

Wind Firming EnergyFarm

DOE Peer Review

September 26, 2012



Primus Power is on track to deliver EnergyPods™ to California's Modesto Irrigation District starting 2014



How will storage integrate into Modesto's system?



Hydro



Coal & Gas



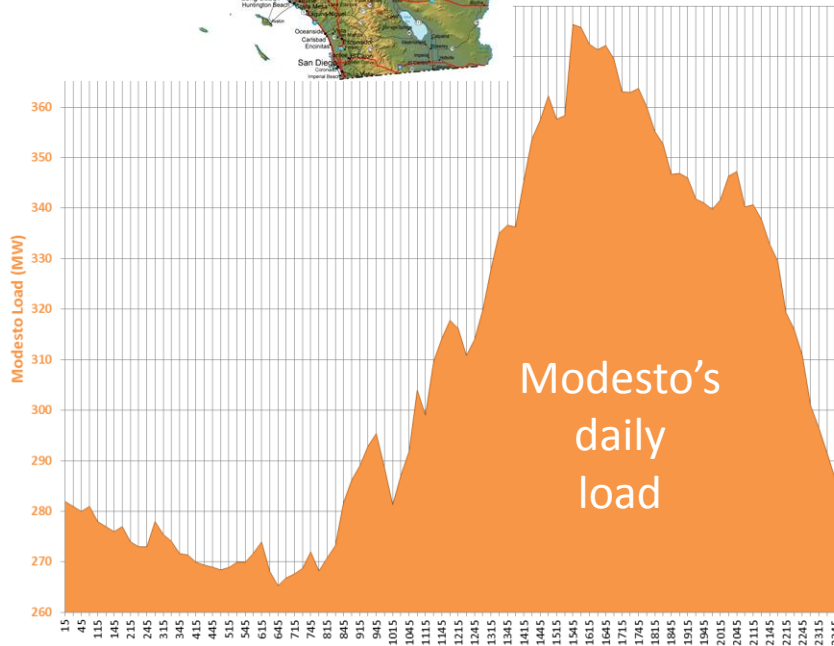
Wind



Solar



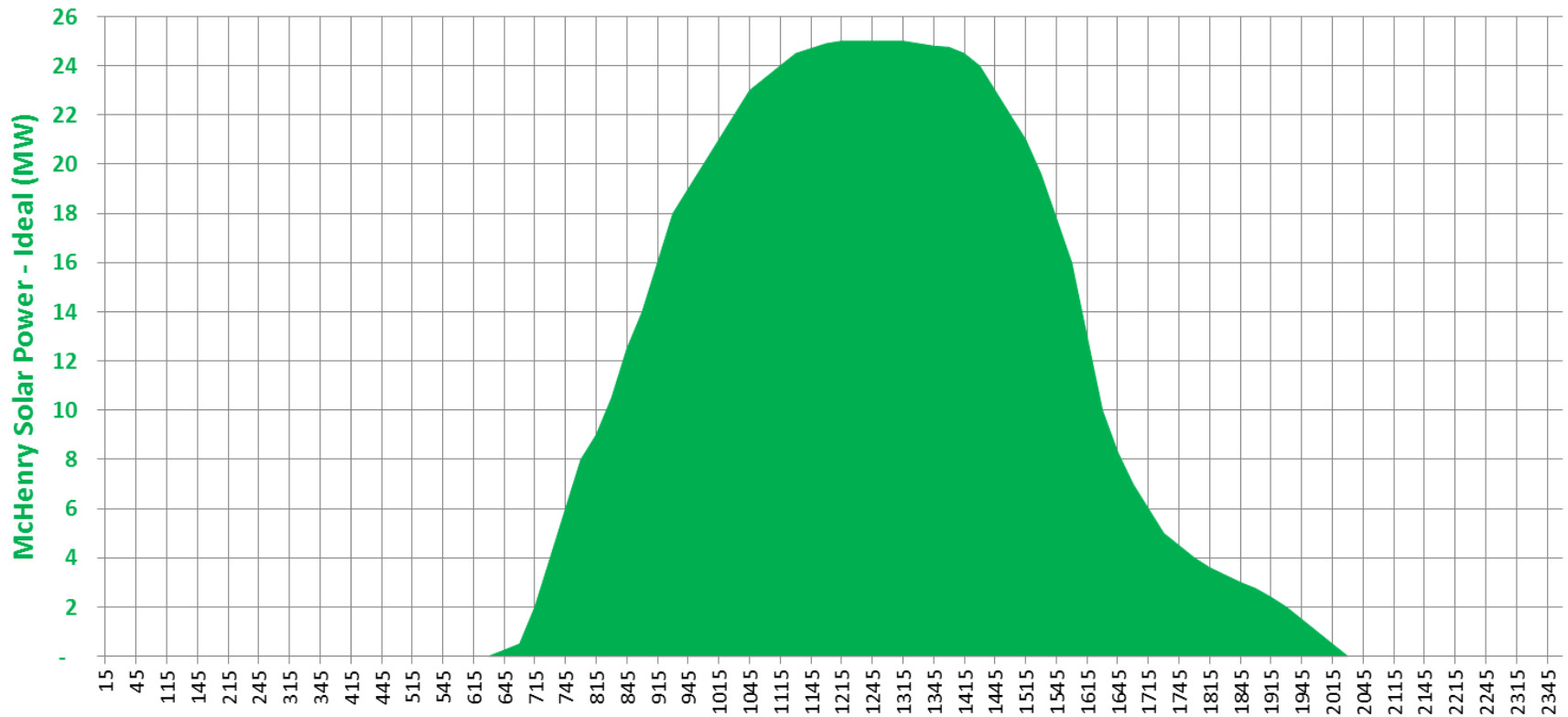
Storage



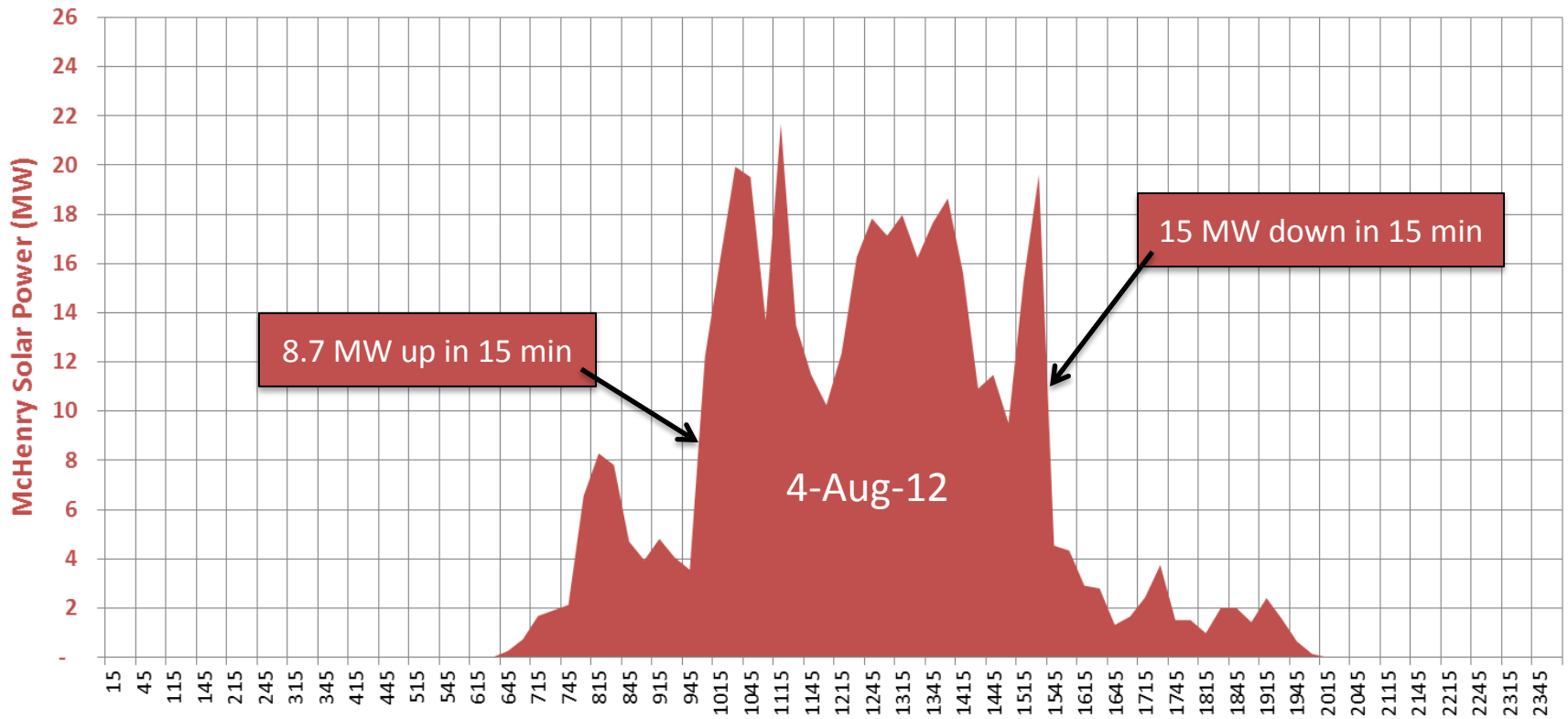
Modesto's 25 MW McHenry solar farm



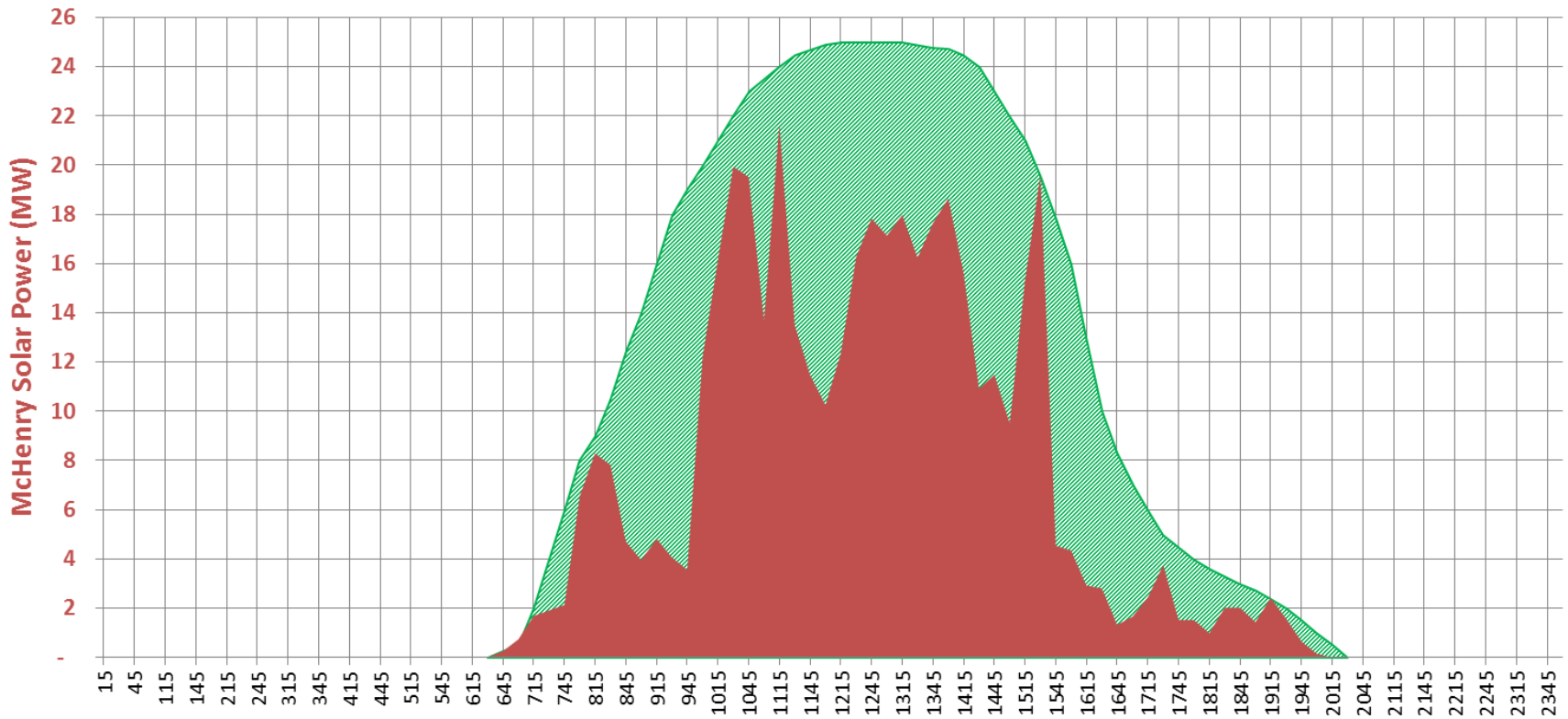
Modesto will use EnergyPods to integrate renewable wind and solar energy



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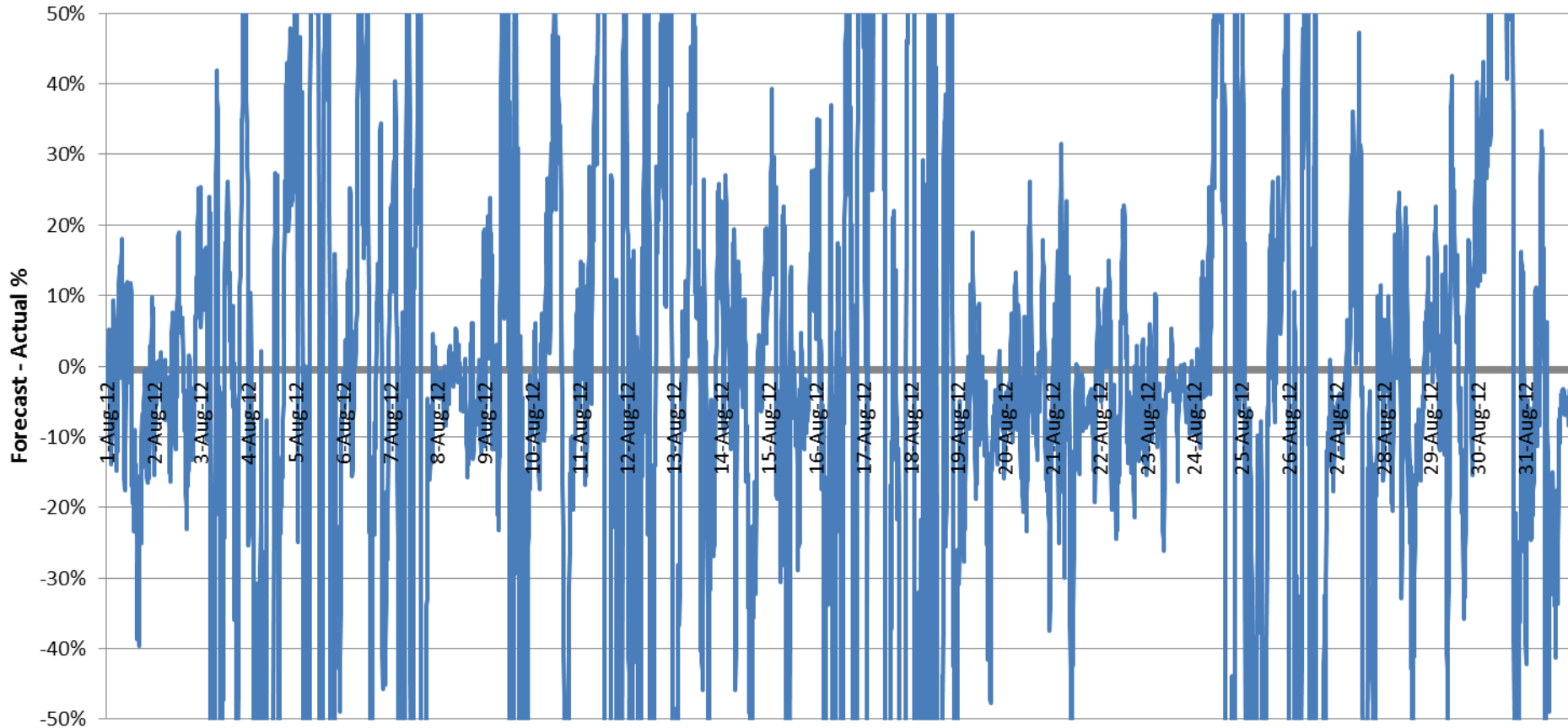


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Modesto receives wind from the Bonneville Power Administration area. Forecasting wind is tricky.

BPA Wind Forecast - Actual



8 Plot shows: (forecast - actual)/forecast. 5 sec data shown.

Modesto currently integrates intermittent renewable solar and wind energy with thermal generators

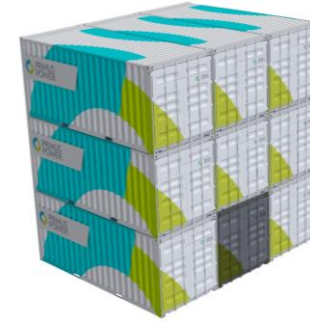


EnergyPods vs. thermal generators for flexibility and balancing

Natural Gas Reciprocating Engines

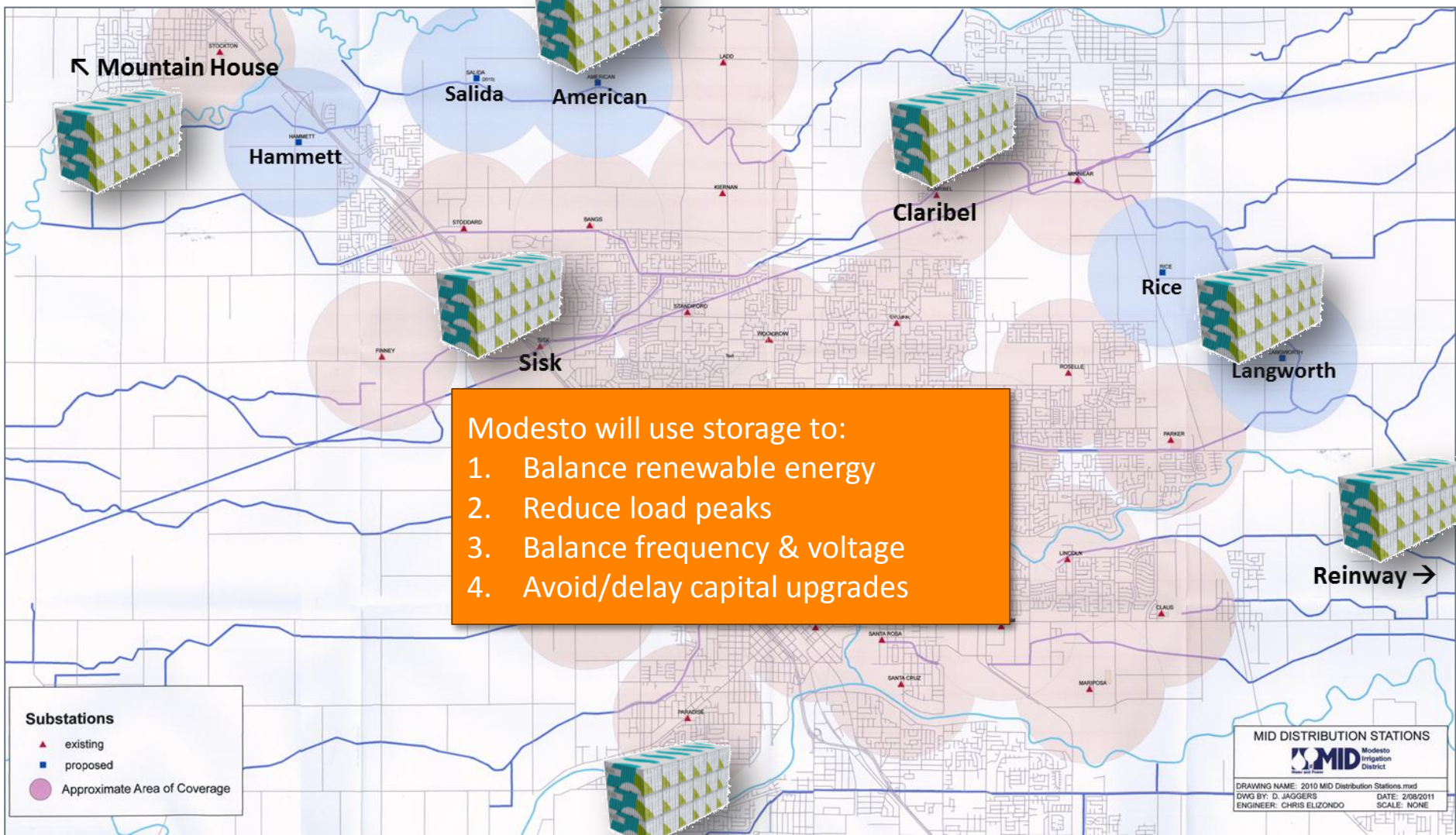


Primus Power EnergyPods™



Firming range (MW)	4 to 50	-25 to 25
Cost	\$73M	<<\$73M
Time to full power (sec)	300	5
Water use (liters)	66,000	0
Natural gas (mmBTU)	2,900,000	0
Pollutants (metric tons)	20 NO _x , 72 CO, 72 VOC	0
CO₂ emissions (metric tons)	66,000	0
Sound (dB)	95 (jackhammer)	30 (whisper)
Installation time (months)	36 to 54	3 to 6
Area (acre)	1	¼

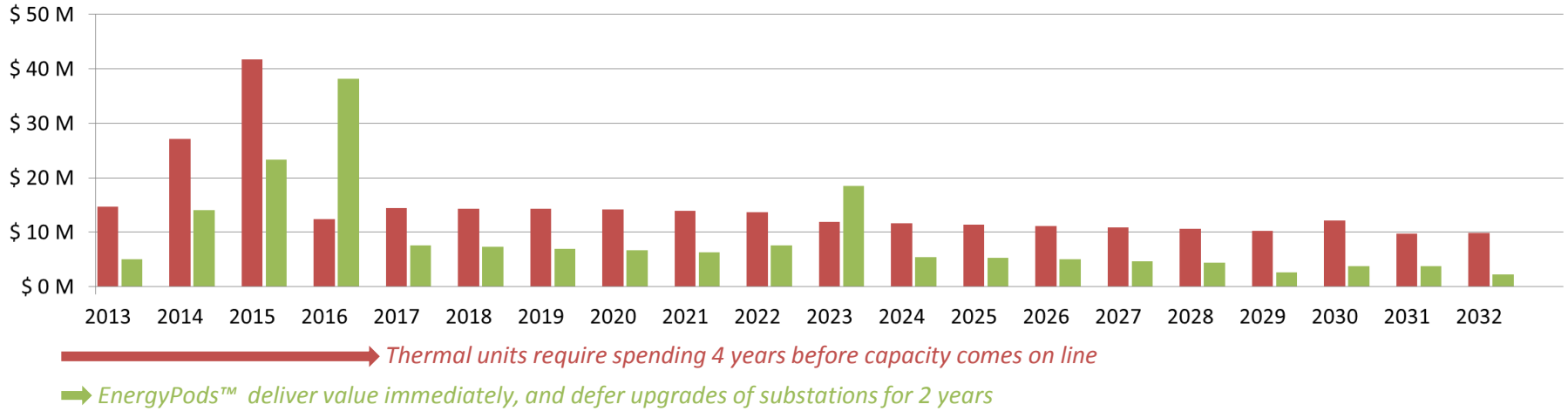
Modesto will use EnergyPods™ for energy balancing and local area stability applications



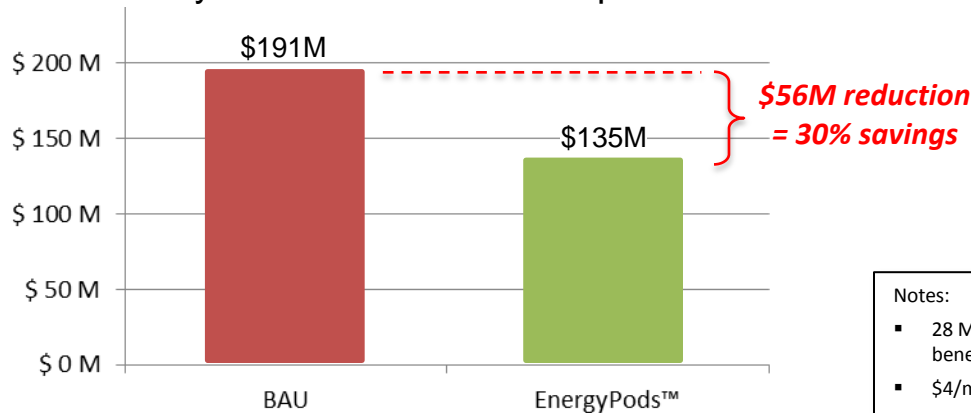


Modesto will save 30% by using EnergyPods™ instead of thermal generators

Centralized thermal units vs. distributed EnergyPods™ for 50 MW of flex capacity



20 year Present Value Comparison



- Notes:
- 28 MW EnergyPods™ deliver the same load balancing benefit as a 50 MW thermal plant
 - \$4/mmBTU average natural gas price over 20 years.
 - Thermal plant installation & commissioning: 4 years.
 - 6% cost of capital.

Several partners are assisting our Modesto deployment

Team



Decades of flow battery expertise

>80% graduate engineering degrees

Proven system integration experience

Deep understanding of energy storage economics

Grants



\$14M Department of Energy • Energy Storage Demonstration [Program](#)



\$2M Advanced Research Projects Agency • [Energy](#)



\$1M California Energy [Commission](#)

Patents



8 granted

30 filed

>350 claims

US & International

Investors



Partners



Integration & Control



3rd Party Testing



 PRIMUS
POWER

Thank you



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