



Briefing on western energy imbalance market and benefits

Mark Rothleder

Vice President, Market Quality & Renewable Integration

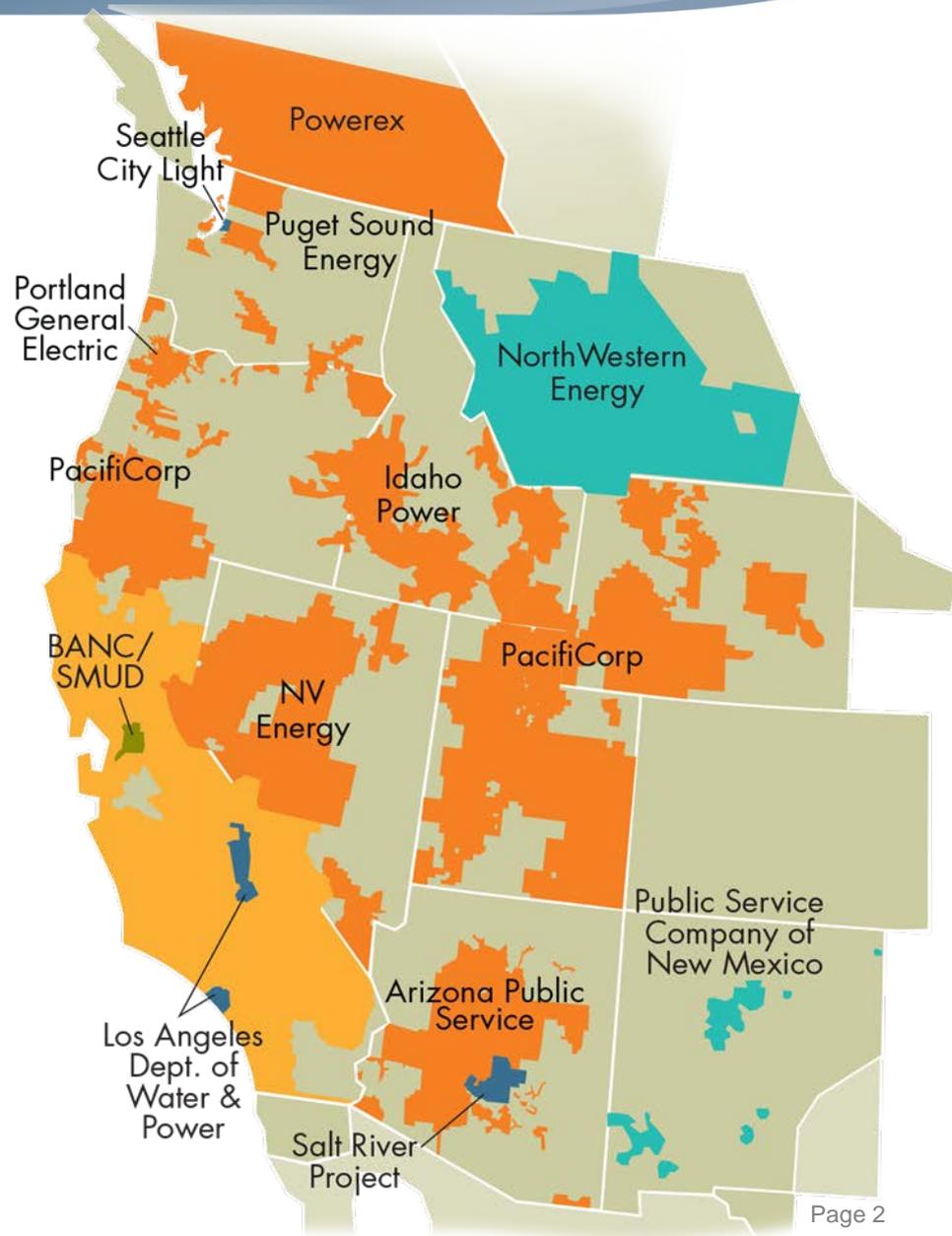
Board of Governors Meeting

General Session

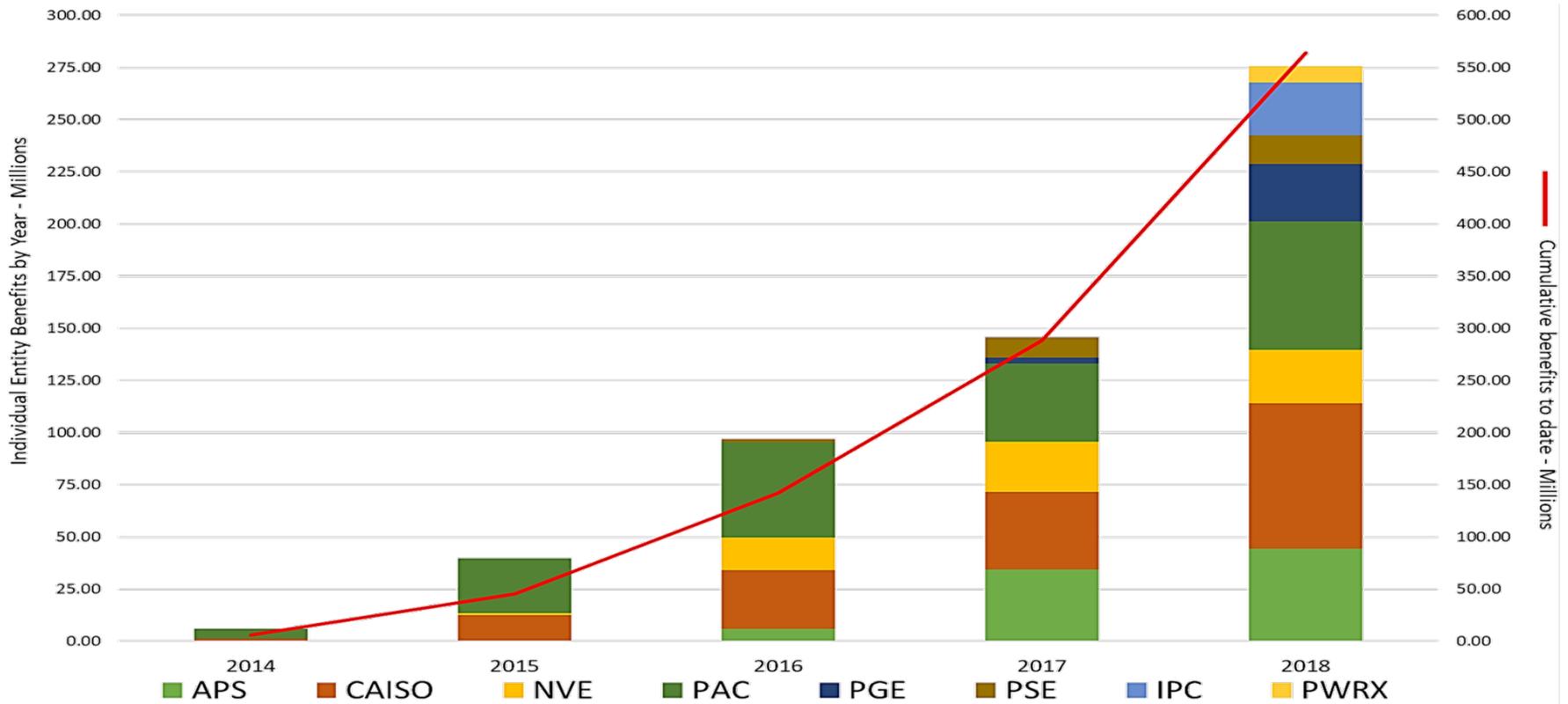
March 27, 2019

EIM Update

- NorthWestern Energy signed implementation agreement – planned entry in 2021.
- BANC/SMUD is currently in parallel operations. All readiness criteria has been passed with an expected go-live date of April 4.
- Work continues with BPA in their process towards stakeholder consideration of EIM.



Gross economic benefits since start of EIM = \$564.88M



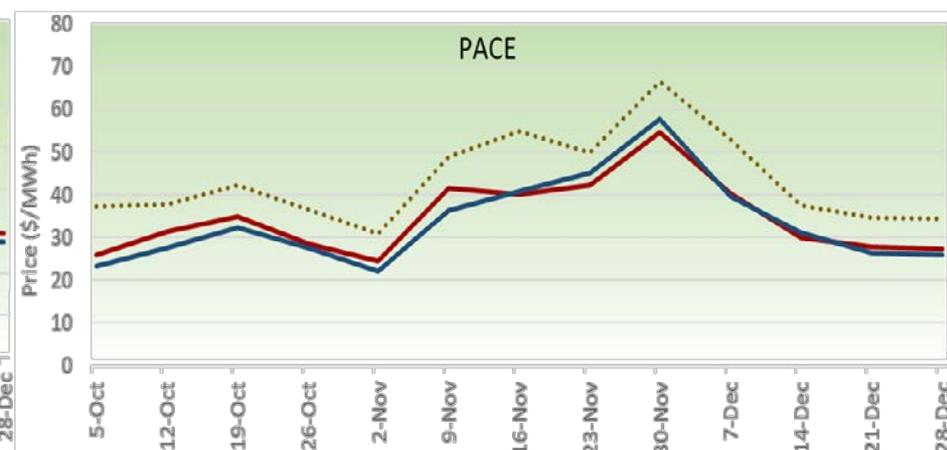
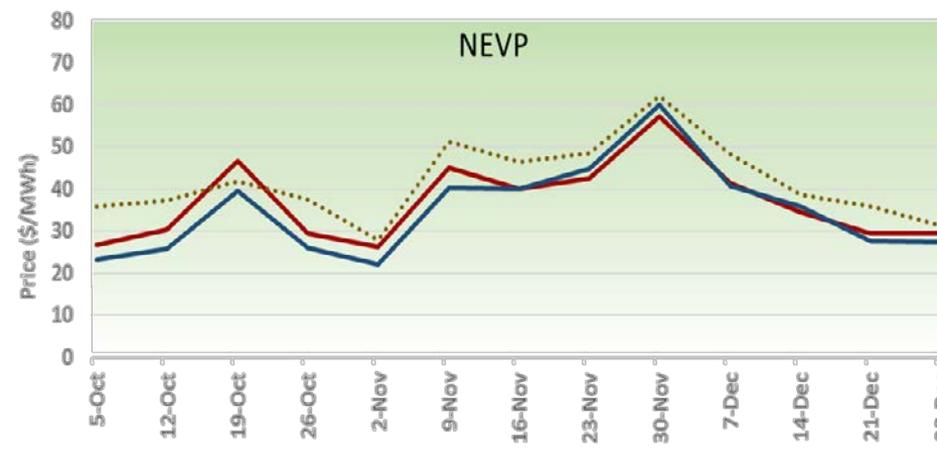
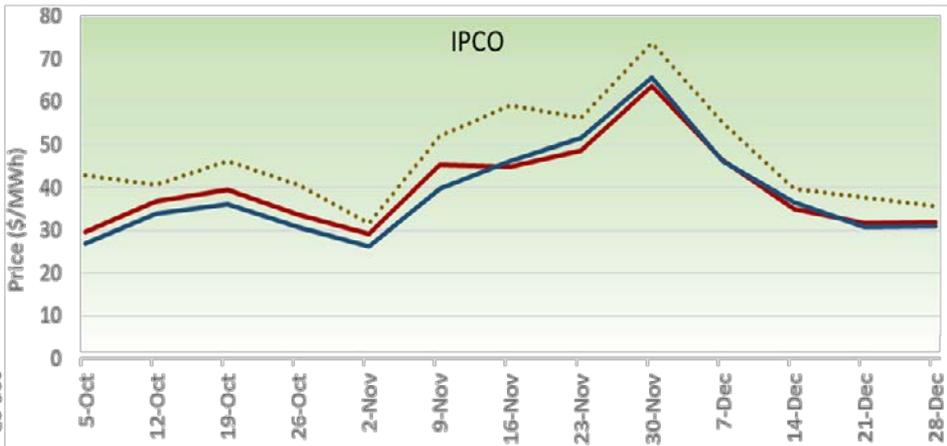
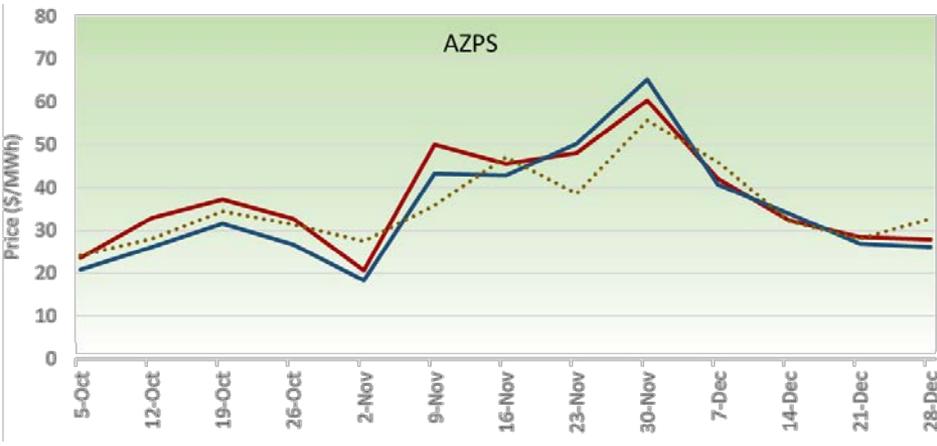
Region	October	November	December	Total
APS	\$3.94	\$2.92	\$3.17	\$10.03
ISO	\$0.27	\$1.17	\$2.70	\$4.14
IPC	\$2.01	\$1.70	\$2.11	\$5.82
NVE	\$1.73	\$1.51	\$1.71	\$4.95
PAC	\$5.25	\$6.79	\$9.64	\$21.68
PGE	\$3.20	\$3.04	\$2.88	\$9.12
PSE	\$1.15	\$1.54	\$1.22	\$3.91
PWX	\$0.62	\$1.23	\$1.07	\$2.92
Total	\$18.17	\$19.90	\$24.50	\$62.57

Flexible ramping procurement diversity savings for 4th quarter, 2018

	October		November		December	
Direction	Up	Down	Up	Down	Up	Down
Average MW saving	743	754	753	749	752	765
Estimated savings	\$439,526	\$0	\$577,133	\$0	\$302,980	\$0
Sum of BAA requirements	1,645	1,674	1,625	1,674	1,654	1,611
Diversity Benefit	45%	45%	46%	45%	45%	47%

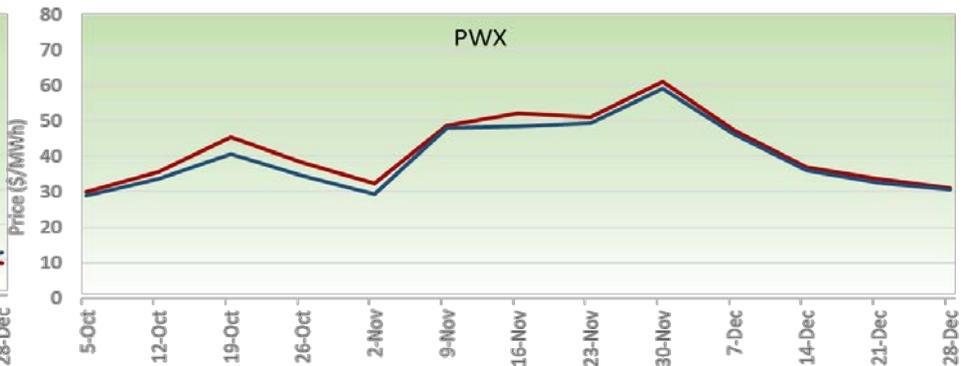
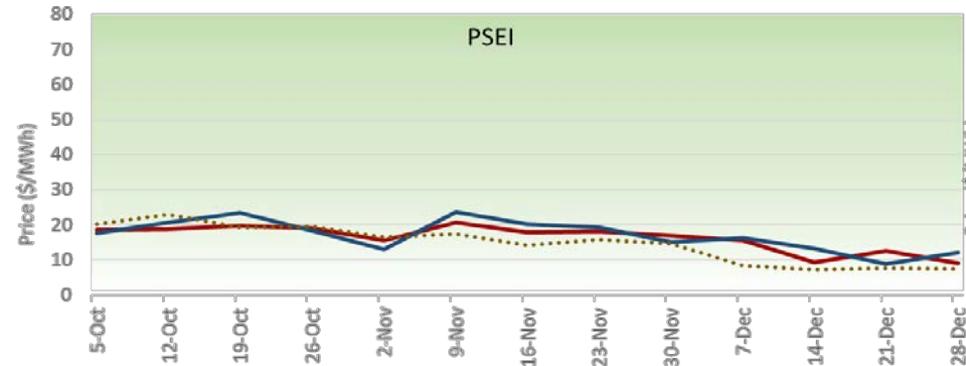
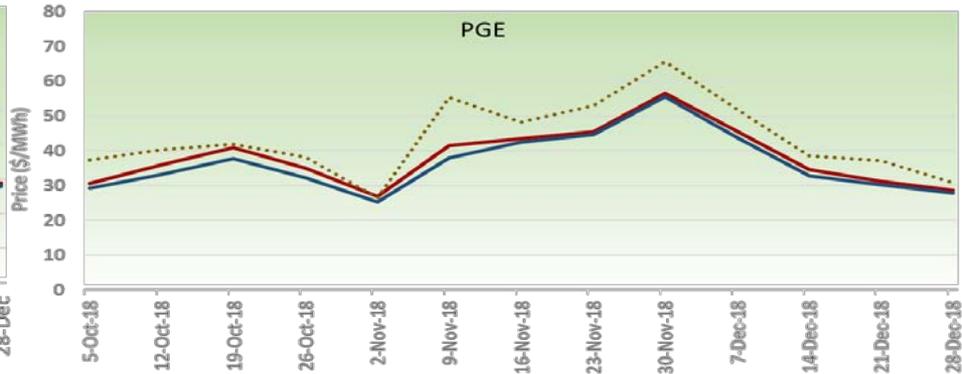
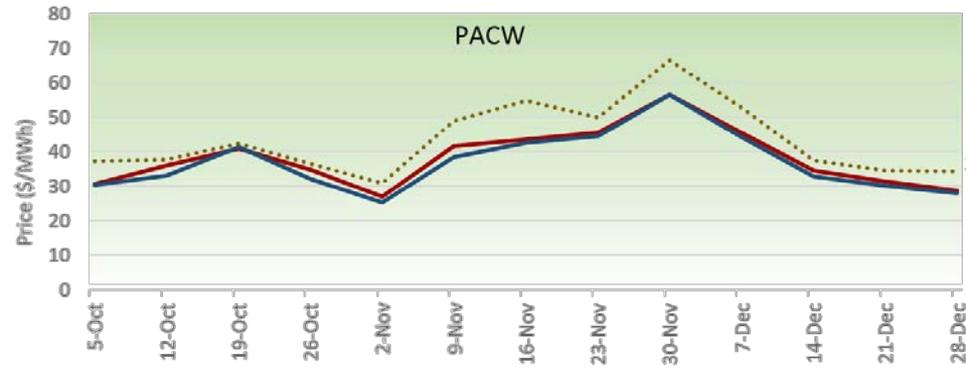
The percentage of savings is the average MW savings divided by the sum of the four individual BAA requirements.

Weekly average prices in EIM areas



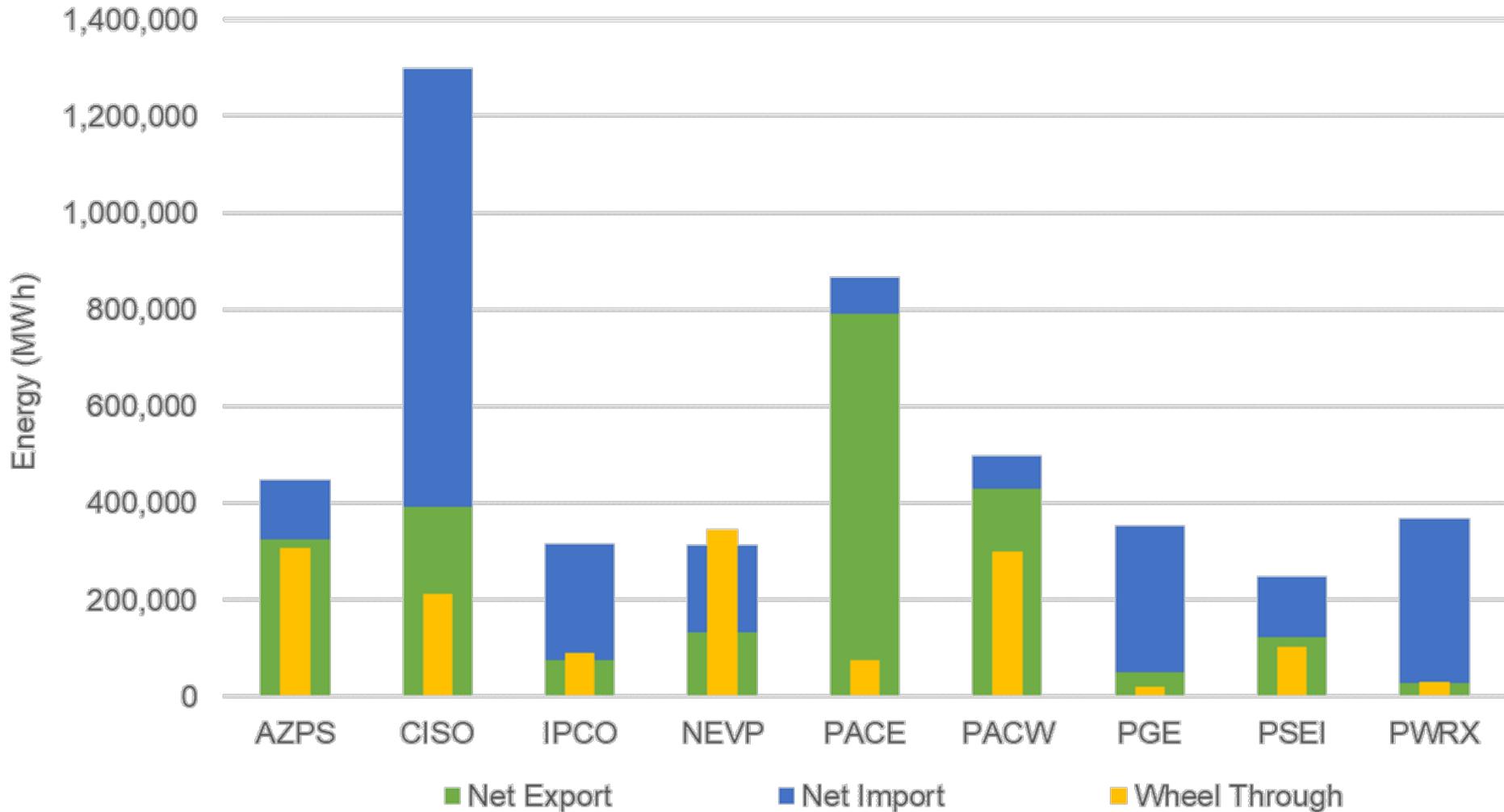
..... Estimated Proxy — RTD ELAP — FMM ELAP

Weekly average prices in EIM areas

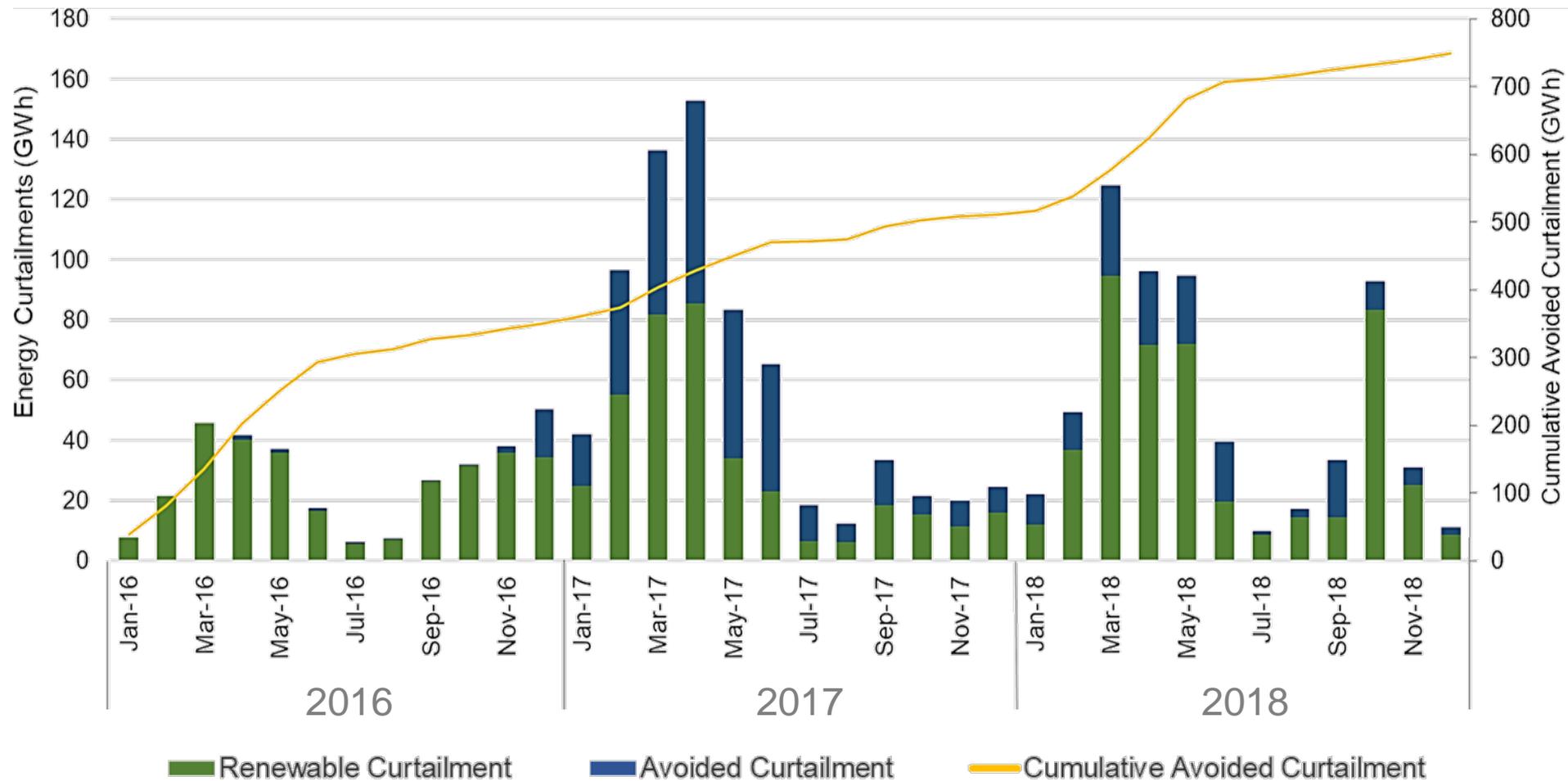


●●● Estimated Proxy
 — RTD ELAP
 — FMM ELAP

Estimated wheel through transfers in Q4, 2018



Energy imbalance market helps avoid curtailment



Robust energy transfers in 4th quarter, 2018

