Meeting Peak Demand through Energy Storage

2018 Advanced Energy Conference

March 28, 2018

FLUENCE

A Siemens and AES Company

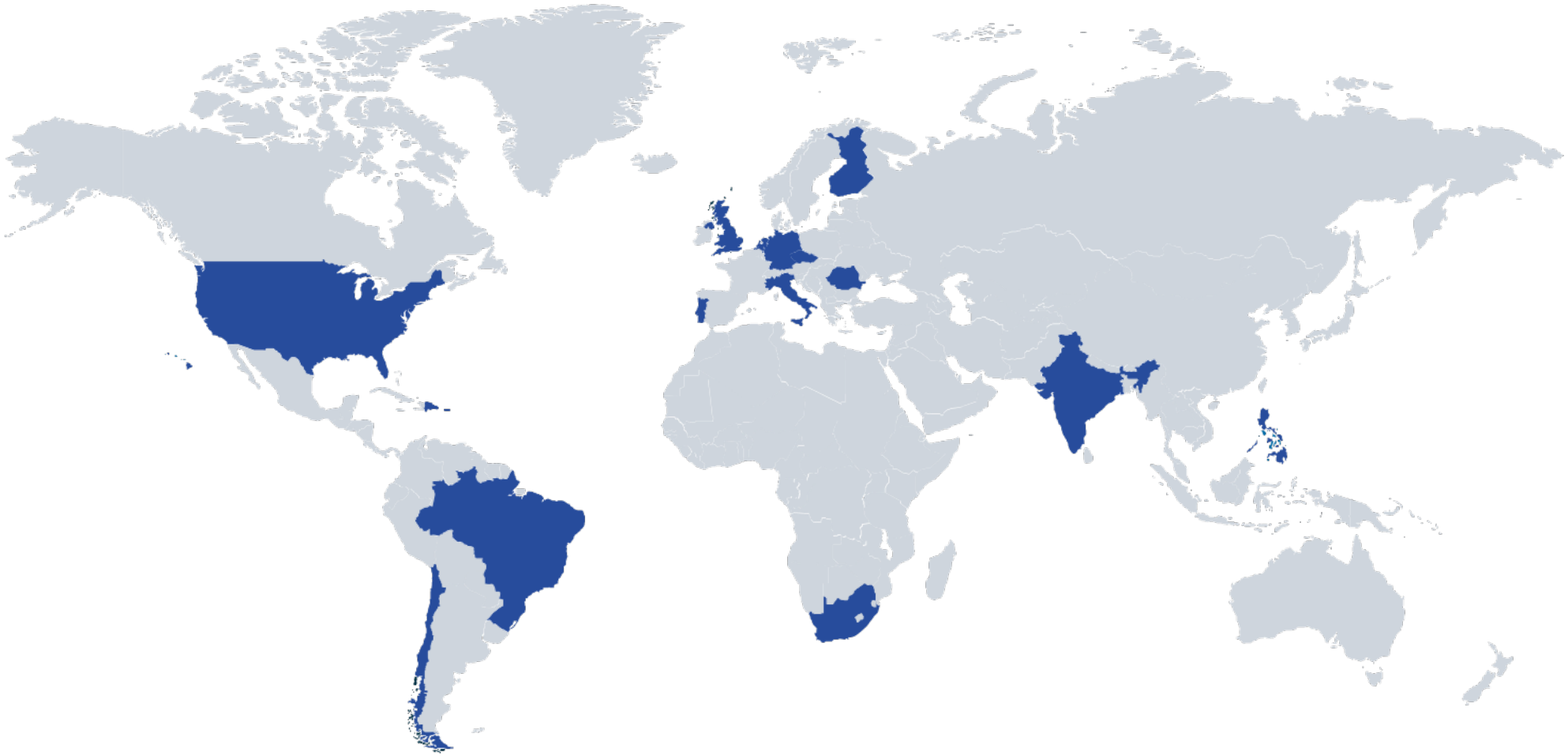
Fluence is the global leader in energy storage with nearly 500 MW in 15 countries

485
TOTAL MW

15
COUNTRIES

56
PROJECTS*

*Deployed or Awarded



Fluence brings unmatched experience at scale from the partner you can trust

EXPERIENCE

10+ years of experience in energy storage from two proven industry pioneers

- World's leading storage provider
- Deployed or been awarded 56 projects, in 15 countries, 486 MW

SCALE

Complete technology and service offerings delivered worldwide

- Proven technology platforms that address full spectrum of applications
- Delivery & integration in 160 countries
- Comprehensive services including financing

THE RIGHT PARTNER

Deep understanding of modern power markets, customer needs, and local market challenges

- Collaborate with customers to solve their energy challenges
- Avoid pitfalls of inexperienced packagers and integrators
- Strong financial backing and industry staying power

Created and backed by two industry powerhouses

SIEMENS Ingenuity for life + AES we are the energy

Unique capabilities vs. traditional resources

ALWAYS ON

Versus Average Peaker Plant

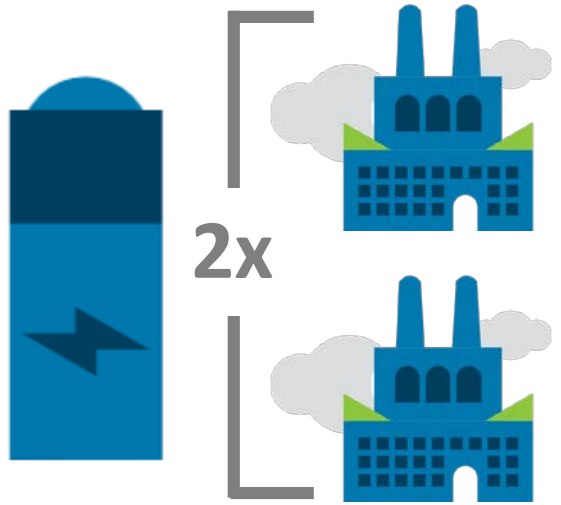
6.6% vs. 97%

15X more service hours

HIGHLY RELIABLE

Parallel Array For High Availability

UNIQUELY FLEXIBLE

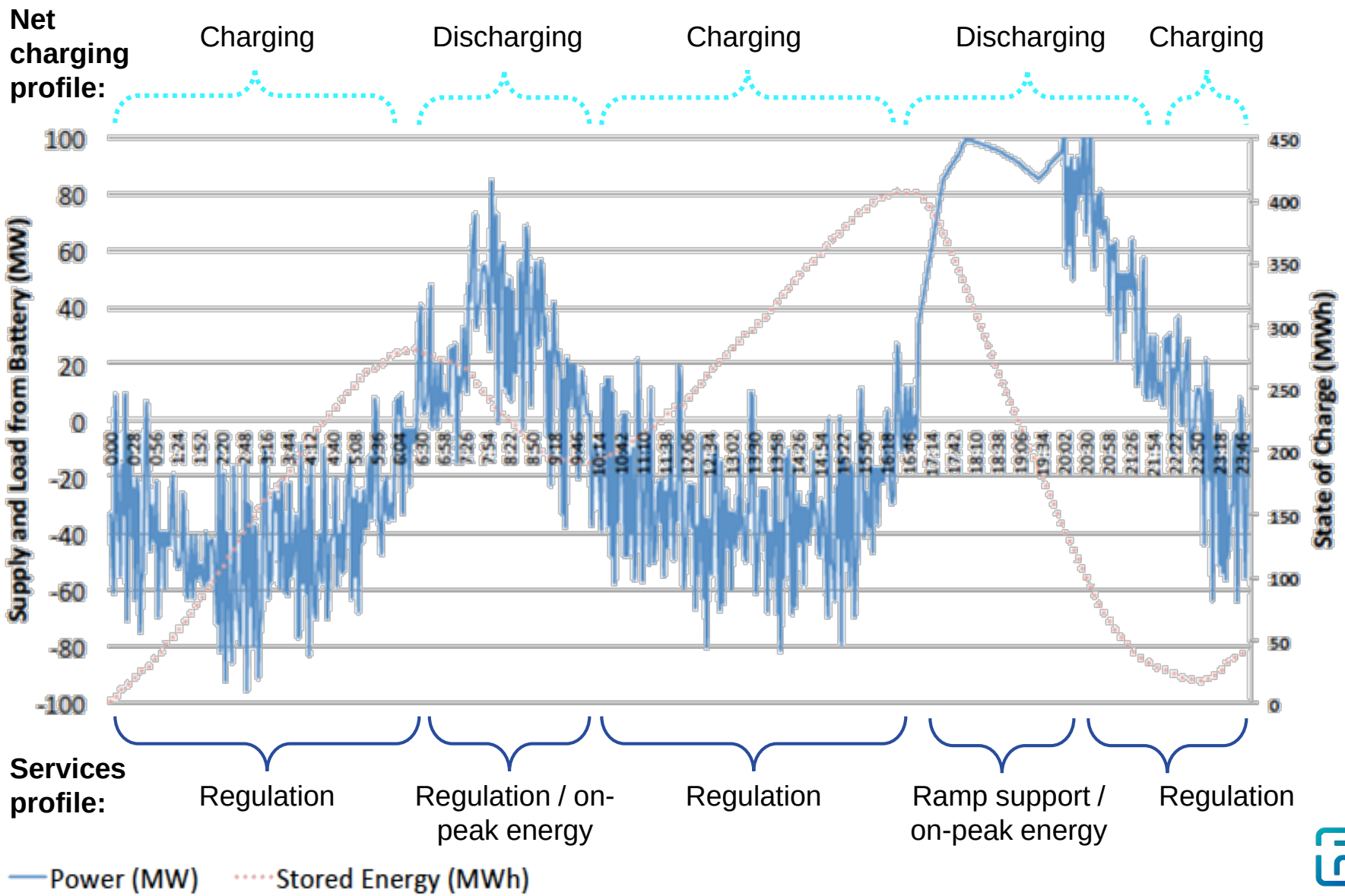


Storage is “always on” to provide multiple services

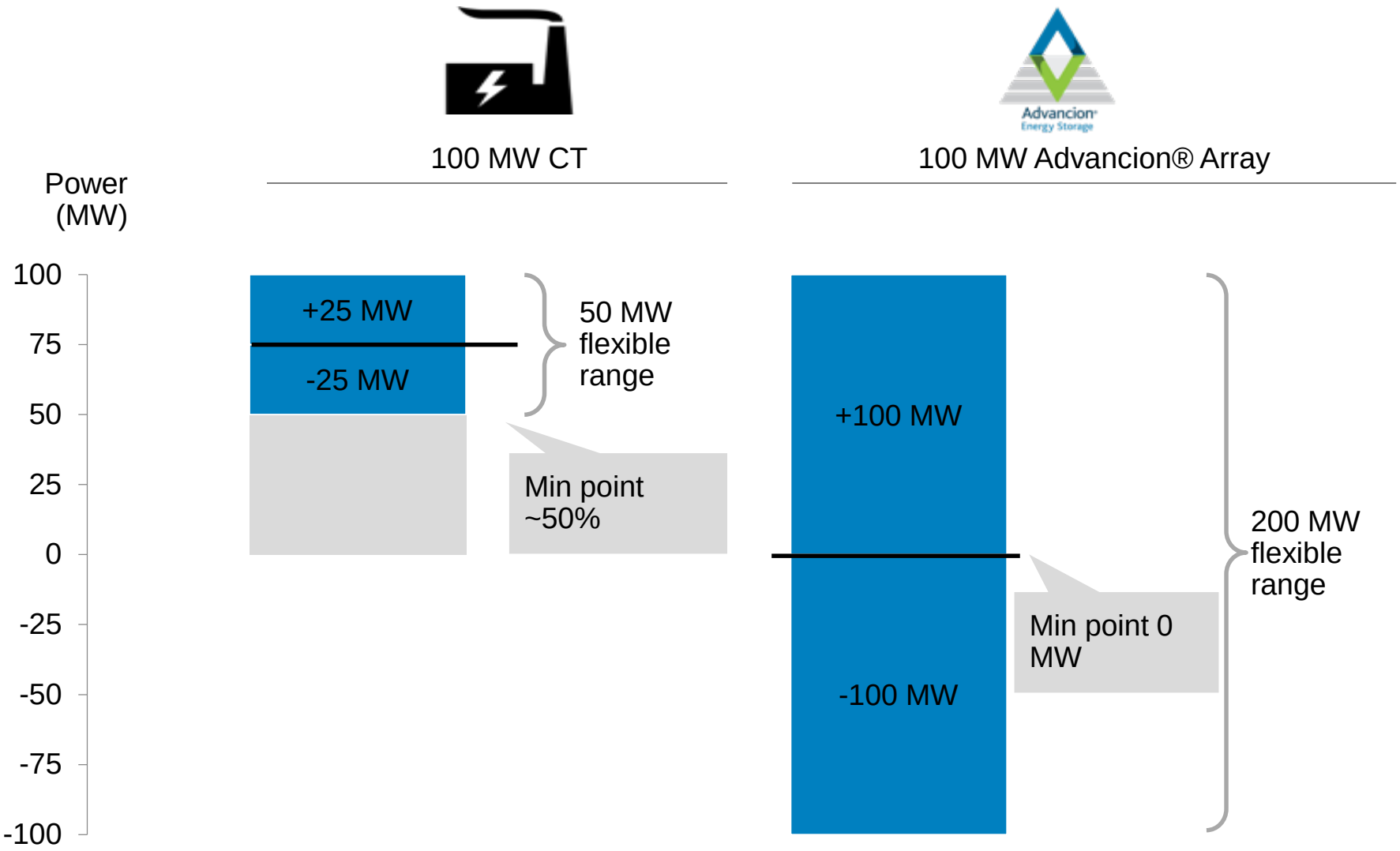
Composite Dispatch Profile:

- 100 MW storage array for load following / ramping
- 10 MW RegUp and RegDown except HE18-20

(based on possible California 2020 net load expectations)



Storage provides up to 4x the effective resource of a thermal peaker



Advantages of battery storage

- Fast ramp (<2 sec)
- Unlimited starts / stops (no cost)
- No emissions or water use
- Ease of permitting
- Rapid deployment
- Always synchronized

Storage provides better system flexibility at lower cost than gas peakers

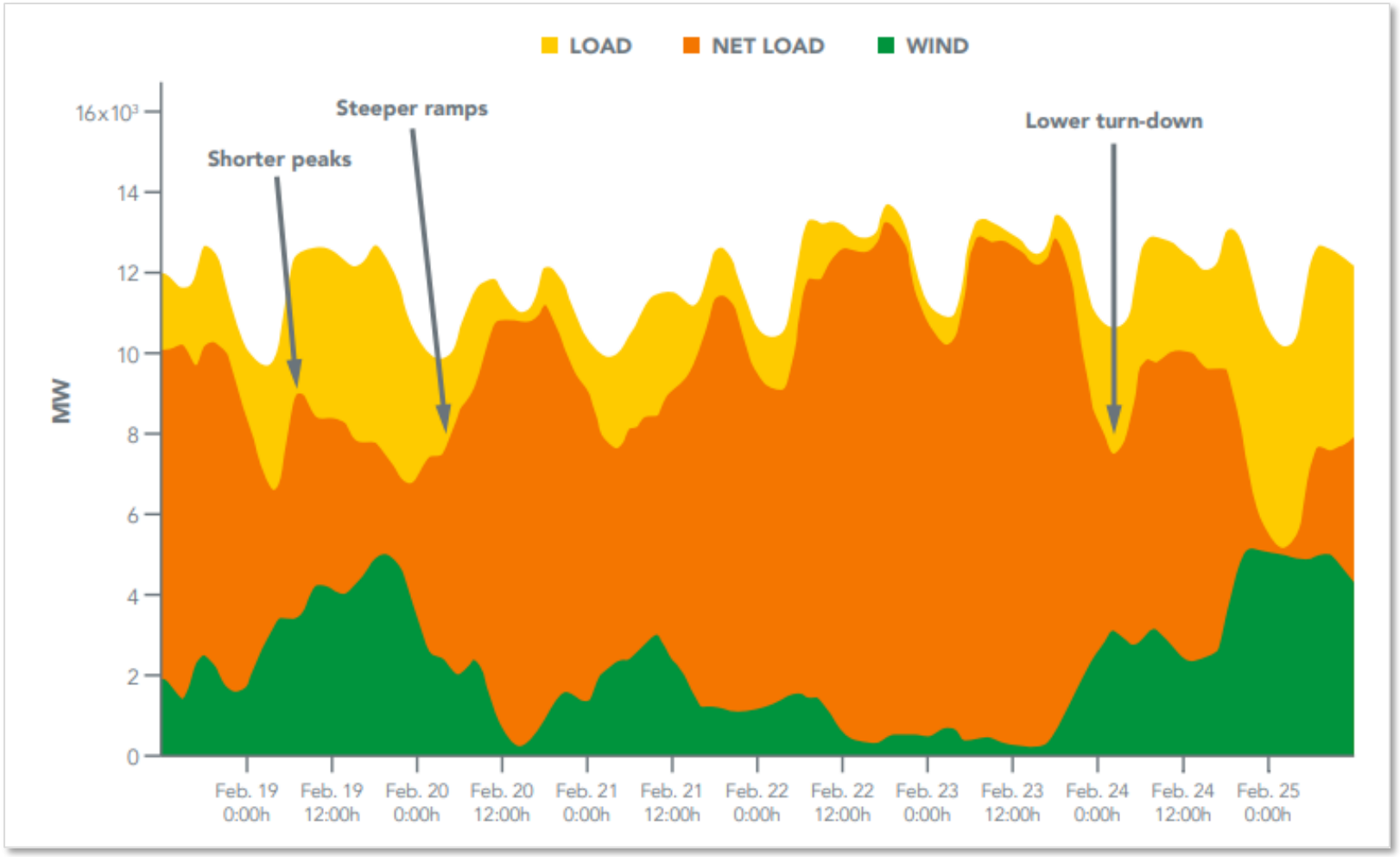
Example: Public Service New Mexico 2017 IRP Preliminary Reliability Analysis

	Renewable Penetration	LF Target	Curtailment	Curtail-ment	$LOLE_{CAP}$	$LOLE_{FLEX}$	ProductionCosts
	% of Load	% of Load	%	MWh	Events Per Year	Events Per Year	M$
Base Case 40% RPS (66.7% Wind)	40.6%	13%	9.4%	541,689	0.10	0.48	543.0
Base Case 40% RPS (66.7% Wind)	40.6%	15%	10.0%	579,932	0.10	0.28	549.7
Base Case 40% RPS (66.7% Wind) and 2 LM6000 (80 MW)	40.6%	13%	9.2%	534,093	0.04	0.50	539.0
Base Case 40% RPS (66.7% Wind) and 100 MW 2 hour storage	40.6%	13%	8.9%	514,306	0.04	0.31	536.7
Base Case 40% RPS (66.7% Wind) and 100 MW 4 hour storage	40.6%	13%	8.6%	495,383	0.03	0.27	535.7
Base Case 40% RPS (66.7% Wind) and 100 MW 6 hour storage	40.6%	13%	8.4%	483,445	0.02	0.27	535.5

Higher reliability and lower cost with energy storage vs. flexible thermal resources (e.g., aero-derivatives)

Source: Astrape Consulting, PNM 2017 IRP – Initial draft results of 2024 RPS Scenarios adding Flexible Generation or Battery

The peak need changes as renewable penetration increases



Source: Cochran, Miller, et al., “Flexibility in 21st Century Power Systems” (2014)

The value of storage also increases as renewable penetration increases

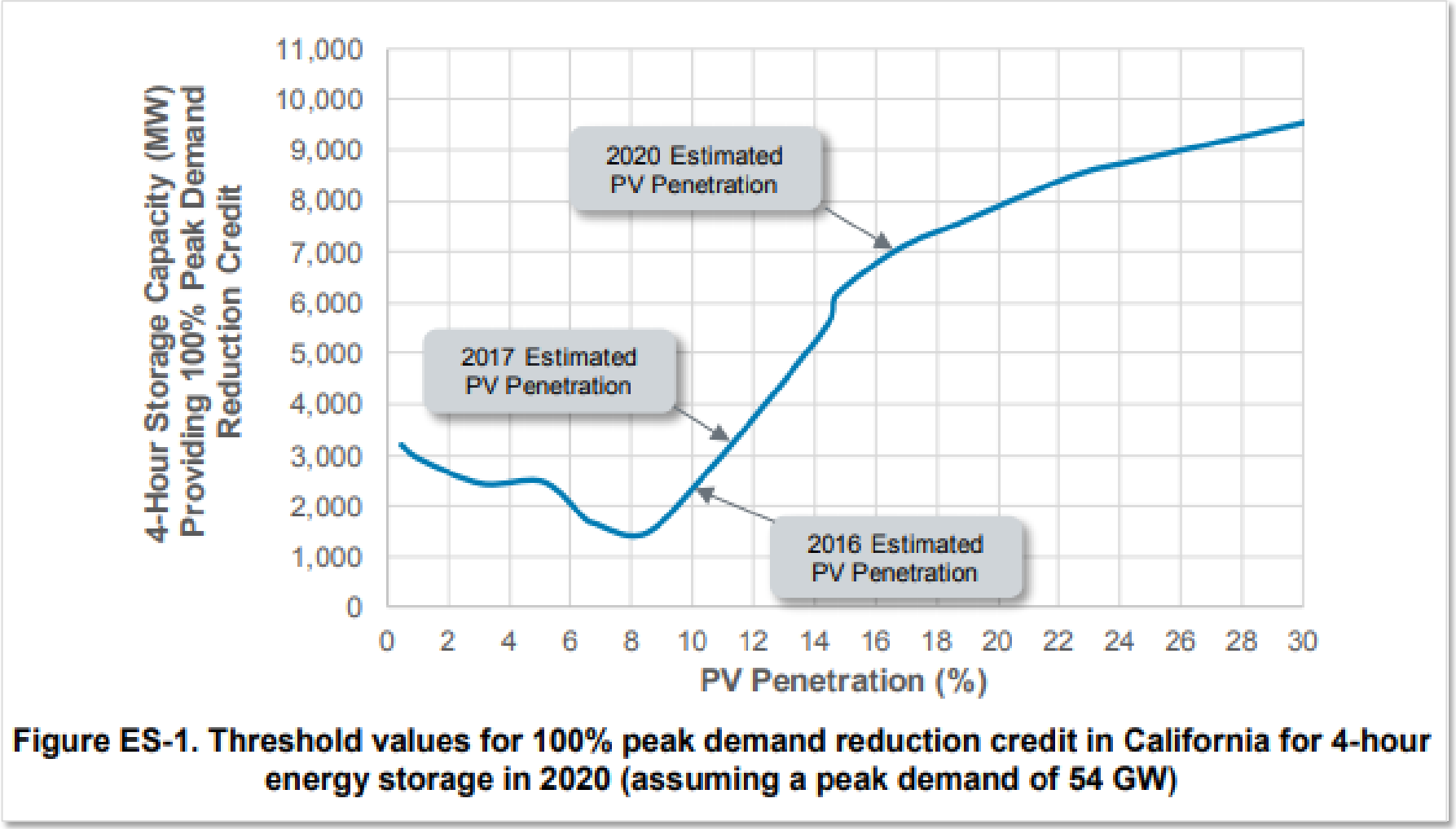


Figure ES-1. Threshold values for 100% peak demand reduction credit in California for 4-hour energy storage in 2020 (assuming a peak demand of 54 GW)

Source: Denholm, P. and Margolis, R., "The Potential for Energy Storage to Provide Peaking Capacity in California under increased Penetration of Solar Photovoltaics" (2018)

30 MW of energy storage for San Diego Gas & Electric, California, United States

- Largest energy storage project in the western hemisphere
- Contract to online in 6 months
- Sited on 1 acre, where a power plant could not be permitted

Generation Enhancement

Long Beach, California, United States

100 MW, 4-hour (400 MWh)

AES Alamitos, COD Jan 1, 2021

SERVICES

- Capacity, local reliability
- Peak power/off peak mitigation
- Ancillary services

IMPACT

- Competitive bid vs thermal peaker, cost effective
- Replaces environmental retired units
- Meets flexibility (duck curve)

World’s largest contracted energy storage project

Transmission & Distribution Enhancement

Arizona, United States

2 MW / 8MWh

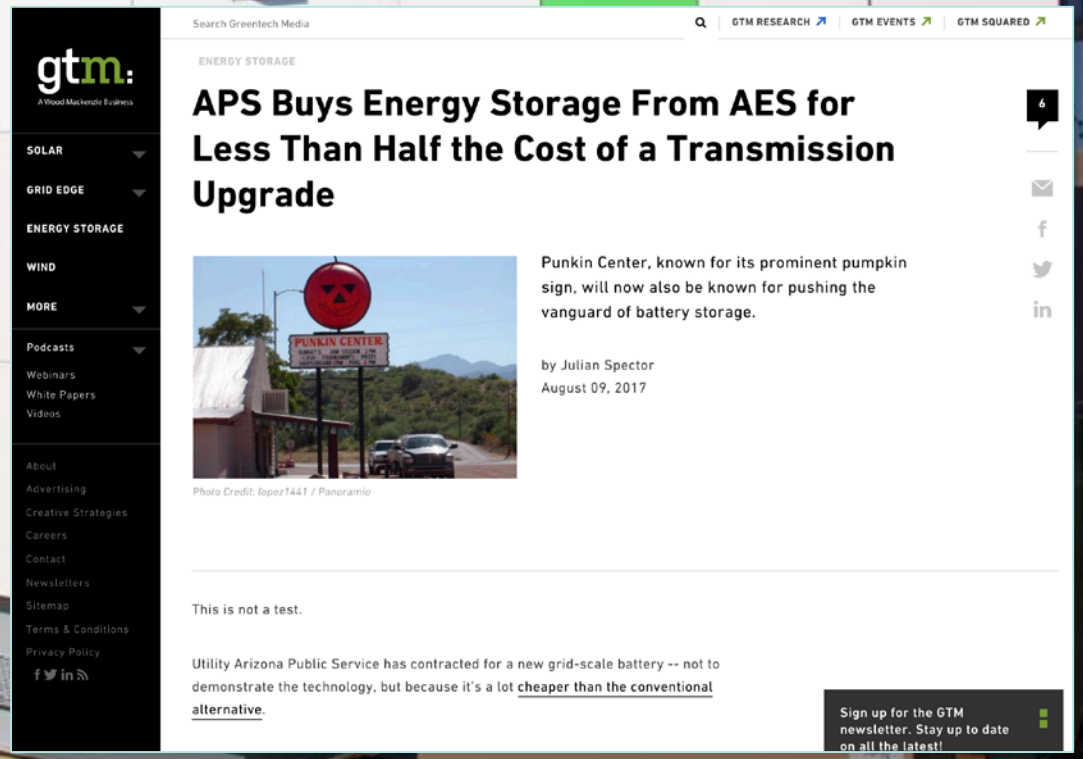
Arizona Public Service (APS), Punkin Center (under construction)

SERVICES

- Transmission upgrade deferral
- Peak management

IMPACT

- Power reliability at half the cost of a transmission



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ENERGY STORAGE

APS Buys Energy Storage From AES for Less Than Half the Cost of a Transmission Upgrade

Punkin Center, known for its prominent pumpkin sign, will now also be known for pushing the vanguard of battery storage.

by Julian Spector
August 09, 2017

Photo Credit: lopez1441 / Panoramio

This is not a test.

Utility Arizona Public Service has contracted for a new grid-scale battery -- not to demonstrate the technology, but because it's a lot cheaper than the conventional alternative.

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Thank You

Ray Hohenstein | Market Applications Director
o: (703) 795-1363 | Ray.Hohenstein@fluenceenergy.com