



Western energy imbalance market update

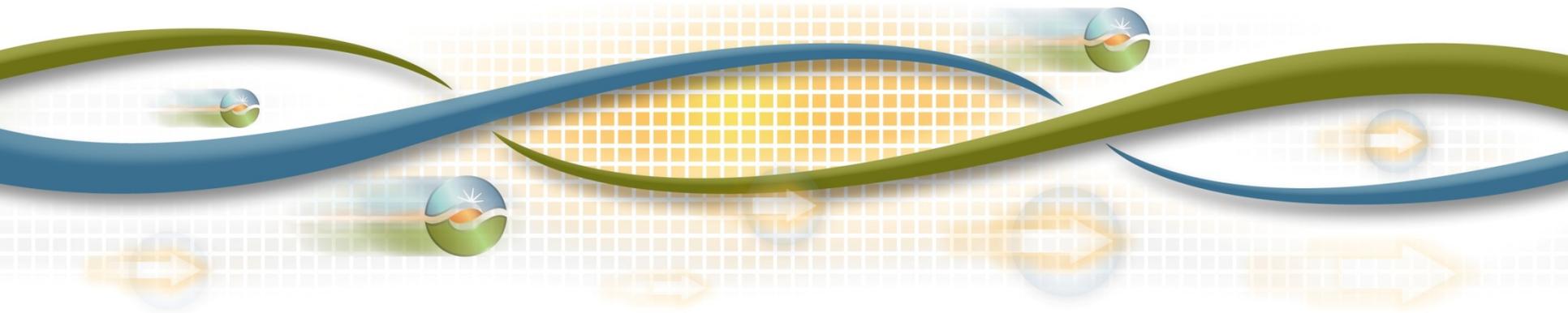
Mark Rothleder

Vice President, Market Quality & Renewable Integration

Board of Governors Meeting

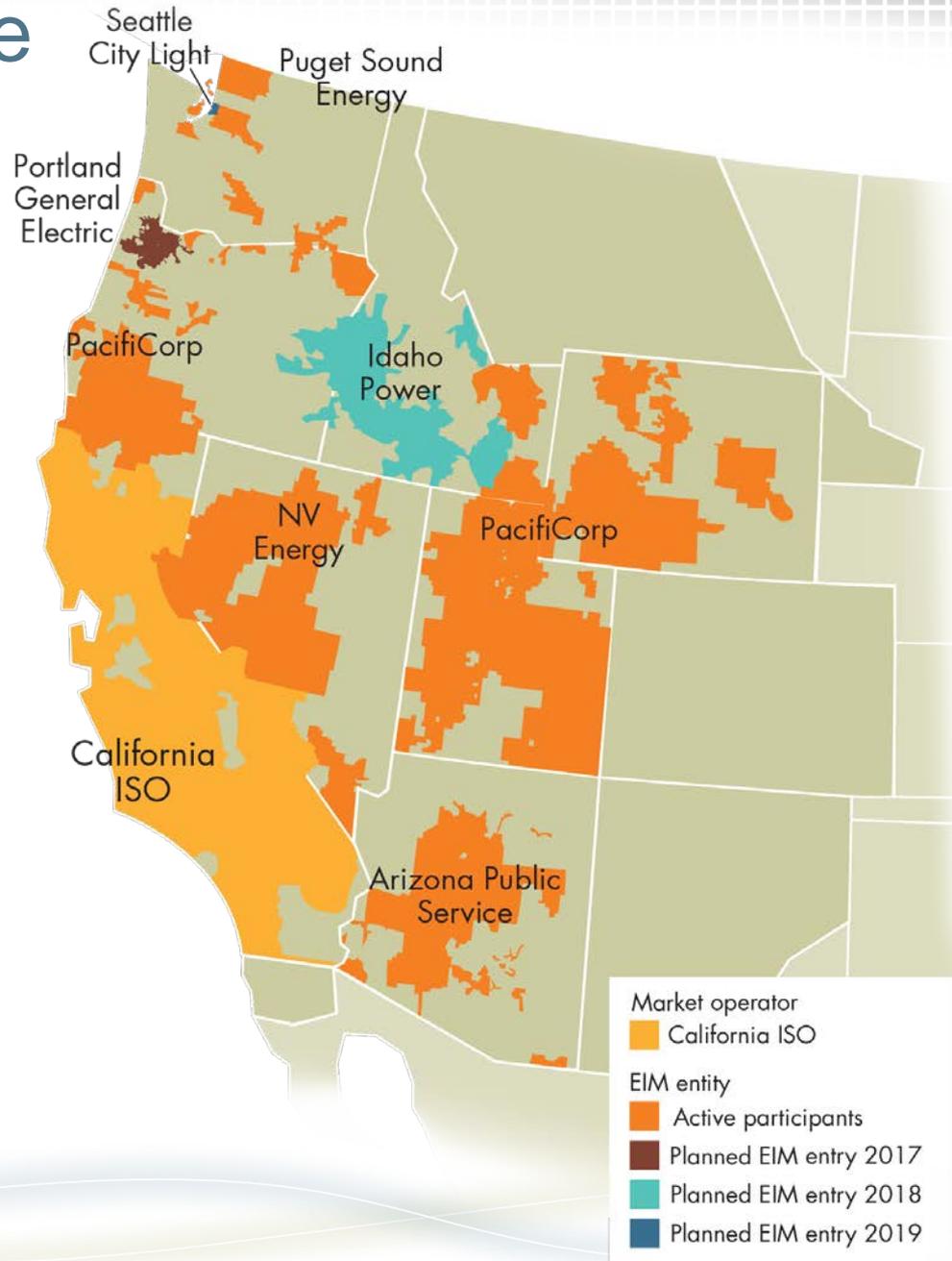
General Session

February 16, 2017



Implementation update

- EIM entities now in the implementation phase
 - ~ Portland General – Fall 2017
 - ~ Idaho Power – Spring 2018
 - ~ Seattle City Light – Spring 2019
- Entities exploring future entry
 - ~ CENACE, Baja, CA
 - ~ Balancing Authority of Northern California (BANC)
 - ~ Los Angeles Department of Water & Power (LADWP)
 - ~ Salt River Project
 - ~ Northwestern Energy



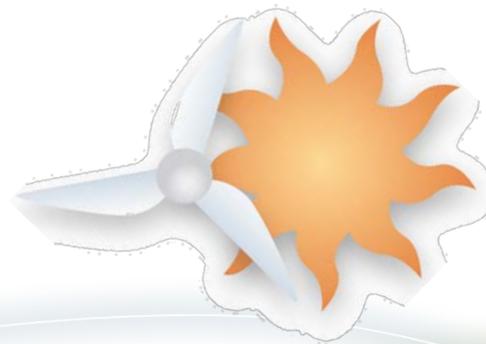
Gross economic benefits since start of EIM = \$142.62M

BAA	4 th Qtr 2014	1 st Qtr 2015	2 nd Qtr 2015	3 rd Qtr 2015	4 th Qtr 2015	1 st Qtr 2016	2 nd Qtr 2016	3 rd Qtr 2016	4 th Qtr 2016	Total
APS									5.98	5.98
CAISO	1.23	1.44	2.46	3.48	5.28	6.35	7.89	5.44	8.67	42.24
NVE	-	-	-	-	0.84	1.70	5.20	5.60	3.07	16.41
PAC	4.73	3.82	7.72	8.52	6.17	10.85	10.51	15.12	8.99	76.43
PSE									1.56	1.56
Total	5.97	5.26	10.18	12.00	12.29	18.90	23.60	26.16	28.27	142.62

BAA	October	November	December	Q4 – 2016 Total
APS	2.81	1.68	1.49	5.98
CAISO	1.62	3.10	3.95	8.67
NVE	1.00	1.47	0.60	3.07
PAC	3.24	1.89	3.86	8.99
PSE	0.25	0.66	0.65	1.56
Total	8.92	8.8	10.55	28.27

Continued to observe reduced renewable curtailment in 4th quarter, 2016

Reduced Renewable Curtailment	1 st Qtr 2015	2 nd Qtr 2015	3 rd Qtr 2015	4 th Qtr 2015	1 st Qtr 2016	2 nd Qtr 2016	3 rd Qtr 2016	4 th Qtr 2016	Total To-Date
Mwh curtailment avoided	8,860	3,629	828	17,765	112,948	158,806	33,094	23,390	359,320
Estimated metric tons of CO2 displaced	3,792	1,553	354	7,521	48,342	67,969	14,164	10,011	153,706

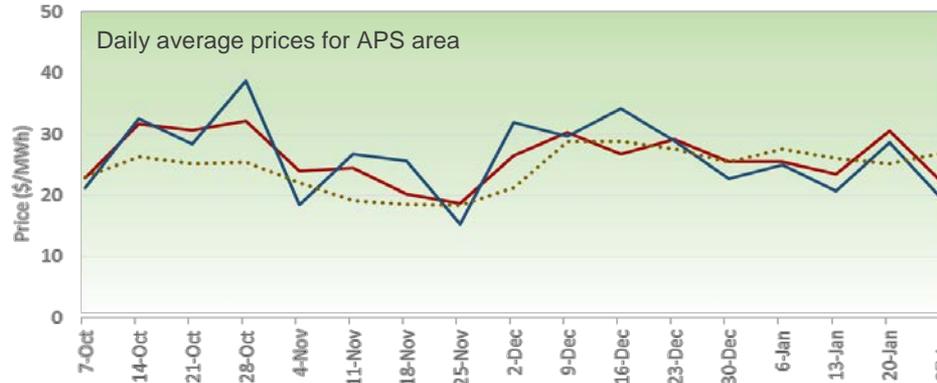


Flexible ramping procurement diversity savings for 4th quarter, 2016

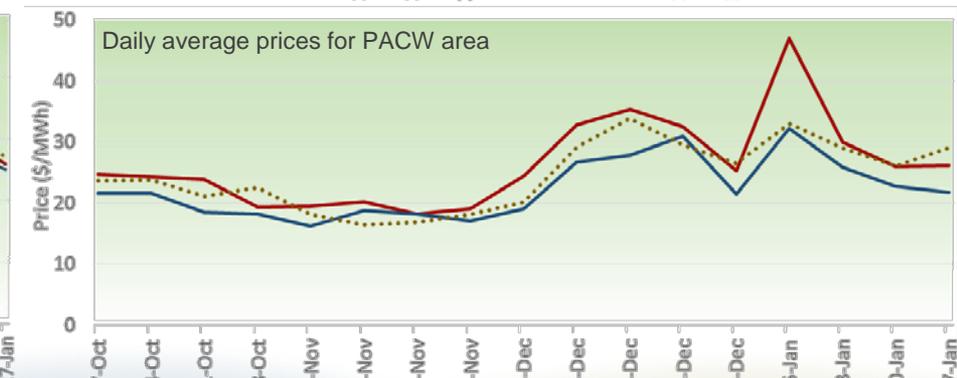
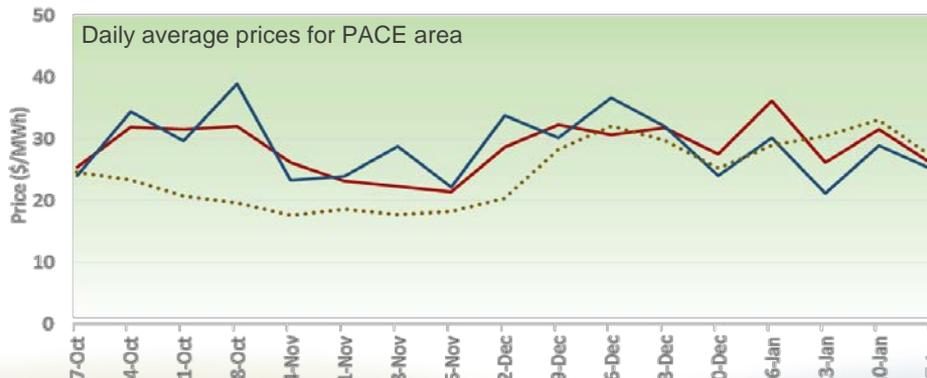
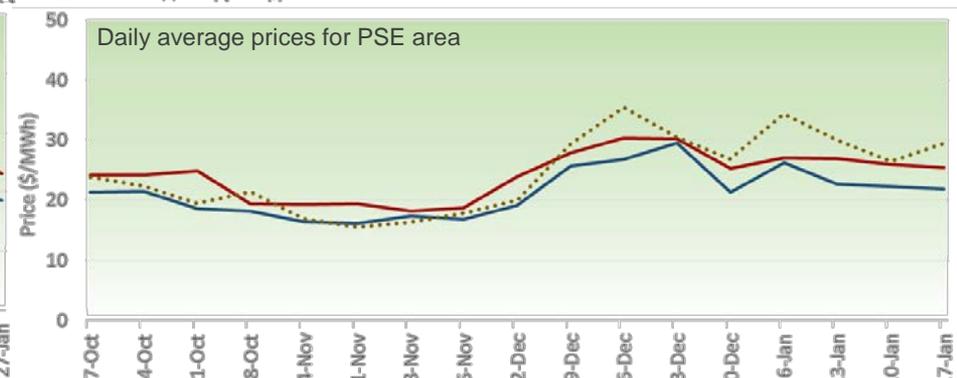
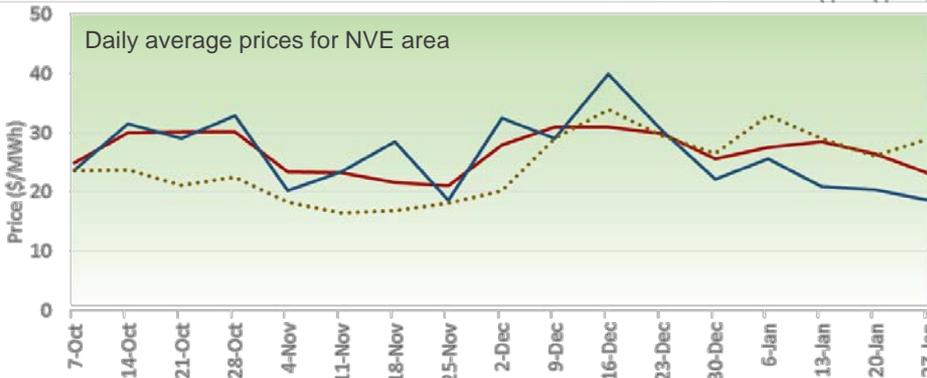
	October		November		December	
Direction	Up	Down	Up	Down	Up	Down
Average MW saving	490	N/A	415	474	399	482
Sum of BAA requirements	986	N/A	1,238	1,162	1,236	1,166
Diversity Benefit	50%	N/A	33%	41%	32%	41%

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

Daily average prices in EIM areas



- FMM ELAP
- RTD ELAP
- ⋯ Estimated Proxy



Energy transfer capability in 4th quarter, 2016

