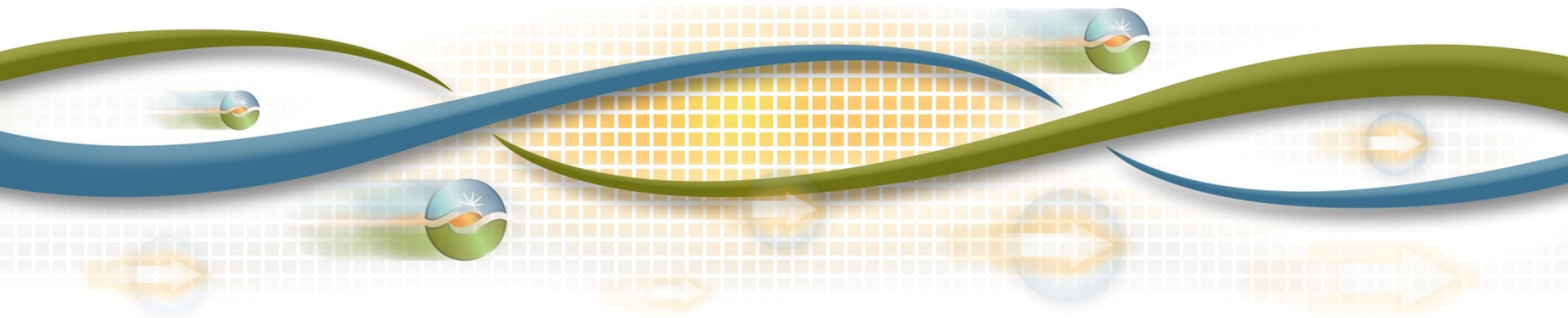




Briefing on Western energy imbalance market

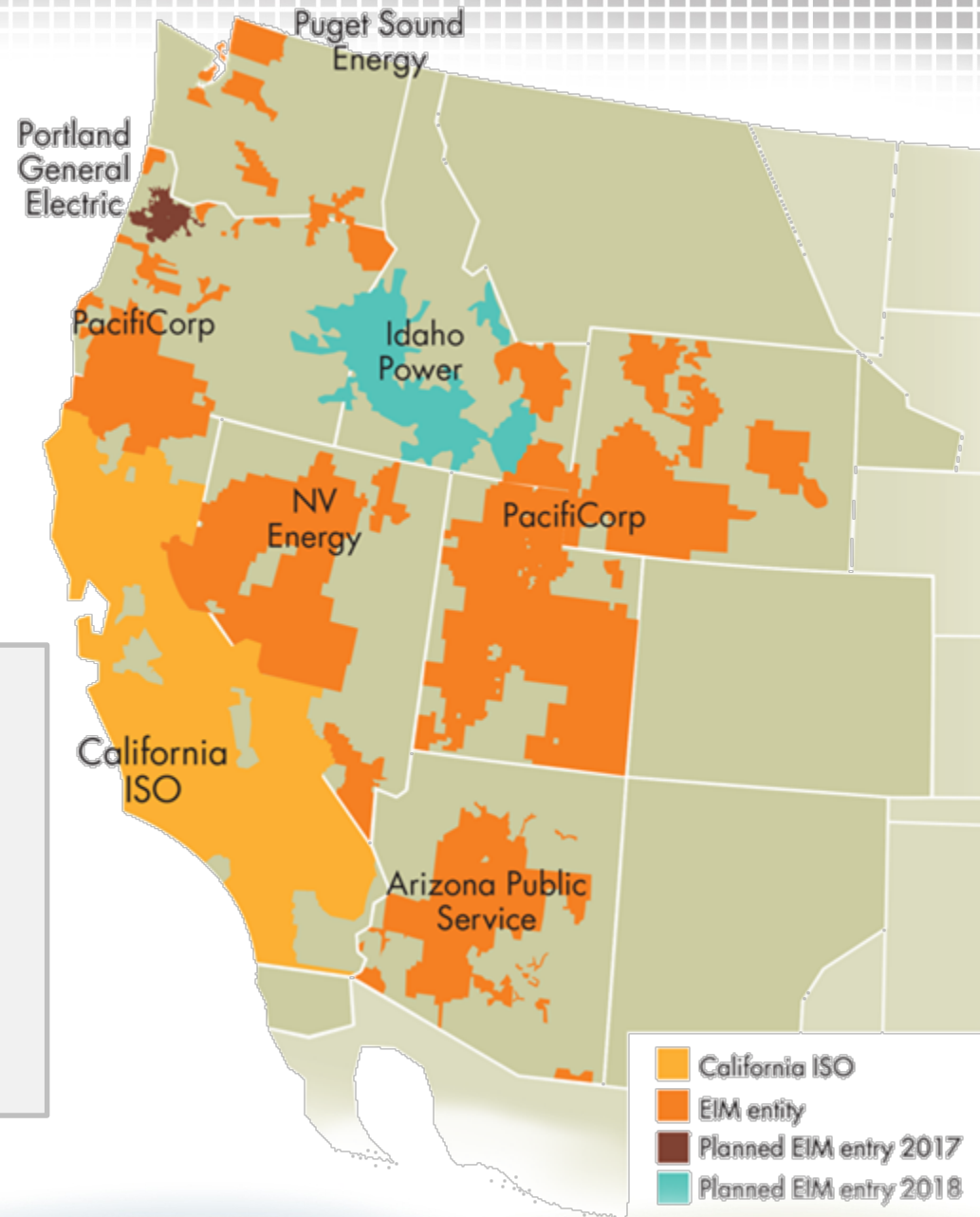
Khaled Abdul-Rahman, Executive Director,
Power Systems & Smart Grid Technology Development

Board of Governors Meeting
General Session
October 26-27, 2016



EIM update

- Arizona and Puget
 - Went live October 1
 - Portland General
 - Fall 2017
 - Idaho Power
 - Spring 2018
- Entities exploring future entry
 - CENACE, Baja CA
 - Balancing Authority of Northern California (BANC)
 - Los Angeles Department of Water & Power (LADWP)
 - Seattle City Light (SCL)



Gross economic benefits since start of EIM = \$114.36M

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	Total
CAISO	1.24	1.44	2.46	3.48	5.28	6.35	7.89	5.44	33.58
NVE	-	-	-	-	0.84	1.70	5.20	5.60	13.34
PAC	4.73	3.82	7.72	8.52	6.17	10.85	10.51	15.12	67.44
Total	5.97	5.26	10.18	12.00	12.29	18.90	23.60	26.16	114.36

BAA	July	August	September	Q3 – 2016 Total
CAISO	2.24	1.38	1.82	5.44
NVE	1.88	2.16	1.55	5.60
PAC	6.09	4.92	4.12	15.12
Total	10.21	8.46	7.49	26.16

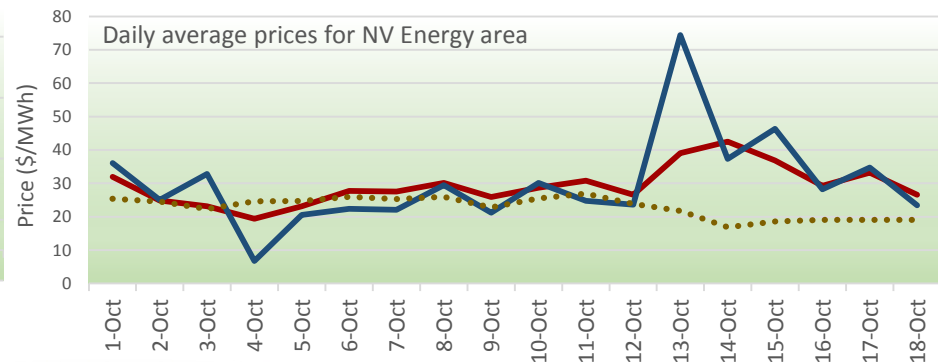
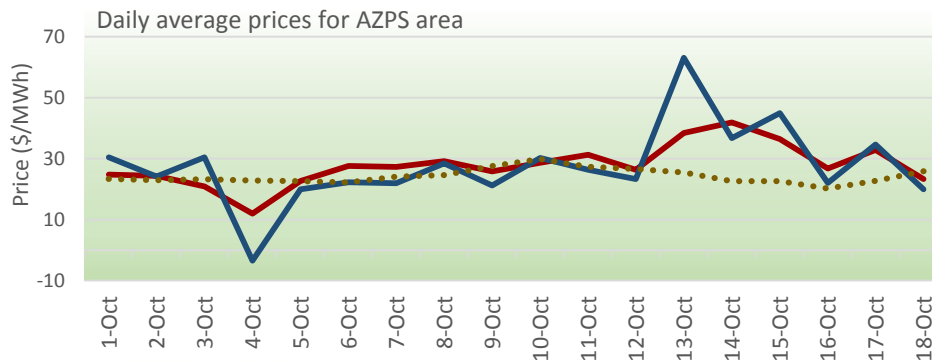
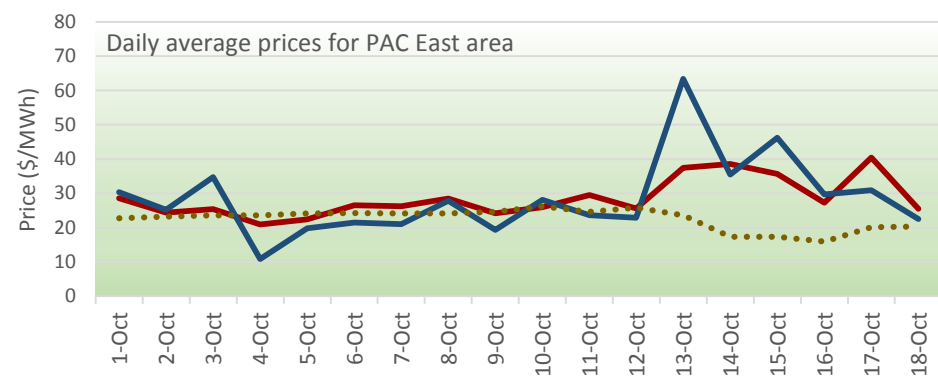
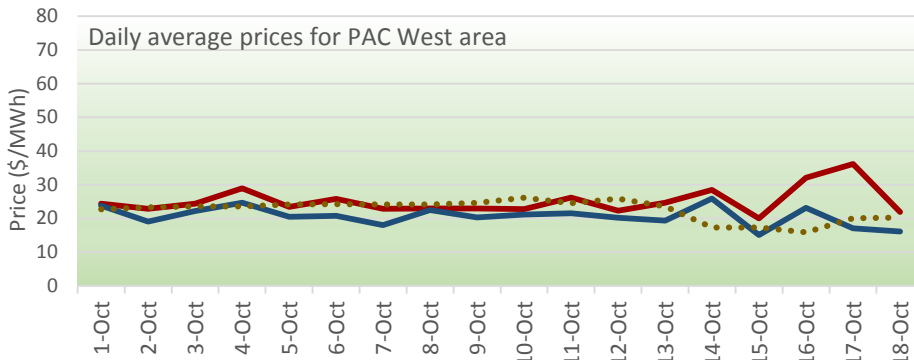
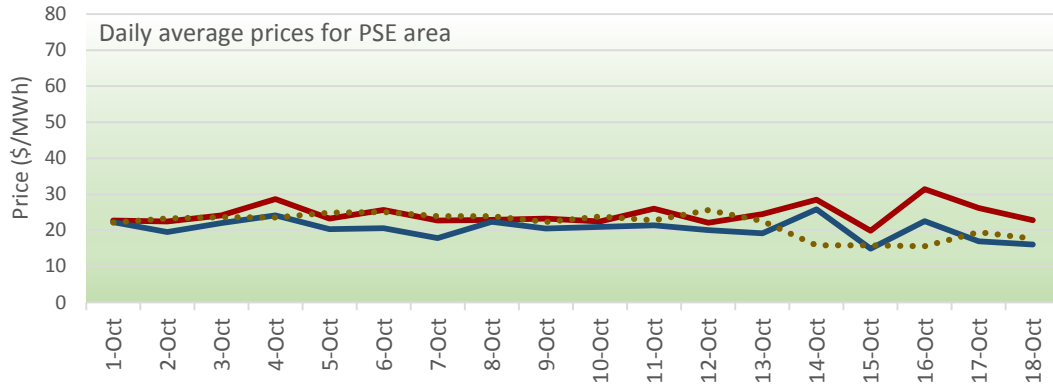
Avoided curtailment of 335,930Mwh of renewables, displacing an estimated 143,695 metric tons of CO2.

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	Total To-Date
Mwh curtailment avoided	8,860	3,629	828	17,765	112,948	158,806	33,094	335,930
Estimated metric tons of CO2 displaced	3,792	1,553	354	7,521	48,342	67,969	14,164	143,695

APS and PSE demonstrating good performance, through October 16

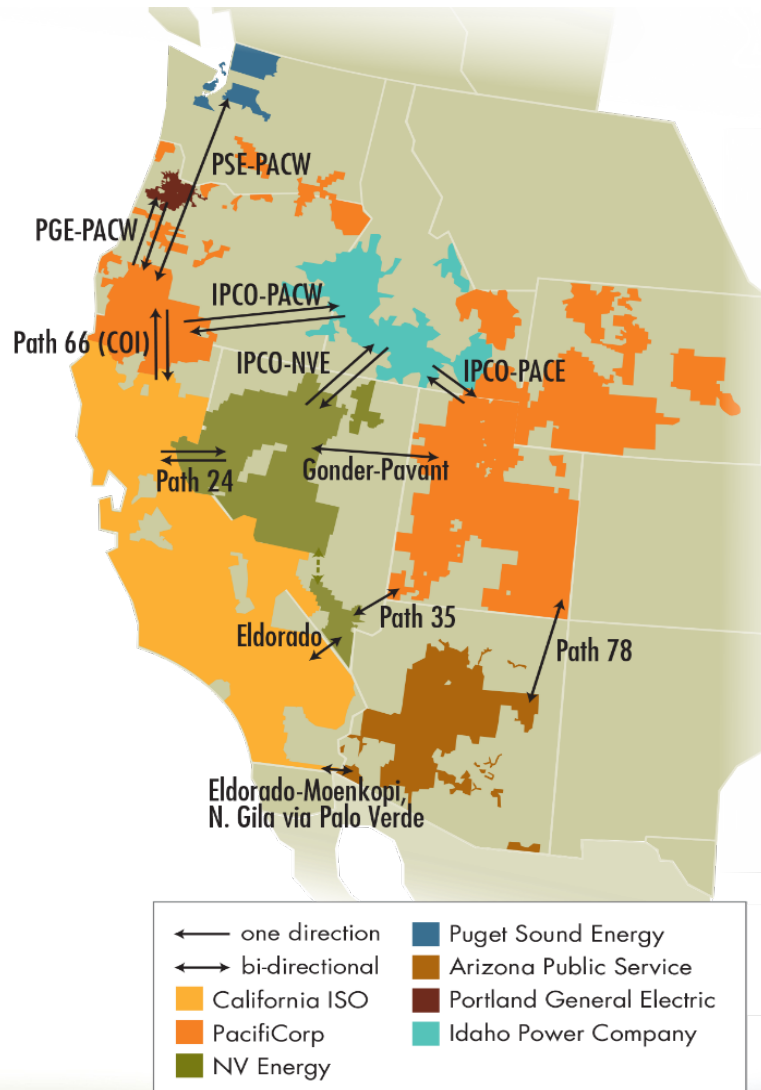
- Balancing test pass rate
 - APS: 96.6%
 - PSE: 97.9%
- Feasible solution in 15-minute market
 - APS: 99.61%
 - PSE: 99.94%
- Feasible solution in 5-minute market
 - APS: 99.81%
 - PSE: 99.57%

Daily average prices in EIM areas



— FMM ELAP — RTD ELAP Estimated Proxy

Transfer capability increases as EIM entities join



Path	Estimated Max Capacity (MW)*
Path 24 (west to east)	100
Path 24 (east to west)	35-90
Eldorado	1,500
Path 35 (west to east)	580
Path 35 (east to west)	538
Gonder-Pavant	130
Path 66 (ISO to PACW)	331
Path 66 (PACW to ISO)	432
Path 66 (ISO to PGE)	627
Path 66 (PGE to ISO)	296
PSE to PACW	300
PGE to PACW	306
PACW to PGE	276
IPCO to PACW	1,587
PACW to IPCO	510
IPCO to NVE	478
NVE to IPCO	262
IPCO to PACE	1,000
PACE to IPCO	2,557
Eldorado, Moenkopi, N. Gila, Palo Verde	2,500
Path 78	600

*Current as of May 2016

Transfer capabilities have been gradually released

