

SMUD's EIM Experience to date...

Sacramento Municipal Utility District (SMUD)
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EIM RIF
Mar 12th, 2020

Powering forward. Together.



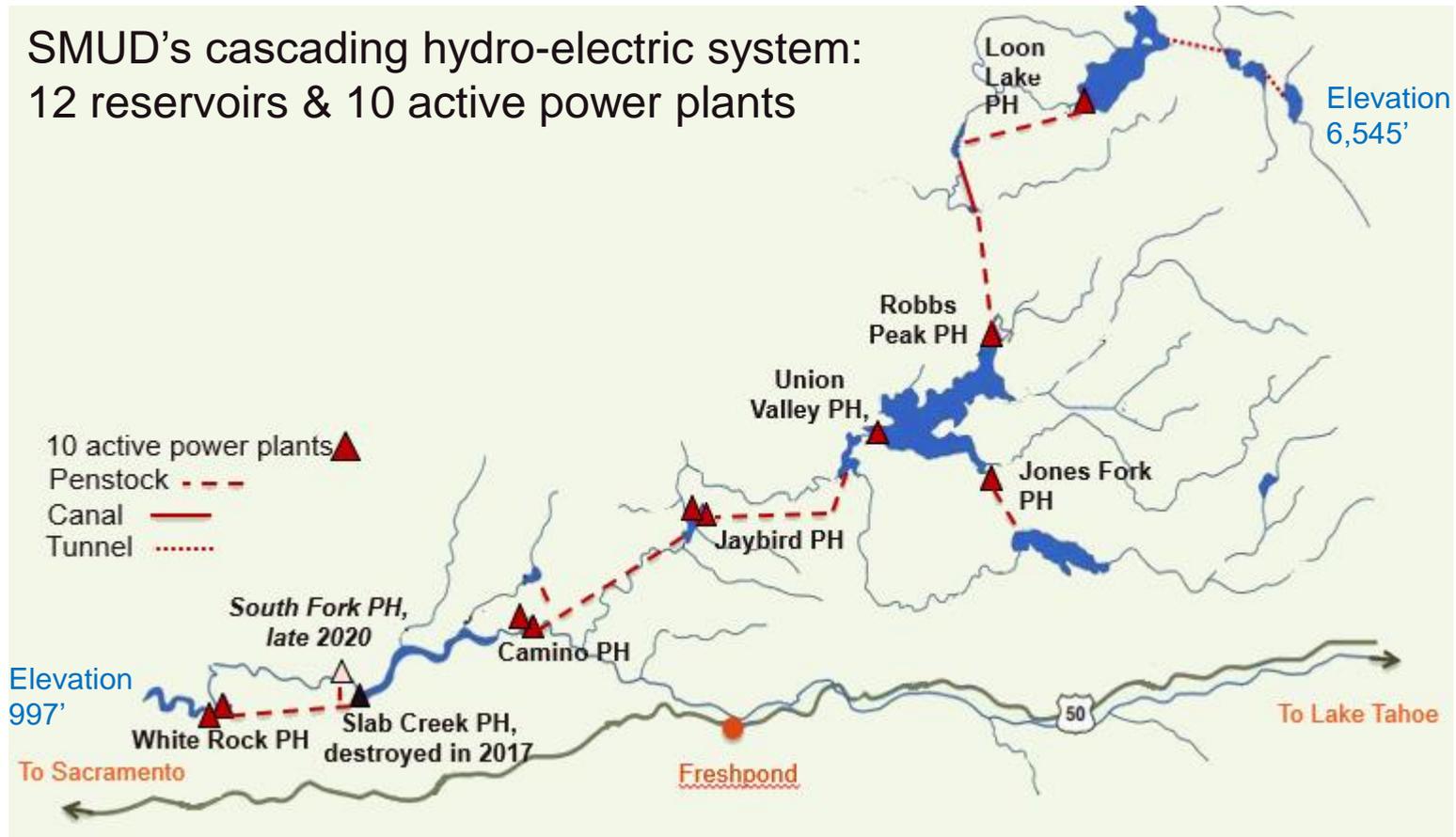
Agenda

- Pre-EIM: Hydro Asset Modeling
- EIM Participation: SMUD's Experience
- Lessons Learned

Hydro Asset Modeling

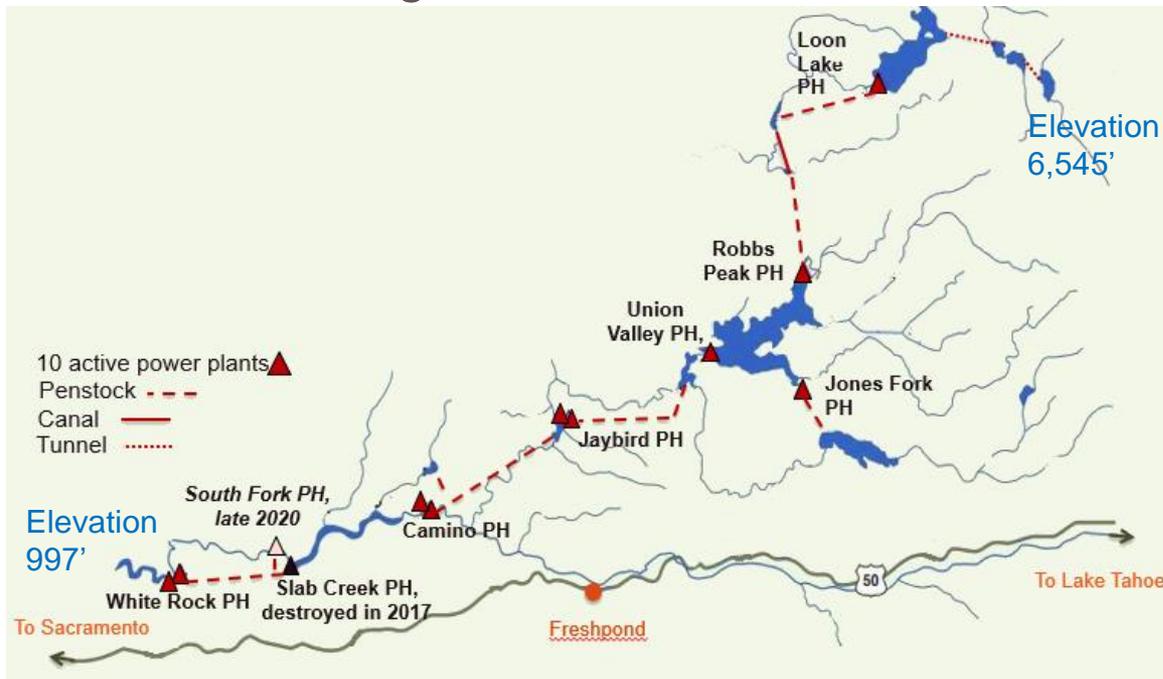
Pre-EIM: To aggregate or not to aggregate?

SMUD's cascading hydro-electric system:
12 reservoirs & 10 active power plants



Why disaggregate?

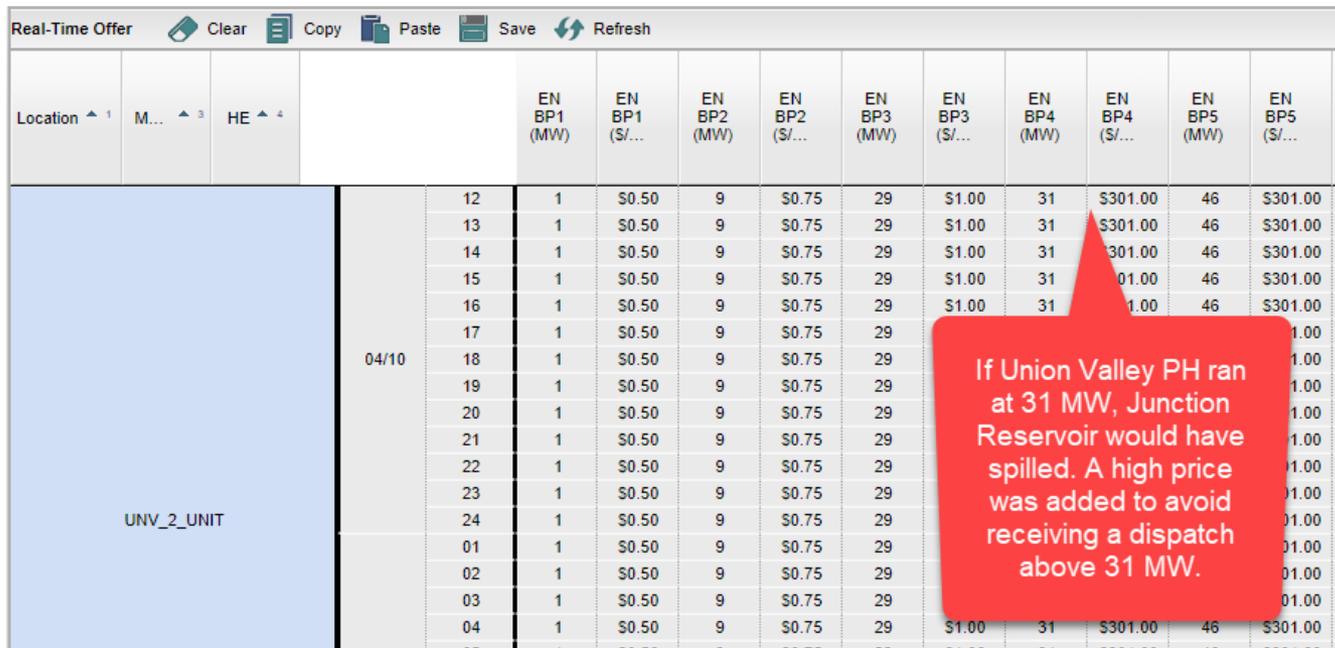
- To improve water management
 - Each reservoir/power plant combination is unique
 - Each reservoir has different FERC license water demands
- To collect start-up costs on each unit
- To make unit outages consistent between CAISO and SMUD



SMUD's EIM Experience

SMUD's EIM Experience: Bids are not just for bidding

- Bid strategy yielded desired water flow
- Strategy resulted in an overstatement of CAISO's calculated EIM benefits attributed to SMUD

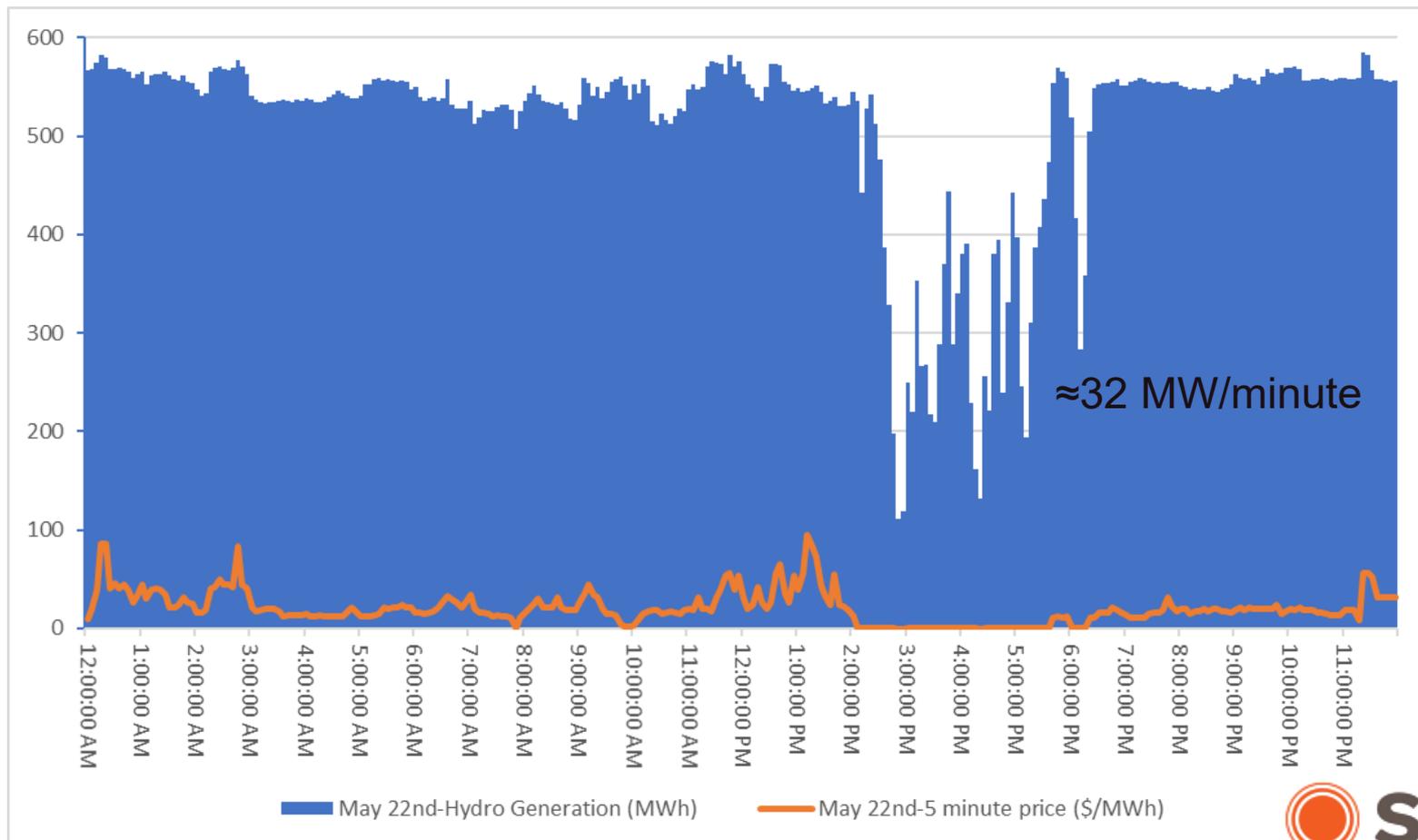


Real-Time Offer				Clear	Copy	Paste	Save	Refresh						
Location	M...	HE		EN BP1 (MW)	EN BP1 (\$/...	EN BP2 (MW)	EN BP2 (\$/...	EN BP3 (MW)	EN BP3 (\$/...	EN BP4 (MW)	EN BP4 (\$/...	EN BP5 (MW)	EN BP5 (\$/...	
UNV_2_UNIT	04/10	12	1	\$0.50	9	\$0.75	29	\$1.00	31	\$301.00	46	\$301.00		
		13	1	\$0.50	9	\$0.75	29	\$1.00	31	\$301.00	46	\$301.00		
		14	1	\$0.50	9	\$0.75	29	\$1.00	31	\$301.00	46	\$301.00		
		15	1	\$0.50	9	\$0.75	29	\$1.00	31	\$301.00	46	\$301.00		
		16	1	\$0.50	9	\$0.75	29	\$1.00	31	\$301.00	46	\$301.00		
		17	1	\$0.50	9	\$0.75	29	\$1.00	31	\$301.00	46	\$301.00		
		18	1	\$0.50	9	\$0.75	29	\$1.00	31	\$301.00	46	\$301.00		
		19	1	\$0.50	9	\$0.75	29	\$1.00	31	\$301.00	46	\$301.00		
		20	1	\$0.50	9	\$0.75	29	\$1.00	31	\$301.00	46	\$301.00		
		21	1	\$0.50	9	\$0.75	29	\$1.00	31	\$301.00	46	\$301.00		
		22	1	\$0.50	9	\$0.75	29	\$1.00	31	\$301.00	46	\$301.00		
		23	1	\$0.50	9	\$0.75	29	\$1.00	31	\$301.00	46	\$301.00		
		24	1	\$0.50	9	\$0.75	29	\$1.00	31	\$301.00	46	\$301.00		
		01	1	\$0.50	9	\$0.75	29	\$1.00	31	\$301.00	46	\$301.00		
		02	1	\$0.50	9	\$0.75	29	\$1.00	31	\$301.00	46	\$301.00		
		03	1	\$0.50	9	\$0.75	29	\$1.00	31	\$301.00	46	\$301.00		
		04	1	\$0.50	9	\$0.75	29	\$1.00	31	\$301.00	46	\$301.00		

- Changed default bids to better account for the water flow

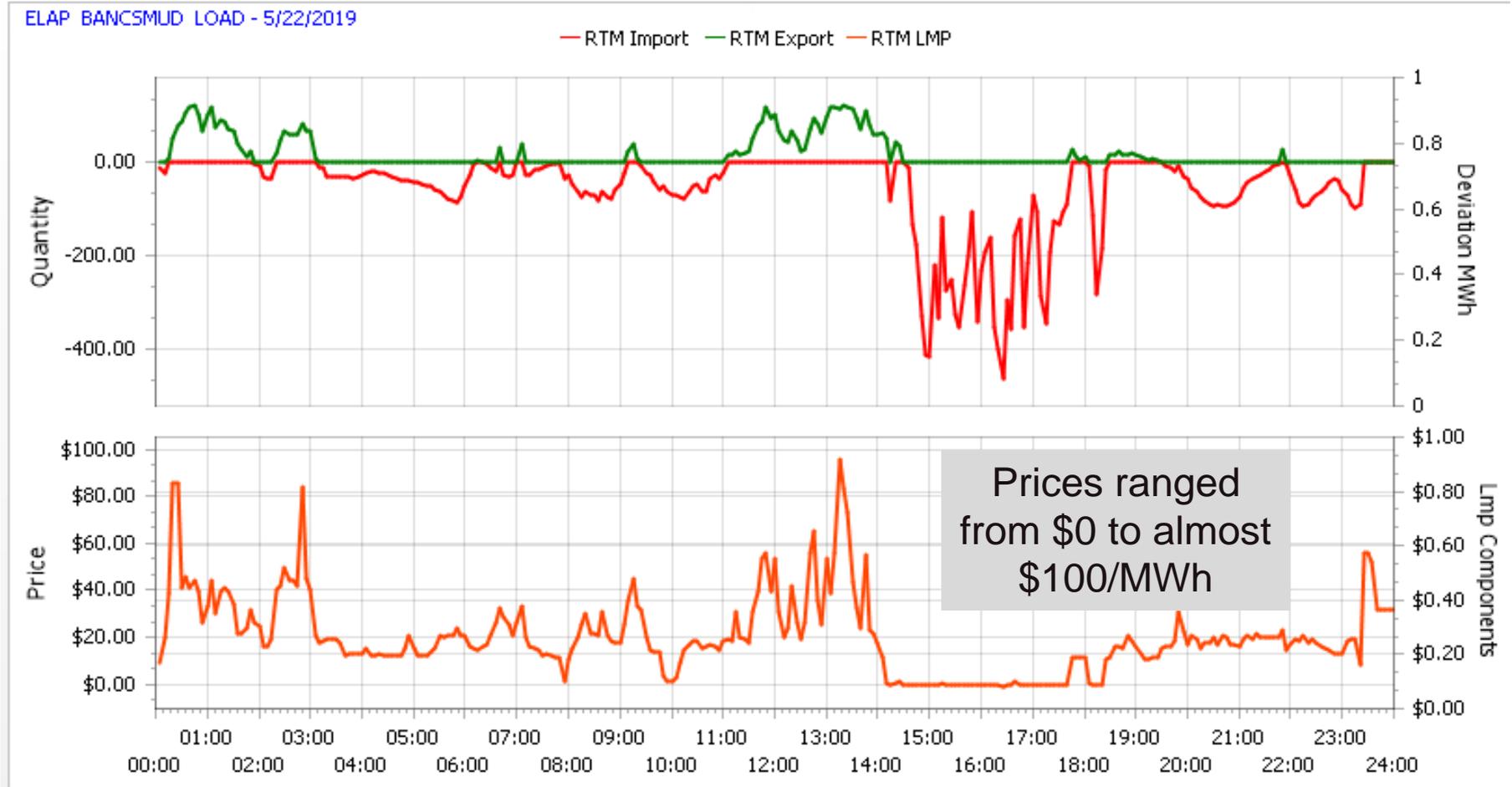
SMUD's EIM Experience: Units operate differently

- Hydro units ramp up and down more



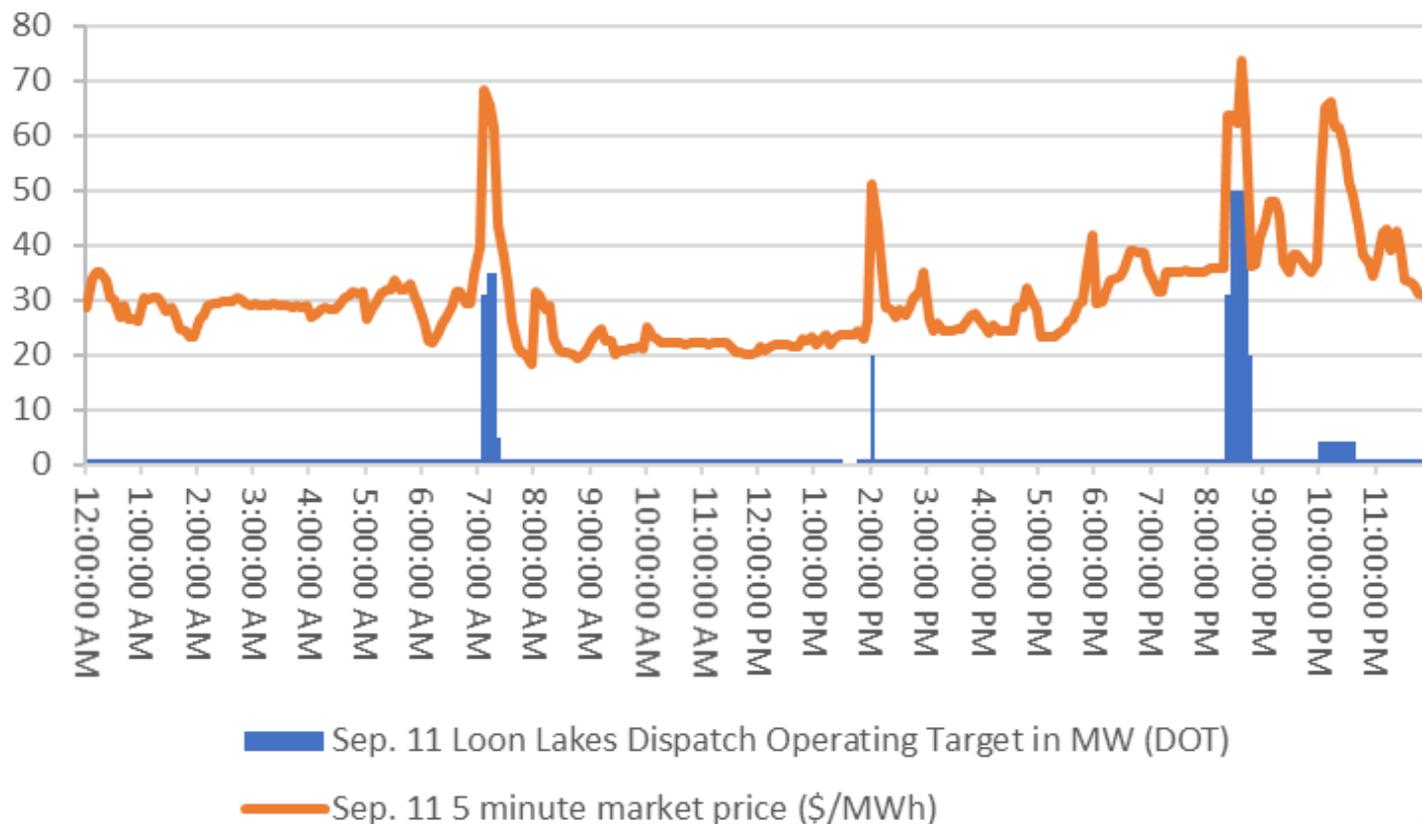
SMUD's EIM Experience: ETSR flows...

The entire footprint is optimized together, increasing market efficiency



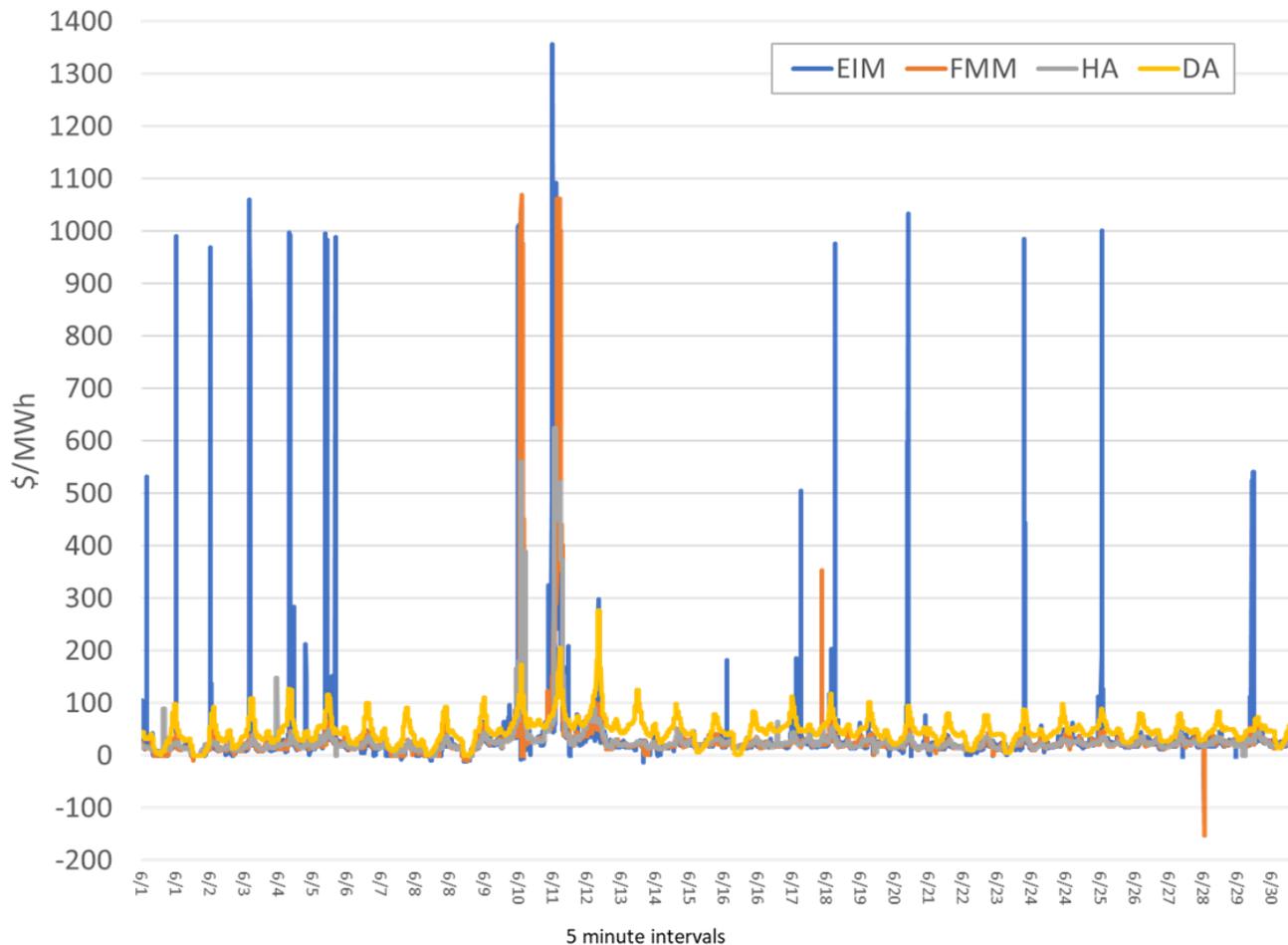
SMUD's EIM Experience: The market price is a clear signal

- Generation responds to market price



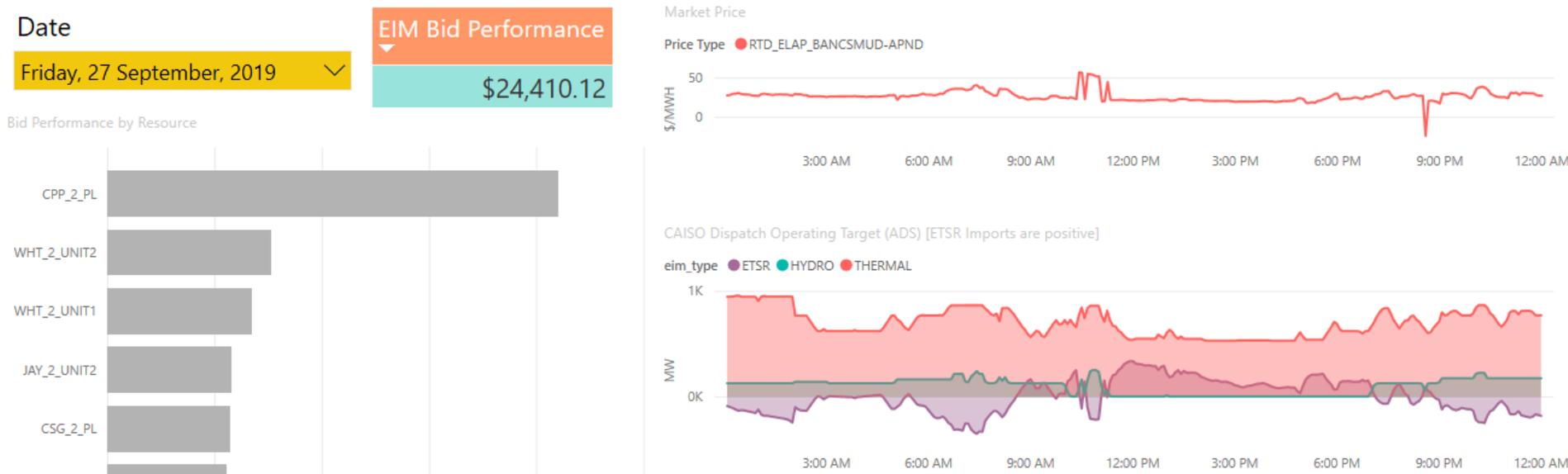
SMUD's EIM Experience: EIM prices are volatile

- EIM prices are more volatile than other markets



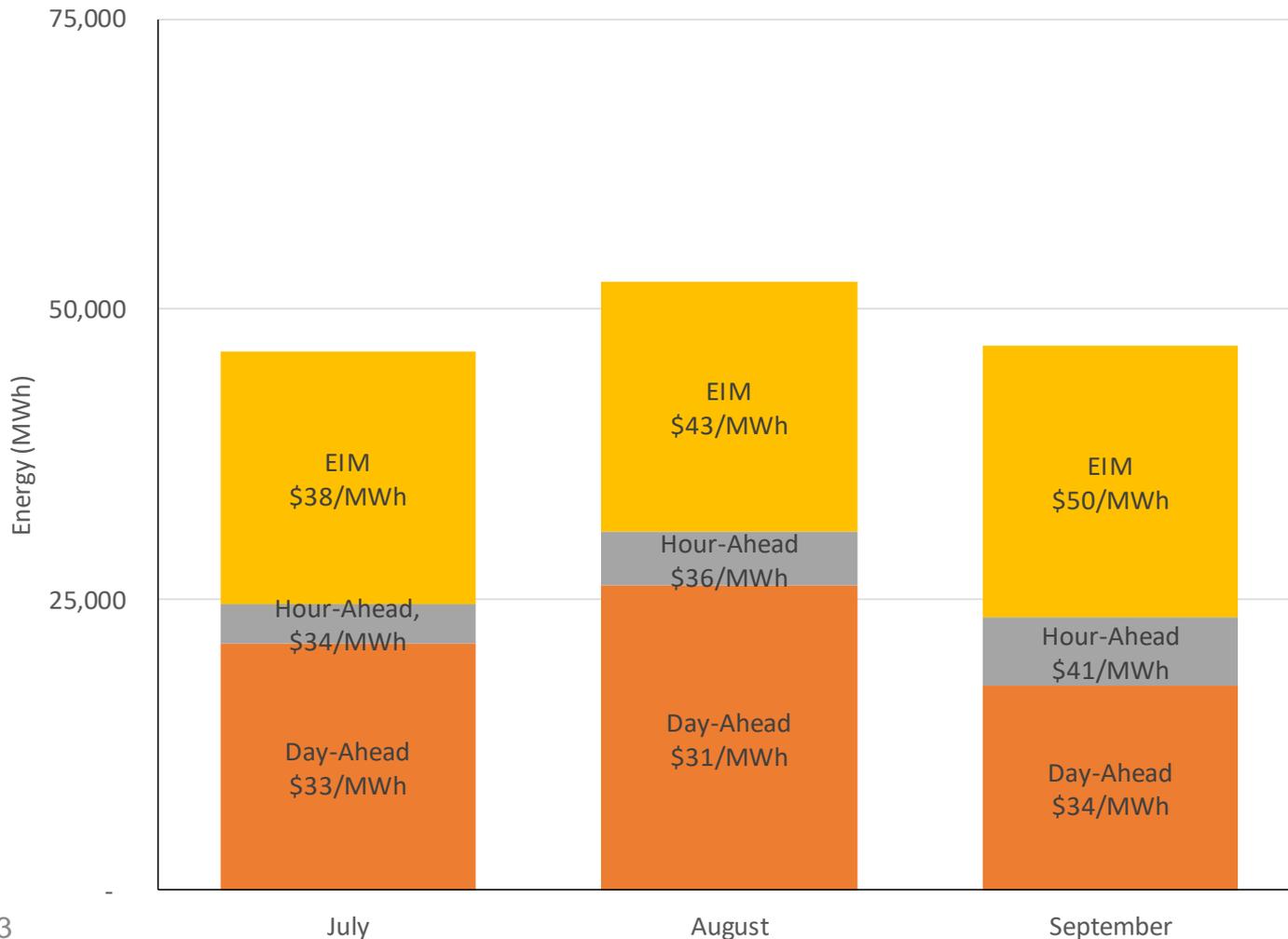
SMUD's EIM Experience: Post-analysis is needed

- Analytics essential for interpreting and learning from the abundance of market data



SMUD's EIM Experience: Q3 Benefit: Higher revenue from sales

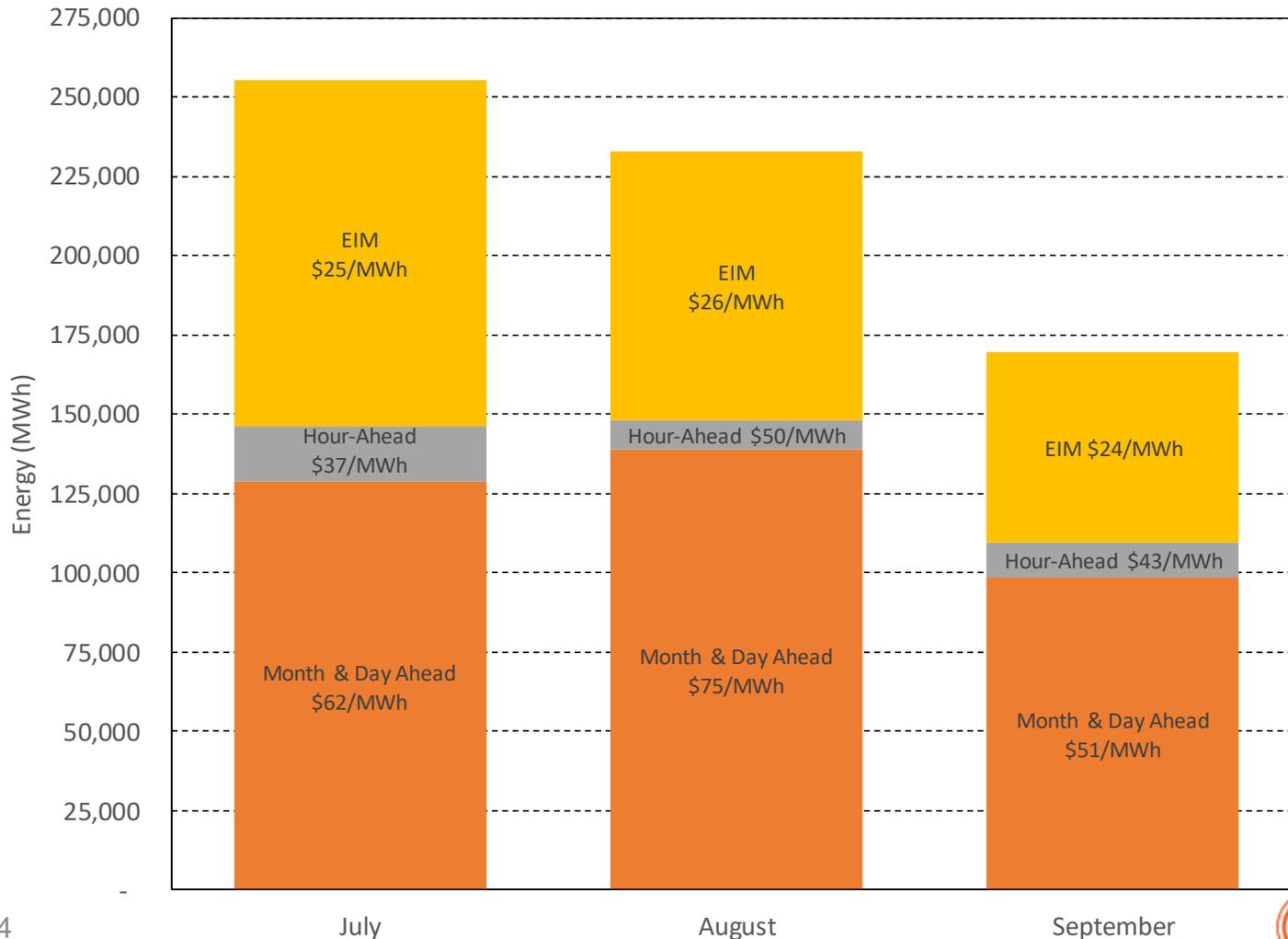
Significant volume & higher sales revenue compared to other markets.



EIM sales are about 45% of short-term market sales

SMUD's EIM Experience: Q3 Benefit: Lower cost for purchases

Significant volume and lower purchase costs compared to other markets.



EIM purchases are about 40% of short-term market purchases

Lessons Learned

Lessons Learned

- Bids impact dispatch and the CAISO's benefit calculation
- Units that can ramp faster have more EIM value
- The short time intervals and price volatility in EIM provides more opportunity to lower purchase costs and increase sales revenue
- Post analytics is needed for better understanding the benefits of EIM and for continuing to extract the most value from this market

Thank you

