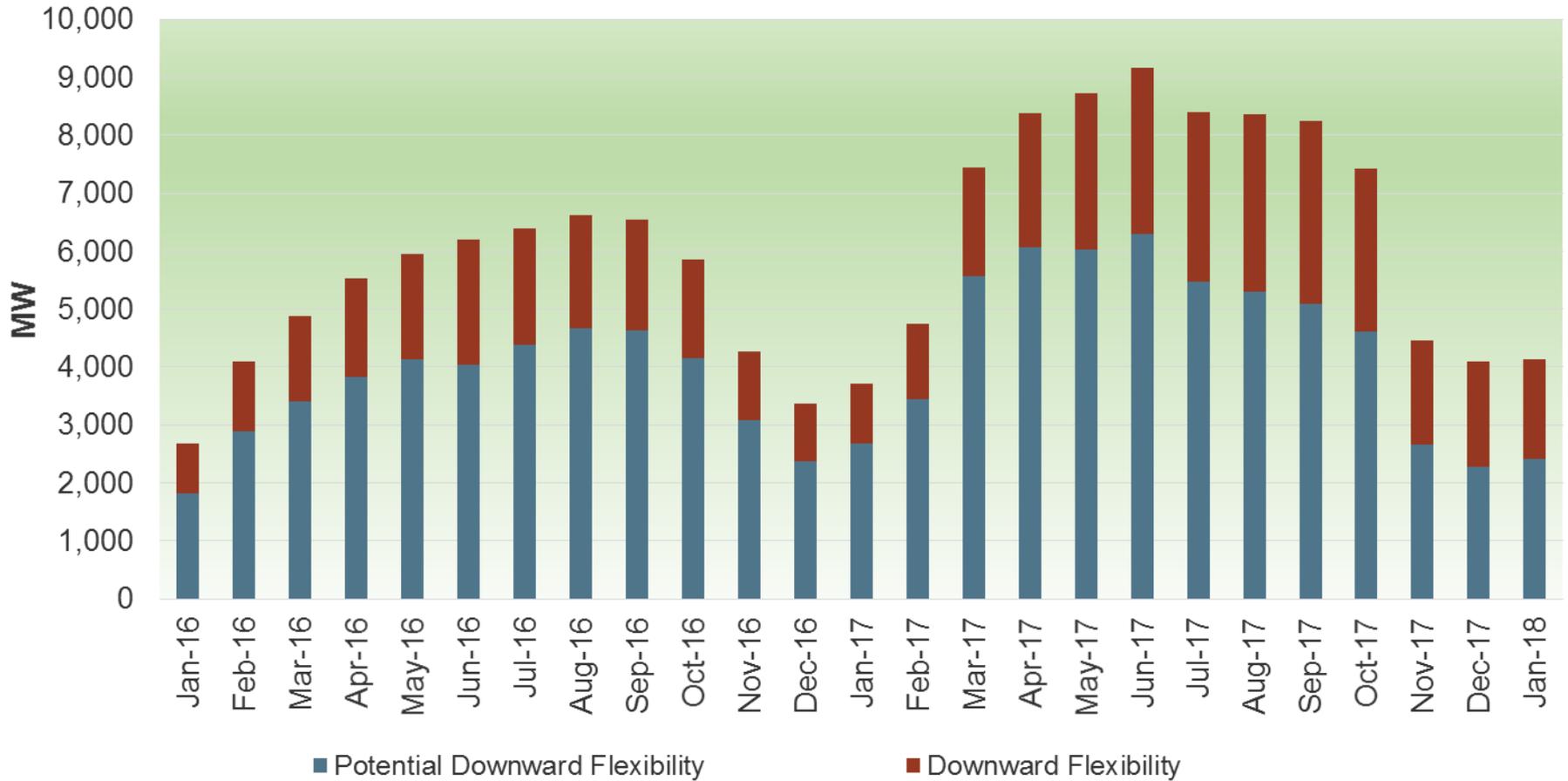
IFM under-scheduling of wind generation



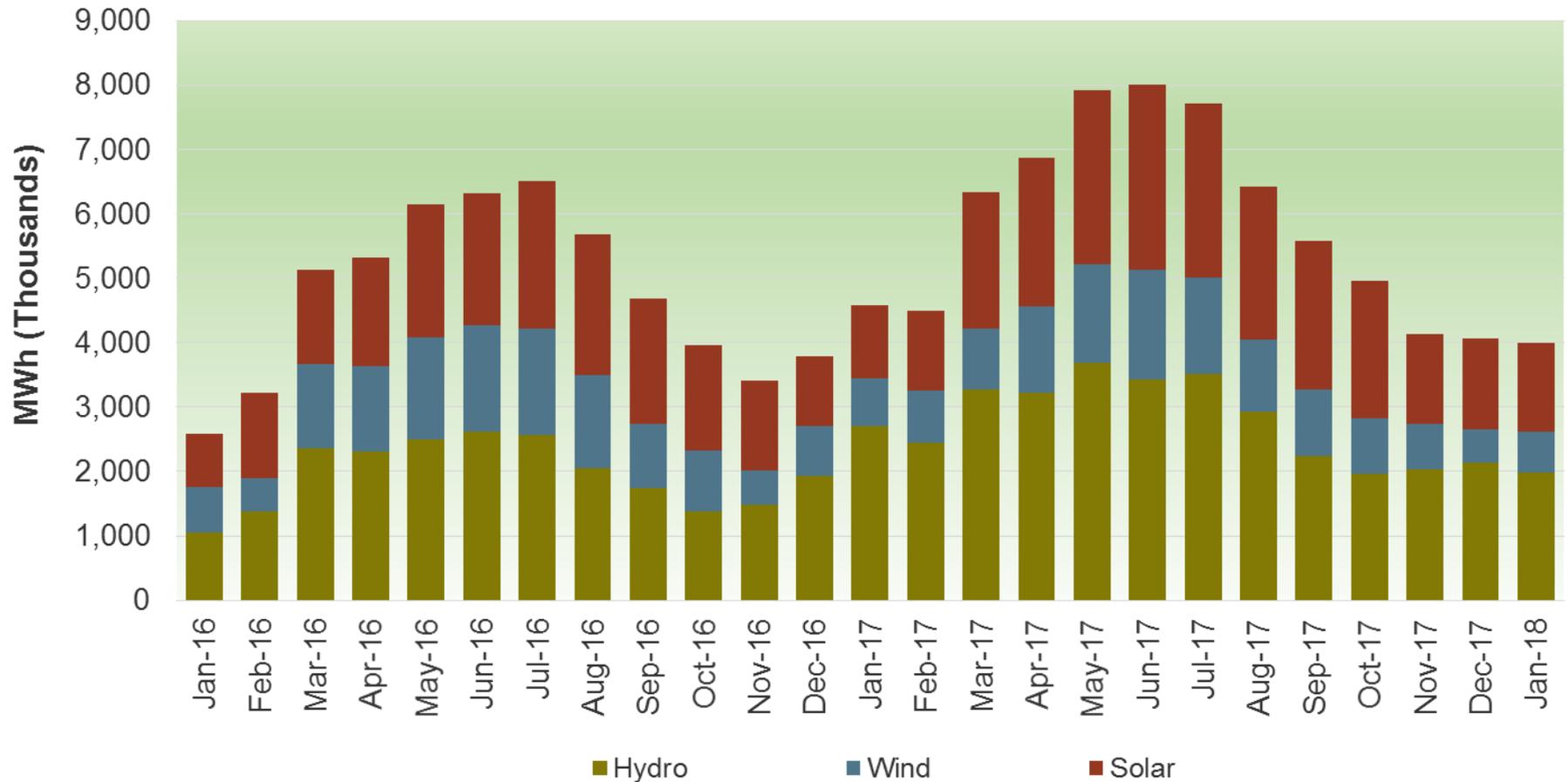
Monthly wind (VERS) downward flexibility in FMM



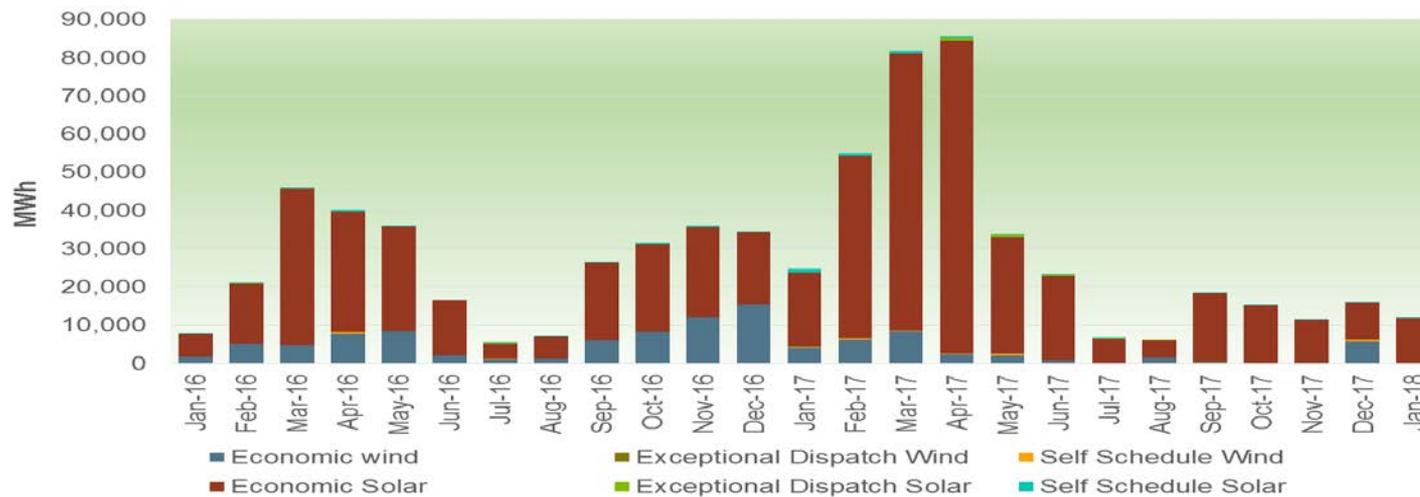
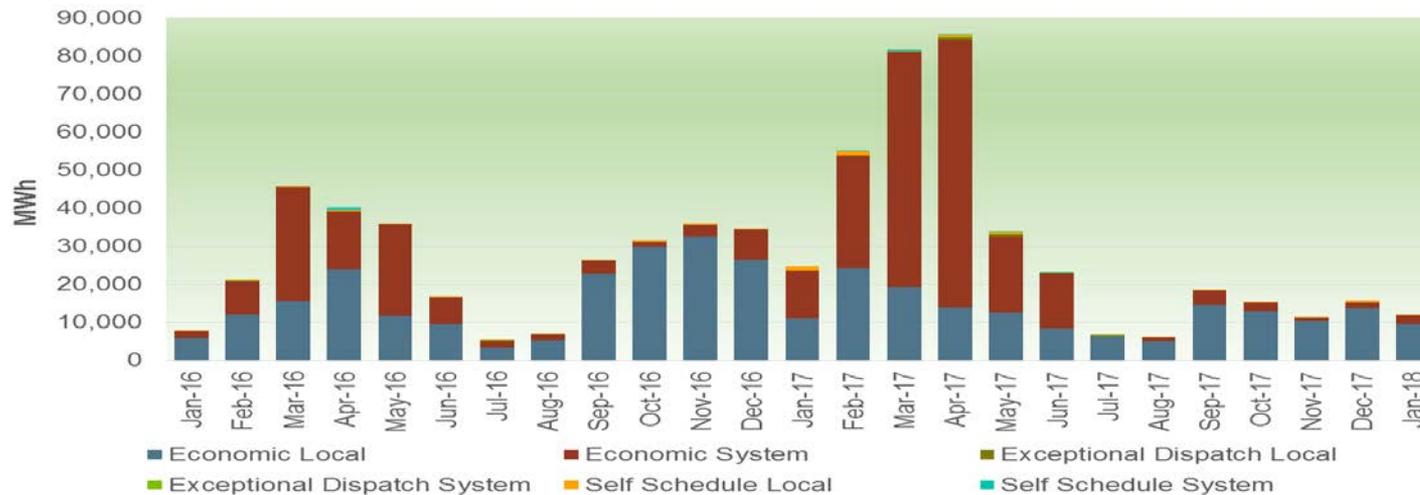
Monthly solar (VERs) downward flexibility in FMM from 11 AM to 5 PM



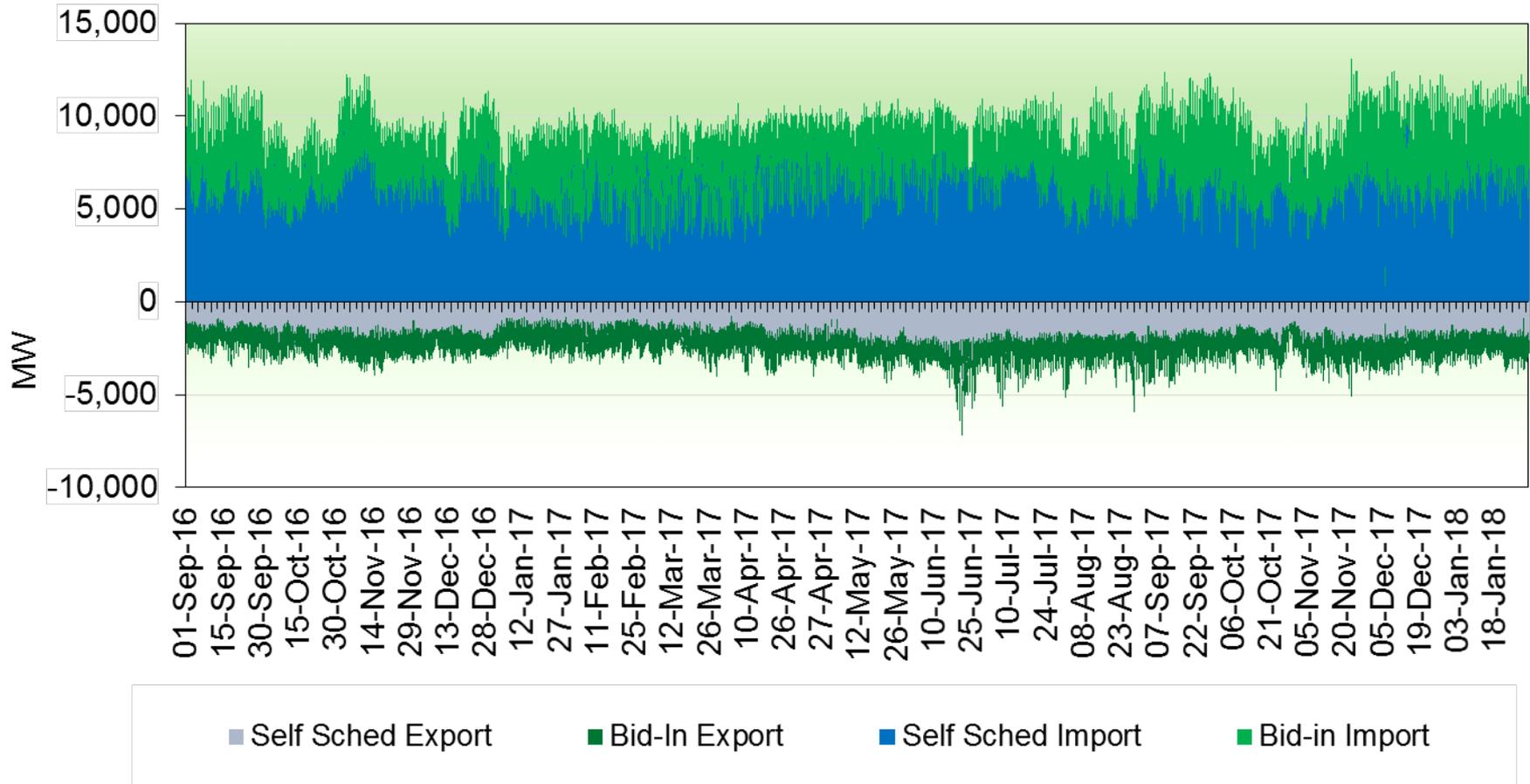
Hydro production coming down with seasonal and lower hydro conditions



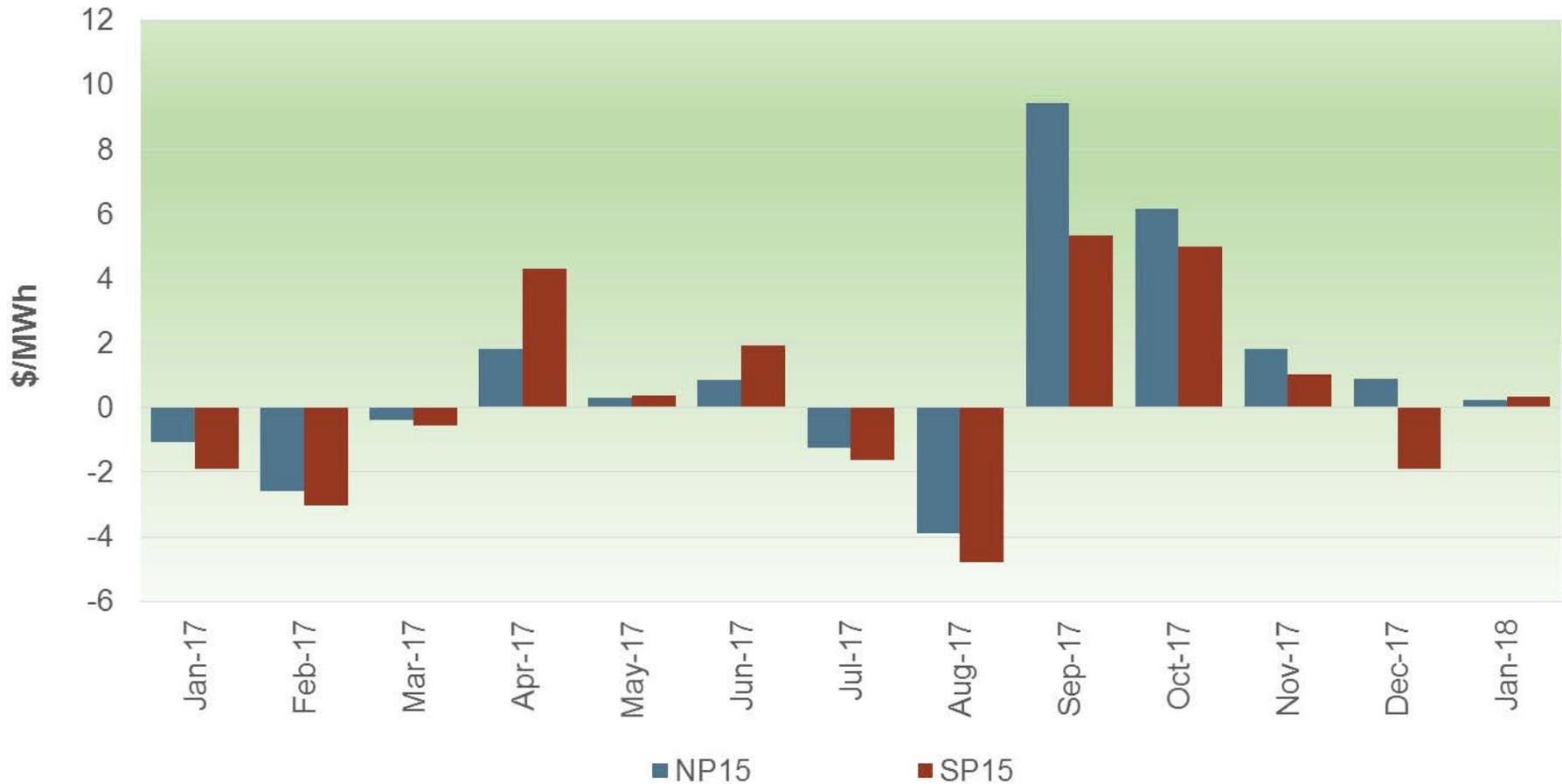
RTD renewable (VERS) curtailment moderated since May 2017



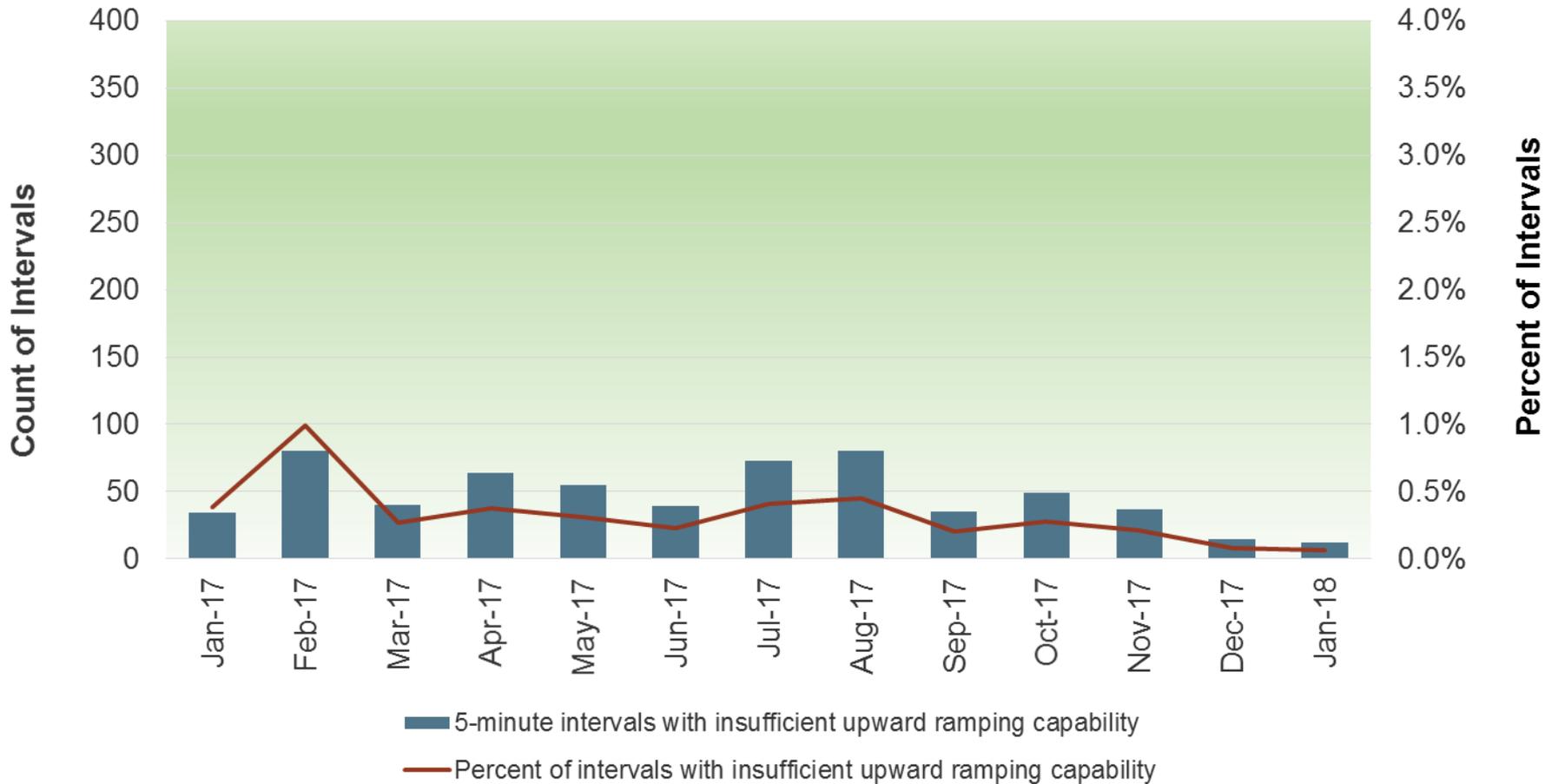
Self scheduled interties in the real-time market remained high



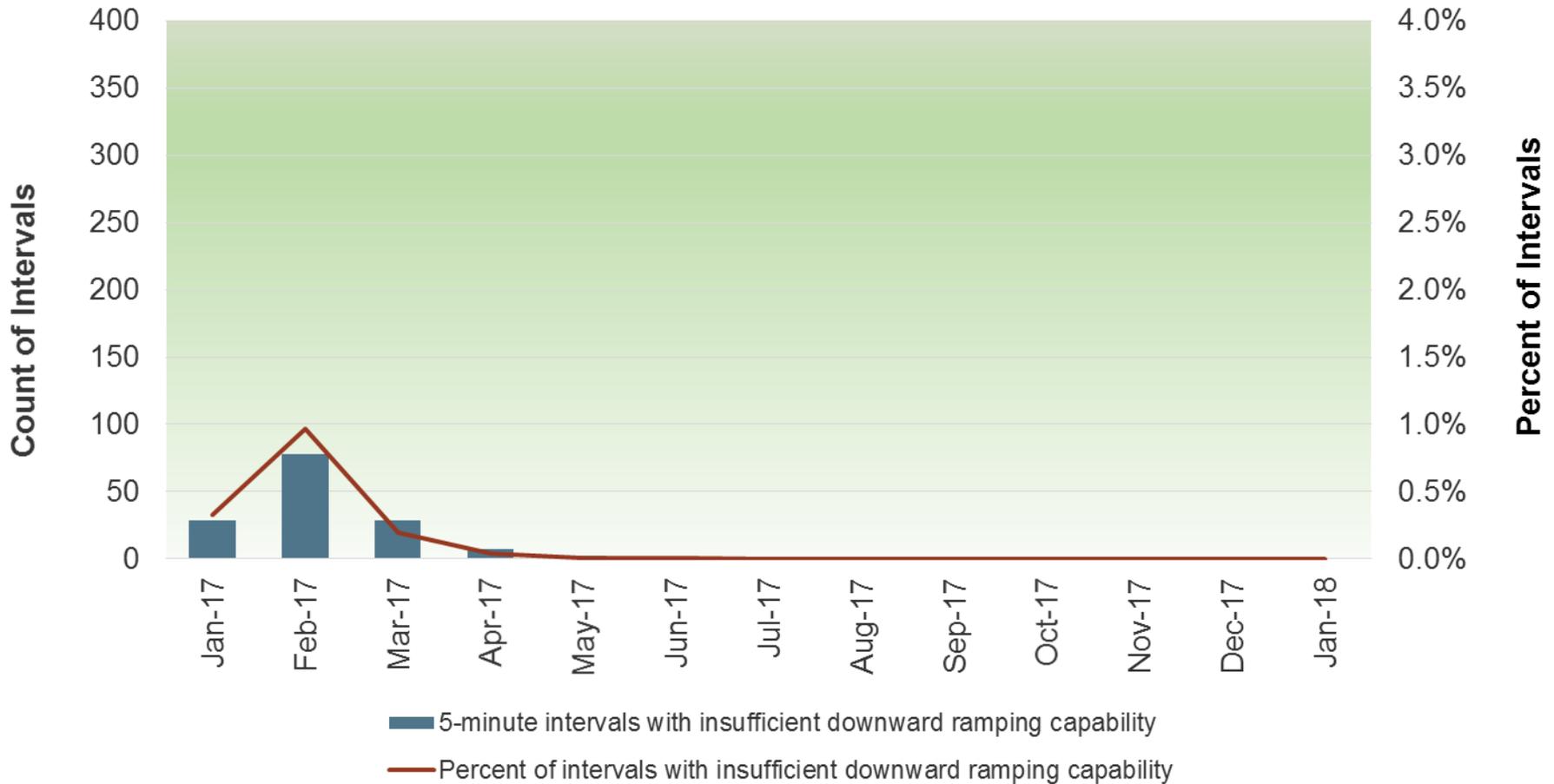
Good convergence of RT and DA prices for both NP15 and SP15 in January



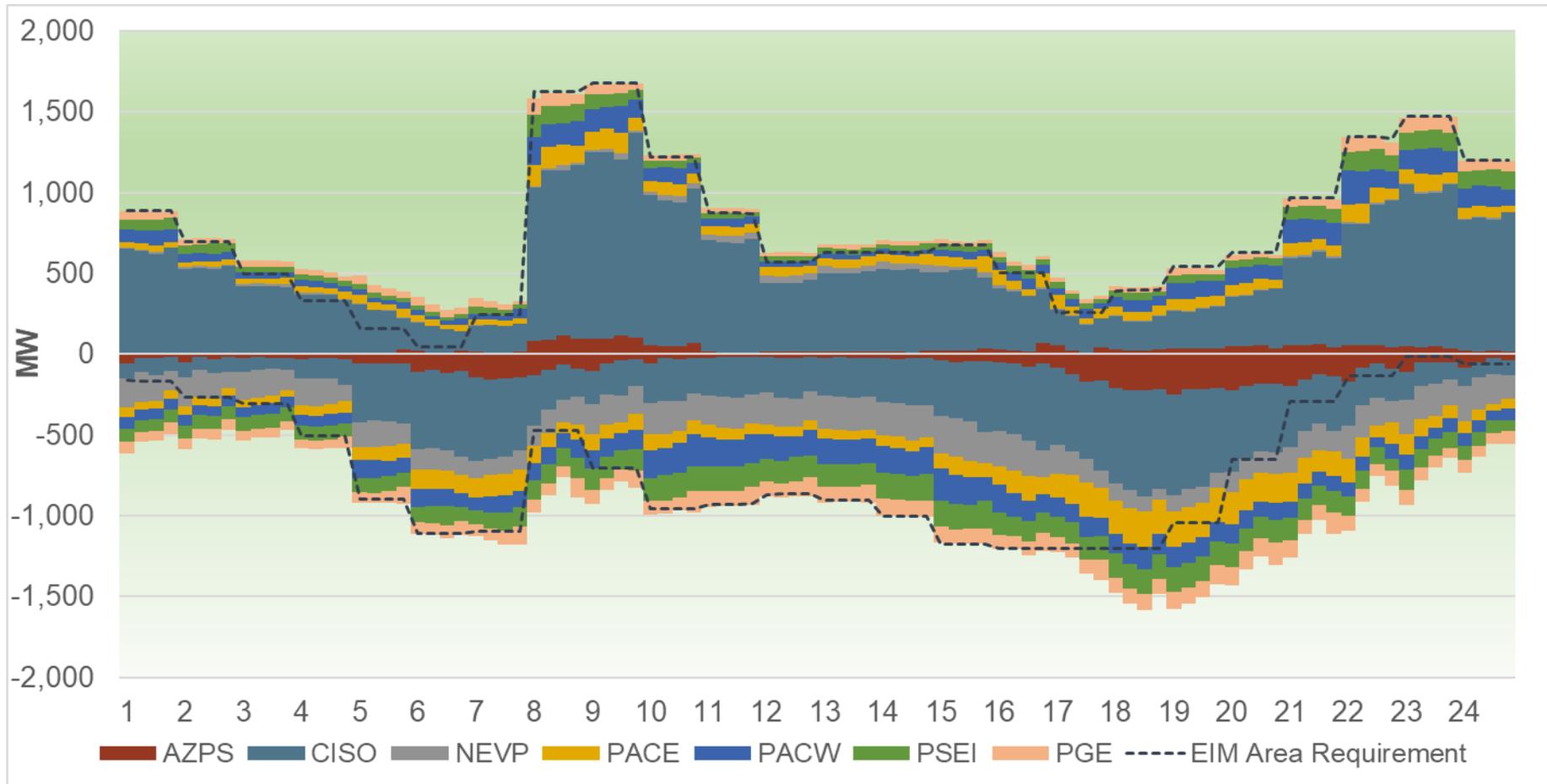
Insufficient upward ramping capacity in ISO stayed low in December and January



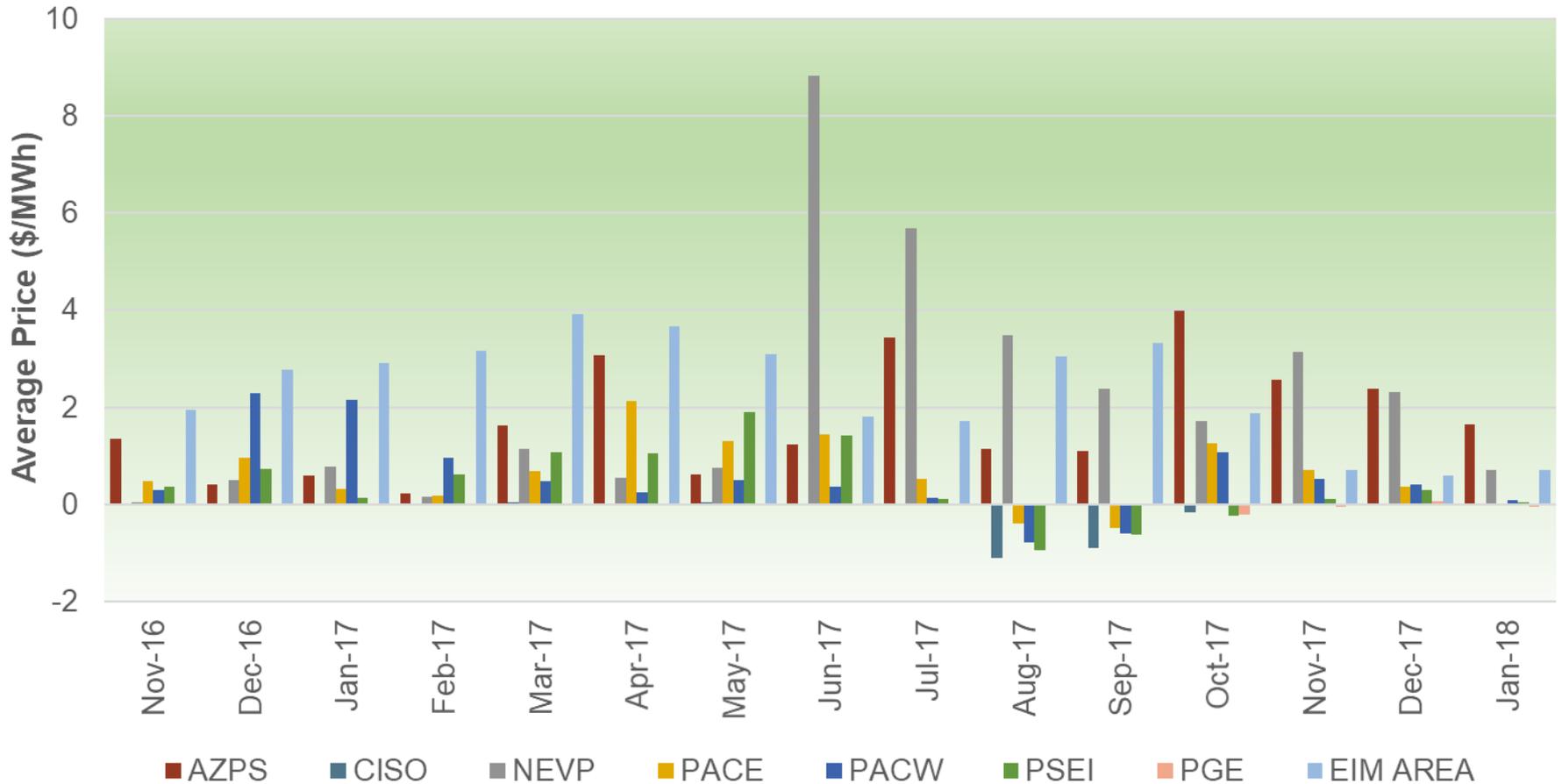
Insufficient downward ramping capacity declined since last February



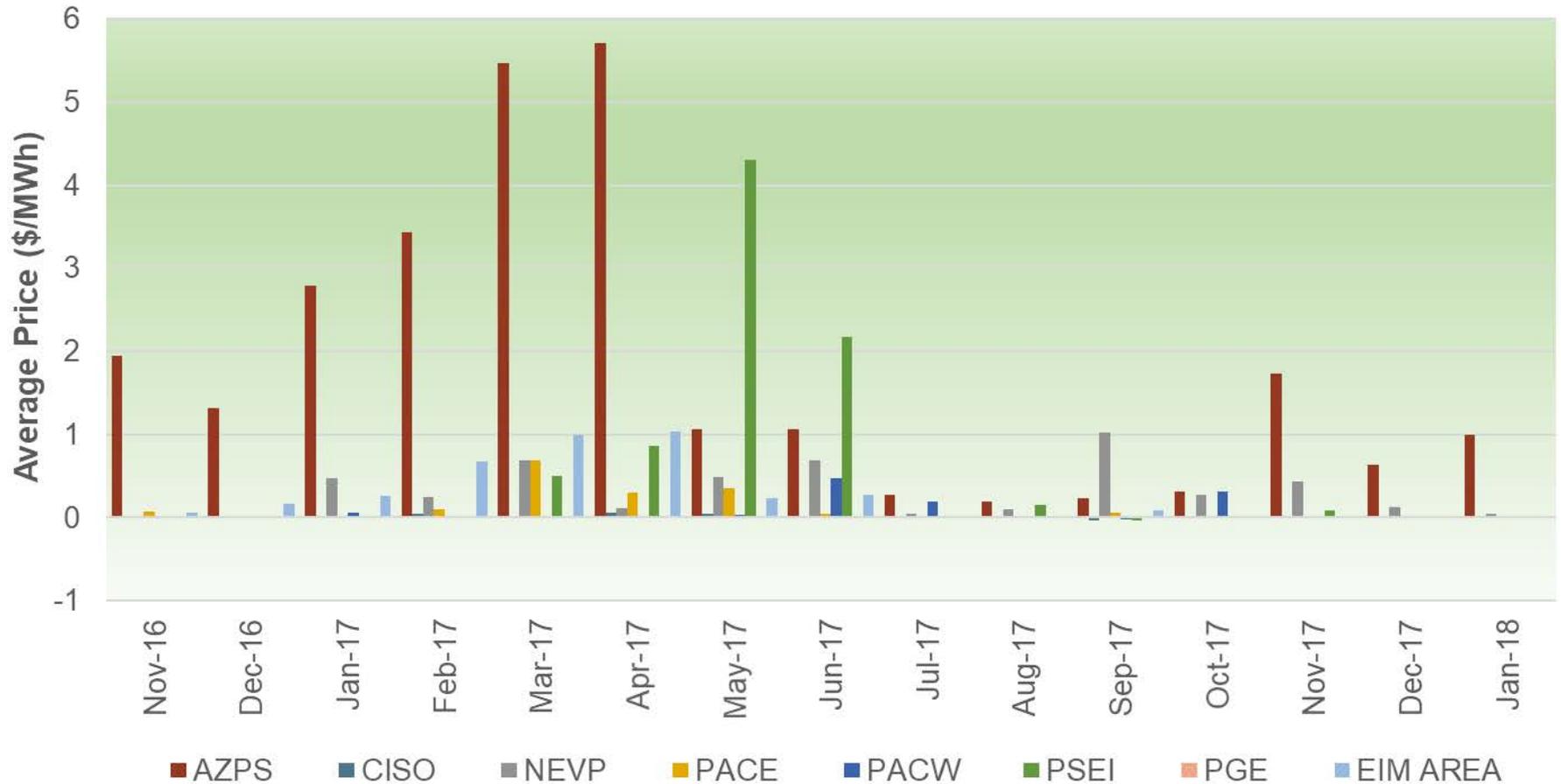
Average Flexible Ramp Product Cleared Awards for each area with EIM Area Requirement from Oct - Jan 2018



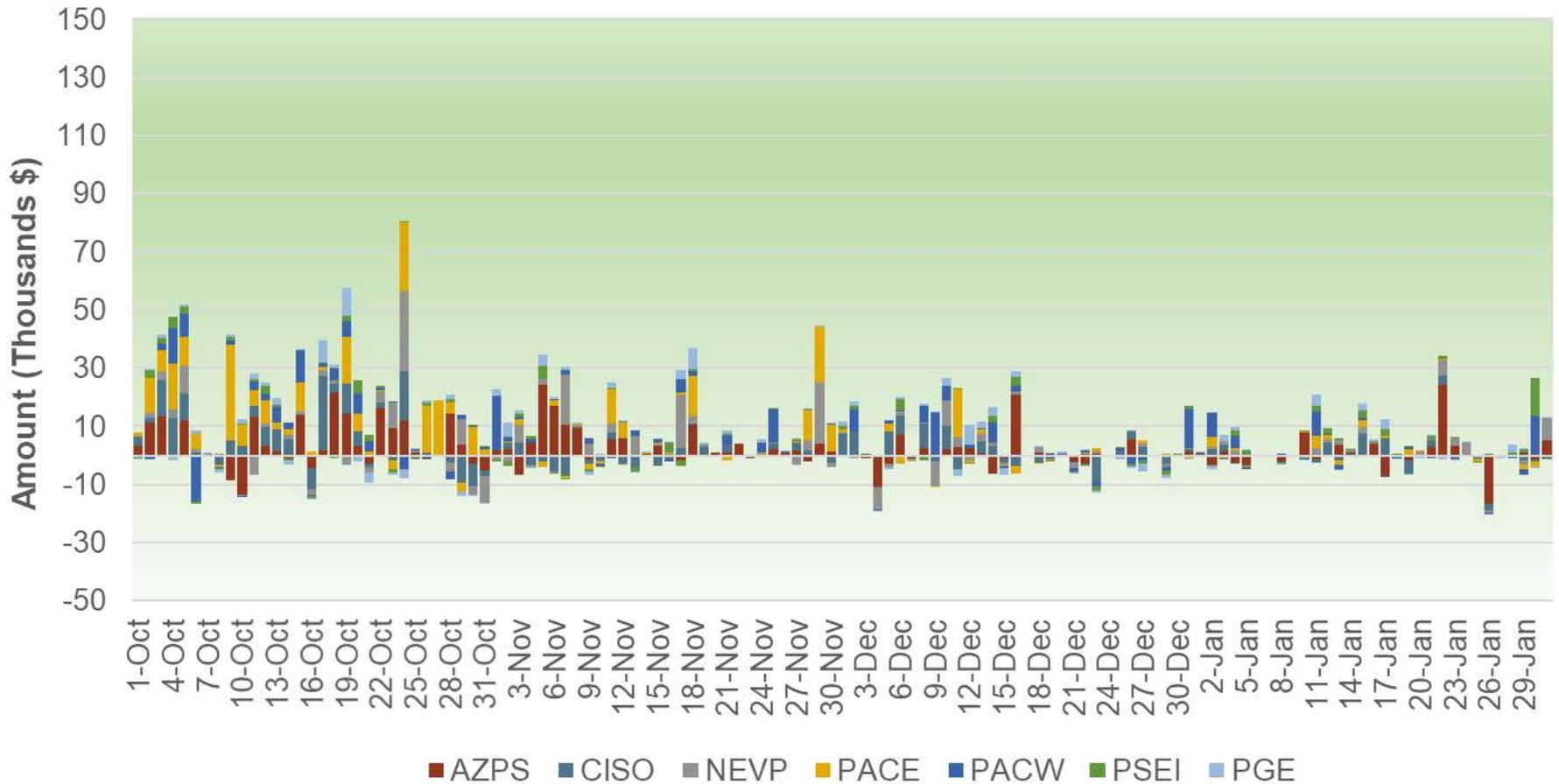
Average Flexible Ramp Up Price (\$/MWh)



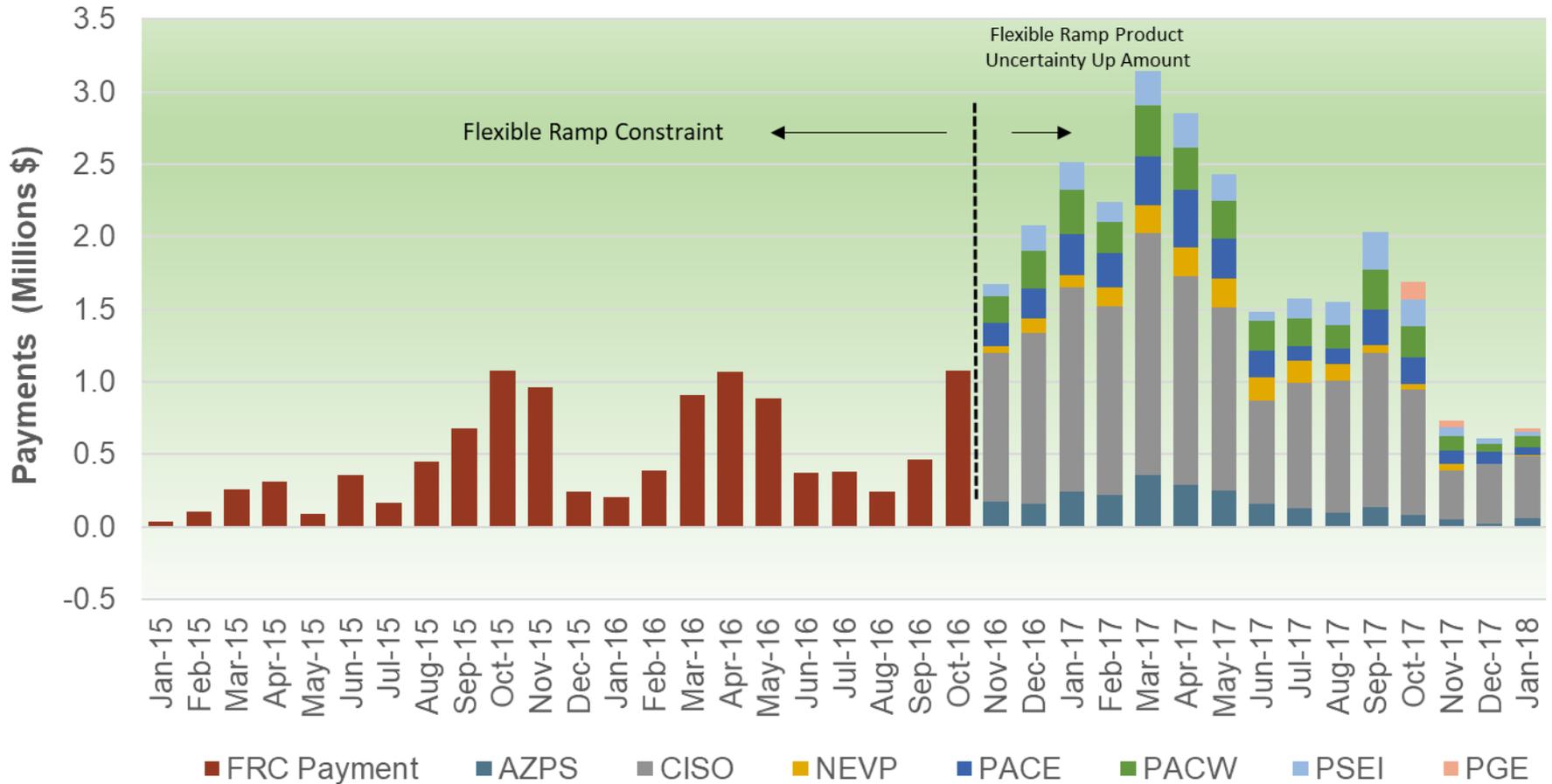
Average Flexible Ramp Down Price (\$/MWh)



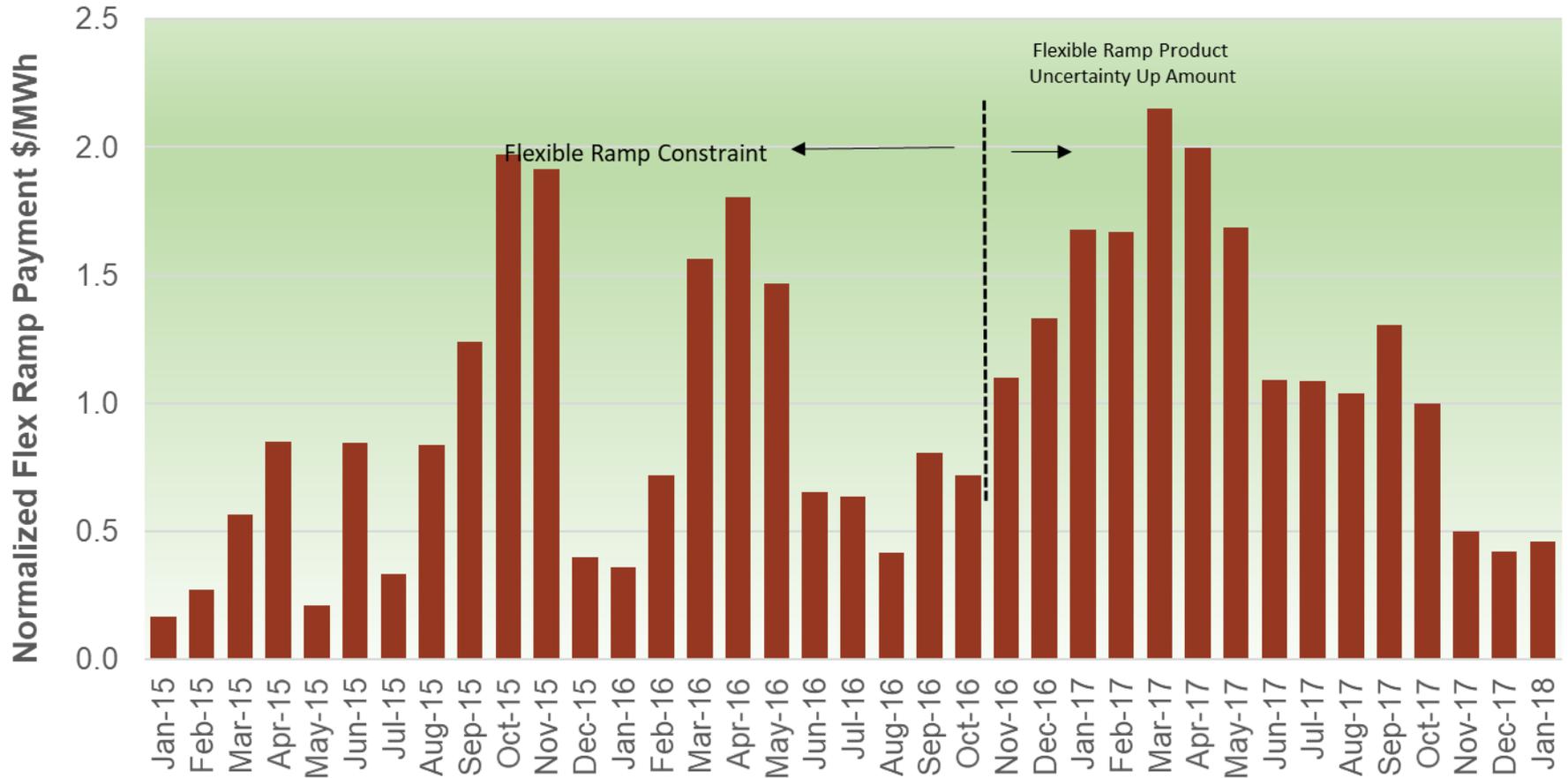
Forecasted Movement Settlement



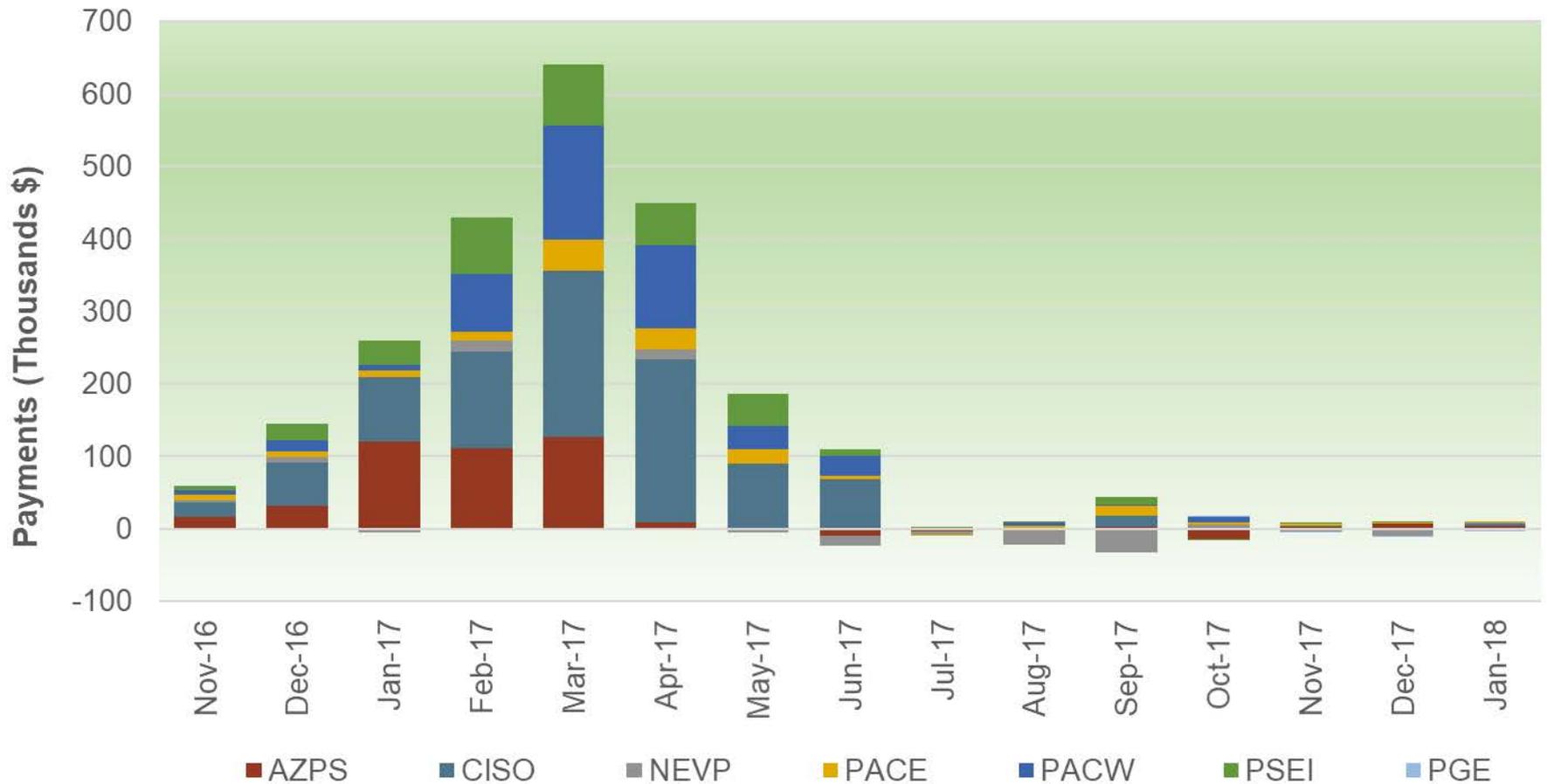
Uncertainty Up Settlement Amount



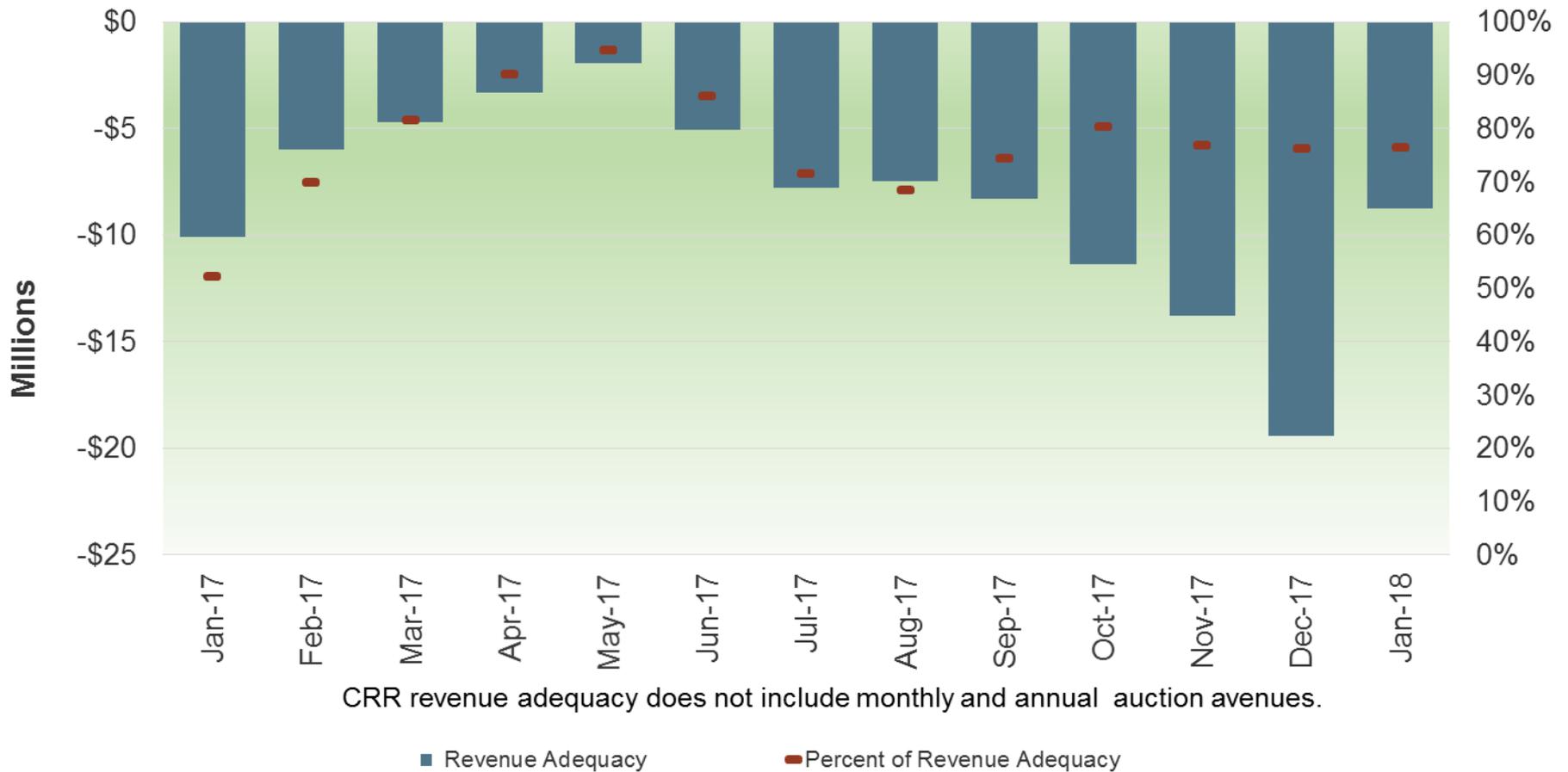
Normalized Flex Ramp Up Payment



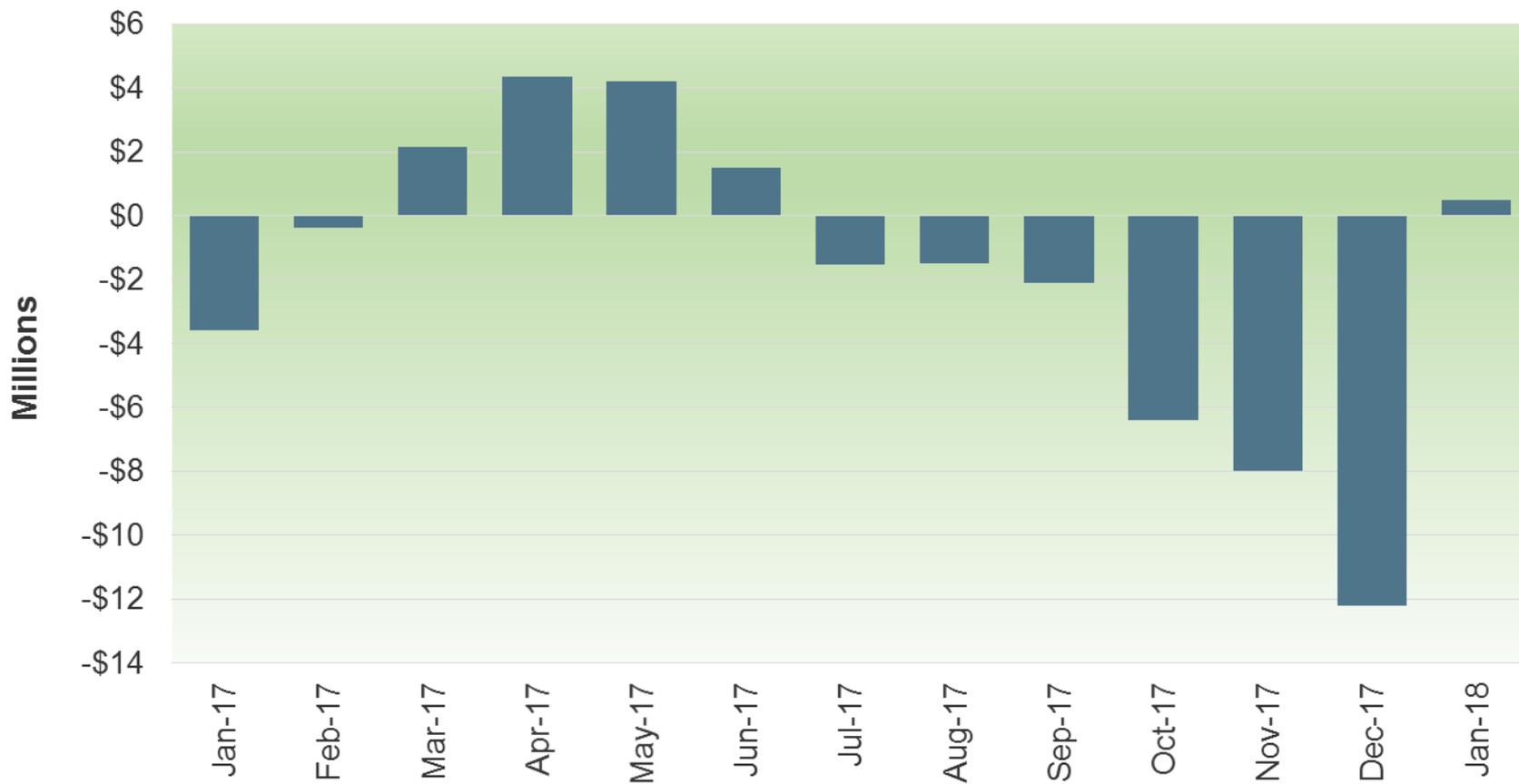
Uncertainty Movement Down Settlement



Congestion revenue rights market revenue inadequacy without auction revenues



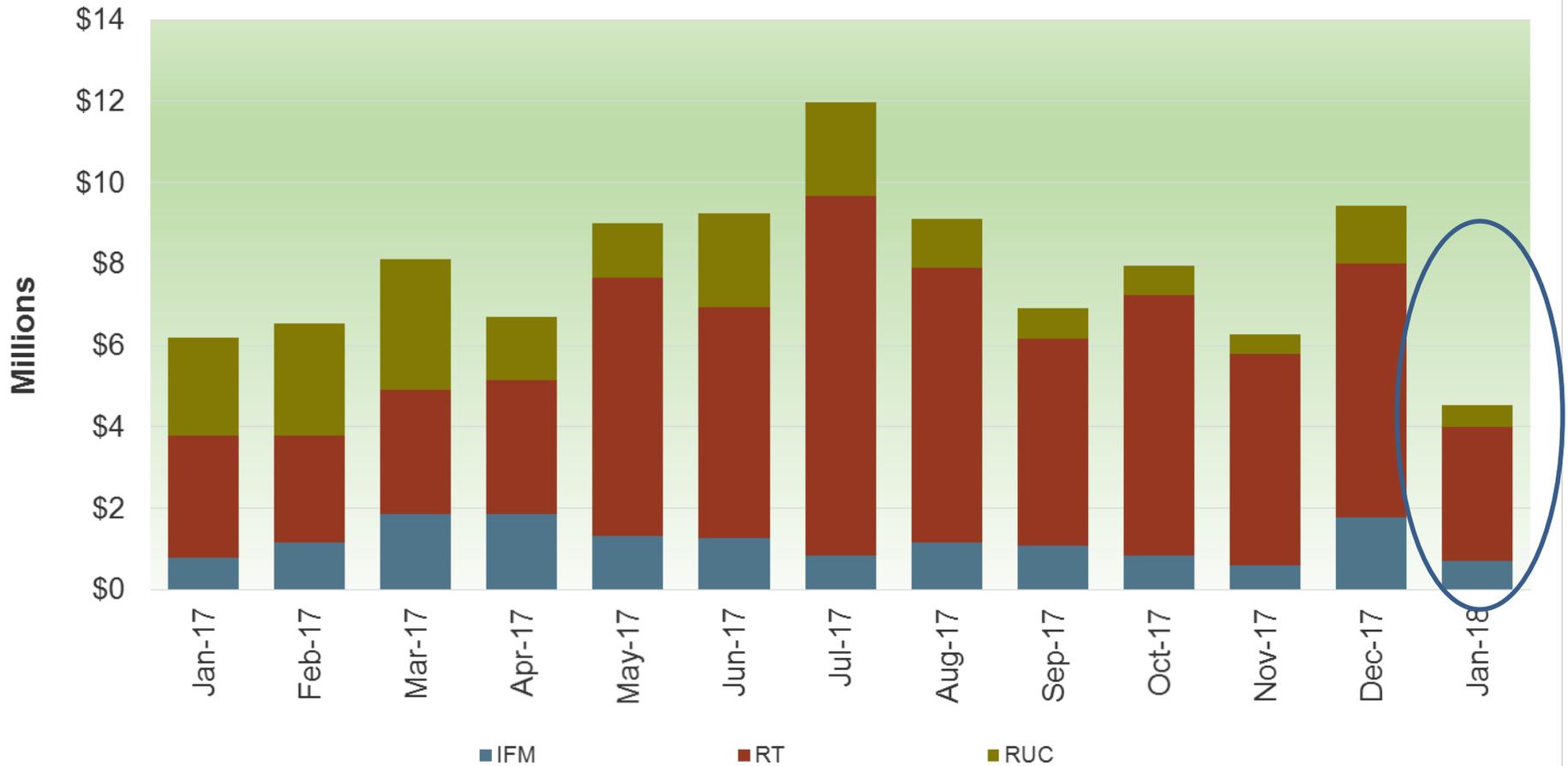
Congestion revenue rights market revenue sufficiency including auction revenues.



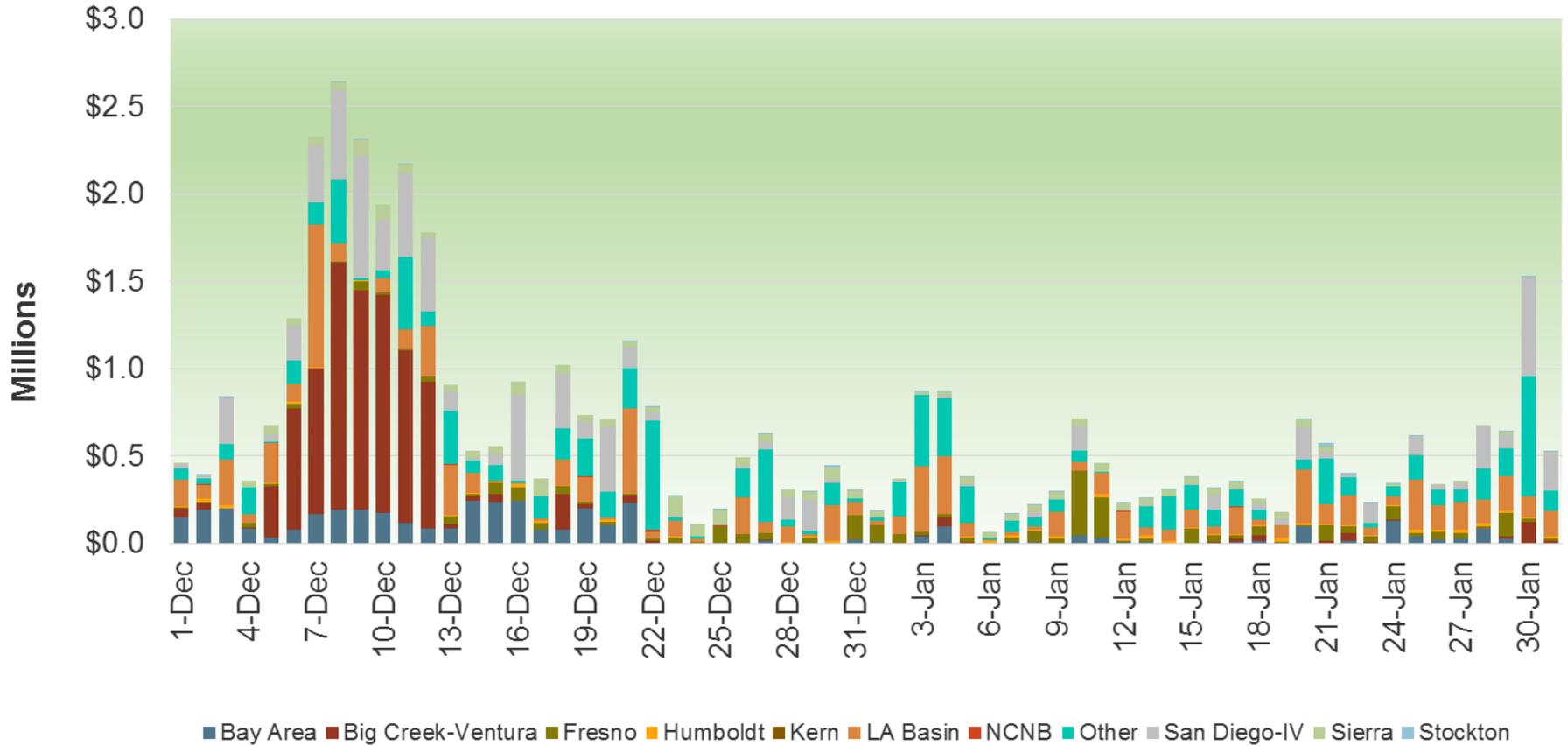
Exceptional dispatch volume in the ISO area was low in January



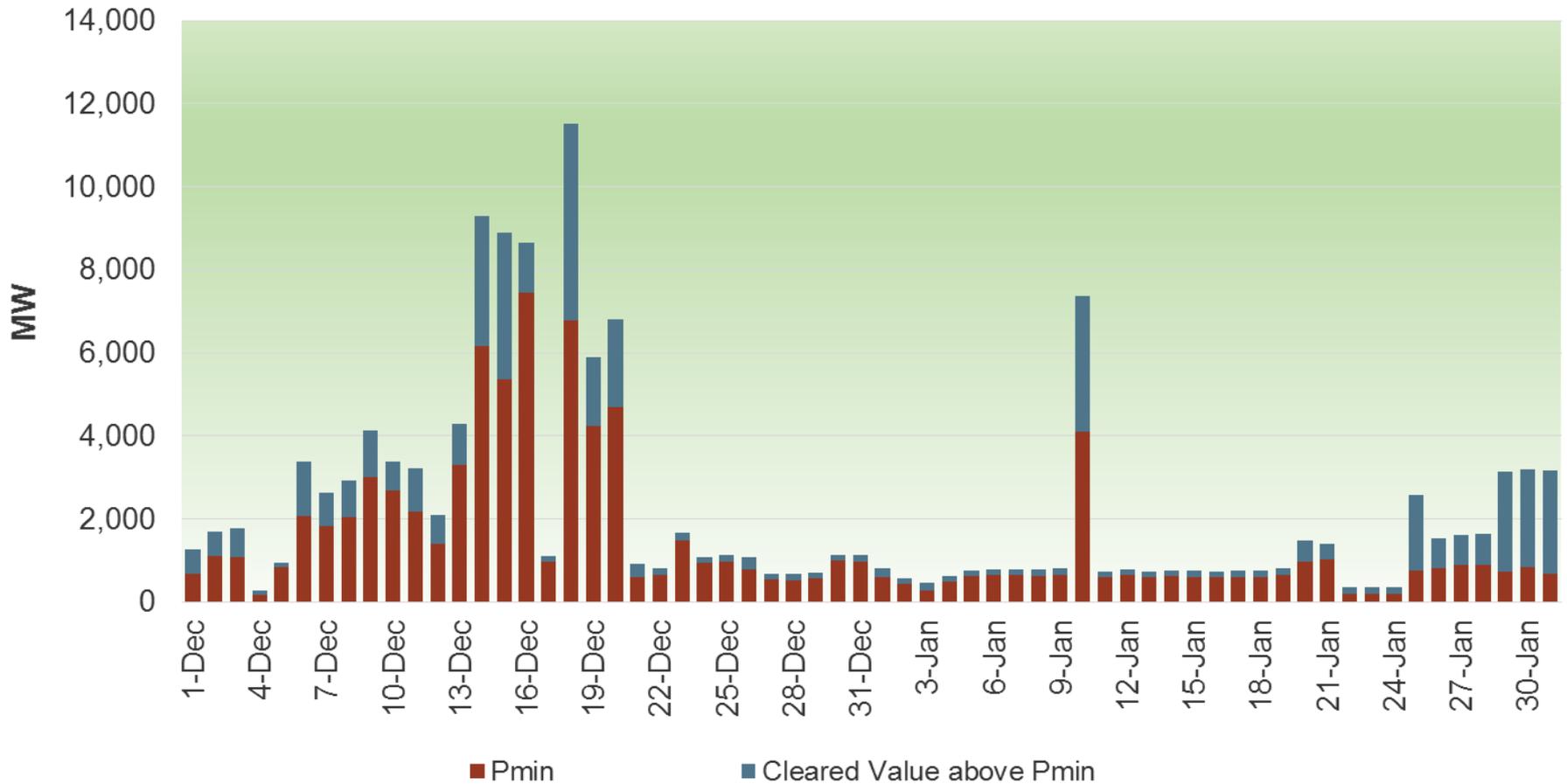
Real-time Bid cost recovery decreased in January



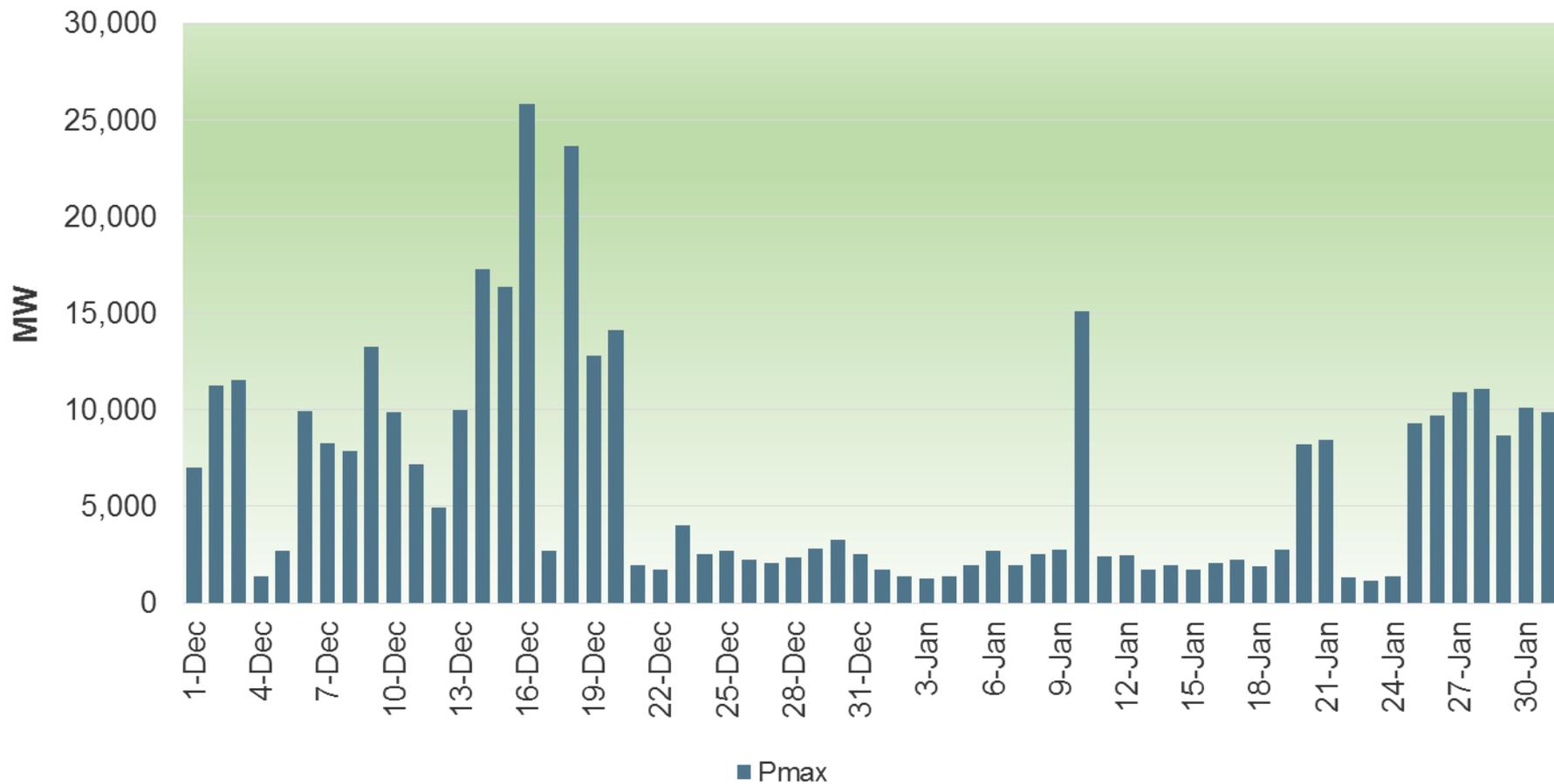
Bid cost recovery (BCR) by Local Capacity Requirement area



Minimum online commitment (MOC)



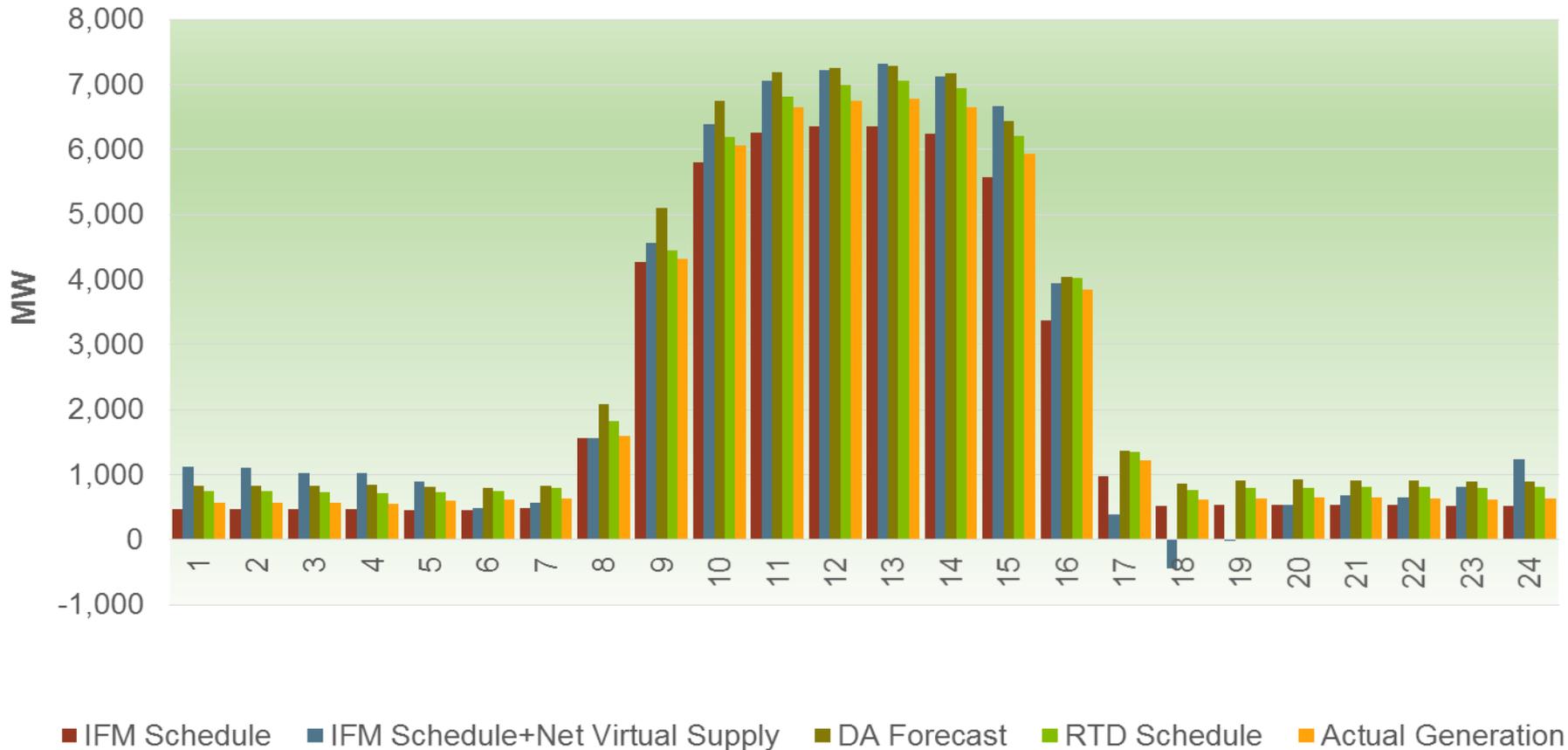
Pmax of MOC Cleared Units



Enforcement of minimum online commitments in December and January

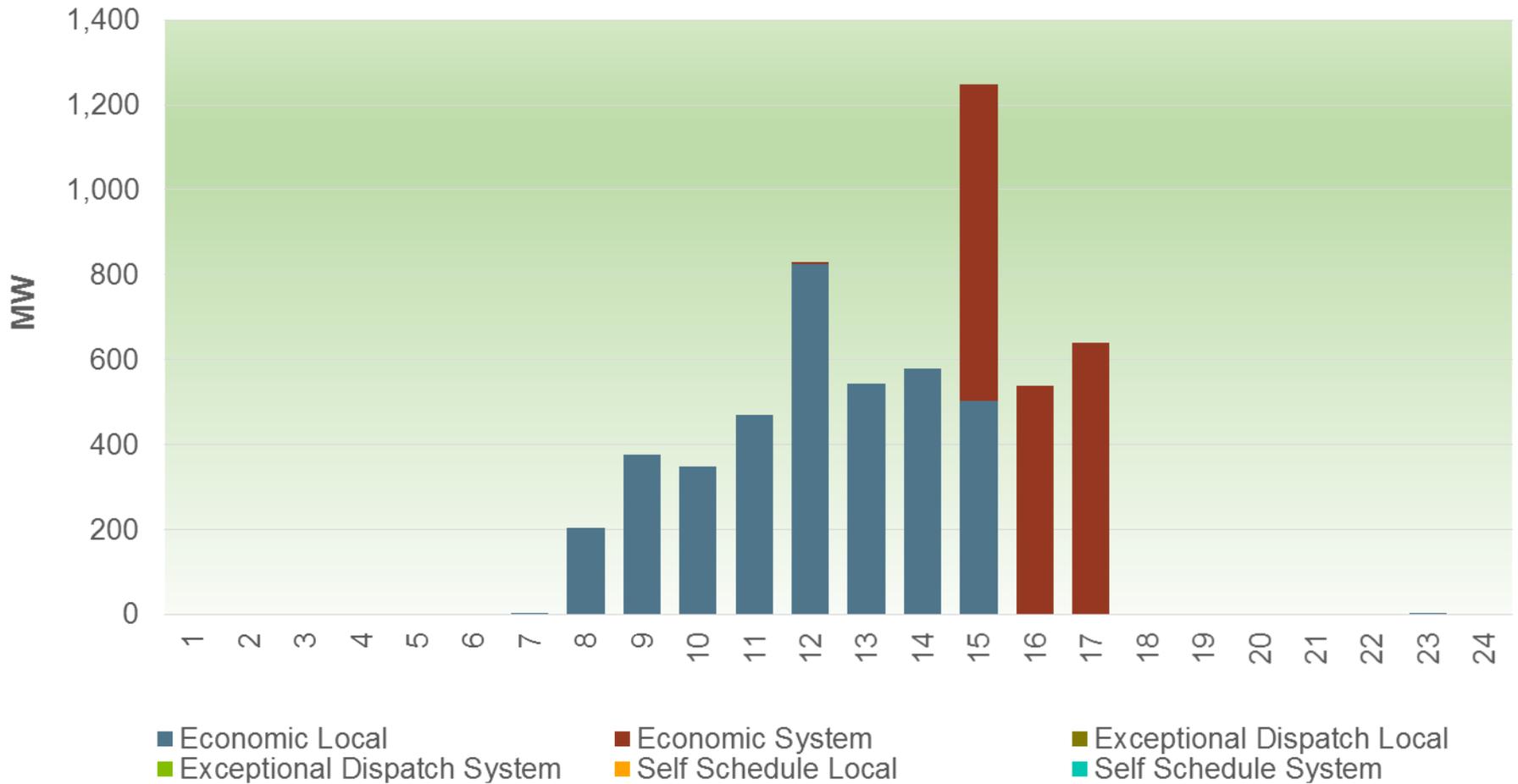
MOC Name	Number (frequency) of hours in October and November
Humboldt 7110 SVC In	1304
MOC Palermo 5443153	554
MOC Rollins 5408044	480
MOC Table 5453707	236
Orange County 7630	212
MOC SAN ONOFRE BUS	125
MOC Rio Hondo 5320375	75
SDGE 7820	53
MOC Bay Area 1 Winter No TBC	53
SCIT MOC	49
MOC Mesa-Redondo 5506738	48
MOC Narows 5509865	10

Renewable (VERs) schedules including net virtual supply aligns with VER forecast in December and January

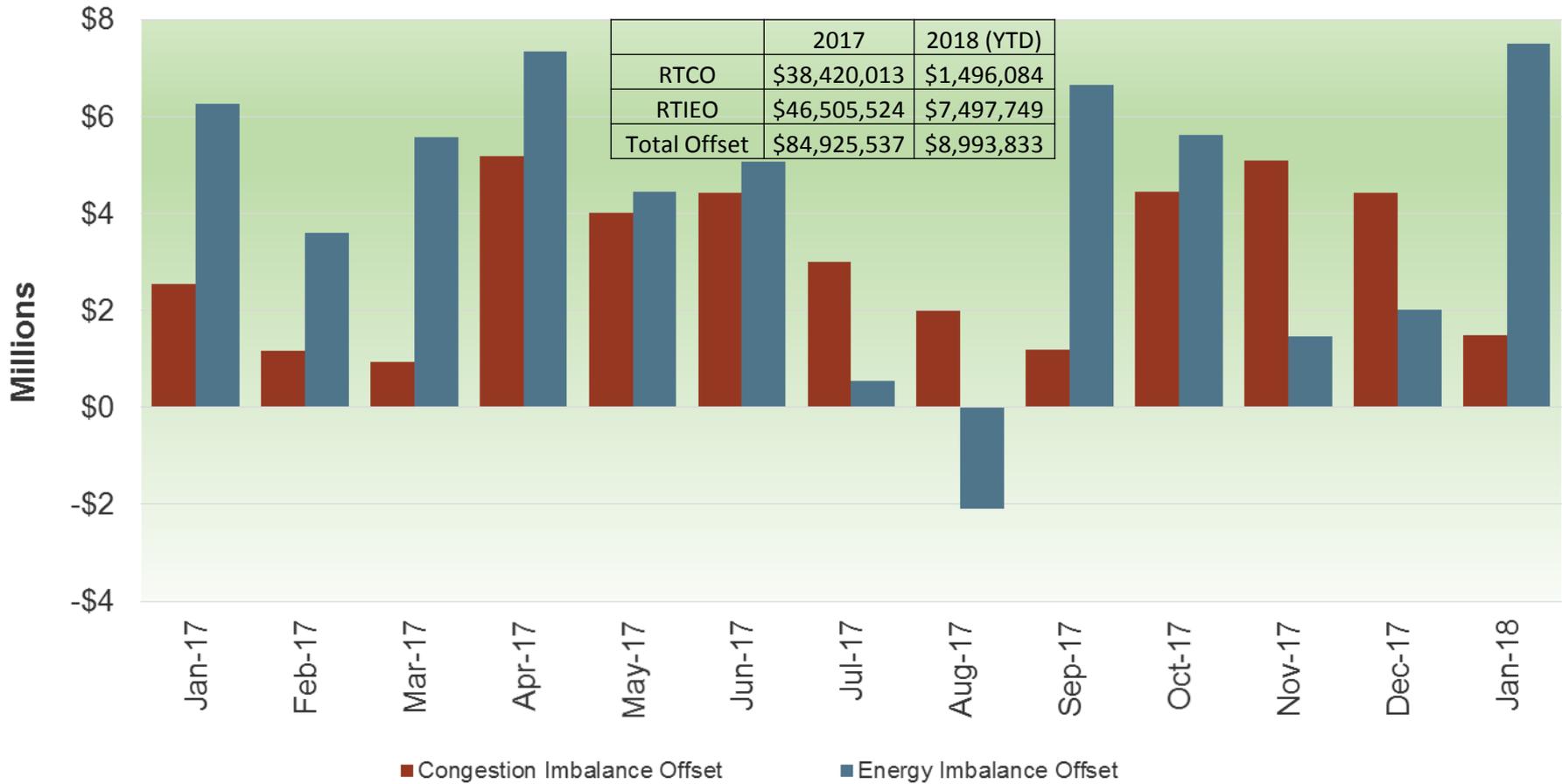


<http://www.caiso.com/Pages/documentsbygroup.aspx?GroupID=EFF75C2E-F28E-4087-B88B-8DFFAED828F8>

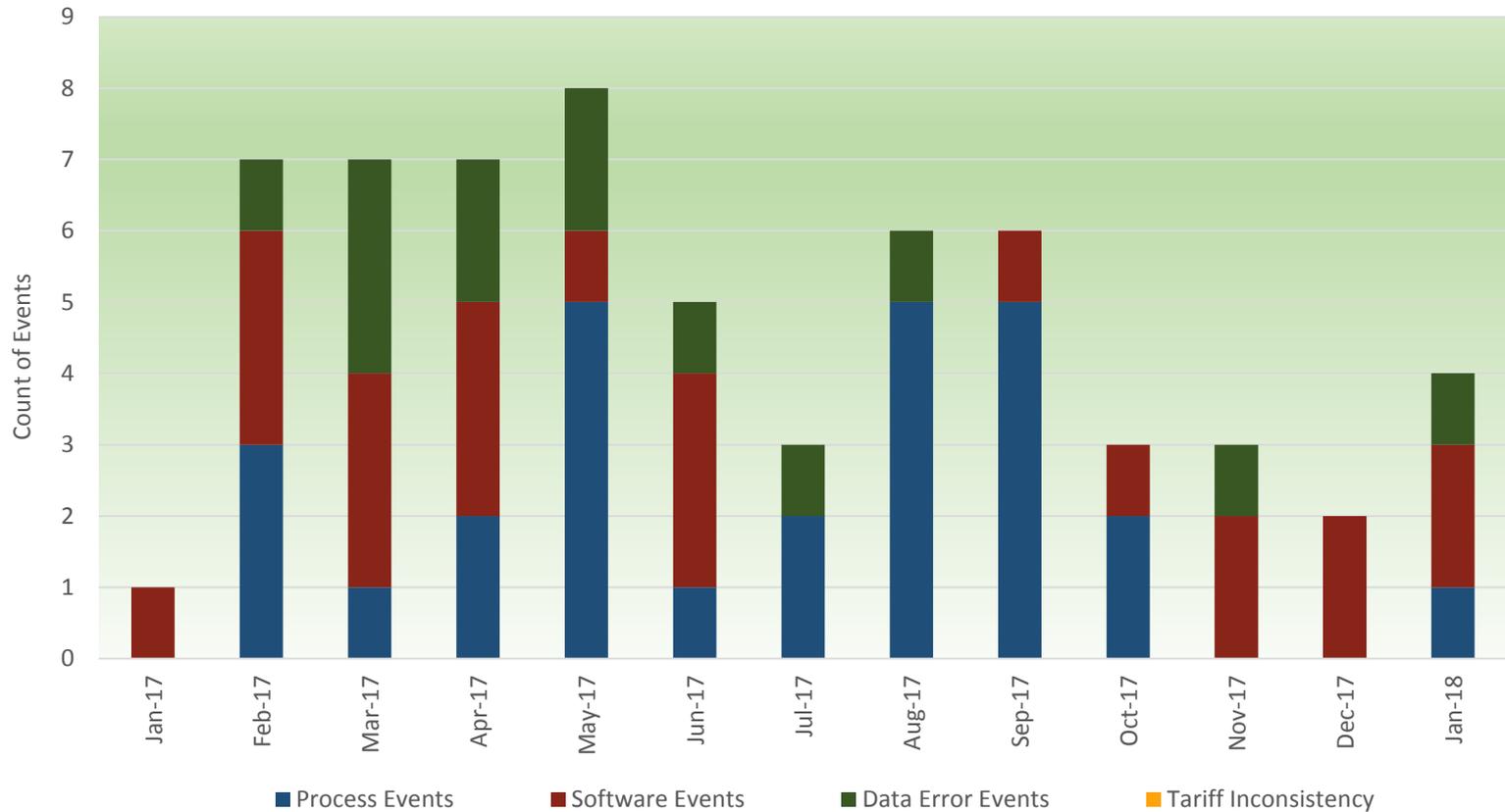
Hourly distribution of maximum RTD renewable (VERS) curtailment in January



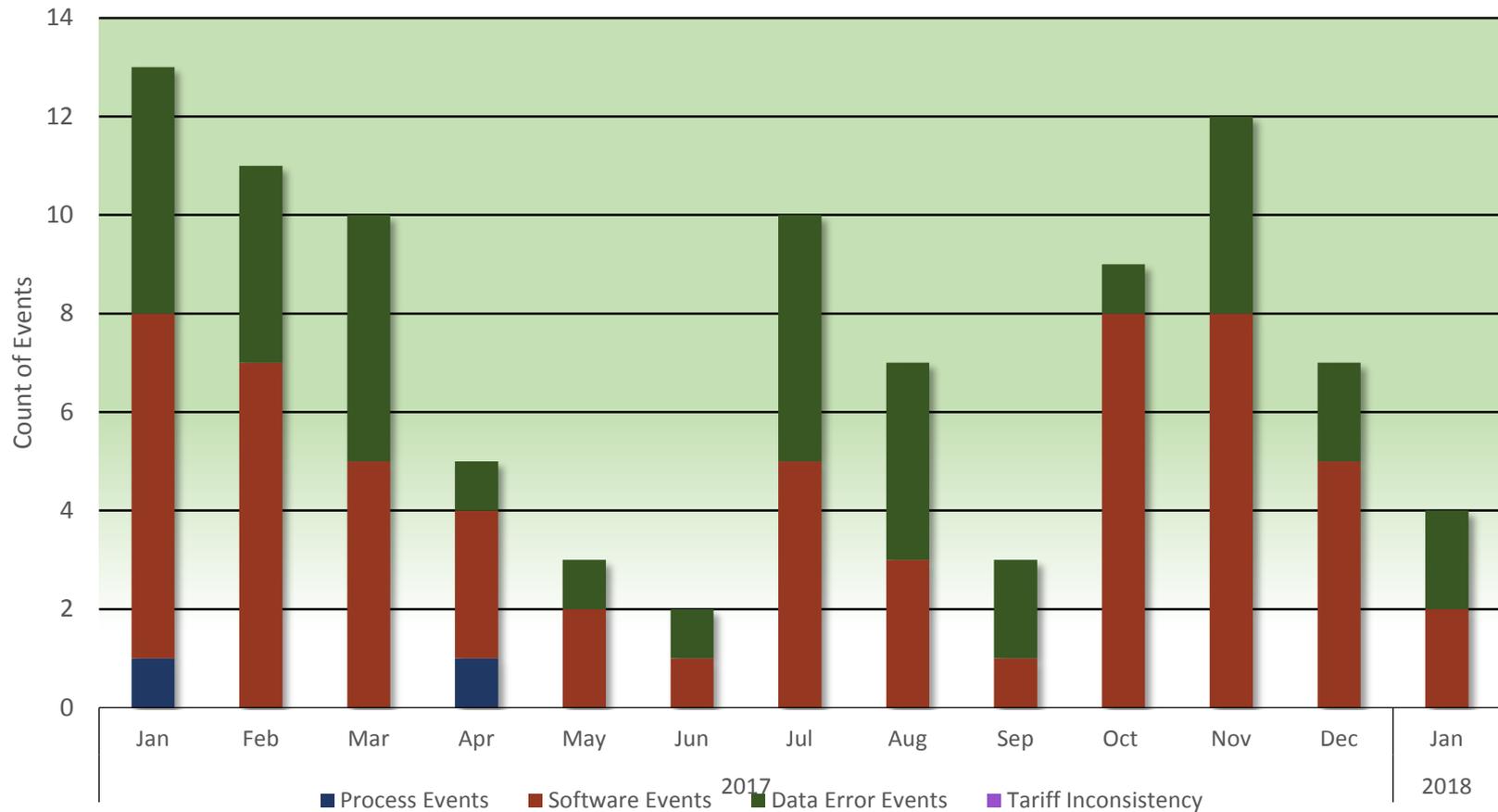
ISO area RTIEO rose in January



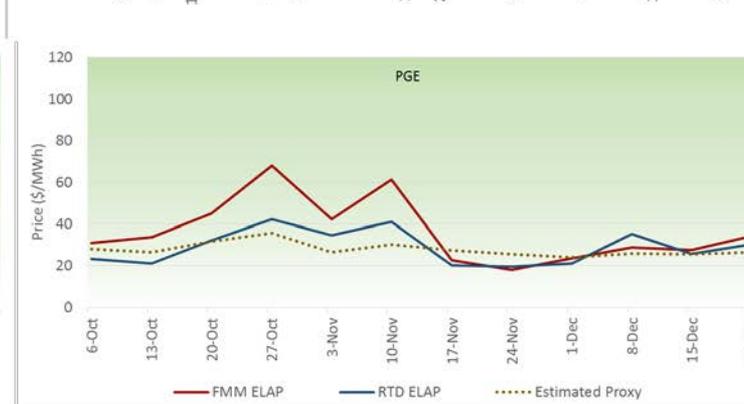
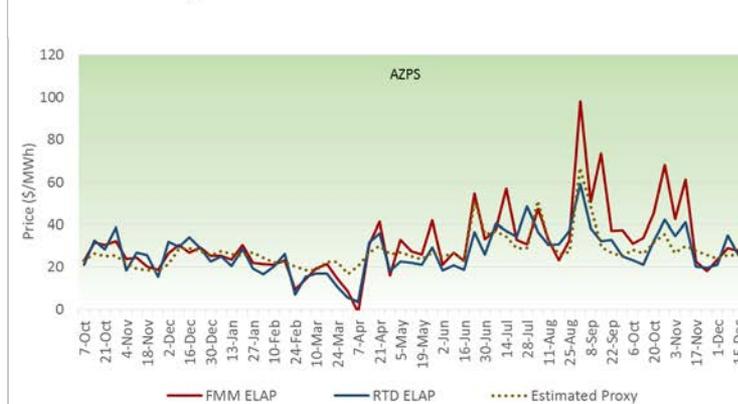
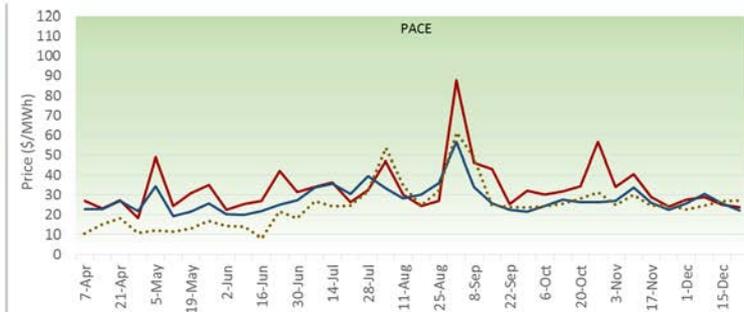
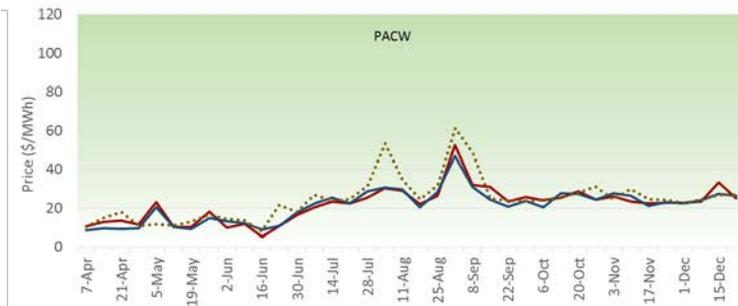
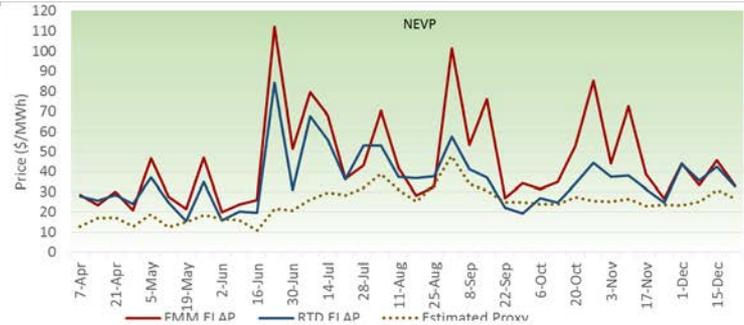
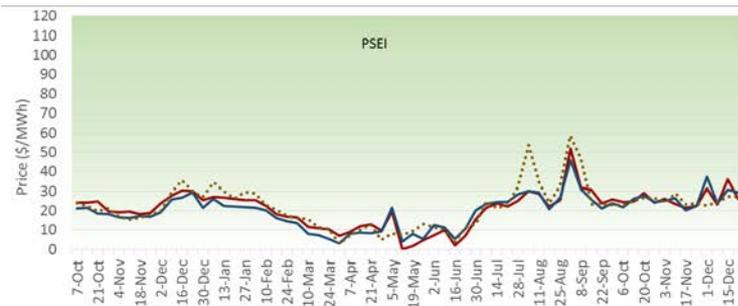
CAISO Price correction events increased in January



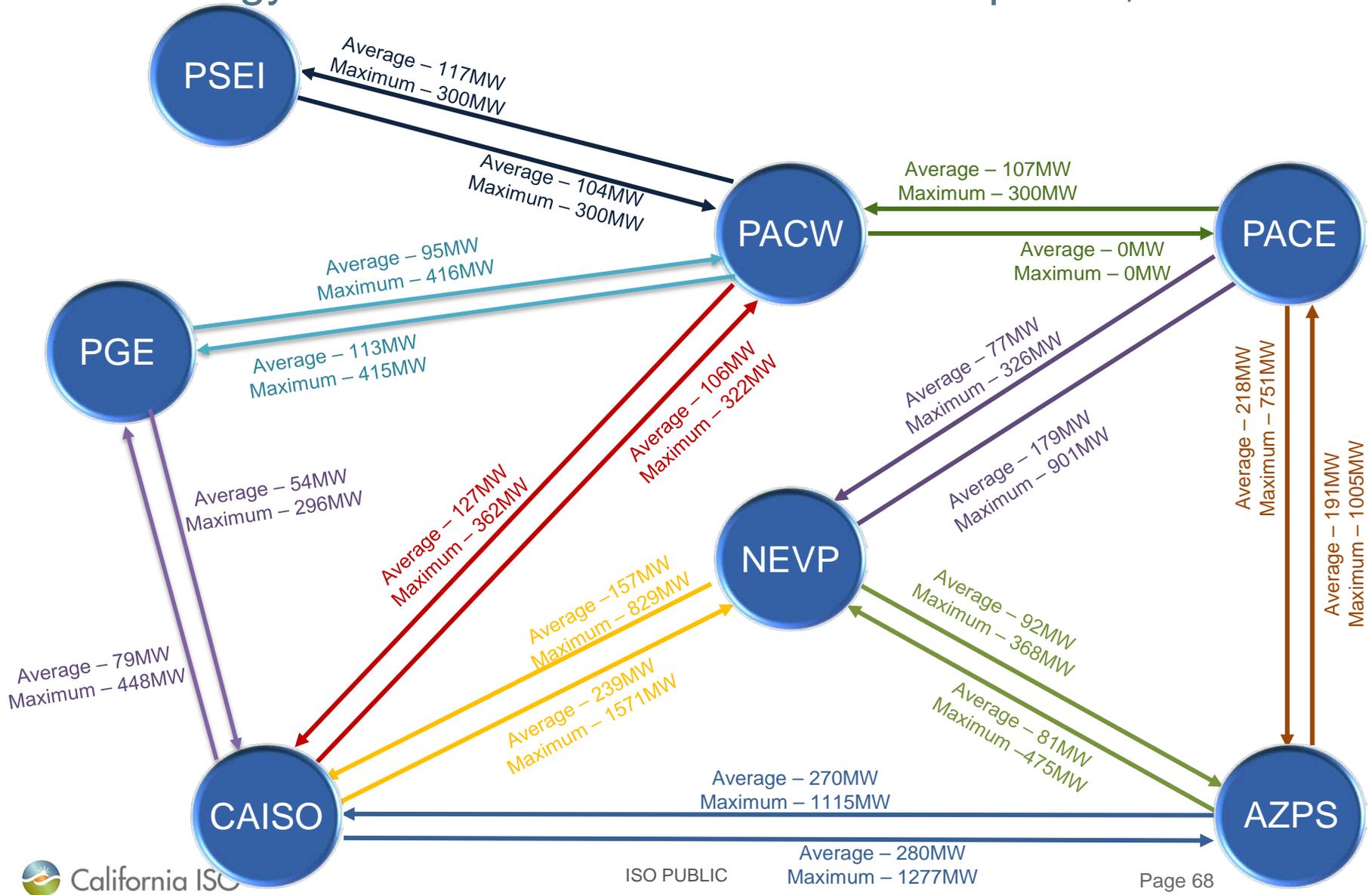
EIM-Related Price correction events decreased in January



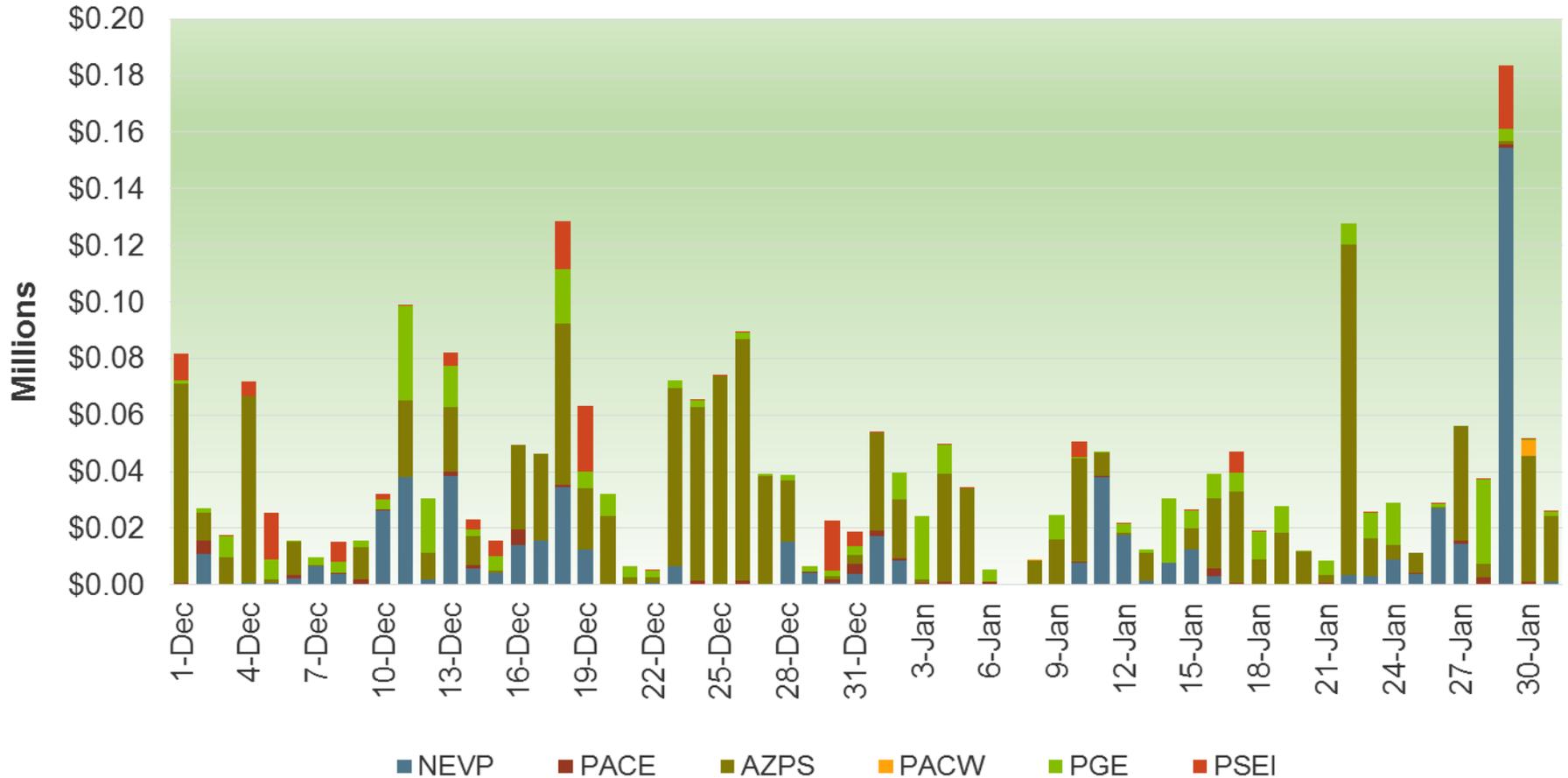
EIM prices observed less volatility after summer



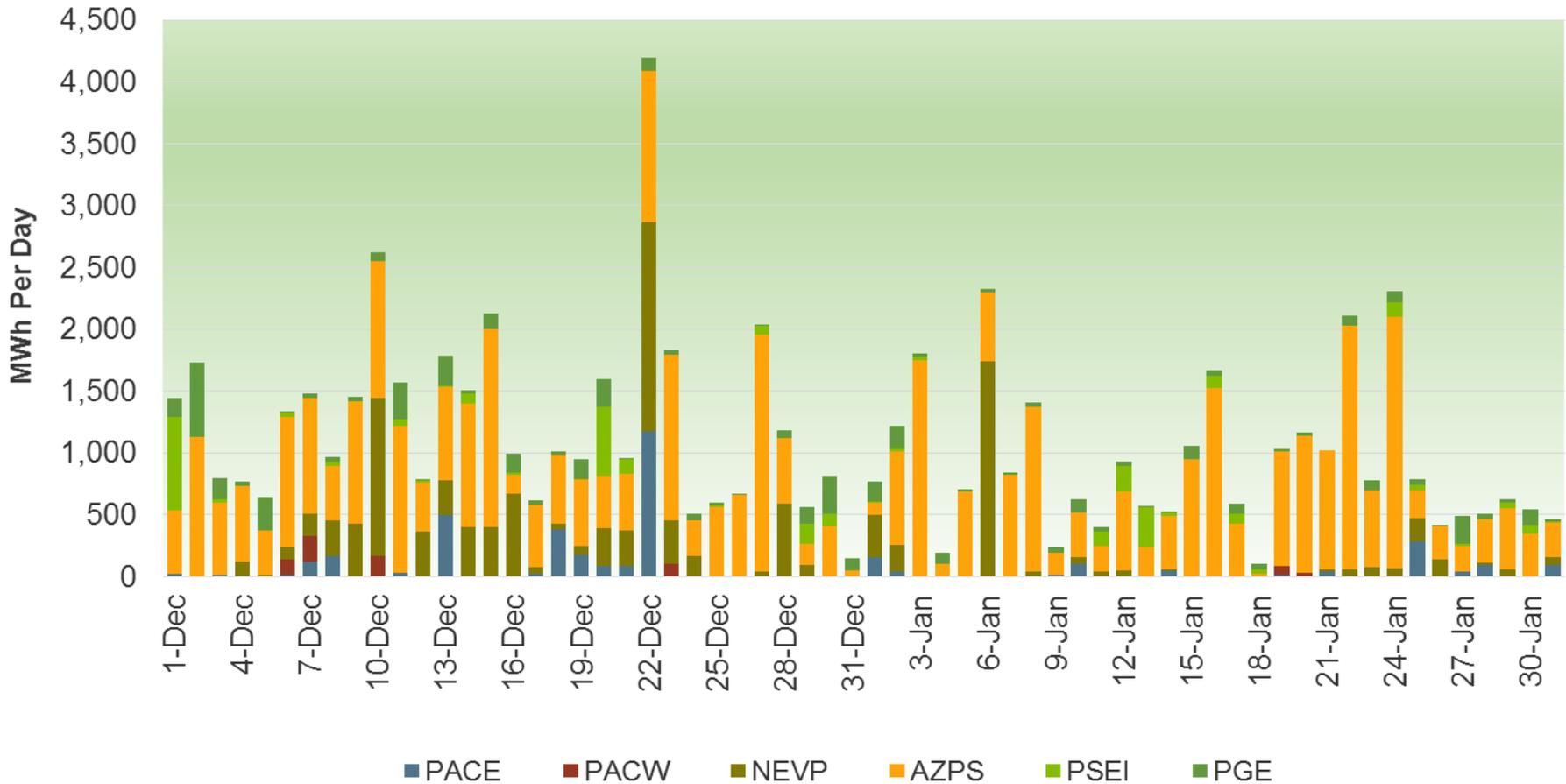
Robust energy transfers were observed in 4th quarter, 2017



EIM BCR decreased in January compared with December



EIM Manual Dispatch fell in January and was mostly concentrated in APS area



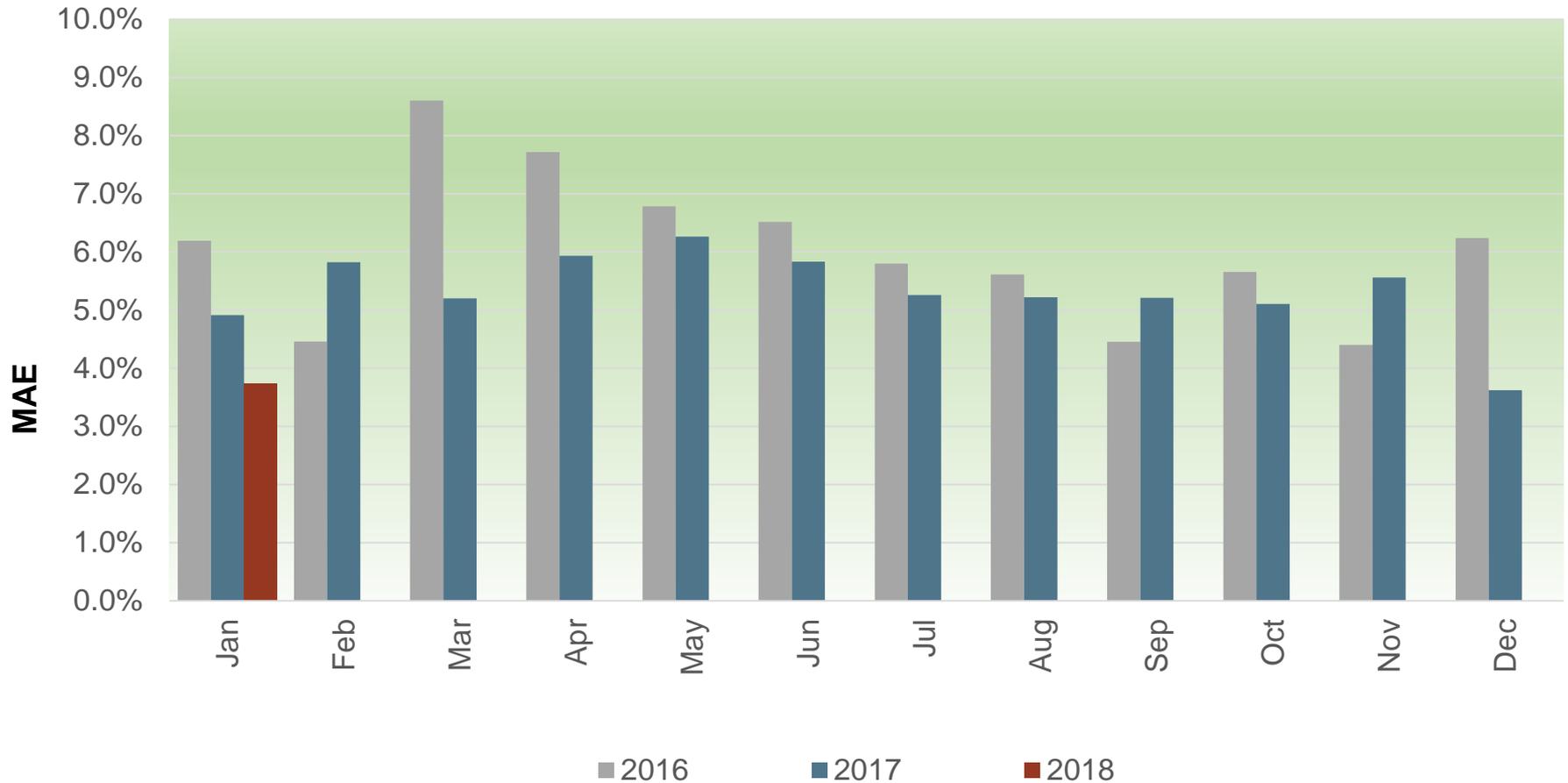
Day-ahead load forecast



Day-ahead peak to peak forecast accuracy



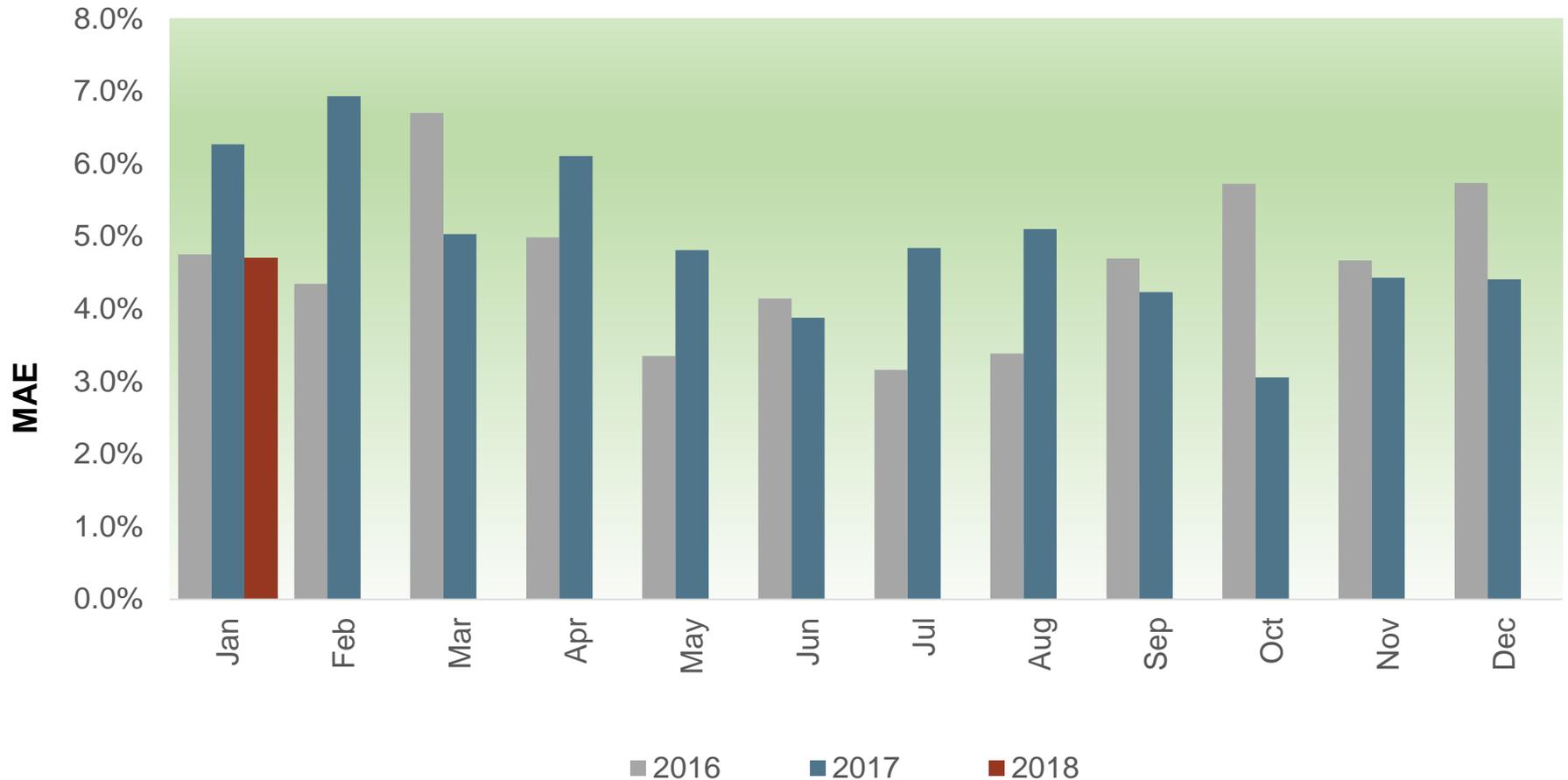
Day-ahead wind forecast



**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



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

Department of Market Monitoring Update

Evaluating the effectiveness of Aliso gas price scalars in the real-time market

Sai Koppolu

Senior Analyst, Monitoring and Reporting

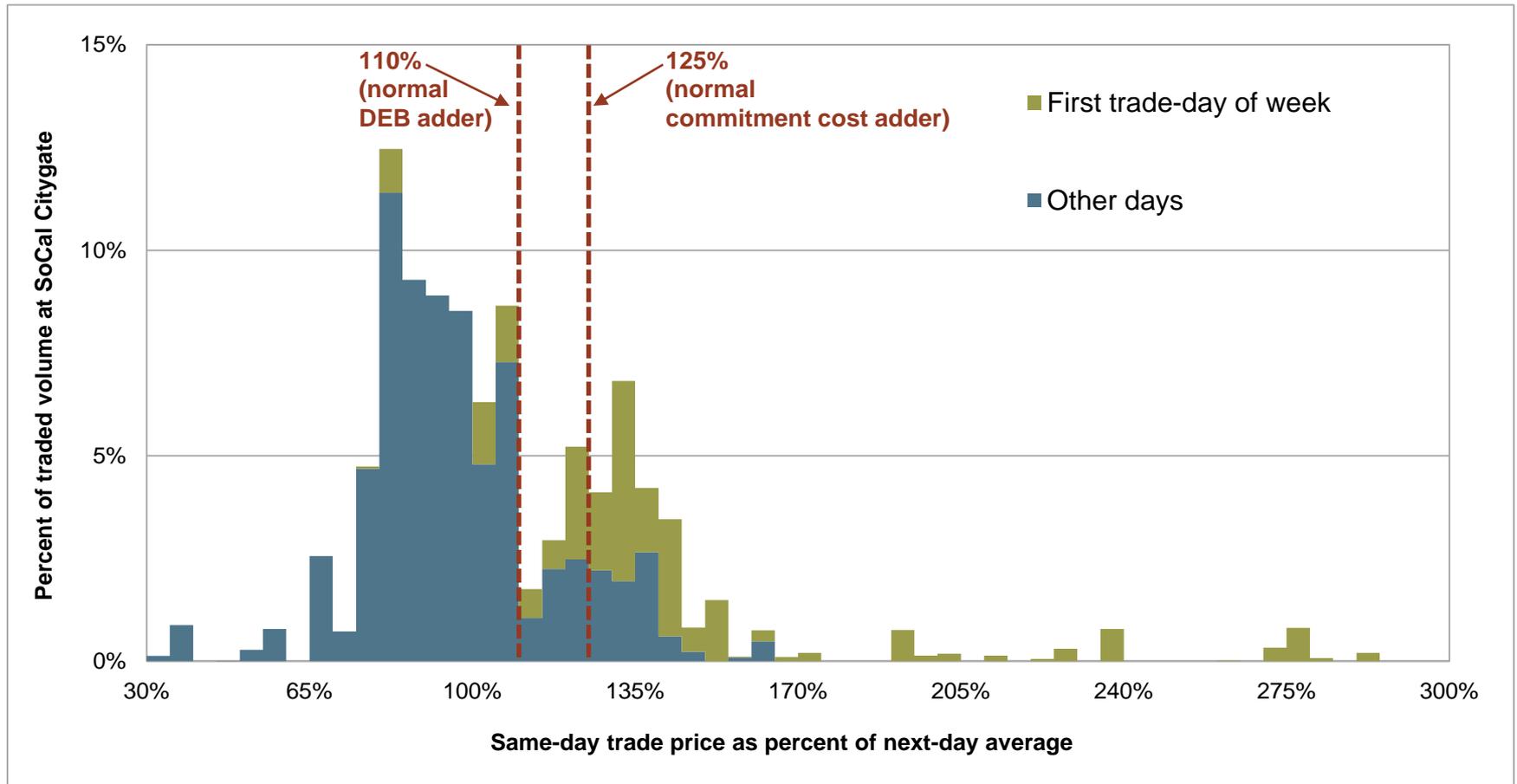
Department of Market Monitoring

February 20, 2018

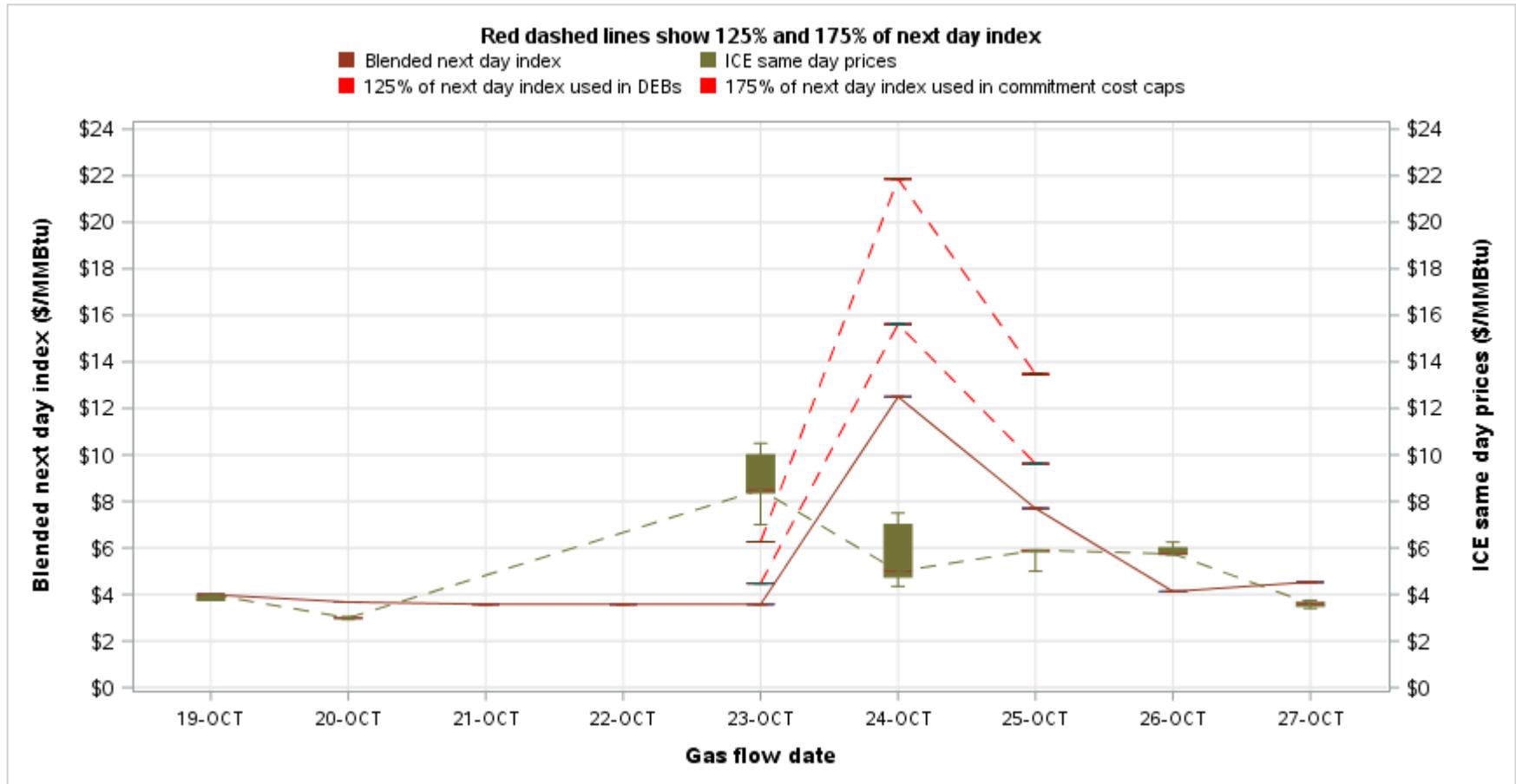
Background

- On July 6th 2016, ISO started including a 125% and 175% scalar to the SoCal Citygate gas price used in calculating DEBs and commitment costs, respectively.
- Primary purpose of Aliso gas price scalars:
 - reflect higher same-day natural gas prices
 - avoid dispatch of SoCalGas resources for system needs, instead of local needs
- Scalars were active during:
 - July 6, 2016 – July 31, 2017
 - August 4 – 7, 2017
 - October 23 – 25, 2017
 - December 7, 2017 – January 31, 2018

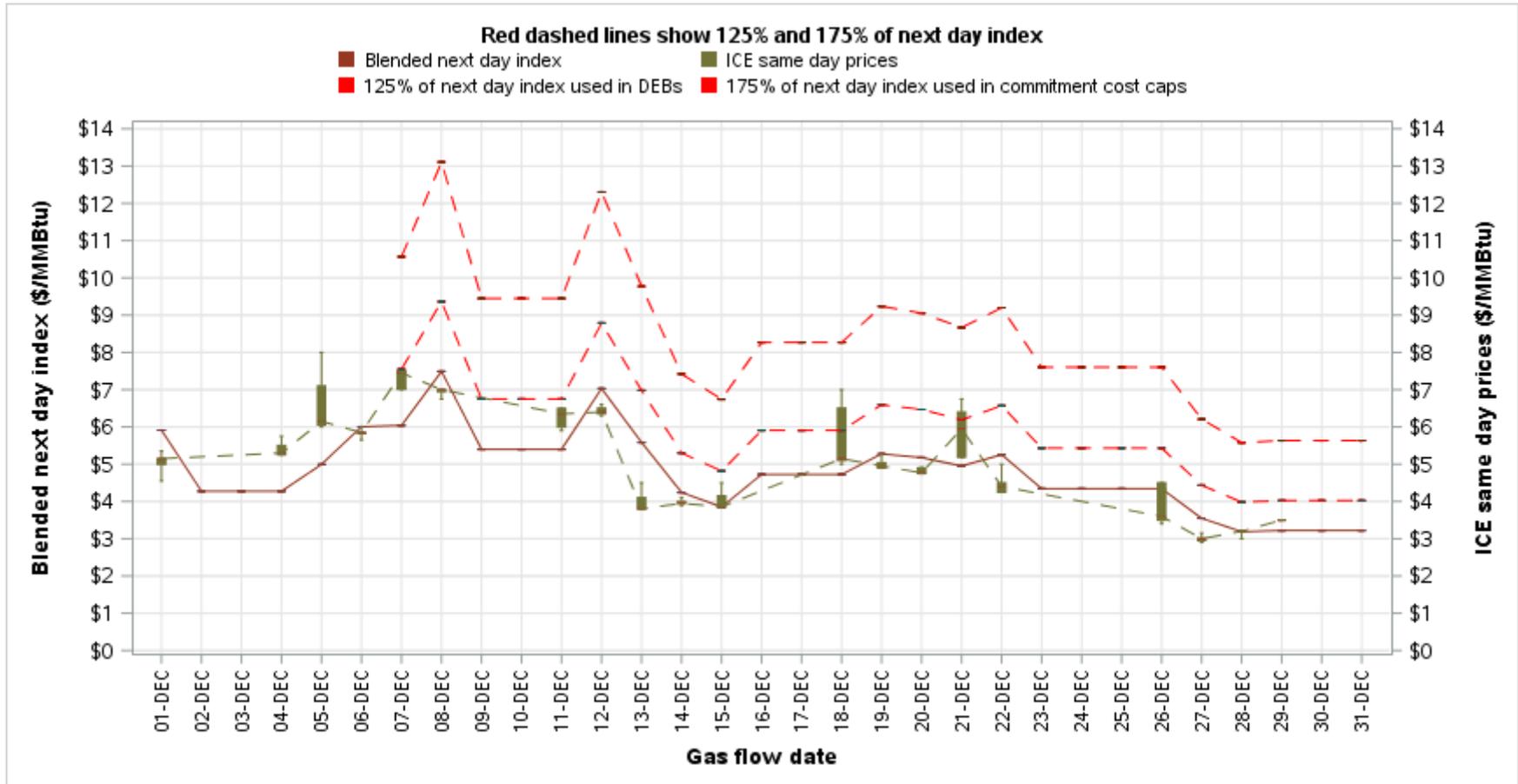
High next-day gas prices and significant same-day price volatility at SoCal Citygate on some days during the fourth quarter



Real-time gas price scalars are ineffective to reflect the same-day gas price volatility



In December, gas price used in commitment costs is significantly higher than prevailing same-day prices



Minimum load capacity economic merit order ranking – December 8, 2017

Figure: Minimum load proxy cost caps (No SoCal gas scalar)

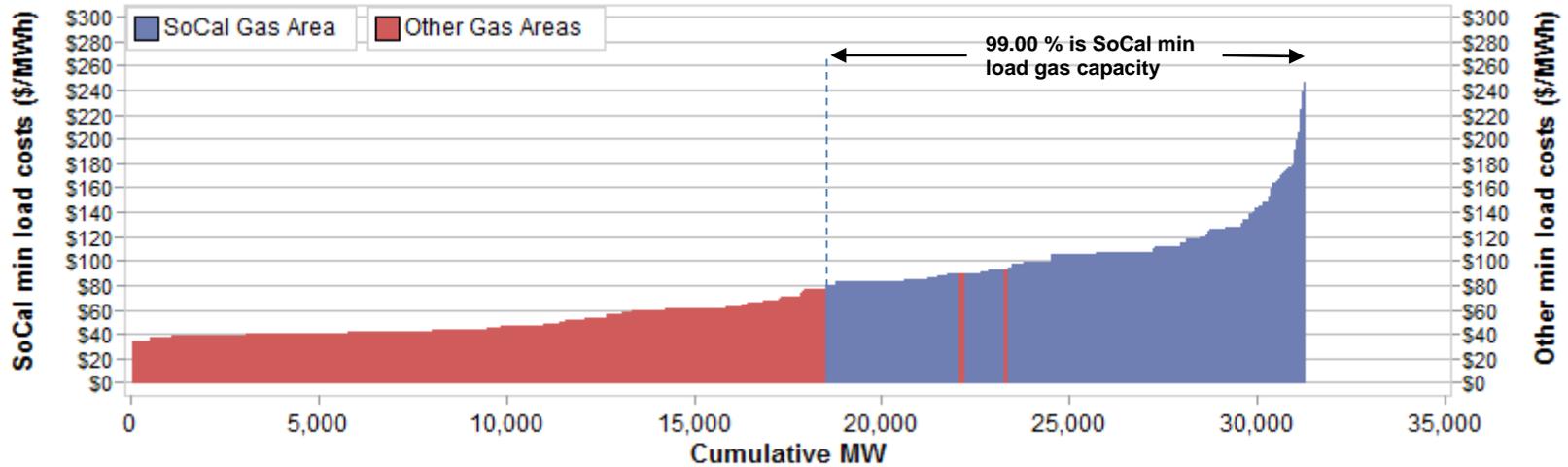
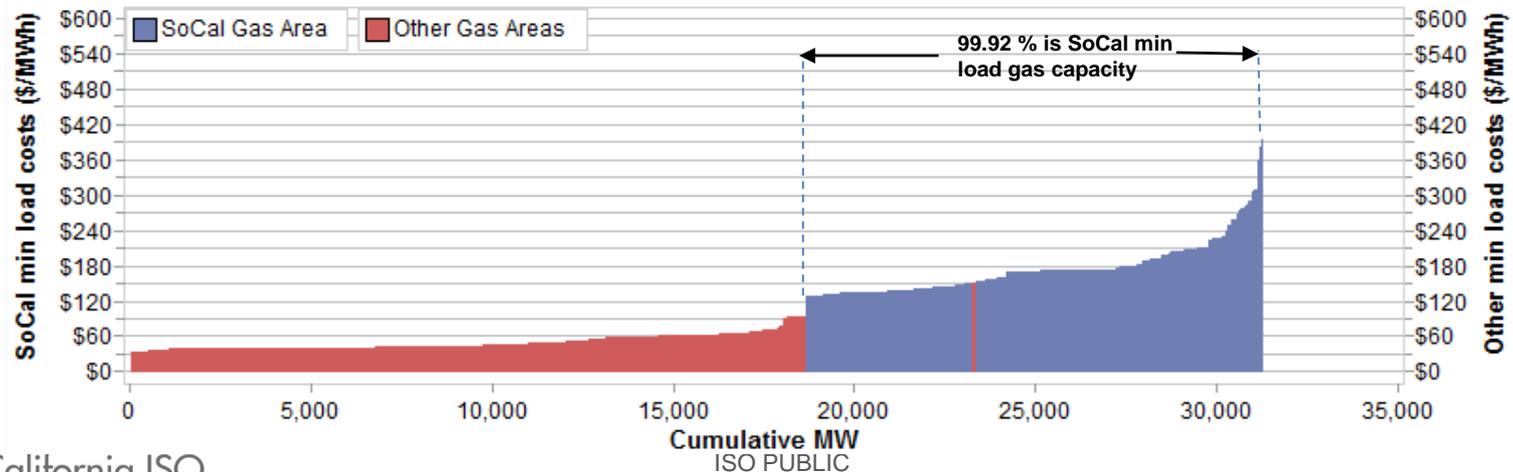


Figure: Minimum load proxy cost caps (175 percent SoCal gas scalar)



Minimum load capacity economic merit order ranking – December 8, 2017

Figure: Actual real-time minimum load bids

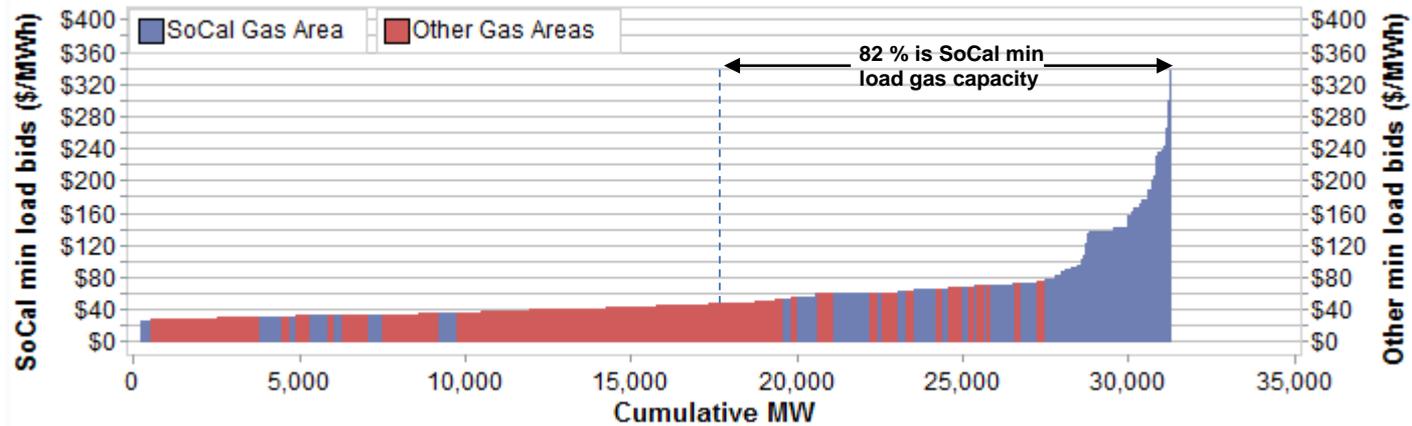
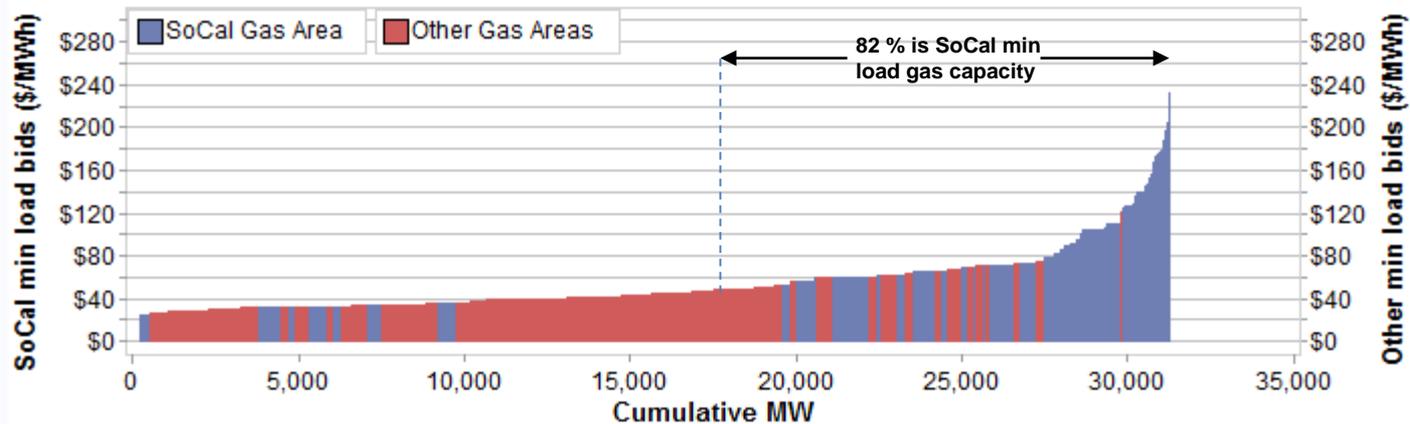
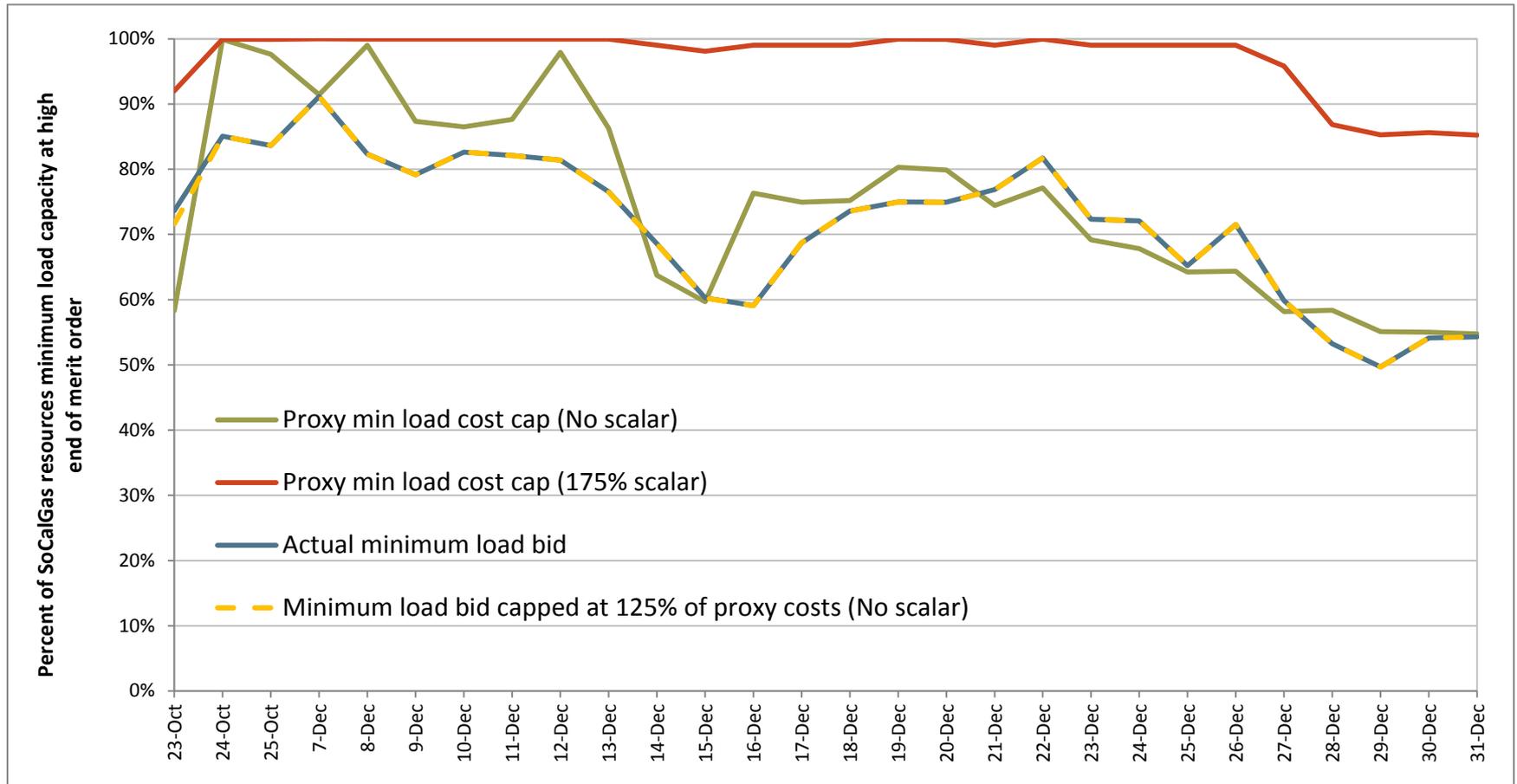


Figure: Actual real-time minimum load bids capped at 125% of proxy costs (No SoCal gas scalar)



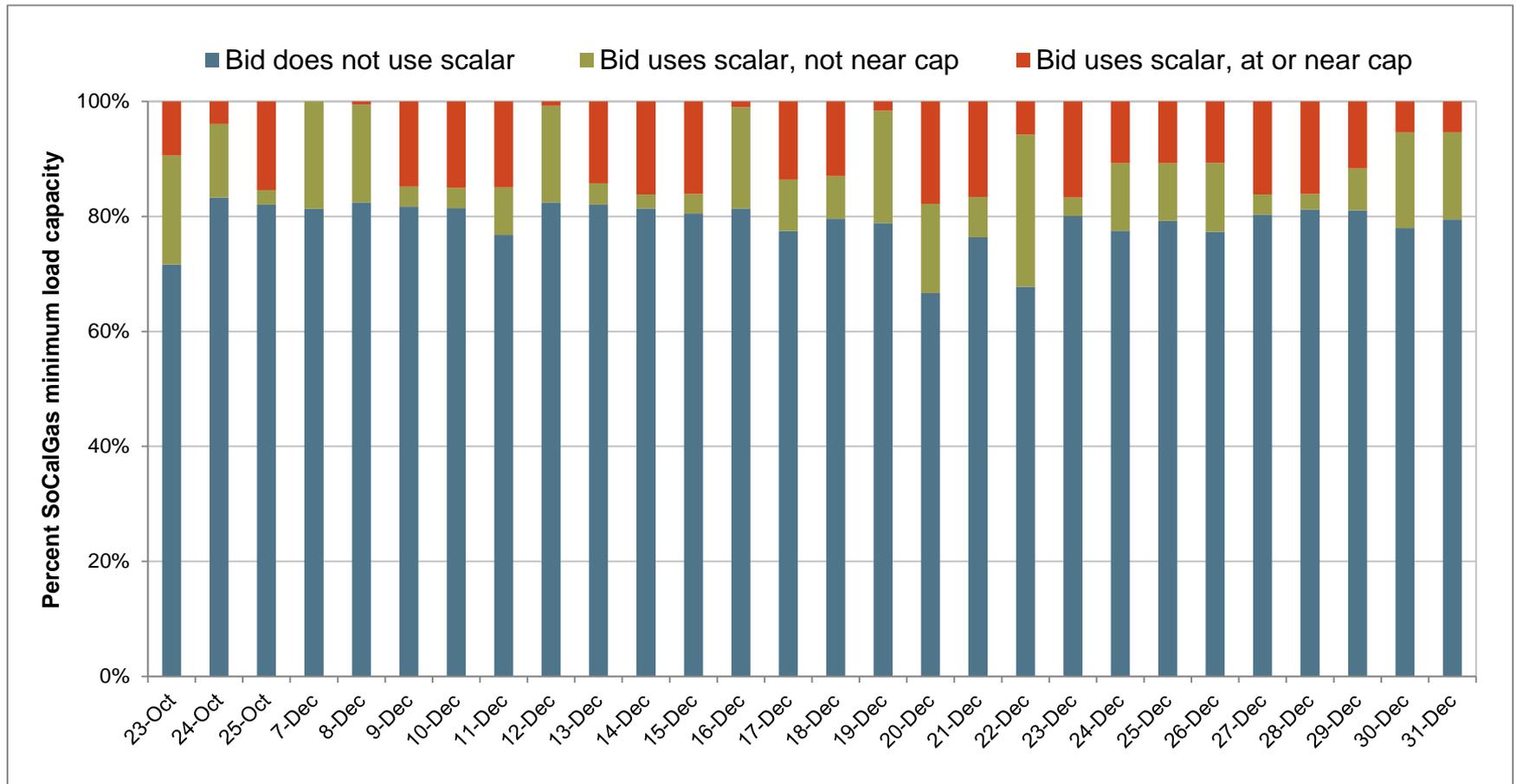
Real-time gas price scalars don't significantly change the merit order of commitment



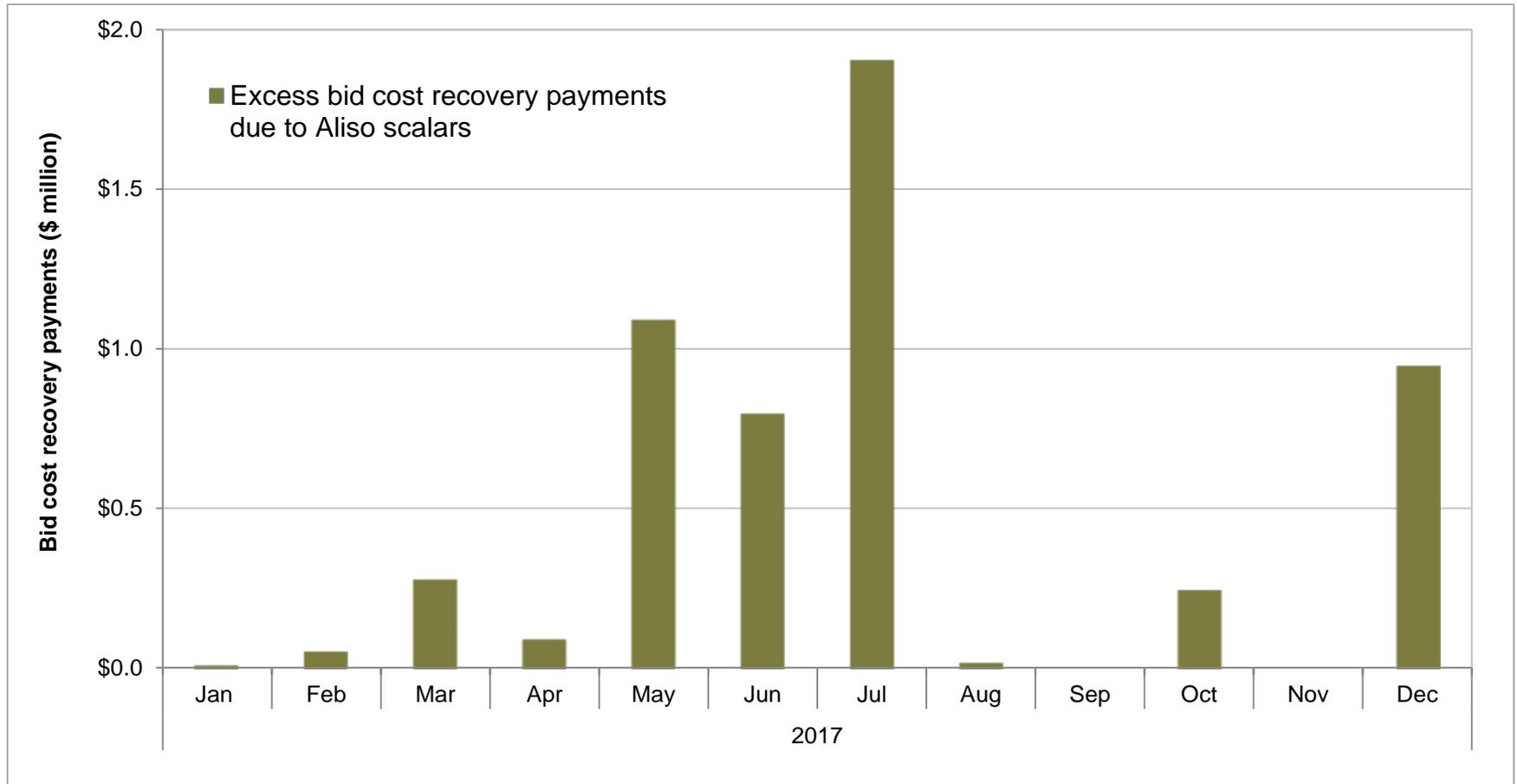
Methodology used to calculate high end of merit order is described in Section 2 of DMM comments on Aliso gas-electric coordination initiative:

http://www.caiso.com/Documents/DMMComments_AlisoCanyonGas_ElectricCoordinationRevisedDraftFinalProposal.pdf

The gas price scalars are being used by a small number of participants



DMM estimates that activation of the gas price scalars in 2017 resulted in over \$5 million in excess bid cost recovery payments to resources using the scalar



Policy Update

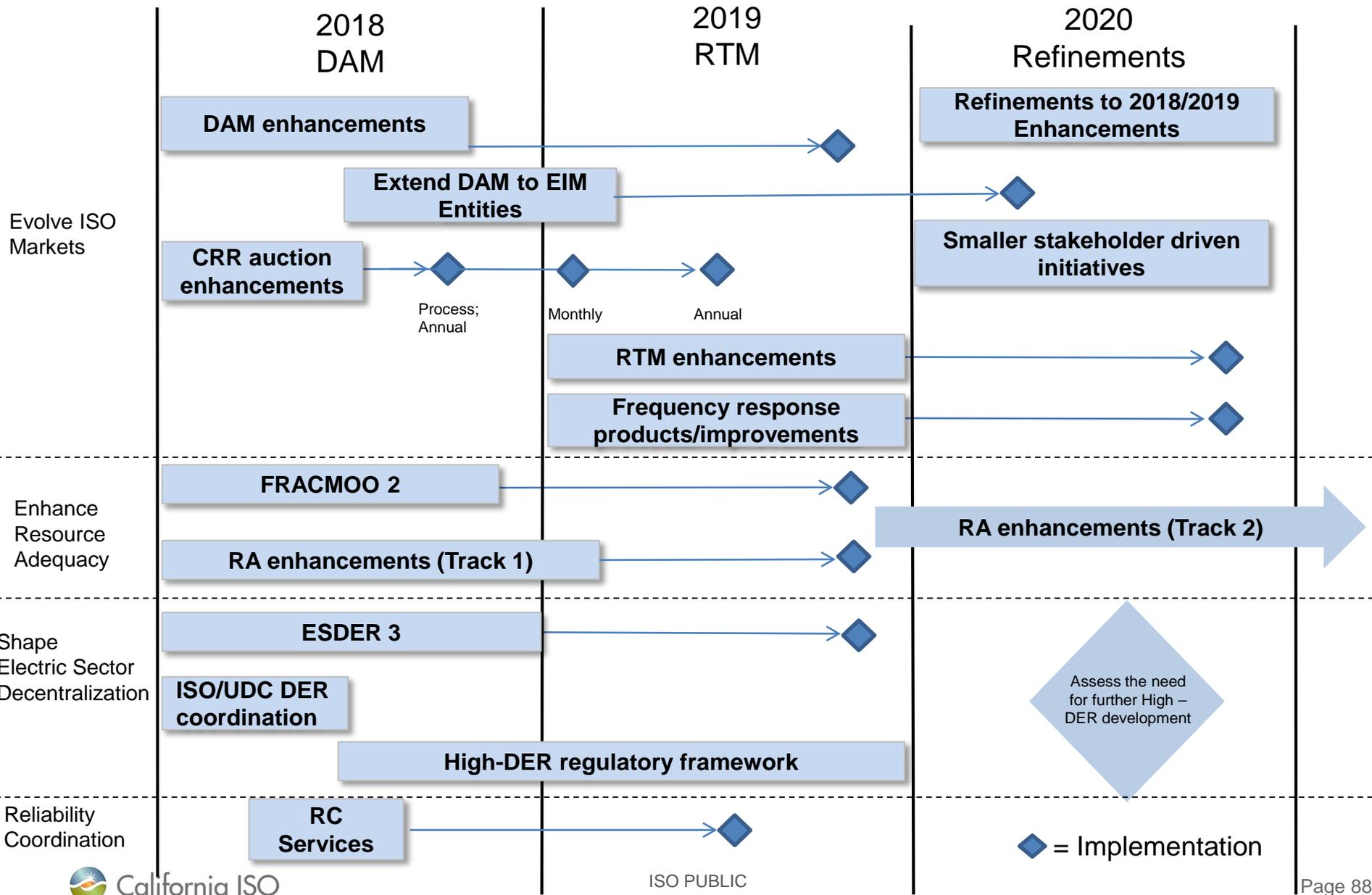
Brad Cooper

Manager, Market Design Policy

John Goodin

Manager, Infrastructure & Regulatory Policy

Three-year Policy Roadmap of Major New Initiatives



Ongoing policy stakeholder initiatives

- Commitment costs and default energy bid enhancements
 - EIM Governing Body advisory role
 - Revised draft final proposal posted on January 31st 2018
 - Stakeholder call on proposed changes to revised draft final proposal on February 1st
 - March 2018 EIM Governing Body and CAISO Board Meetings
- Congestion revenue right auction efficiency
 - Stakeholder meeting on proposed changes to track 1 draft final proposal on February 13th
 - March CAISO Board Meeting for track 1 issues
 - Track 2 straw proposal posted April 2018
 - July 2018 CAISO Board Meeting for track 2 issues

Ongoing policy stakeholder initiatives (continued)

- Imbalance conformance enhancements
 - EIM Governing Body advisory role
 - Stakeholder call on February 6th to discuss proposed changes on draft final proposal
 - April 2018 EIM Governing Body Meeting
 - May 2018 CAISO Board Meeting
- EIM greenhouse gas attribution enhancements
 - Draft final proposal posted on February 15th
 - Stakeholder call on February 22nd to discuss proposed changes on the draft final proposal

Ongoing policy stakeholder initiatives (continued)

- Review transmission access charge (TAC) structure
 - Revised straw proposal posted on March 22nd
 - Stakeholder meeting April 2018 to discuss straw proposal
 - CAISO Board Meeting Q3 2018
- Flexible resource adequacy criteria and must-offer obligation – phase 2
 - Stakeholder meeting on February 7th to discuss proposed changes on draft final proposal
 - Second revised flexible capacity framework posted early April 2018
 - CAISO Board Meeting Q4 2018 (tentative)

Ongoing policy stakeholder initiatives (continued)

- Energy storage and distributed energy resources 2
 - Implementation scheduled for 10/1/2018
 - Draft Tariff language published and comments received
 - 12/12/2017 stakeholder review conference call completed
 - Business requirement specification completed, System requirements in development
 - change request made to incorporate additional data submittal requirements based on DMM Draft Tariff comments
 - Monthly customer partnership group conference calls in progress
 - 12/13/2017, 1/29/2018 completed

Ongoing policy stakeholder initiatives (continued)

- Energy storage and distributed energy resources (ESDER)
Phase 3
 - EIM Governing Body advisory role
 - Straw proposal posted on February 14th
 - Stakeholder call on February 21st to discuss proposed changes on straw proposal
 - August 2018 EIM Governing Body Meeting
 - September 2018 CAISO Board Meeting

Ongoing policy stakeholder initiatives (continued)

- Capacity procurement mechanism risk of retirement process enhancements
 - First call on draft tariff language held on November 6th, 2017
 - Second call on draft tariff language held on December 18th
 - Tariff filed at FERC on January 12th
 - Assessing comments from stakeholders on tariff filing
 - In late February ISO will file at FERC its response to comments

Ongoing policy stakeholder initiatives (continued)

- Review of RMR and CPM
 - Issue paper for overall initiative and straw proposal for phase 1 items posted on January 23rd
 - Stakeholder meeting on January 30th to discuss issue paper and straw proposal for phase 1 items
 - Draft final proposal for phase 1 items posted on March 13th
 - Stakeholder meeting on March 20th to discuss overall initiative and straw proposal for phase 1 items
 - May 2018 CAISO Board Meeting to approve phase 1 items

Upcoming policy stakeholder initiatives

- **Clarification of tariff rules regarding following DOT**
 - EIM Governing Body advisory role
 - Straw proposal and draft tariff language to be posted 2018
 - Targeting EIM GB and ISO BOG decision in 2018
- **Day ahead market enhancements**
 - EIM Governing Body advisory role
 - Issue paper posted on February 22nd
 - Stakeholder meeting on March 1st to discuss proposed changes on issue paper
 - July 2018 EIM Governing Body and CAISO Board Meetings
- **Intertie deviation settlement**
 - Issue paper posted on March 15th
 - Straw proposal posted May 2018
 - September 2018 CAISO Board Meeting

Upcoming policy stakeholder initiatives

- Storage as a transmission facility
 - Issue paper Q2 2018
 - Potential scope items include
 - Determining splits for
 - Regulated and market cost recovery
 - Cost allocation
 - Contingency need and market participation
 - Establishing comparable treatment of resource options
 - Including depreciation for contingency and market participation
 - RA eligibility

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>
Feb 21	Scheduling Infrastructure and Business Rules (SIBR) User Interface (UI) Upgrade (webinar)
Mar 6	Resource Interconnection Management System 5 (RIMS 5) *part of Resource Interconnection Fair at ISO
Mar 15	Resource Interconnection Management System 5 (RIMS 5) (webinar)
April 19	Welcome to the ISO (webinar)
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

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

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

Contact us: CustomerTraining@caiso.com

Release Plan 2017 Summary: Spring 2018

Winter 2017

- Energy Imbalance Market (EIM) 2017 Enhancements
- Energy Imbalance Market (EIM) Winter 2017 Enhancements
- Energy Storage and Distributed Energy Resources (ESDER) Phase 1C
- Energy Imbalance Market (EIM) 2018 Idaho Power Company (new participant)
- Energy Imbalance Market (EIM) 2018 Powerex (new participant)

Independent 2018

- Black Start and System Restoration Phase 2
- Deactivation of Transport Layer Security (TLS) 1.0 & 1.1

Spring 2018

- Resource Adequacy Availability Incentive Mechanism (RAAIM) Calculation Modifications
- Reliability Services Initiative (RSI) 2017
- Commitment Cost Enhancement (CCE) Phase 3
- Resource Interconnection Management System (RIMS) Functional Enhancements
- Scheduling Infrastructure and Business Rules (SIBR) User Interface (UI) Upgrade

Release Plan Summary: Fall 2018 – Spring 2020

Fall 2018

- Green House Gas (GHG) Enhancements for EIM
- Contingency Modeling Enhancements
- Commitment Costs and Default Energy Bid (CCDEB) Enhancements
- Aliso Canyon Phase 3
- 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
- Capacity Procurement Mechanism (CPM) – Risk-of-Retirement

Spring 2019

- Energy Imbalance Market (EIM) 2019 Balancing Authority of Northern California (BANC) / Sacramento Municipal Utility District (SMUD) (new participant)
- Energy Imbalance Market (EIM) 2019 Los Angeles Dept. of Water and Power

Fall 2019 – tentative, subject to impact assessment

- Frequency Response Phase 2
- Congestion Revenue Right (CRR) Auction Efficiency (July 2019)
- Flexible Resource Adequacy Criteria and Must-offer Obligation (FRACMOO) Phase 2
- Transmission Access Charge (TAC) Billing Structure
- Enhanced Day-Ahead Market

Spring 2020

- Energy Imbalance Market (EIM) 2020 Salt River Project (new participant)
- Energy Imbalance Market (EIM) 2019 Seattle City Light (new participant)

Release Plan Summary: subject to further planning

TBD – tentative, subject to impact assessment

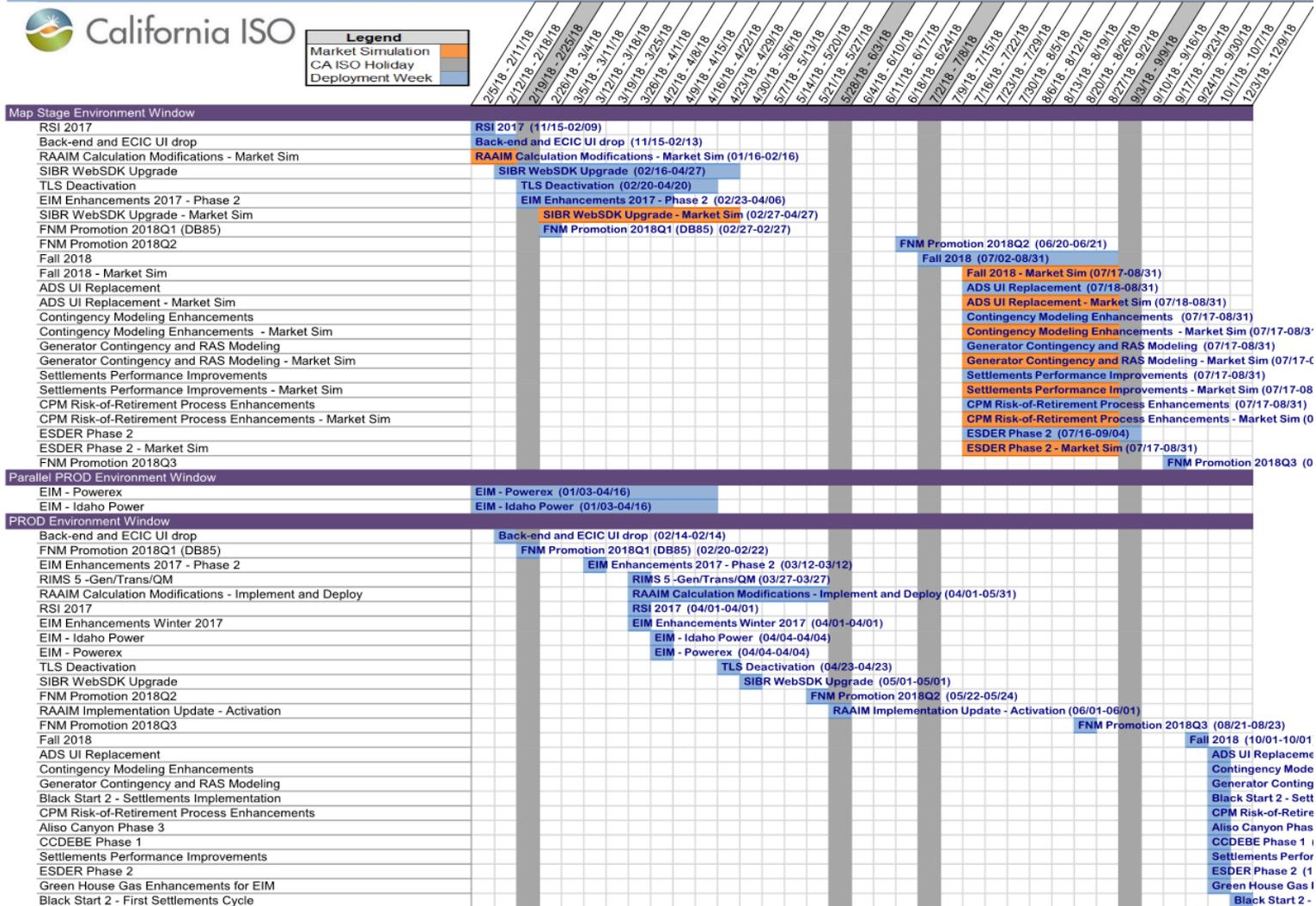
- Imbalance Conformance Enhancements (ICE)
- Energy Storage and Distributed Energy Resources Phase 3
- Inertie Deviation Settlement
- Variable Energy Resource Dispatch Operating Point (VER DOT)

Release Schedule - 2018

Date of Data Refresh: 2/8/18 1:20 PM



Legend	
Market Simulation	Orange
CA ISO Holiday	Grey
Deployment Week	Blue



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



ISO PUBLIC

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	TBD (2018)	TBD (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	TBD (February 2018)	4/1/2018	v1.0 (Winter released 11/6)	3.7.0 (released 11/6)
Spring 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
Spring 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

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

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	4/1/2018	V1.2	5.1.1

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

Product View - Master File changes

Release	Project	Change Type	External Impact	MP Action	UI Change	Web Service	Major Version	Minor Version	MAP Stage	Production 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	4/1/2018	v4.0.1	V3.6
Winter 2017	EIM 2017	Modify	EIM Market	Required for Generic NGR	N/A	submitGeneratorRDT	4	20180201	12/1/2017	4/1/2018	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

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

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 Grid Resource Data Template (GRDT) Clarifications

	Active in Master File	Active in Market
Electric Region	Fall 2017 Bidding Rules Enhancement Part B (BREB)	Fall 2017
COM MW	Fall 2017 Reliability Services Initiatives (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

Winter 2017 - EIM Enhancements 2017– Phase 2

Project Info	Details/Date
Application Software Changes	<p>Address enhancements identified by policy, operations, technology, business and market participants.</p> <p><u>Scope:</u></p> <ol style="list-style-type: none"> 1. Access & Integration Enhancements: EIM Entity Access in ALFS, MF, OASIS, WebOMS, and CMRI. 2. EIM data report enhancements to support market participant and EIM entity settlements 3. Change to ETSR formulation to separate base energy transfer to distinct non-optimizable ETSRs.
BPM Changes	<p>Energy Imbalance Market: Access & Integration, Data Report</p> <p>Outage Management: Access & Integration</p> <p>Market Instruments: Access & Integration, Data Reports</p> <p>Market Operations: Data Report</p> <p>Settlements & Billing: Data Report</p>
Business Process Changes	N/A

Winter 2017 - EIM Enhancements 2017– Phase 2

Milestone Type	Milestone Name	Dates	Status
Board Approval	BOG Approval	Sep 06, 2016	✓
BPMs	Publish Final Business Practice Manuals	Mar 30, 2018	
External BRS	Post External BRS	Jan 23, 2017	✓
	Post Updated External BRS to public site	Apr 10, 2017	✓
Tariff	File Tariff	N/A	
Config Guides	Post Configuration Guides	Jun 27, 2017	✓
Tech Spec	Publish Updated Technical Specifications: CMRI v3.6.3	Oct 27, 2017	✓
	Publish Updated Technical Specifications: OASIS v5.1.2	Oct 27, 2017	✓
	Publish Updated Technical Specifications: Master File v4.1.1	Jun 30, 2017	✓
Market Sim	Market Sim Window	N/A	
Production Activation	EIM Enhancements 2017 - Phase 2	Apr 01, 2018	

Winter 2017 – EIM Enhancements Winter 2017

Project Info	Details/Date
Application Software Changes	<p>Scope and System Impact:</p> <ul style="list-style-type: none"> • Auto-matching for post T-40 Intertie and other EIM Non-Participating Resource (EIMNPR) schedule changes from a single dedicated EIMNPR with the ability to generate or consume energy (MF, RTM) • Auto-mirroring for ISO import/export schedules at ISO Scheduling Points (MF, RTM) • BASE ETSR imbalance energy settlement: LMP at specified financial location (MF, RTM, Settlement) • No-EIM Fee: Exclude EIM administrative fee for non-US transactions after T-40 (MF, RTM, Settlement) • Suppress LMP publication in OASIS for non-US Pnodes (MF, OASIS) • Allow submission of Base Generation Distribution Factors (GDFs) for aggregate EIMNPR (BSAP, RTM) • Allow EIM Entity control to enforce/not enforce EIM BAA internal transmission constraints (MF,RTM) • Report resource ramp capability in CMRI for SCs (BSAP, CMRI) • Allow EIM and other resources modeled as an aggregation using the Generic NGR model that has the ability to generate or consume energy (MF, RTM, Settlement)
BPM Changes	Energy Imbalance Market and Settlements & Billing
Business Process Changes	Manage Real Time Operations - Maintain Balancing Area

Winter 2017 – EIM Enhancements Winter 2017

Milestone Type	Milestone Name	Dates	Status
Board Approval	Obtain Board of Governors Approval	Nov 29, 2017	✓
BPMs	Post Draft BPM changes	Jan 10, 2018	✓
	Publish Final Business Practice Manuals	Mar 30, 2018	
External BRS	Post External BRS	Aug 04, 2017	✓
	Post External BRS v2	Nov 13, 2017	✓
Tariff	Draft Tariff	Nov 03, 2017	✓
	File Tariff	Dec 15, 2017	✓
Config Guides	Post Configuration Guides	Oct 25, 2017	✓
Tech Spec	Post ISO Interface Tech spec	Nov 15, 2017	✓
	Post CMRI Tech Spec	Nov 06, 2017	✓
	Post MF Tech Spec	Oct 13, 2017	✓
Market Sim	Market Sim Window CMRI Resource Ramp Capacity Report	Dec 01, 2017 - Jan 31, 2018 February 22, 2018	✓
Production Activation	EIM Enhancements Winter 2017	Apr 01, 2018	

ESDER 1C – Incorporated in the EIM Enhancements Winter 2017

Project Info	Details/Date
Business Requirements Specification	ESDER 1C requirements incorporated in version 1.1 of the BRS for EIM Enhancements Winter 2017. The nine BRQs identified as ESDER 1C requirements related to the Generic NGR model are: BRQ161, BRQ162, BRQ163, BRQ321, BRQ322, BRQ324, BRQ465, BRQ466, BRQ516
Application Software Changes	<p>Allow market participant to registry NGR Generic Resource (Generic, new subtype of NGR, in addition to LESR and DDR) of NGR with load and generation modes without SOC</p> <p>MF: Define NGR resource with subtype Generic</p> <p>SIBR/BSAP/IFM-RTM</p> <ul style="list-style-type: none"> • SC to submit bids for NGR Generic resource • SC to submit EIM Base Schedule for NGR Generic resource • Combine the distributed schedules from multiple aggregated resources that have overlapping aggregation in NA <p>Settlement: Settlement calculation to NGR Generic resources level</p> <p>WebOMS - Include NGR Generic resource outage/de-rate in the market</p>
BPM Changes	<p>Market Operations</p> <p>Energy Imbalance Market</p> <p>Settlements and Billing</p>

Milestone Type	Milestone Name	Dates	Status
ESDER 1C milestones	Same as EIM Winter Enhancements 2017		

Winter 2017 – EIM Idaho Power Company

Project Info	Details/Date
Application Software Changes	Implementation of Idaho Power Company as an EIM Entity.
BPM Changes	EIM BPM was updated to more clearly define the requirement for Independent VER forecast submission.
Market Simulation	Idaho Power completed executing all Market Simulation structured scenarios. Settlement validation is in progress and expected to be complete by February 23, 2018 after receiving the final settlement statement.
Parallel Operations	Idaho was activated as an EIM Entity in Parallel Operations effective 2/1/18. Idaho Power cutover full network model will move to production on 2/22/18.

Milestone Type	Milestone Name	Dates	Status
Tariff	File Readiness Certification	March 01, 2018	
Market Sim	Market Sim Window	Dec 01, 2017 – Feb 23, 2018	
Parallel Operations	Parallel Operations Window	Feb 01, 2018 - Mar 30, 2018	
Production Activation	EIM - Idaho Power	Apr 04, 2018	

Winter 2017 – EIM Powerex

Project Info	Details/Date
Application Software Changes	Implementation of Powerex in the EIM Market.
BPM Changes	No BPM changes identified.
Market Simulation	Powerex completed executing all Market Simulation structured scenarios. Settlement validation is in progress and expected to be complete in February after final validation of settlement statements.
Parallel Operations	Powerex was activated in the EIM Market in Parallel Operations effective 2/1/18. Powerex cutover full network model will move to production on 2/22/18

Milestone Type	Milestone Name	Dates	Status
Tariff	File Readiness Certification	March 01, 2018	
Market Sim	Market Sim Window	Dec 01, 2017 – Feb 23, 2018	
Parallel Operations	Parallel Operations Window	Feb 01, 2018 - Mar 30, 2018	
Production Activation	EIM - Powerex	Apr 04, 2018	

2018 – Black Start and System Restoration Phase 2

Project Info	Details/Date
Application Software Changes	<p>Settlements:</p> <ul style="list-style-type: none">• Modifications to existing charge codes for Black Start capacity and Black Start allocations will need to occur. <p>MPP (Market Participant Portal):</p> <ul style="list-style-type: none">• Possibility to use current functionality for receiving RMR invoices for Black Start units.
BPM Changes	<p>Definitions & Acronyms:</p> <ul style="list-style-type: none">• Revision of the following definitions to match the Tariff language: Ancillary Services (AS), Black Start Generator, Black Start Generating Unit, Interim Black Start Agreement, Reliability Services Costs <p>Settlements & Billing:</p> <ul style="list-style-type: none">• Pending Settlements review. Revisions will be directly based on Tariff changes.

2018 – Black Start and System Restoration Phase 2

Milestone Type	Milestone Name	Dates	Status
Board Approval	Obtain Board of Governors approval	May 01, 2017	✓
BPMs	BPM changes required	Mar 27, 2018	
RFP	Closure of Request for Proposal (RFP)	Jul 31, 2017	✓
	Awards and final report	Dec 01, 2017	✓
	Posted RFP documents	Jun 15, 2017	✓
External BRS	Complete and post External BRS	Nov 10, 2017	✓
Tariff	File Tariff	May 15, 2017	✓
	Tariff approval	Nov 01, 2017	✓
	Filed tariff amendment related to cost allocation	Aug 03, 2017	✓
Config Guides	Publish draft Settlements Configuration Guides	Aug 01, 2018	
Tech Spec	Create ISO Interface Spec (Tech spec)	N/A	
Market Sim	Market Simulation	N/A	
Production Activation	Black Start and System Restoration Phase 2	Dec 03, 2018	
	Settlements changes effective date	Dec 01, 2017	✓
	Settlements implementation	Oct 01, 2018	
	First Settlements cycle	Dec 03, 2018	

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	✓

2018 – RIMS 5 Functional Enhancements

Milestone Type	Milestone Name	Dates	Status
Board Approval	Board approval not required	N/A	
BPMs	Generator Interconnection and Delivery Allocation	Apr 29, 2016	✓
External BRS	External BRS not Required	N/A	
Tariff	No Tariff Required	N/A	
Config Guides	Configuration Guides not required	N/A	
Tech Spec	No Tech Specifications Required	N/A	
Training	Train the PTOs	Feb 13, 2018	✓
	Half hour intro to the new RIMS App at the Resource Interconnection Fair	Mar 06, 2018	
	WebEx full training	Mar 15, 2018	
Production Activation	RIMS5 App & Study	Mar 21, 2016	✓
	RIMS5	Mar 27, 2018	

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 20, 2018	
Production	Deactivate TLS 1.0 & 1.1 in Production	Apr 23, 2018	

Winter 2017 – EIM Enhancements Winter 2017

Milestone Type	Milestone Name	Dates	Status
Board Approval	Obtain Board of Governors Approval	Nov 29, 2017	✓
BPMs	Post Draft BPM changes	Jan 10, 2018	✓
	Publish Final Business Practice Manuals	Mar 30, 2018	
External BRS	Post External BRS	Aug 04, 2017	✓
	Post External BRS v2	Nov 13, 2017	✓
Tariff	Draft Tariff	Nov 03, 2017	✓
	File Tariff	Dec 15, 2017	✓
Config Guides	Post Configuration Guides	Oct 25, 2017	✓
Tech Spec	Post ISO Interface Tech spec	Nov 15, 2017	✓
	Post CMRI Tech Spec	Nov 06, 2017	✓
	Post MF Tech Spec	Oct 13, 2017	✓
Market Sim	Market Sim Window CMRI Resource Ramp Capacity Report	Dec 01, 2017 - Jan 31, 2018 Feb 22, 2018	✓
Production Activation	EIM Enhancements Winter 2017	Apr 01, 2018	

Spring 2018 – RAAIM Calculation Modifications

Project Info	Details/Date
Application Software Changes	<p>RAAIM (Resource Adequacy Availability Incentive Mechanism) – California ISO intends to release a new RAAIM 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 week in Feb 2/14, 2/15 and 2/16 Includes mini-monthly – currently being processed) – additional market simulation requested in early March and to be discussed during market simulation calls.	Jan 16 – Feb 16, 2018	
Production Deployment	Implement and deploy into Production revised charge codes per Winter release deployment plan.	May 1 – Jun 30, 2018	
Production Activation	Revised RAAIM 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><u>CIRA:</u></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><u>Settlements:</u></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><u>Manage Market & Reliability Data & Modeling</u></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	✓
BPMs	Post Draft BPM Changes - Settlements & Billing	Aug 30, 2017	✓
	Post Draft BPM Changes - Reliability Requirements	Dec 05, 2017	✓
	Post Final BPM - Settlements & Billing	Feb 07, 2018	✓
	Post Final BPM - Reliability Requirements	Mar 28, 2018	
External BRS	Post Updated External BRS v1.3 (RSI 1B)	Mar 03, 2017	✓
	Post Updated External BRS v1.1 (RSI 2)	Apr 07, 2017	✓
	Post RSI 2017 External BRS v2.0	Apr 19, 2017	✓
Tariff	File Tariff	Sep 29, 2017	✓
	Receive FERC Order	Jan 18, 2018	✓
Training	External Training - Session 1	Jan 10, 2018	✓
	External Training - Session 2	Jan 17, 2018	✓
Config Guides	Config Guide	Jun 23, 2017	✓
Tech Spec	Publish Technical Specifications	Apr 03, 2017	✓
Market Sim	Market Simulation	Dec 05, 2017 - Jan 31, 2018	✓
Production Deployment	Production Deployment	Mar, 2018	
Production Activation	Production Activation	May 01, 2018	

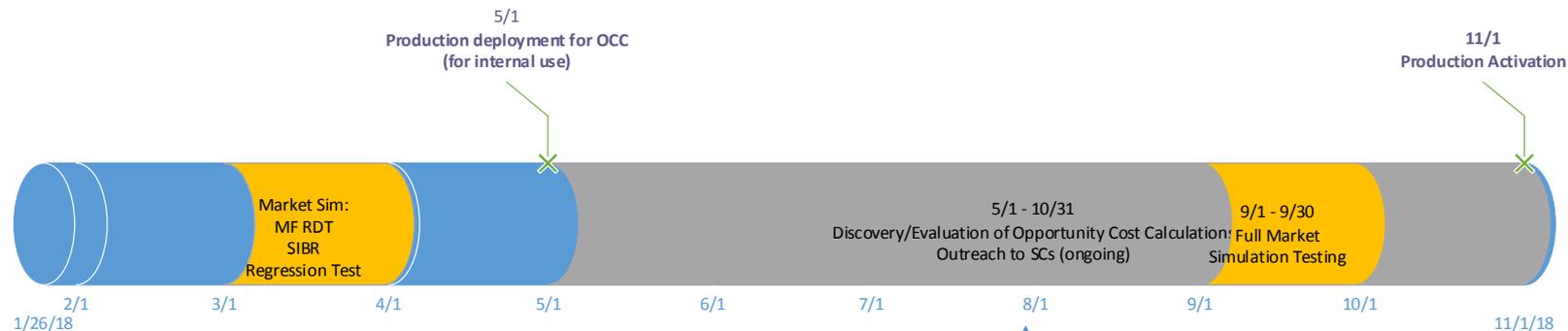
Spring 2018 - Commitment Cost Enhancements Phase 3

Project Info	Details/Date
Application Software Changes	<p><u>Scope:</u></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><u>Impacted Systems:</u></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

Spring 2018 - Commitment Cost Enhancements Phase 3 (cont.)

Milestone Type	Milestone Name	Dates	Status
Board Approval	Board of Governors (BOG) Approval	Mar 25, 2016	✓
BPMs	Post Draft BPM changes	Feb 26, 2018	
	Post External BRS	Jan 06, 2017	✓
External BRS	Post Updated External BRS	Jul 13, 2017	✓
	Post Updated External BRS	Aug 21, 2017	✓
	Post Draft Tariff	Jul 31, 2017	✓
Tariff	Post Updated Draft Tariff (based on feedback)	Dec 5, 2017	✓
Config Guides	Config Guide	Jun 27, 2017	✓
	Publish ISO Interface Spec (Tech spec) – MF	Apr 03, 2017	✓
	Publish Updated ISO Interface Spec (Tech spec) – MF	Jun 30, 2017	✓
	Publish Updated ISO Interface Spec (Tech spec) – MF	Nov 30, 2017	✓
Tech Spec	Publish ISO Interface Spec (Tech spec) – CMRI	Apr 17, 2017	✓
	Publish Updated ISO Interface Spec (Tech spec) – CMRI	Jun 28, 2017	✓
	Publish Updated ISO Interface Spec (Tech spec) – CMRI	Oct 27, 2017	✓
Market Sim	Market Sim Start	March 2018	
Production Deployment	Commitment Costs Phase 3 Production Deployment	May 1, 2018	
	Deploy Opportunity Cost Calculator		
Tariff Effective Date and Production activation	Deploy and implement in the market the process to automate the validation Flexible RA Capacity per proposed tariff section 4.6.4	August 2018	
	Opportunity costs and resource characteristics changes proposed tariff effective date	November 1, 2018	

Spring 2018 - Commitment Cost Enhancements Phase 3 (cont.)



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.

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 Scheduling Infrastructure Business Rules (SIBR) user interface (UI). 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	
BPMs	Publish Final Business Practice Manuals	N/A	
External BRS	Post Draft BRS	N/A	
Config Guides	Configuration Guide	N/A	
Tech Spec	Publish Tech Specs	N/A	
User Guide	SIBR User Guide “Draft”	Dec 14, 2017	✓
Training	Conduct External Training	Feb 21, 2018	
Market Sim	Market Sim Window	Feb 27, 2018 – Apr 27, 2018	
Production Activation	SIBR WebSDK Upgrade	May 01, 2018	

Fall 2018 Release – Overview

	Board Approval	External BRS	Configuration Guides	Tech Spec	Tariff	BPMs	Market Simulation	Production Activation
Fall 2018	1/1/2018	4/6/2018	5/18/2018	5/18/2018	6/15/2018	7/2/2018	Jul 17, 2018 - Aug 31, 2018	10/1/2018
Green House Gas Enhancements for EIM	12/14/2017	TBD	TBD	TBD	TBD	TBD	TBD	10/1/2018
Contingency Modeling Enhancements	12/14/2017	3/29/2018	TBD	TBD	TBD	TBD	Jul 17, 2018 - Aug 31, 2018	10/1/2018
CCDEBE Phase 1	3/22/2018	3/16/2018	TBD	TBD	TBD	TBD	TBD	10/1/2018
Aliso Canyon Phase 3	7/26/2017	N/A	N/A	N/A	9/5/2017	N/A	N/A	N/A
Settlements Performance Improvements	N/A	2/20/2018	TBD	TBD	TBD	N/A	Jul 17, 2018 - Aug 31, 2018	10/1/2018
ESDER Phase 2	7/26/2017	3/1/2018	5/18/2018	3/20/2018	6/1/2018	7/2/2018	Jul 17, 2018 - Aug 31, 2018	10/1/2018
Generator Contingency and RAS Modeling	9/19/2017	3/16/2018	TBD	TBD	TBD	TBD	Jul 17, 2018 - Aug 31, 2018	10/1/2018
ADS UI Replacement	N/A	4/6/2018	TBD	TBD	N/A	TBD	Jul 18, 2018 - Aug 31, 2018	10/1/2018
CPM Risk-of-Retirement Process Enhancements	11/2/2017	3/16/2018	TBD	TBD	1/12/2018	TBD	Jul 17, 2018 - Aug 31, 2018	10/1/2018

**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	✓
BPMs	Publish Final Business Practice Manuals	TBD	
External BRS	Complete External BRS & Post for MPs	TBD	
Config Guides	Post Configuration Guides	TBD	
Tech Spec	Publish Technical Specifications	TBD	
Market Sim	Market Sim Window	TBD	
Production Activation	Green House Gas Enhancements for EIM	Oct 01, 2018	

Fall 2018 – Contingency Modeling Enhancements

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 • Settlements
BPM Changes	Market Operations, Market Instruments, Definitions and Acronyms, Settlements and Billing
Business Process Changes	TBD

Milestone Type	Milestone Name	Dates	Status
Board Approval	Obtain Board of Governors Approval	Dec 14, 2017	✓
BPMs	Post Draft BPM changes	TBD	
External BRS	Complete and Post External BRS	Mar 29, 2018	
Tariff	File Tariff	TBD	
Config Guides	Design review - BPM and Tariff SMEs	TBD	
Tech Spec	Create ISO Interface Spec (Tech spec)	TBD	
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>Scope: Suppliers are requesting the flexibility 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 • Requires supporting verified costs of energy bids above \$1,000/MWh <p>Impacted Systems:</p> <ol style="list-style-type: none"> 1. MQS/PCA: insert cost based generated commitment cost (CC) when resource committed but CC supplied by market, locking rule, static list of critical non-competitive constraints 2. SIBR, ECIC: negotiated reference level prices, automate Ex Ante adjustments, commitment cost caps as configurable percentages, ability to calculate energy cost reference, minimum cost, start-up cost, and transition cost reference levels using reasonable thresholds 3. IFM/RTM: recalibrate the penalty price parameters, adjust pricing run to reflect merit order, \$2,000/MWh cap for calculating LMP 4. IFM/RTM, CMRI, EDR, Integration: use new DCPA to designate path competitiveness for critical constraints, identify commitment costs that need to be mitigated 5. IFM/RTM, Portal, EDR: identify MOC for reactive power and voltage support
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)

Fall 2018 – Commitment Cost and Default Energy Bid Enhancements

Milestone Type	Milestone Name	Dates	Status
Draft Policy	Publish Draft Business Rules externally	Jan 31, 2018	✓
BPMs	Draft BPM changes	TBD	
	Post Draft BPM changes	TBD	
	Publish Final Business Practice Manuals	TBD	
External BRS	Complete and Post External BRS	Mar 16, 2018	
Board Approval	Obtain Board of Governors Approval	Mar 22, 2018	
Tariff	File Tariff	TBD	
Config Guides	Design review - BPM and Tariff SMEs	TBD	
Tech Spec	Create ISO Interface Spec (Tech spec)	TBD	
Market Sim	Market Sim Window	TBD	
Production Activation	CCDEBE Phase 1	Oct 01, 2018	

Fall 2018 – Aliso Canyon Phase 3

Project Info	Details/Date
Application Software Changes	Scope: IFM/RTM: (DCPA) Automation of Dynamic Competitive Path Assessment will be discussed in context with future FERC filing.
BPM Changes	Market Operations – Updated extension of existing gas nomogram
Business Process Changes	None

Milestone Type	Milestone Name	Dates	Status
Board Approval	Obtain Board of Governors Approval	Jul 26, 2017	✓
BPMs	Post BPM changes	Jan 30, 2018	✓
External BRS	Complete and Post External BRS	N/A	
Tariff	File Tariff	Sep 05, 2017	✓
Config Guides	Design review - BPM and Tariff SMEs	N/A	
Tech Spec	Create ISO Interface Spec (Tech spec)	N/A	
Market Sim	Market Sim Window	N/A	
Production Activation	Aliso Canyon Phase 3	N/A	

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

Milestone Type	Milestone Name	Dates	Status
Board Approval	Obtain Board of Governors Approval	N/A	
BPMs	Publish Final Business Practice Manuals	N/A	
External BRS	Complete and Post External BRS	Feb 20, 2018	
Tariff	File Tariff	TBD	
Config Guides	Design review - BPM and Tariff SMEs	TBD	
Tech Spec	Create ISO Interface Spec (Tech spec)	TBD	
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	✓
BPMs	Post Draft BPM changes	Jun 04, 2018	
	Publish Final Business Practice Manuals	Jul 02, 2018	
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 20, 2018	
	File Tariff with FERC	Jun 01, 2018	
CPG	Next CPG Meeting	Feb 27, 2018	
Config Guides	Settlements Config Guides	May 18, 2018	
Tech Spec	Publish ISO Interface Spec (Tech spec)	Mar 20, 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 Settlements and Billing EIM
Business Process Changes	<ul style="list-style-type: none"> Manage Congestion Revenue Rights (MMR LII) Manage Real Time Operations - Transmission & Electric System (MMG LII)

Milestone Type	Milestone Name	Dates	Status
Board Approval	Obtain Board of Governors Approval	Sep 19, 2017	✓
BPMs	Post Draft BPM changes	TBD	
External BRS	Post External BRS	Mar 16, 2018	
Tariff	File Tariff	TBD	
Config Guides	Design review - BPM and Tariff SMEs	TBD	
Tech Spec	Create ISO Interface Spec (Tech spec)	TBD	
Market Sim	Market Sim Window	Jul 17, 2018 - Aug 31, 2018	
Production Activation	Generator Contingency and RAS Modeling	Oct 01, 2018	

Fall 2018 Release – ADS User Interface Replacement

Project Info	Details/Date
Application Software Changes	Transition our web-based user interface standard to eliminate the need to install at the customer site.
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	
BPMs	Publish Final Business Practice Manuals	TBD	
External BRS	Post External BRS	Apr 06, 2018	
Tariff	File Tariff	N/A	
Config Guides	Design review - BPM and Tariff SMEs	TBD	
Tech Spec	Publish Technical Specifications	TBD	
Market Sim	Market Sim Window	Jul 17, 2018 - Aug 31, 2018	
Production Activation	ADS UI Replacement	Oct 01, 2018	

Fall 2018 – CPM Risk-of-Retirement Process Enhancements

Project Info	Details/Date
Application Software Changes	Impacted systems: RA System Access Provisioning (AIM)
BPM Changes	Reliability Requirements
Business Process Changes	Manage CPM Risk of Retirement Resources

Milestone Type	Milestone Name	Dates	Status
Board Approval	Obtain Board of Governors Approval	Nov 02, 2017	✓
BPMs	Post Draft BPM changes	TBD	
	Publish Final Business Practice Manuals	TBD	
External BRS	External BRS Completed	Mar 16, 2018	
Tariff	File Tariff	Jan 12, 2018	✓
Config Guides	Post Draft Config Guides	TBD	
Tech Spec	Create ISO Interface Spec (Tech spec)	TBD	
Market Sim	Market Sim Window	Jul 17, 2018 - Aug 31, 2018	
Production Activation	CPM Risk-of-Retirement Process Enhancements	Oct 01, 2018	

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

Milestone Type	Milestone Name	Dates	Status
Tariff	File Readiness Certification	Mar 2, 2019	
Market Sim	Market Sim Window	Dec 03, 2018 - Jan 31, 2019	
Parallel Operations	Parallel Operations Window	Feb 01, 2019 - Mar 30, 2019	
Production Activation	EIM – BANC/SMUD	Apr 01, 2019	

Spring 2019 – EIM LADWP

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

Milestone Type	Milestone Name	Dates	Status
Tariff	File Readiness Certification	March 1, 2019	
Market Sim	Market Sim Window	Dec 03, 2018 - Jan 31, 2019	
Parallel Operations	Parallel Operations Window	Feb 01, 2019 - Mar 30, 2019	
Production Activation	EIM - LADWP	Apr 01, 2019	

Market Performance and Planning Forum *2018 Schedule*

- April 19
- June 20
- August 29
- October 24
- December 19

Questions or meeting topic suggestions:

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