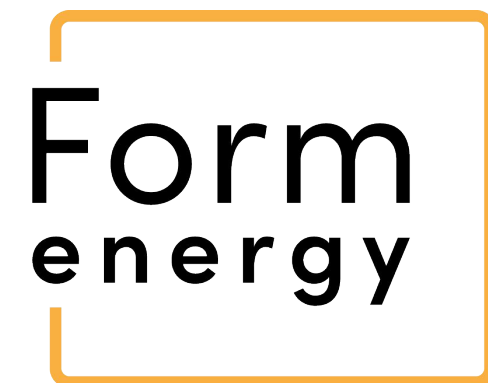


BREAKTHROUGH LOW-COST, MULTI-DAY ENERGY STORAGE

ISO New England Consumer Liaison Group

Jason Houck, Senior Manager, Policy Strategy

June 7, 2023

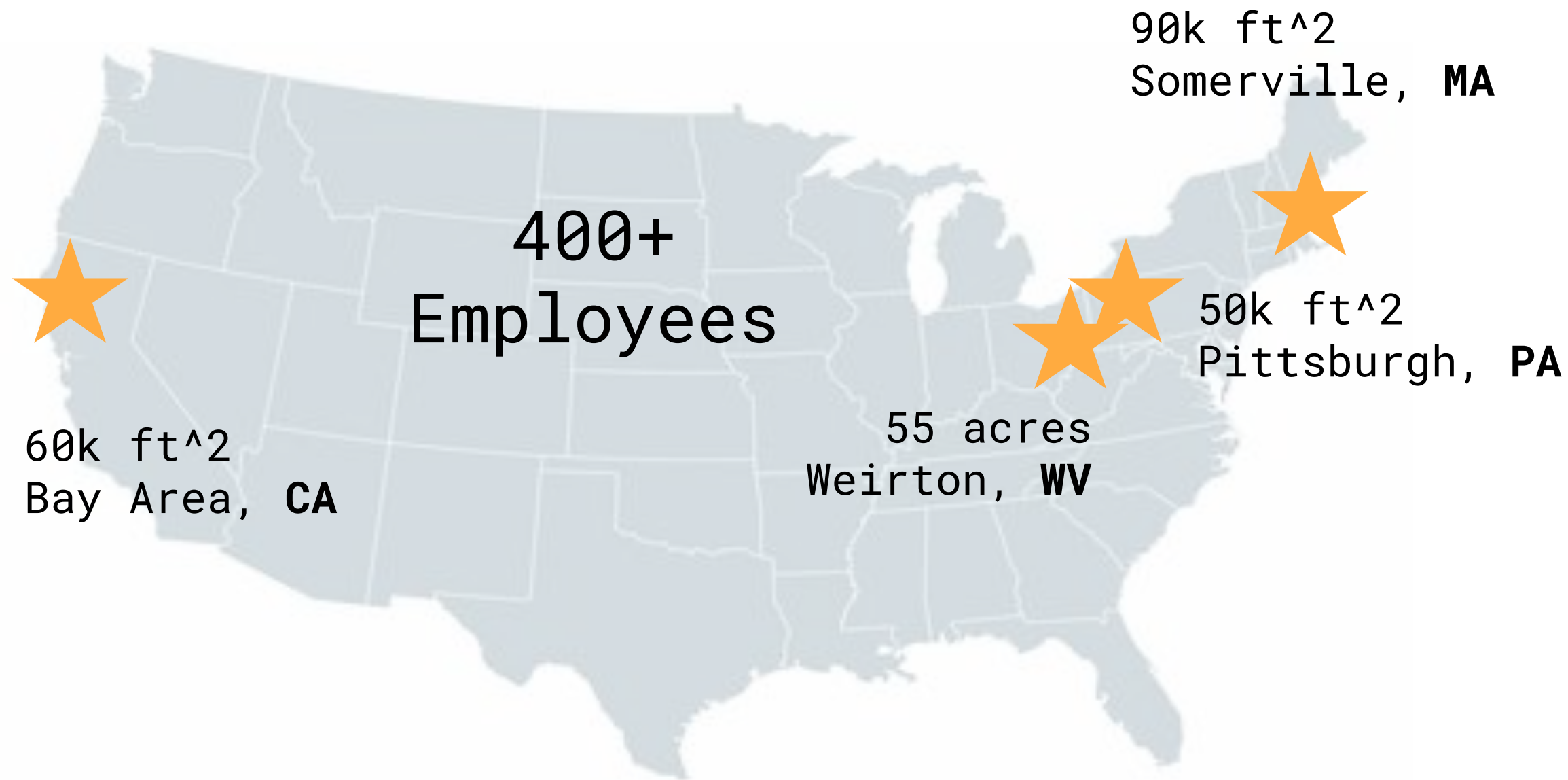


Energy Storage
For A Better World

CONFIDENTIAL



Rising to the challenge of climate change with a team that will deliver



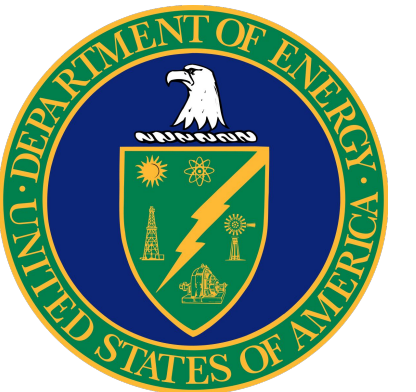
OUR INVESTORS: LONG-TERM AND IMPACT-FOCUSED

\$820M+ in venture capital from top investors including: Breakthrough Energy Ventures (BEV), TPG's Climate Rise Fund, Coatue Management, GIP, NGP Energy Technology Partners III, ArcelorMittal, Temasek, Energy Impact Partners, Prelude Ventures, MIT's The Engine, Capricorn Investment Group, Eni Next, Macquarie Capital, Canada Pension Plan Investment Board, and other long-term, impact oriented investors

LED BY ENERGY STORAGE VETERANS

Decades of cumulative experience in energy storage

- 100's of MW of storage deployed

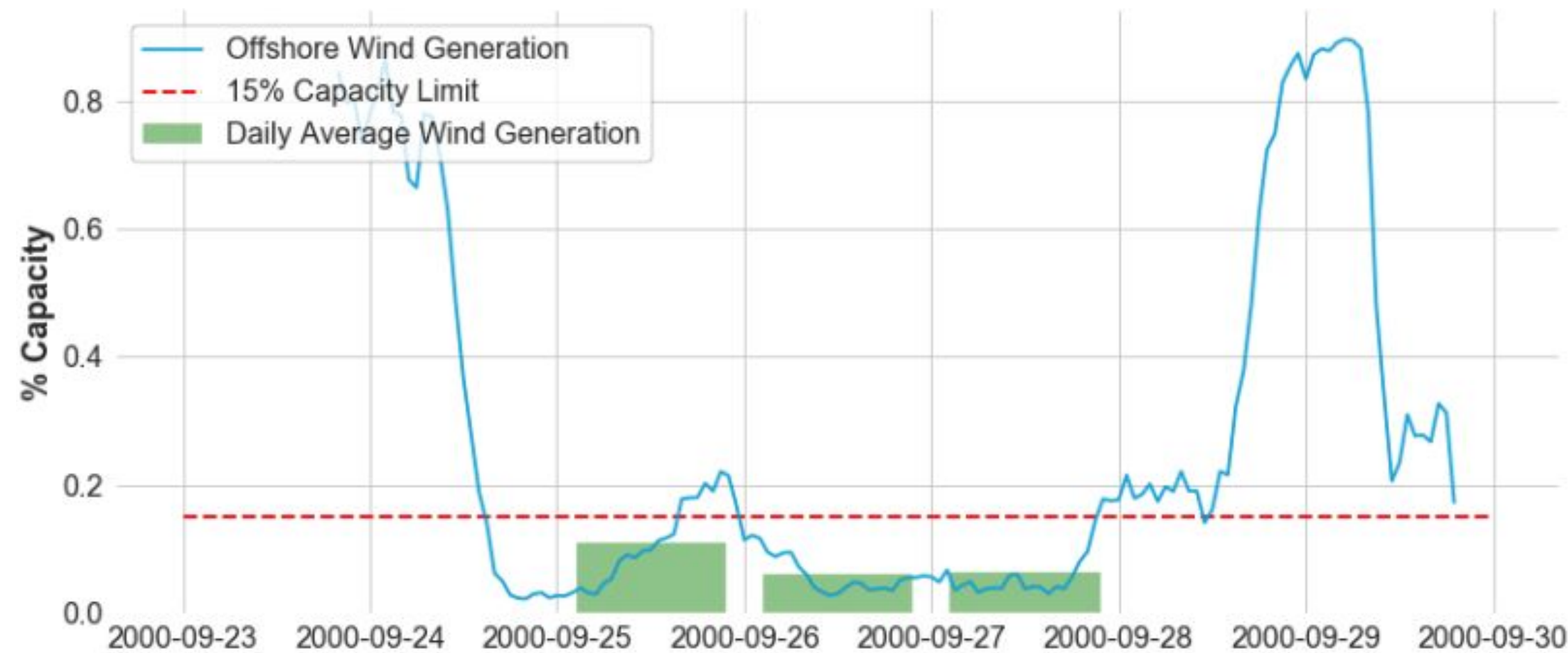


Weather-driven multi-day reliability challenges are universal

Multi-day weather events will drive reliability challenges in a decarbonized future grid

Weather related reliability risks have been identified in nearly every major power market

Modeled New England Multi-Day Offshore Wind Lull, 2000 Weather



Source: [DNV-GL](#) Analysis of Stochastic Dataset for ISO-NE

Pacific Northwest

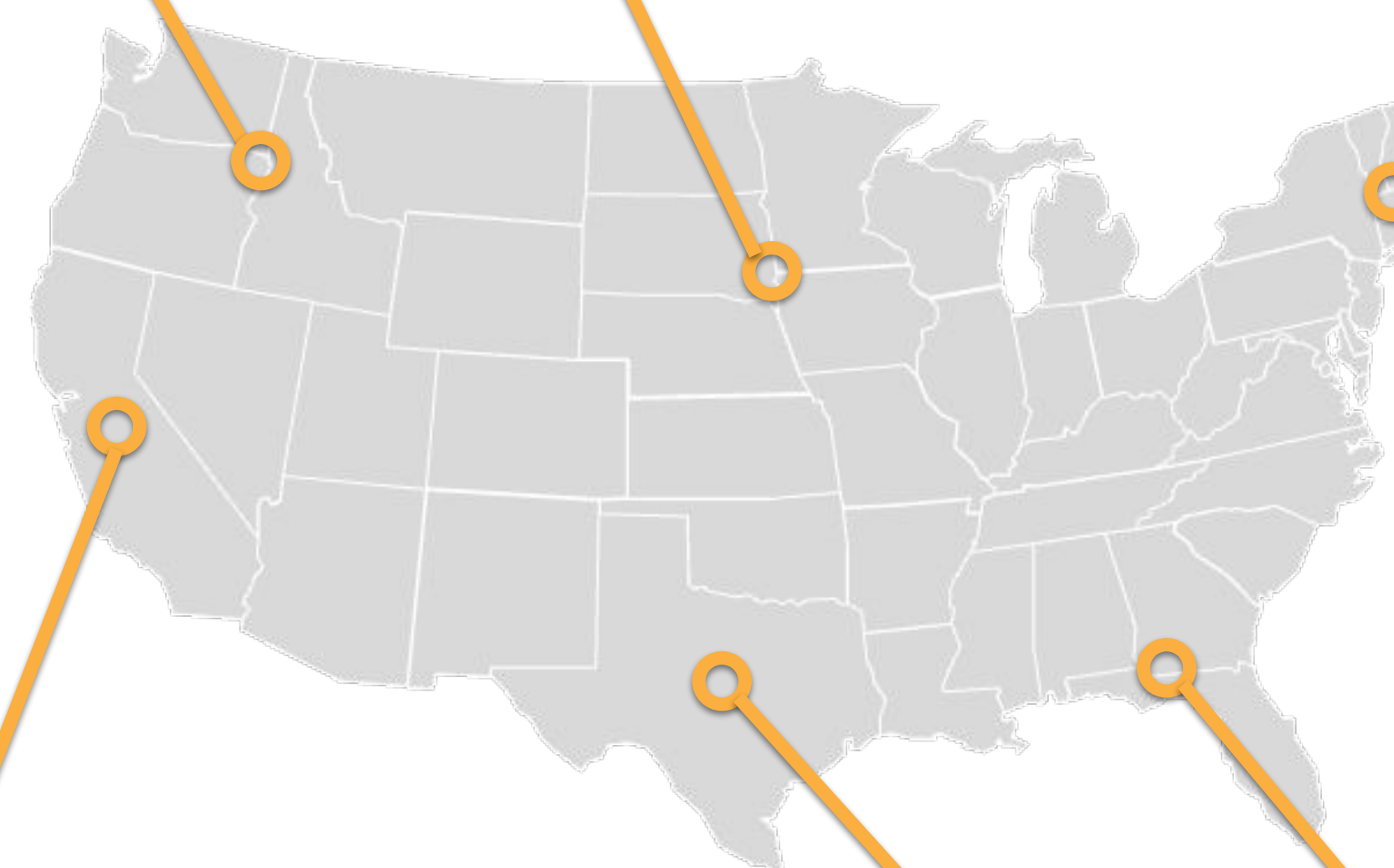
E3 modeled multi-day renewable lull during drought years

Upper Midwest:

Xcel Energy multi-day wind lull during cold winter in 2019

New England:

DNV-GL suggests as many as 2 wind lulls ≥ 3 days during heat waves per year



California

E3 modeled 10 day undersupply during cloudy week in 2050

Texas

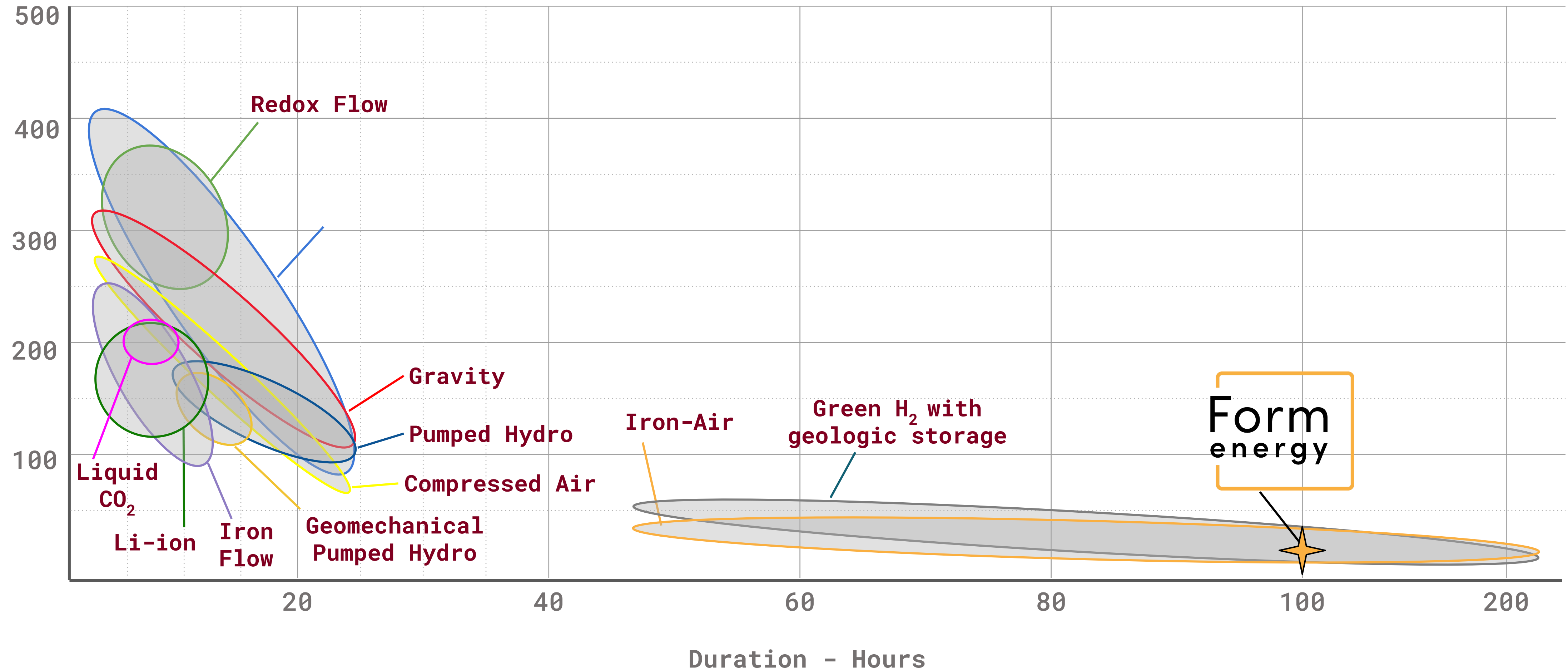
Winter Storm Uri forces 3 days of load shedding in 2021

Southeast

FP&L adopts to winter peak planning to avoid up to 13M customer outages

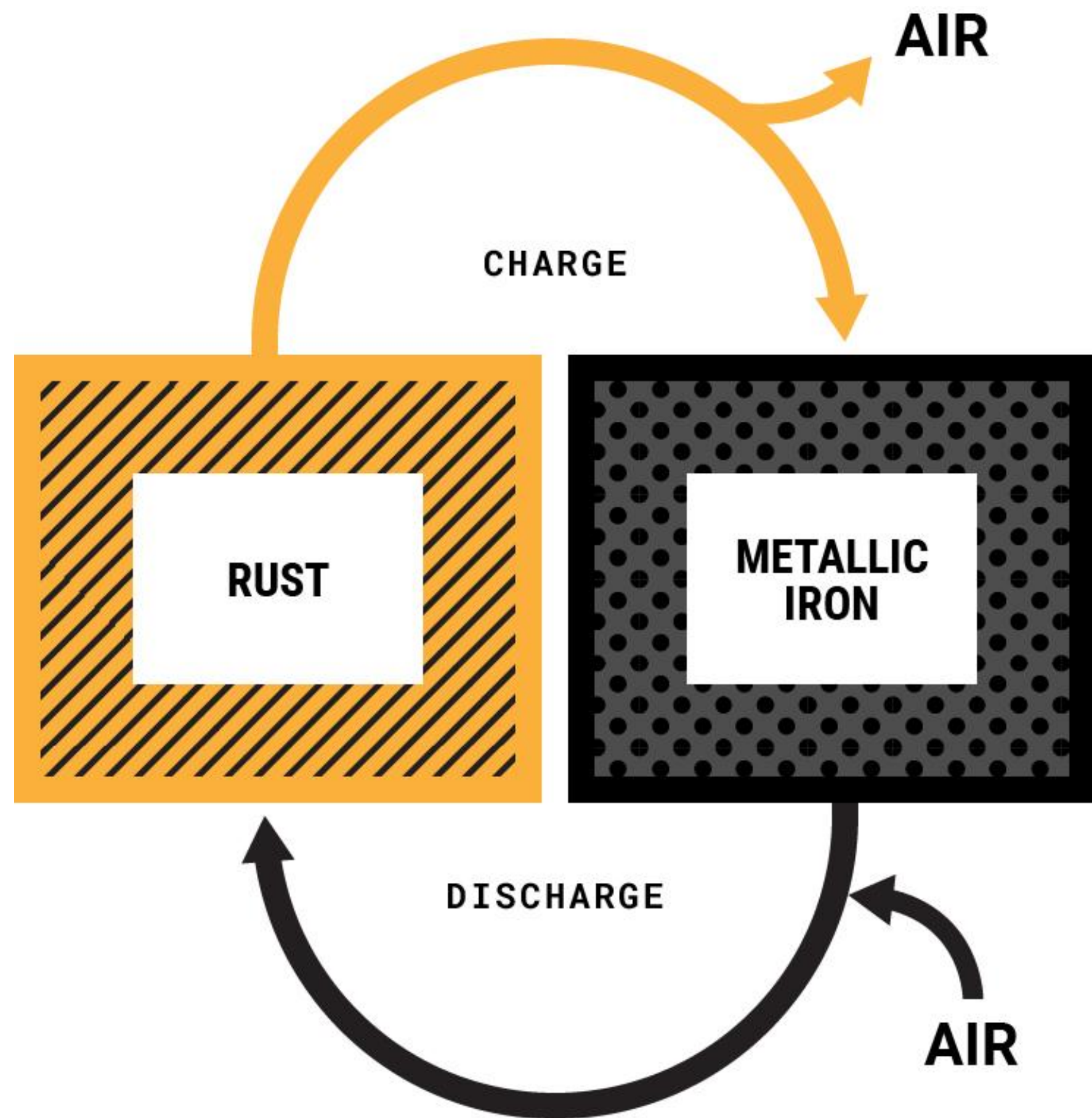
Form's iron-air battery is the only technology targeting multi-day duration without geographic constraints

2030 Installed Cost - \$/kWh



Rechargeable iron-air is the best technology for multi-day storage

Form's 100-Hour Reversible Rust Battery



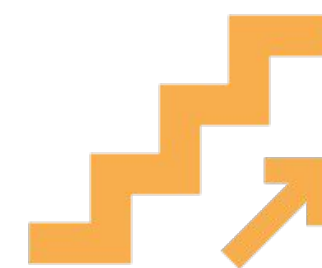
COST

Lowest cost rechargeable battery chemistry.
Less than 1/10th the cost of lithium-ion batteries



SAFETY

Non-flammable aqueous electrolyte. No risk of thermal runaway.



SCALE

Uses materials available at the global scale needed for a zero carbon economy. High recyclability.



DURABILITY

Iron electrode durability proven through decades of life and 1000's of cycles

What makes up a Form Energy system

Modular design enables easy scaling to GWh systems

Cell



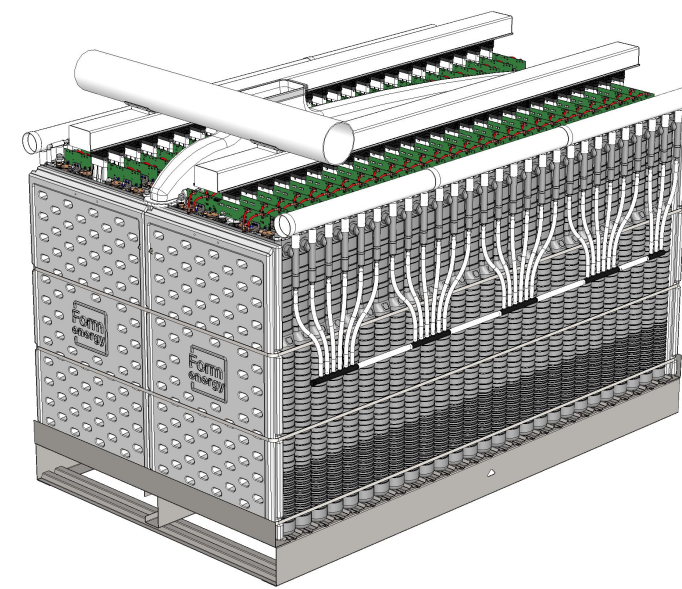
~0.10 kW / 10 kWh

~1m x 60 cm

Electrodes + Electrolyte

Smallest **Electrochemical** Functional Unit

Battery Module



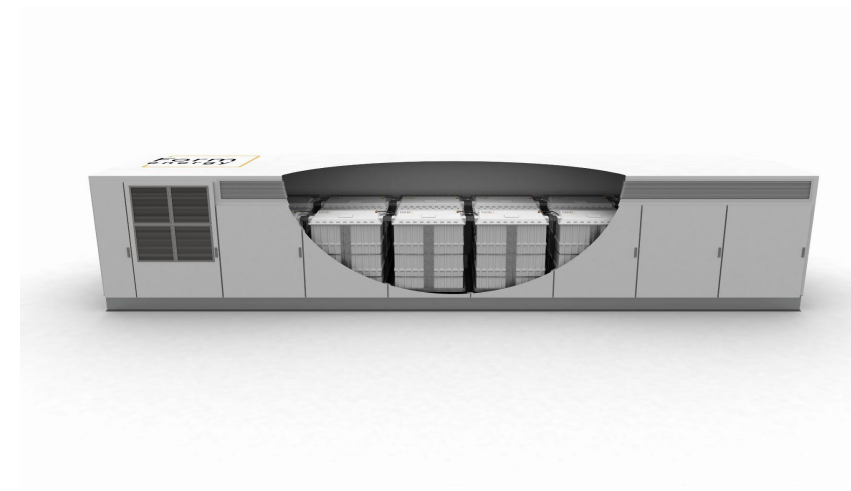
~5 kW / 500 kWh

~2.3 x 1.3 x 1.3m

~50 **Cells**

Smallest Building Block of **DC** Power

Enclosure



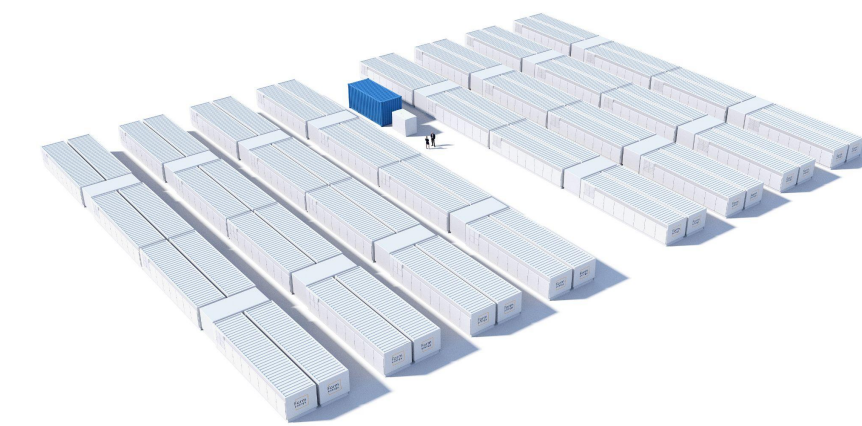
~50 kW

8.6' x 40'

~10 **Modules**

Product Building Block with **integrated module auxiliary systems**

Power Block



~3.5 MW / 350 MWh

<2 acres

~50 - 100 **Enclosures**

Smallest independent system and **AC Power** building block

System



100+ MW / 10 GWh

50+ acres

10s - 100s of **Power Blocks**

Commercial Intent System

Over 3 GWh of Commercial Engagements



Collaborating with Georgia Power on a project application of **up to 15 megawatts/1500 megawatt hours (MW/MWh)** of energy storage systems to be located in the utility's service area

"At Georgia Power, we know that we must make smart investments and embrace new technologies now to continue to prepare for our state's future energy landscape," said **Chris Womack, Chairman, President and CEO of Georgia Power**. "We're excited to have Form Energy as a partner to help us build on Georgia's solid energy foundation."



Partnering with Great River Energy to deploy a first-of-its-kind **1.5 megawatt/150 megawatt hour** multi-day energy storage project in Cambridge, Minnesota in 2024

"Great River Energy is excited to partner with Form Energy on this important project. Commercially viable long-duration storage could increase reliability by ensuring that the power generated by renewable energy is available at all hours to serve our membership," said **Great River Energy Vice President and Chief Power Supply Officer Jon Brekke**.



Partnering with Xcel Energy to deploy **two 10 MW / 1,000 MWh** multi-day storage systems; one in Becker, MN and one in Pueblo, CO. Both projects are expected to come online as early as 2025

"As we build more renewable energy into our systems, our partnership with Form Energy opens the door to significantly improve how we deliver carbon-free energy so that we can continue to provide reliable and affordable electric service to our customers well into the future." said **Bob Frenzel, Xcel Energy President and CEO**.

Form Factory 1: Commercial-Scale Manufacturing

Transforming Weirton Steel Land for Battery Manufacturing in West Virginia



Building rendering

- **Total Local Investment:** \$760 million
- **Construction Start:** Early 2023
- **Production Start:** Late 2024
- **Jobs:** Minimum of 750 full-time jobs

Location Benefits

- Close to our existing pilot manufacturing facility in PA
- Strong natural infrastructure
- Local manufacturing know-how

Factory Function

- Semi-to-fully automated cell, module, & enclosure assembly
- Ability to scale production in modular blocks

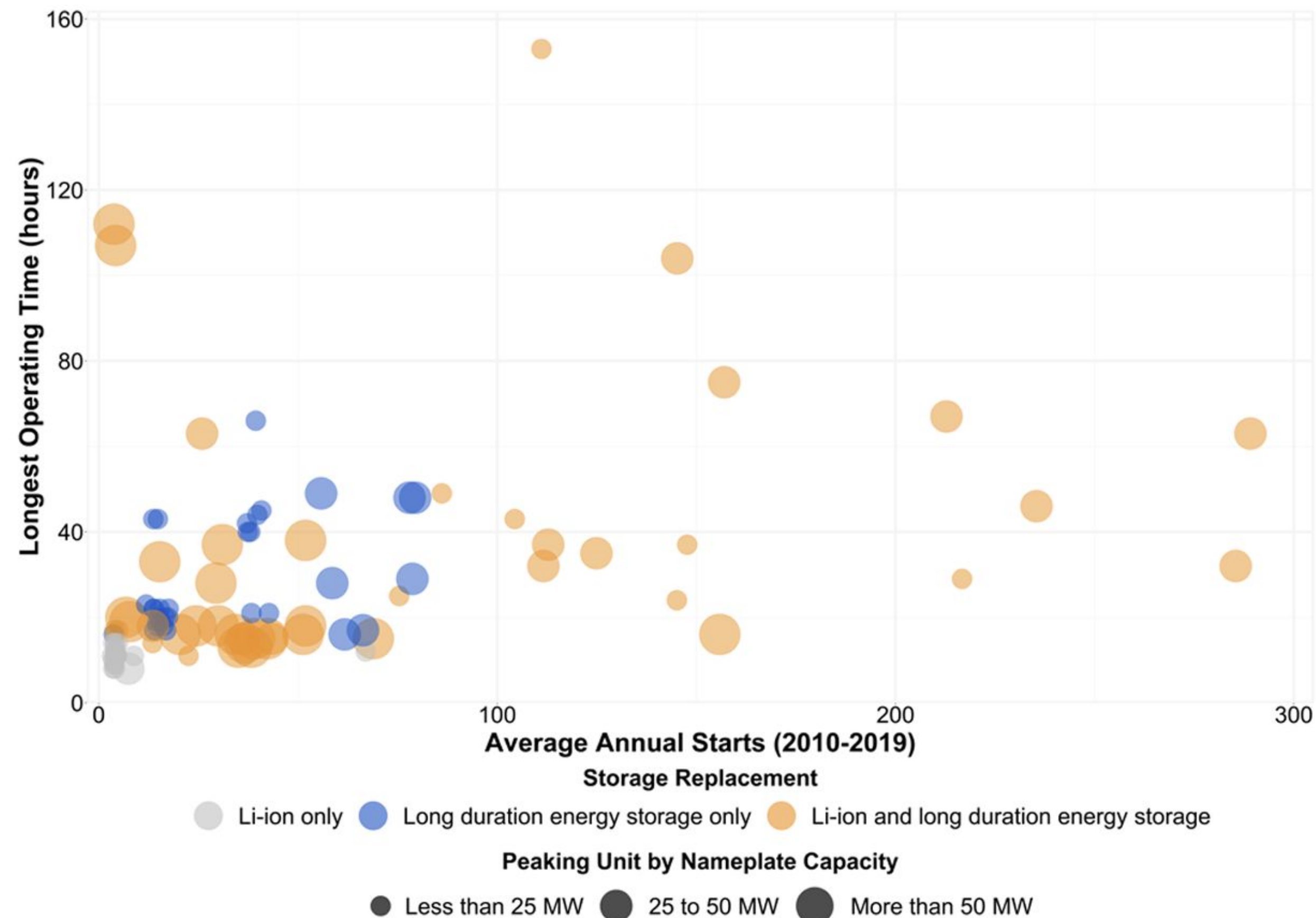
Applications

Firm Capacity for Local Reliability

Multi-day storage can match the performance of peaker plants

- Peaking plants often run for days when called upon for reliability services
- Many are in disadvantaged communities
- State climate goals require non-emitting alternatives that can *guarantee firm output for days*

New York peaking units that storage can cost-effectively replace by each plant's longest operating time and average # of annual starts



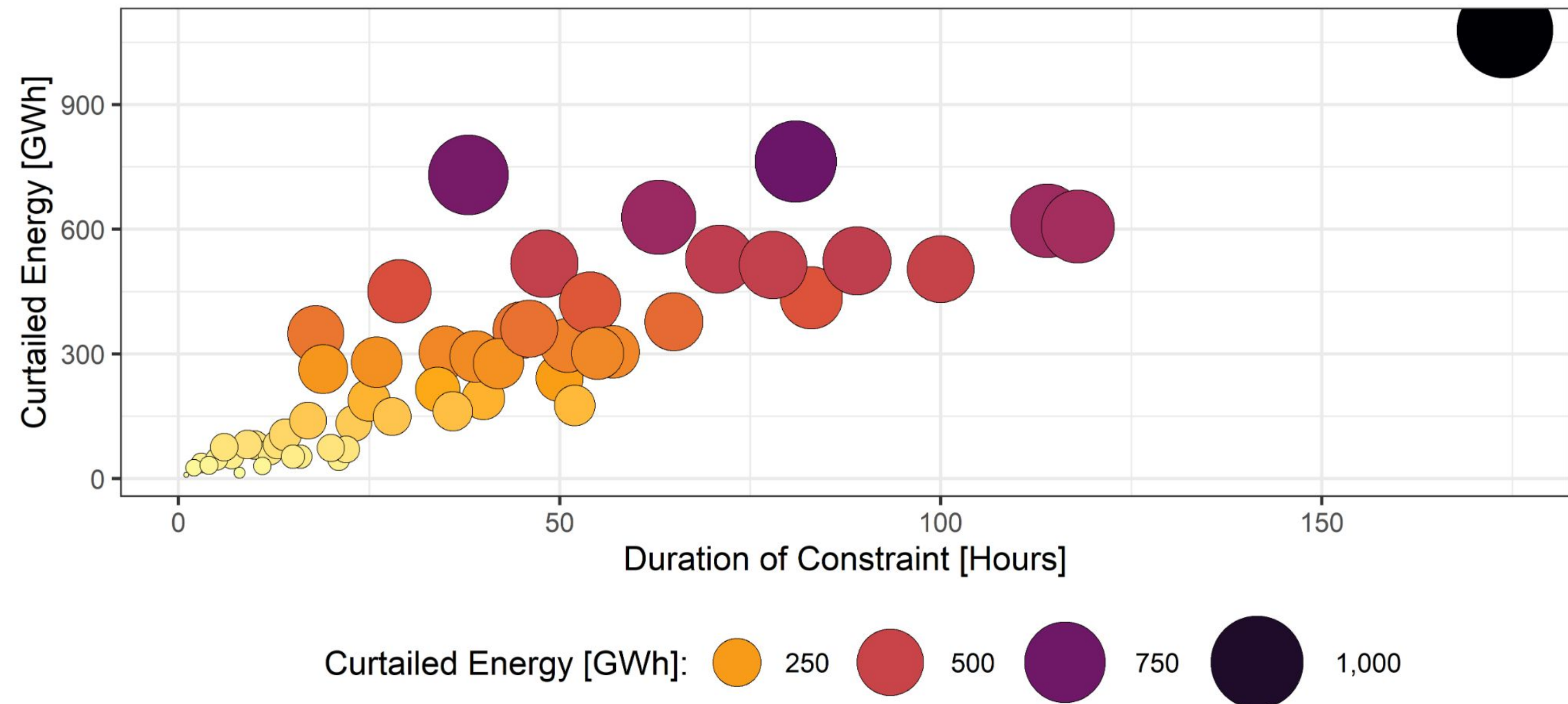
Source: Form Energy, Solving the Clean Energy and Climate Justice Puzzle, 2022

Transmission optimization

Multi-day storage can store wind on gusty days & shape it around transmission constraints

- By 2025 in the UK, nearly 20% of curtailed renewable energy could come from events lasting >100 hours
- Shorter duration storage cannot optimize transmission lines that are regularly congested for more than 50 hours at a time

Curtailed energy at the B7a transmission boundary in the UK, by curtailment event duration



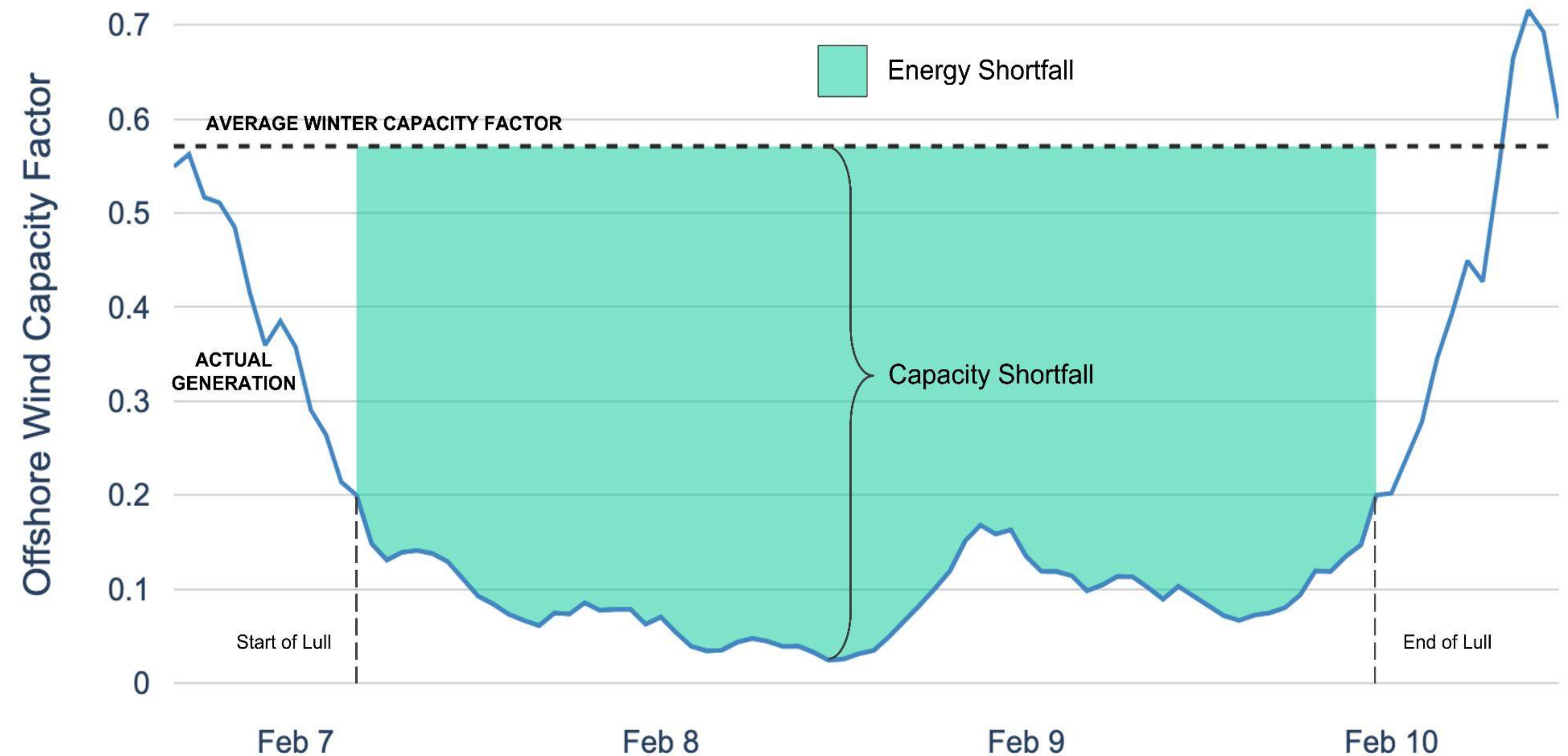
Source: Form Energy and National Grid ESO, 2021. [Link](#).

Firm energy storage reserves

Multi-day storage can fill in during multi-day offshore wind lulls and winter fuel shortages

- What size energy storage reserve could fill these gaps?
 - Capacity reserve: 0.56 MW per MW of offshore wind
 - Energy reserve: 30-35 MWh per MW of offshore wind
- Benefits of a storage reserve
 - Meet winter energy security requirements with non-emitting resources
 - Get more value out of offshore wind investments

Example Offshore Wind Lull, 2005 Weather Year



Source: Forthcoming Form Energy analysis

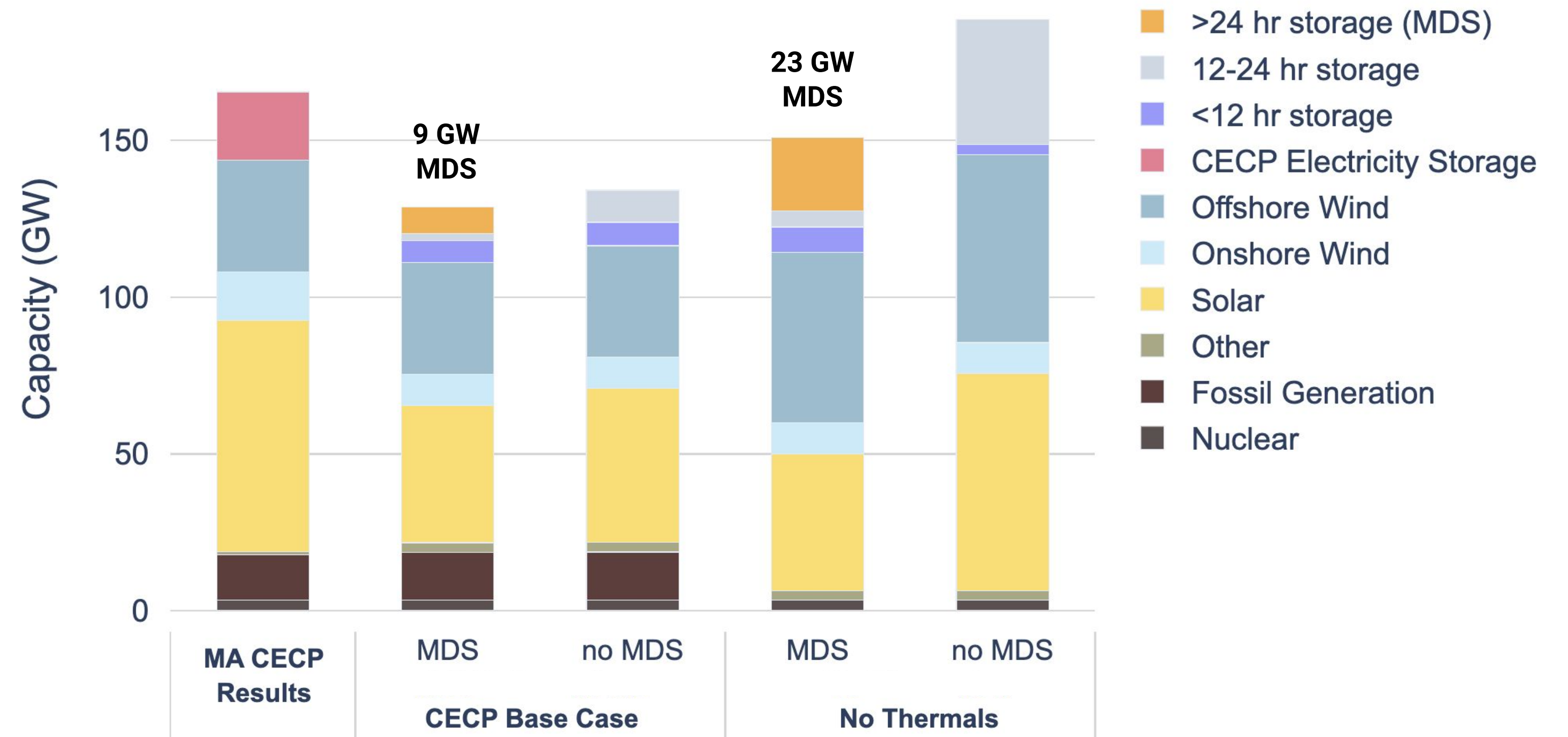
ISO-NE Resource Needs | 2050

9 to 23 GW of multi-day storage needed by 2050, saving \$0.6B-\$2.5B/yr

Key Takeaways

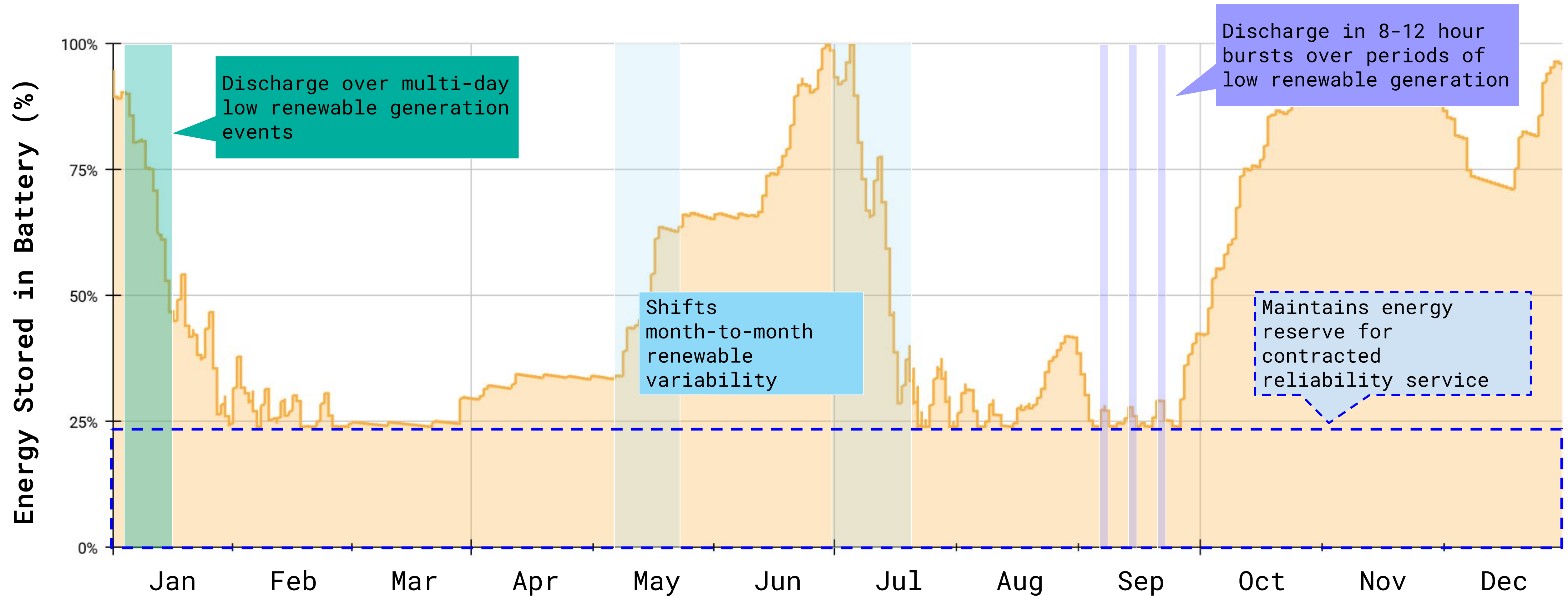
- MA's Clean Energy and Climate Plan (CECP) overstates resource needs by not including diverse storage
 - Diverse storage can avoid 35.5 GW of renewables and 4.1 GW of li-ion
- Inclusion of multi-day storage:
 - Lowers resource needs
 - Lowers portfolio costs
 - Lowers land-use impacts
 - Provides non-emitting firm capacity in lieu of thermal generation




ISO-NE Total Installed Capacity, 2050



Source: Forthcoming Form Energy analysis

Multi-Day Storage operates year-round to balance seasonal, multi-day, and intra-day variability



- 
Multi-Day
- 
Seasonal Up
 (net charge with excess renewables)
- 
Seasonal Down
 (net discharge during peak load season)
- 
Intra-Day
- 
24 hr reliability reserve

How to Build a Market for Long-Duration Storage



Demonstrate: Deploy multi-day storage at relevant scale in 2025/2026 to demonstrate new applications and system value, and to accelerate learning cycles



Plan: Include emerging technologies in resource plans to understand near and long-term value. Plan for atypical weather, 8,760 operations, and deep decarbonization



Procure multi-day storage at scale to support system reliability and resilience. Act with urgency to maximize key opportunities from the IRA that will sunset



Design markets that seek firm resources, plan for atypical events, and recognize the reliability and portfolio benefits of multi-day storage

Thank you!

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