

The Load Bias Limiter, Price Formation, and the Need for Flexible Capacity

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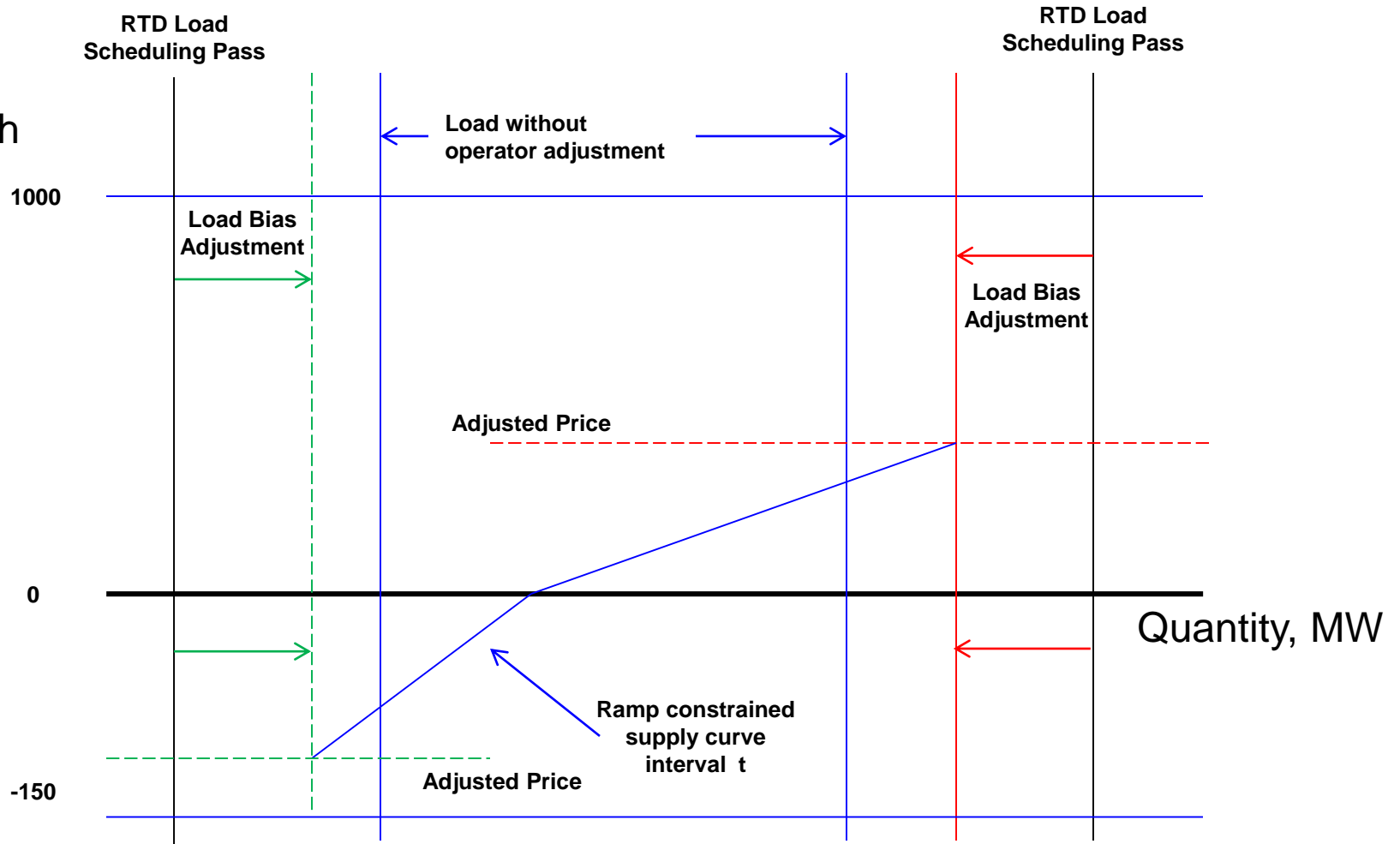


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TOPICS

- Load Bias Limiter and Price Formation
- Flexi-ramp Procurement

Price,
\$/MWh



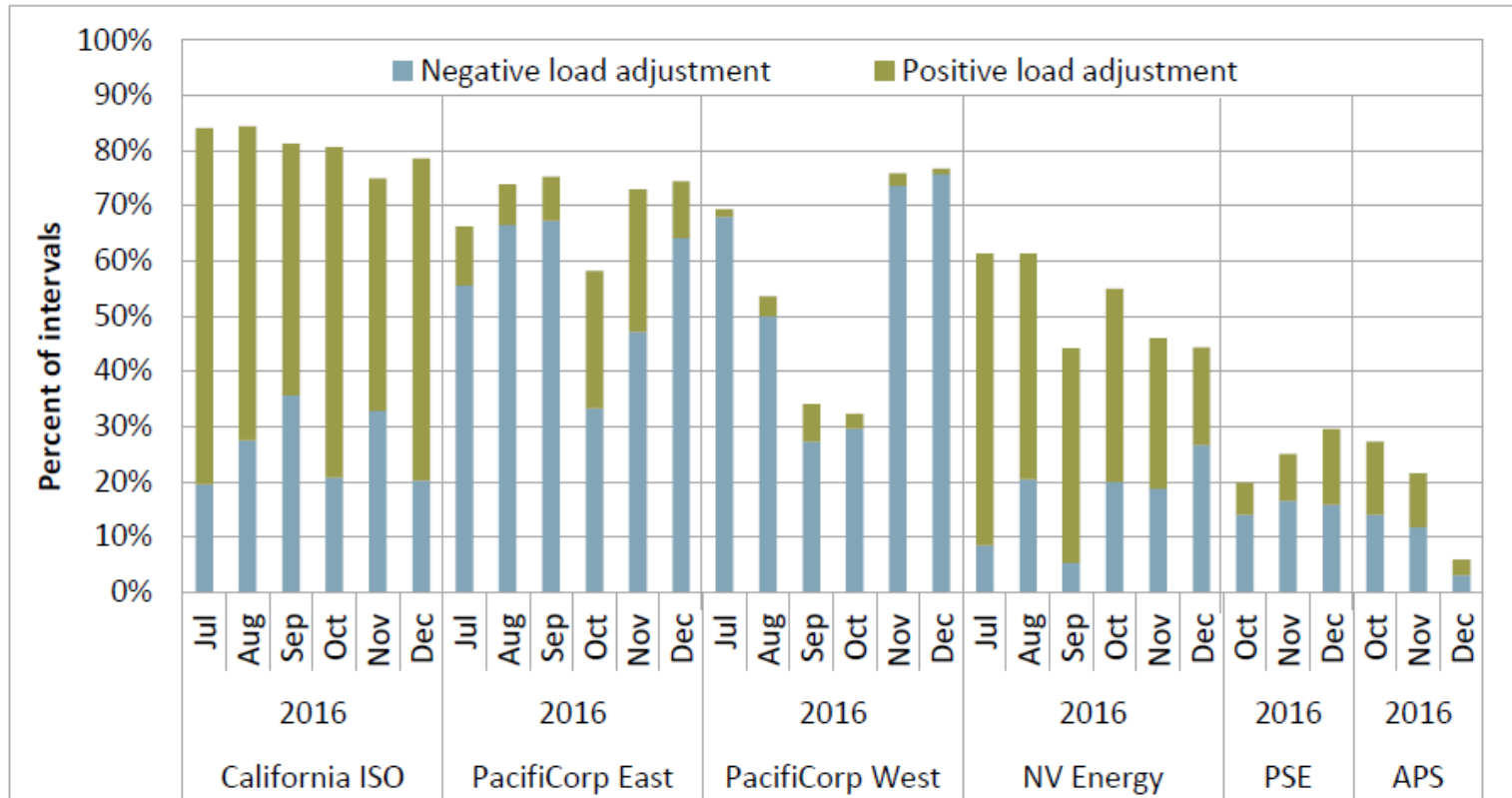
LOAD BIAS LIMITER

What is the load bias limiter?

- The load bias limiter, implemented in December 2012, modifies the load forecast used in the pricing pass to eliminate power balance violations associated with operator load adjustments.
- If the design operates as intended and the size of the power balance violation in the scheduling pass is less than the magnitude of operator load adjustments, then the settlement price will be set by the last economic bid in the pricing pass.

LOAD BIAS LIMITER

Frequency of Load Adjustments – Five Minute Market



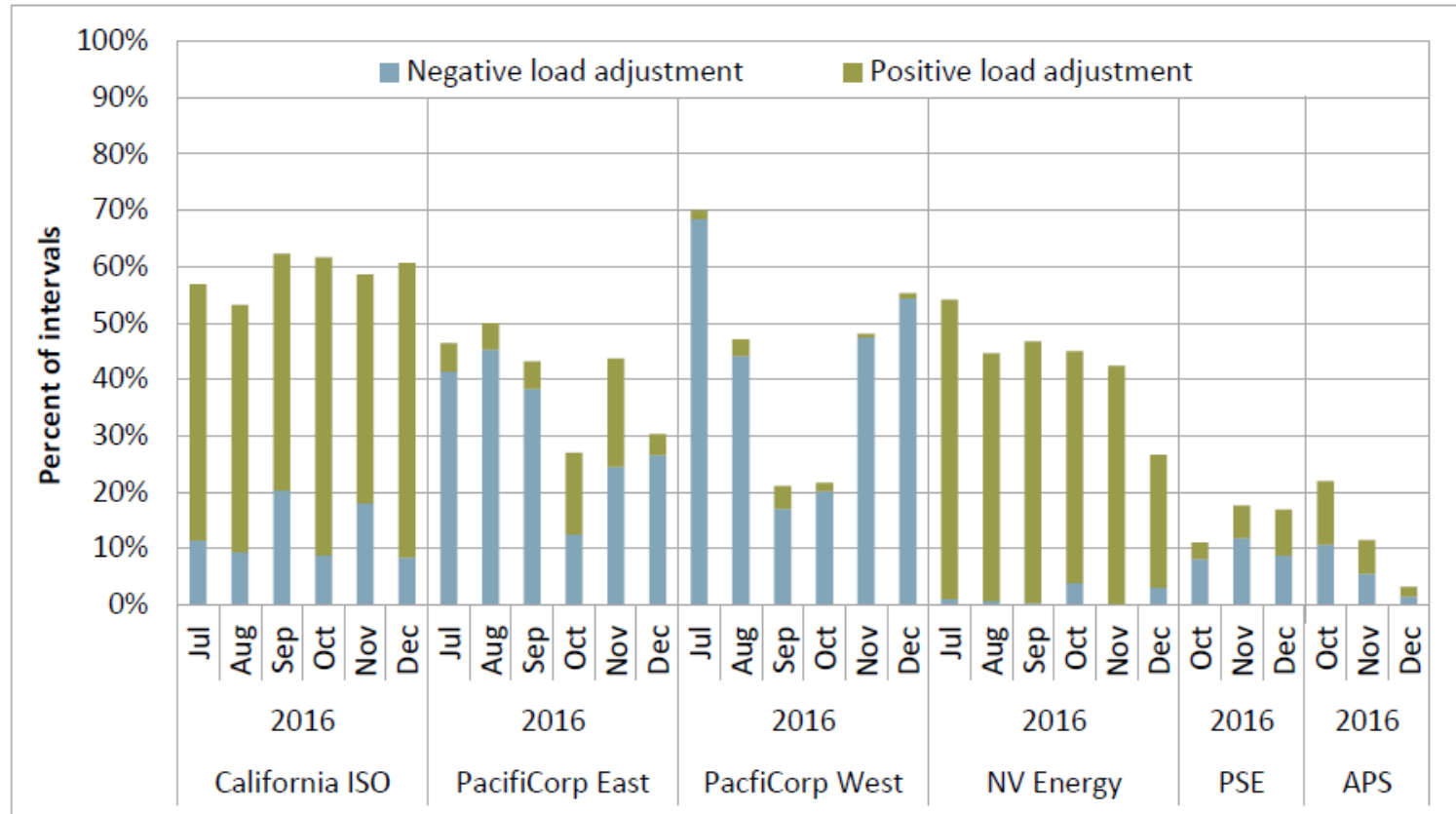
Source: California ISO, Department of Market Monitoring, Q4 2016 Report on Market Issues and Performance, Figure 3.2 p. 50.

LOAD BIAS LIMITER

Department of Market Monitoring data show that the load forecast for the California ISO balancing authority area is being adjusted by CAISO operators in around 80% of RTD intervals during the last half of 2016, so it has the potential to be triggered in most intervals.

LOAD BIAS LIMITER

Frequency of Load Adjustments – Fifteen Minute Market



Source: California ISO, Department of Market Monitoring, Q4 2016 Report on Market Issues and Performance, Figure 3.1 p. 50.

LOAD BIAS LIMITER

Department of Market Monitoring data also show that the load forecast for the California ISO balancing authority area is being adjusted by CAISO operators in around 55-60% of RTPD intervals during the last half of 2016, so it could impact prices in the 15 minute market fairly frequently.

LOAD BIAS LIMITER

Load Adjustments October-December 2016

	Positive load adjustments			Negative load adjustments			Average hourly bias MW
	Percent of intervals	Average MW	Percent of total load	Percent of intervals	Average MW	Percent of total load	
California ISO							
15-minute market	49%	529	2.1%	12%	-274	1.2%	226
5-minute market	54%	437	1.8%	25%	-279	1.2%	167
PacifiCorp East							
15-minute market	12%	114	2.4%	21%	-104	2.2%	-8
5-minute market	20%	107	2.2%	48%	-107	2.2%	-30
PacifiCorp West							
15-minute market	1%	50	1.9%	41%	-51	2.1%	-20
5-minute market	2%	54	2.3%	60%	-56	2.3%	-32
NV Energy							
15-minute market	36%	97	2.6%	2%	-195	5.3%	30
5-minute market	27%	69	1.8%	22%	-80	2.3%	1
Puget Sound Energy							
15-minute market	6%	77	2.3%	10%	-68	2.5%	-2
5-minute market	9%	68	2.1%	15%	-66	2.3%	-4
Arizona Public Service							
15-minute market	6%	105	3.0%	6%	-121	4.4%	-1
5-minute market	9%	107	3.1%	10%	-126	4.6%	-3

Source: California ISO, Department of Market Monitoring, Q4 2016 Report on Market Issues and Performance, Table 3.1 p. 51.

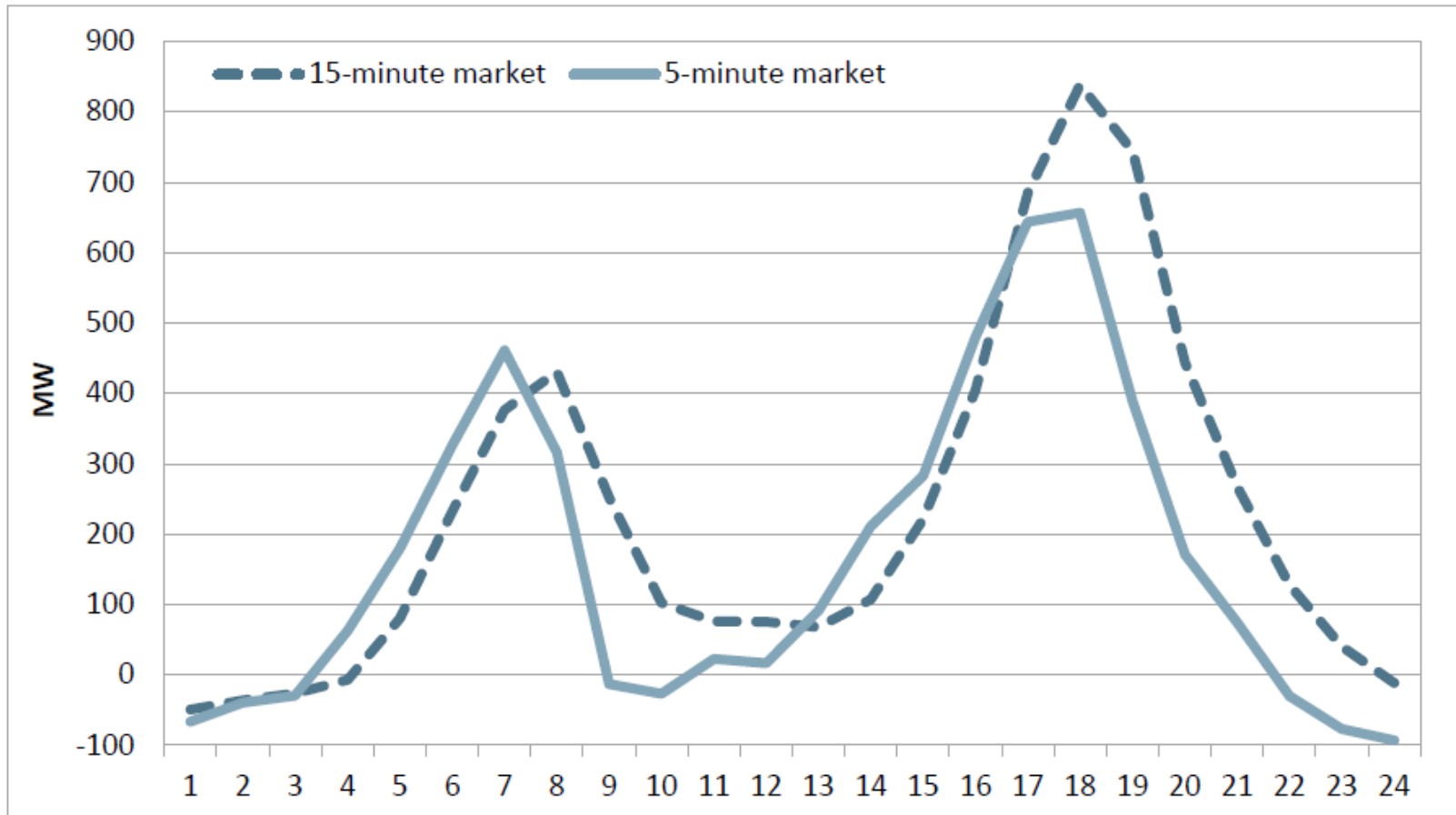
LOAD BIAS LIMITER

Department of Market Monitoring data show that these operator load adjustments are substantial, with positive adjustments for the California ISO balancing authority area averaging 437 megawatts and negative adjustments averaging 279 megawatts in RTD.

- The size of the load adjustments from the application of the load bias limiter are therefore also potentially substantial.

LOAD BIAS LIMITER

Average Load Adjustment – October-December 2016



Source: California ISO, Department of Market Monitoring, Q4 2016 Report on Market Issues and Performance, Figure 3.5 p. 53.

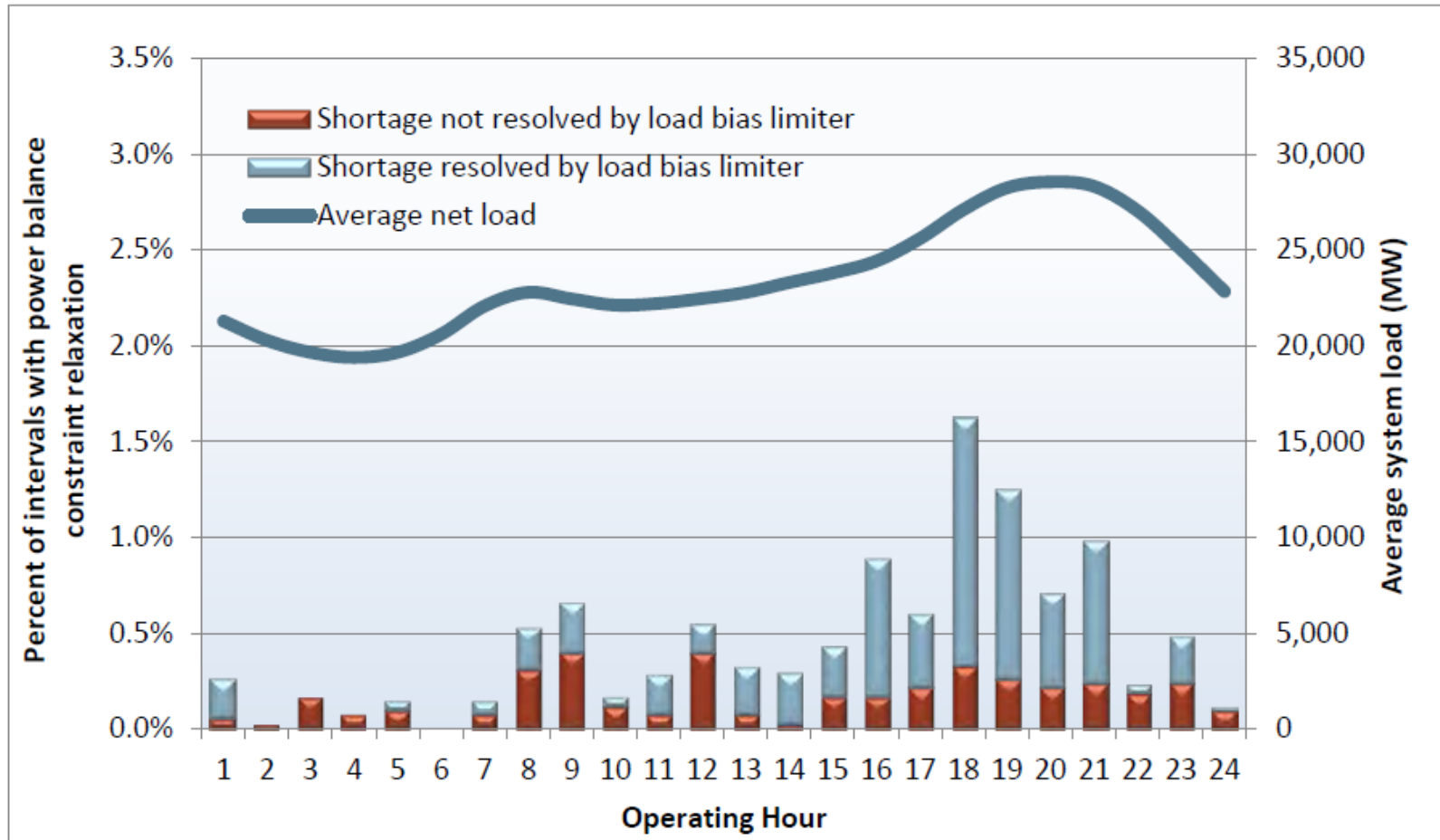
LOAD BIAS LIMITER

Department of Market Monitoring data also show that positive load adjustments are concentrated in the morning and evening ramp periods in both RTPD and RTD.

- These adjustments therefore have a substantial impact on the need for upward ramp capability reflected in the dispatch during these critical periods.
- Removing these load adjustments from the price calculation when they result in a power balance violation has the potential to materially reduce prices during the high ramp hours, reducing the value of flexible capacity.
- The Department of Market Monitoring data report the average adjustment by hour, so the gross adjustments up and down could be larger in some hours.

LOAD BIAS LIMITER

Power Balance Relaxation (Upward Ramping) 2015



Source: California ISO, 2015 Annual Report on Market Issues & Performance, Figure 3.10 p. 83.

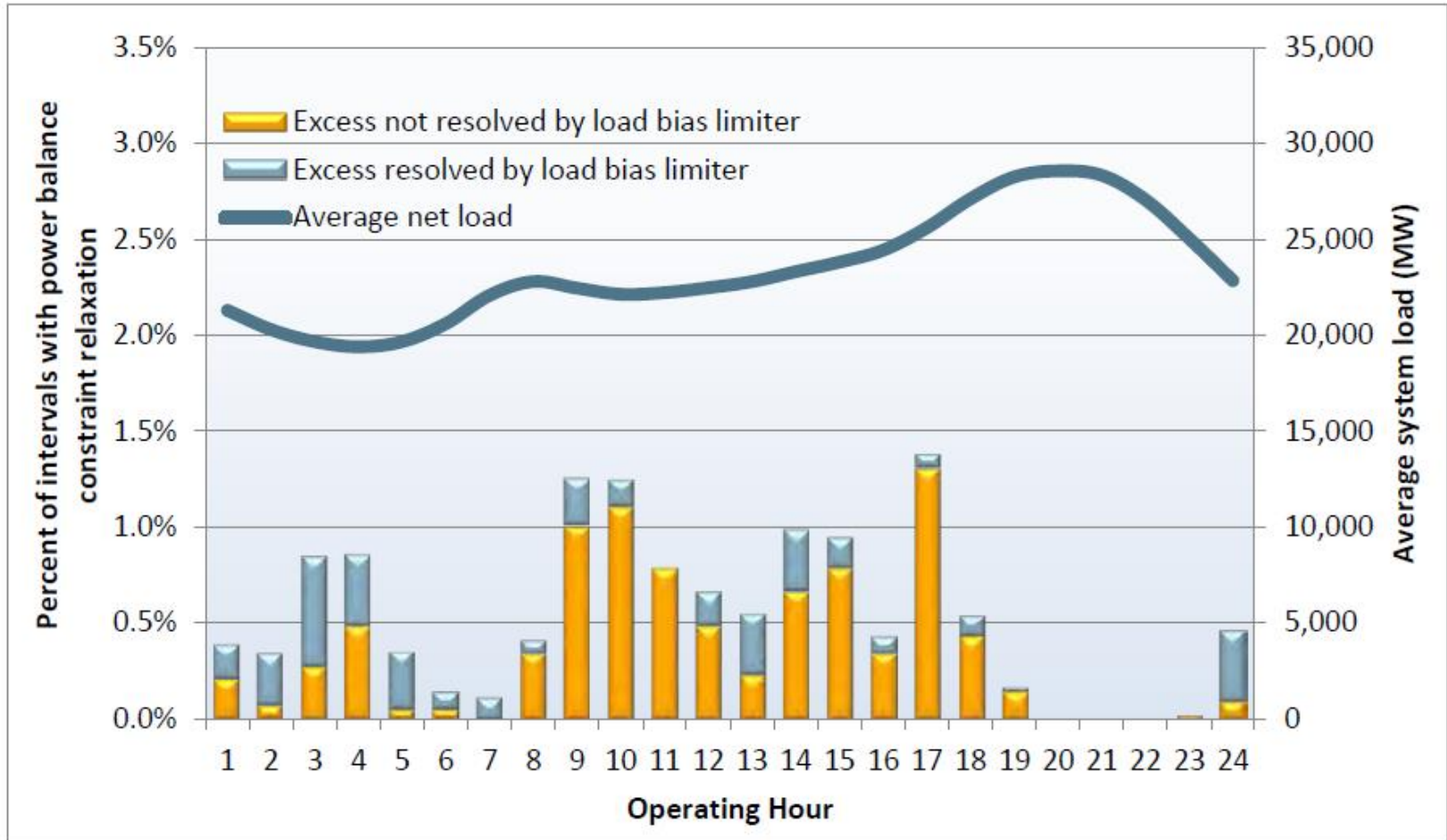
LOAD BIAS LIMITER

Department of Market Monitoring data in the 2015 Annual Market Report show that the application of the “load bias limiter” eliminated a substantial proportion of the shortages of upward ramp capability in RTD, with the most frequent impact falling during the evening ramp hours of 16-21.

- These data show that the load bias limiter directly reduces the market value of flexible capacity during the high ramp hours.
- If the California ISO needs flexible capacity and upward ramp during these hours, real-time prices should reflect this need and not be artificially depressed through the application of the load bias limiter.

LOAD BIAS LIMITER

Power Balance Relaxation (Downward Ramping) 2015



Source: California ISO, 2015 Annual Report on Market Issues & Performance, Figure 3.11 p. 83.

LOAD BIAS LIMITER

Department of Market Monitoring data show that the application of the “load bias limiter” eliminates a smaller proportion of the downward power balance violations, but it was still triggered fairly frequently in some hours during 2015.

- The application of the load bias limiter to raise negative prices reduces the value of capacity with low minimum operating levels, short minimum run times, multiple starts and good ramping capability.

LOAD BIAS LIMITER

Load Bias Impact on EIM Prices – October-December 2016

	Average proxy price	Average EIM price	EIM price without price discovery*	EIM price without price discovery or load bias limiter*	Potential impact of load bias limiter	
					Dollars	Percent
<i>PacifiCorp East</i>						
15-minute market (FMM)	\$24.22	\$26.94	\$26.94	\$27.23	-\$0.29	-1.1%
5-minute market (RTD)	\$24.22	\$27.86	\$27.86	\$28.06	-\$0.19	-0.7%
<i>PacifiCorp West</i>						
15-minute market (FMM)	\$24.22	\$24.64	\$24.64	\$24.64	\$0.00	0.0%
5-minute market (RTD)	\$24.22	\$21.32	\$21.32	\$21.54	-\$0.22	-1.0%
<i>NV Energy</i>						
15-minute market (FMM)	\$22.82	\$28.12	\$28.12	\$28.55	-\$0.43	-1.5%
5-minute market (RTD)	\$22.82	\$29.42	\$29.42	\$29.98	-\$0.56	-1.9%
<i>Puget Sound Energy</i>						
15-minute market (FMM)	\$23.17	\$23.61	\$23.93	\$23.93	\$0.00	0.0%
5-minute market (RTD)	\$23.17	\$20.76	\$22.06	\$22.24	-\$0.17	-0.8%
<i>Arizona Public Service</i>						
15-minute market (FMM)	\$24.22	\$26.39	\$25.21	\$25.18	\$0.03	0.1%
5-minute market (RTD)	\$24.22	\$27.28	\$27.73	\$27.46	\$0.27	1.0%

**Without price discovery applies to Puget Sound Energy and Arizona Public Service only*

Source: California ISO, Department of Market Monitoring, Q4 2016 Report on Market Issues and Performance, Table 3.2 p. 58

LOAD BIAS LIMITER

Department of Market Monitoring data do not show the impact of the load bias limiter on California ISO prices, but the impacts are likely similar to those for the Nevada Energy balancing authority area.

- A price difference of 56 cents per megawatt hour is not large, but if the load bias limiter is only impacting 1% of RTD intervals, the impact is \$56 per megawatt hour on the real-time price during the affected intervals when fast ramping flexible resources are being dispatched up.
- The impact of the load bias limiter on 15 minute prices in the impacted intervals is likely be even larger because the impact is likely concentrated in fewer intervals of power balance violation.
- These average price impacts are also likely reduced by offsetting positive and negative impacts.

LOAD BIAS LIMITER

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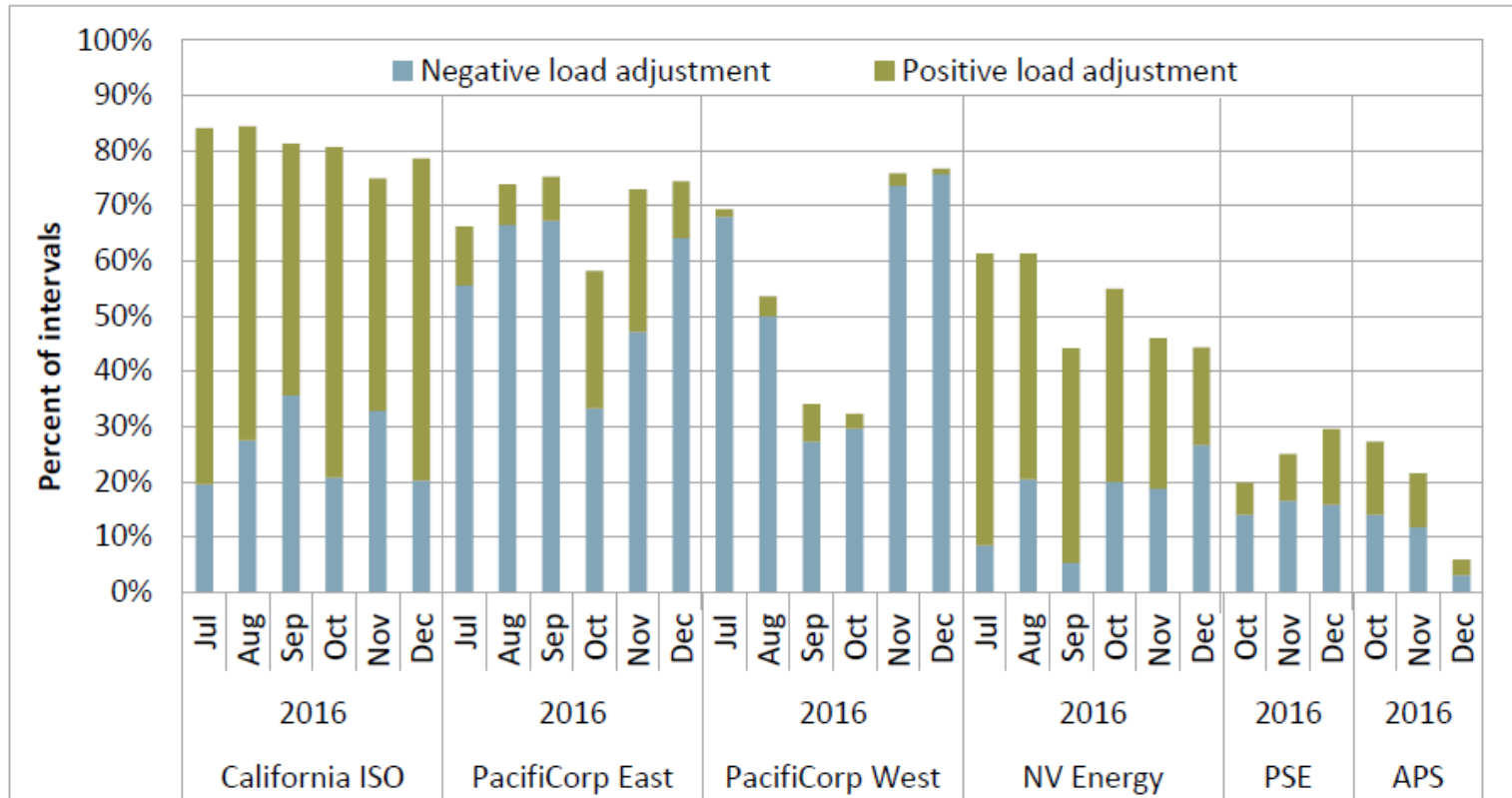
LOAD BIAS LIMITER

If new flexible capacity earns little if any margin in the energy and ancillary services market and simply recovers their variable costs in these markets, their energy and ancillary service margins will be little different from those of inflexible resources receiving large uplift payments.

- If both flexible and inflexible capacity earn little if any energy and ancillary service margins, their procurement cost in the RA process will only reflect their going forward costs, it will not reflect the greater value of flexible capacity.
- How often does flexible capacity earn a positive energy and ancillary service margin in real-time?
- What is the impact of the load bias adjustment on the real-time margins of flexible capacity?

LOAD BIAS LIMITER

Frequency of Load Adjustments – Five Minute Market



Source: California ISO, Department of Market Monitoring, Q4 2016 Report on Market Issues and Performance, Figure 3.2 p. 50.

LOAD BIAS LIMITER

If these operator load adjustments do not reflect a “real” need for increased output and upward ramp, then they should be not be reflected in prices, and they also should not be included in the dispatch.

- If these load adjustments, and the load balance violations they result in, are not “valid,” does this mean that California ISO’s need for flexible capacity is not valid?
- If these operator adjusts are valid and the CAISO needs to maintain flexible capacity, then we should be assessing how much impact the load balance limiter is having on the returns to flexible capacity by eliminating or substantially reducing positive margins for this capacity in the energy and ancillary services market.

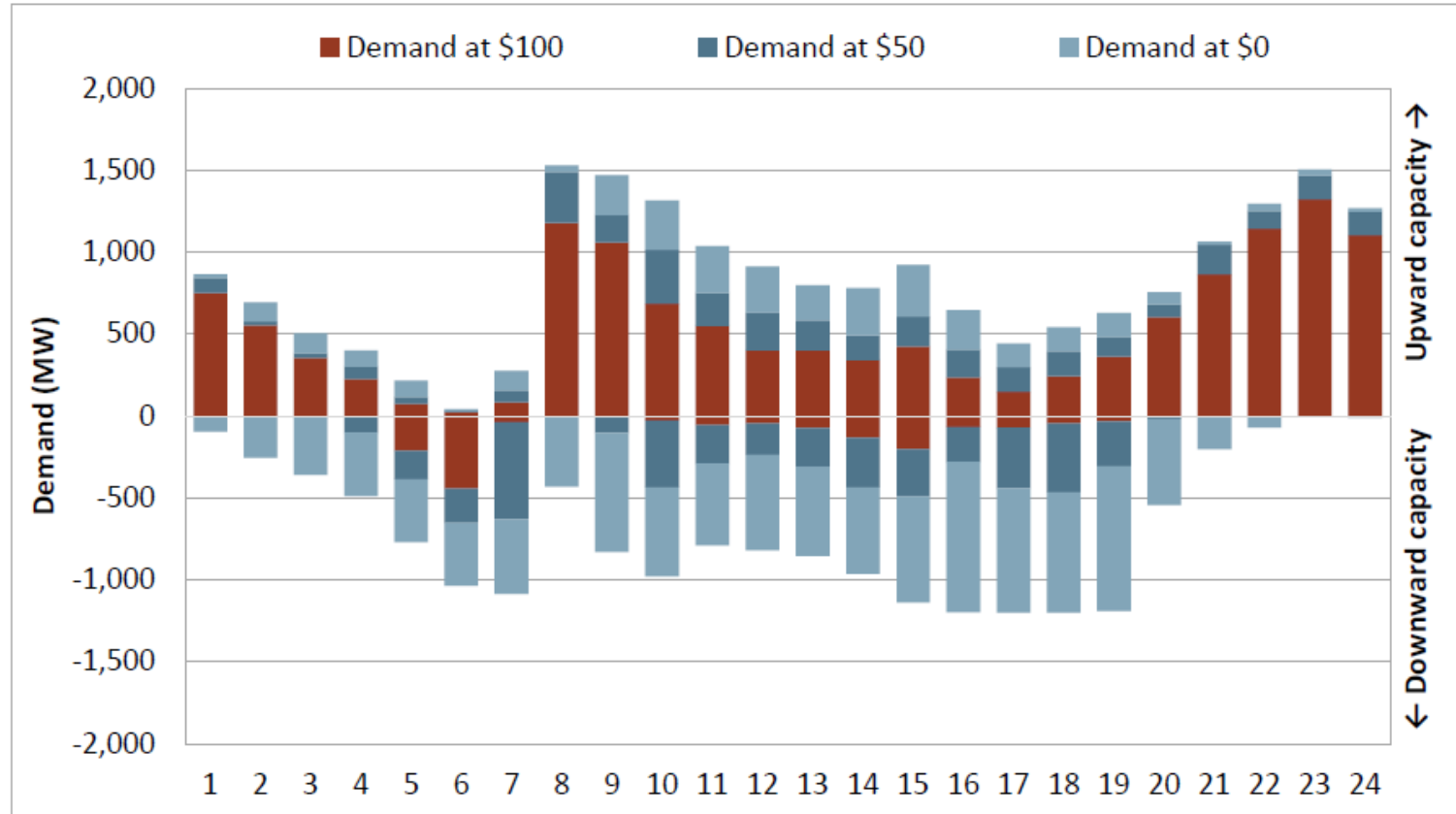
FLEXI-RAMP PROCUREMENT

The California ISO's procurement of flexi-ramp to balance unexpected variations in net load is a component of the California ISO's design for reducing the level and frequency of power balance violations as the resource mix shifts.

- Another factor impacting the level of flexible capacity needed to accommodate the changing resource mix is the effectiveness of the flexi-ramp constraint and product and their impact on price formation.

FLEXI-RAMP PROCUREMENT

Flexible Ramp Demand Curves (15 Minute Market) November-December 2016



Source: California ISO, Department of Market Monitoring, Q4 2016 Report on Market Issues and Performance, Figure 4.1 p. 62

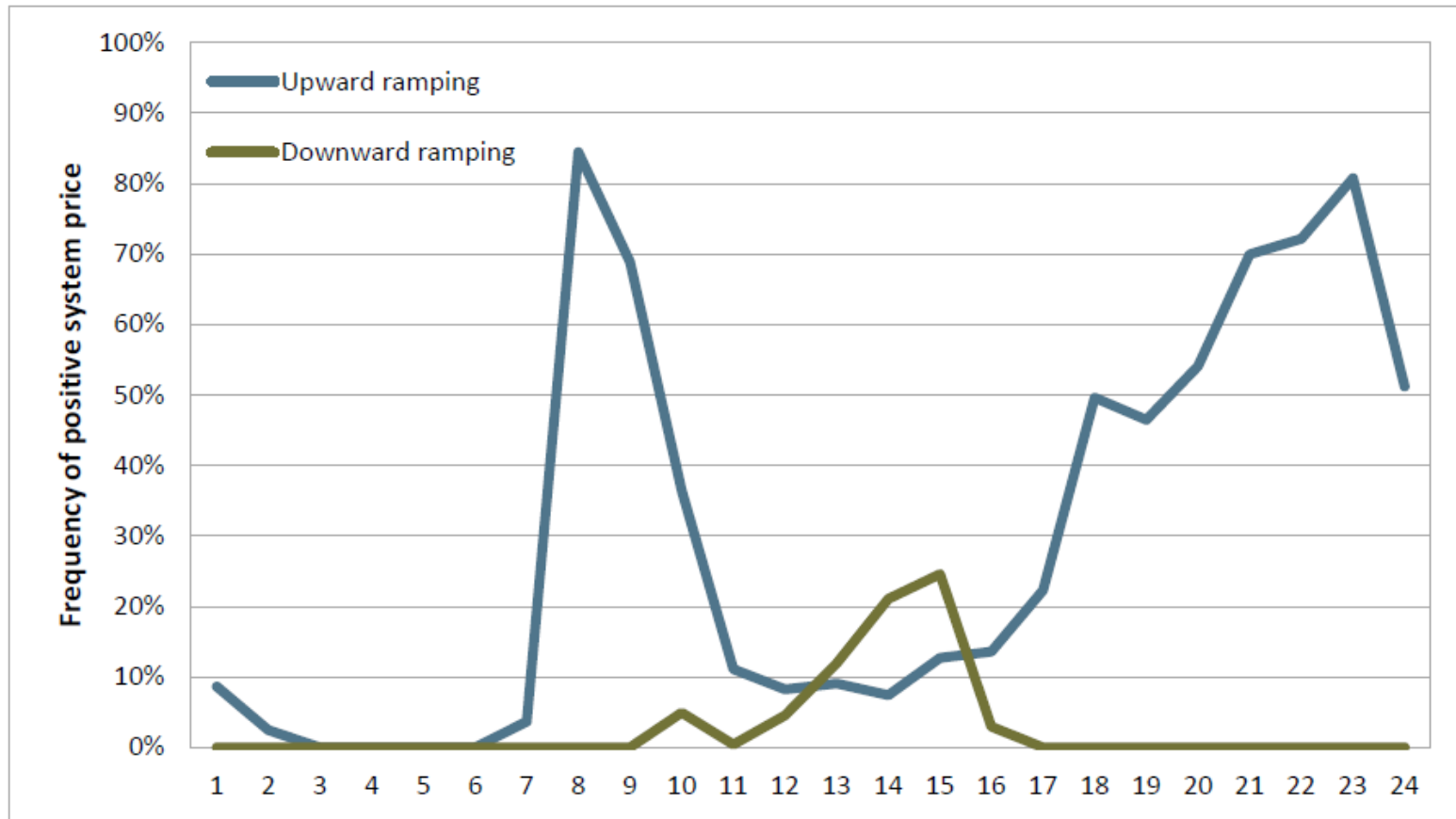
FLEXI-RAMP PROCUREMENT

Department of Market Monitoring data show that the target procurement for upward ramp in the 15 minute market was relatively low in hours 16-21 during November and December 2016.

- Given the relatively high level of upward power balance violations during the evening ramp and during 4th quarter 2016 in general, perhaps we should be reviewing the way the flexi-ramp target is being set and implemented in the dispatch and unit commitment.

FLEXI-RAMP PROCUREMENT

Frequency of Positive 15 Minute Market Flexi Ramp Price November-December 2016



Source: California ISO, Department of Market Monitoring, Q4 2016 Report on Market Issues and Performance, Figure 4.2 p. 63

FLEXI-RAMP PROCUREMENT

Department of Market Monitoring data show that the shadow price of flexi-ramp was non-zero during a relatively low proportion of RTPD intervals during hours 15, 16 and 17 and was only non-zero during around $\frac{1}{2}$ of the RTPD intervals during hours 18 and 19 during November and December 2016.

Perhaps we should be reviewing the frequency with which upward power balance violations have been occurring during the evening ramp during intervals with a zero shadow price for additional upward ramp and assess:

- whether additional ramp capability would have been available at a low cost;
- whether RTPD overstated the amount of ramp that was available; and/or
- whether the zero shadow price in these hours reflects market design or implementation issues.

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