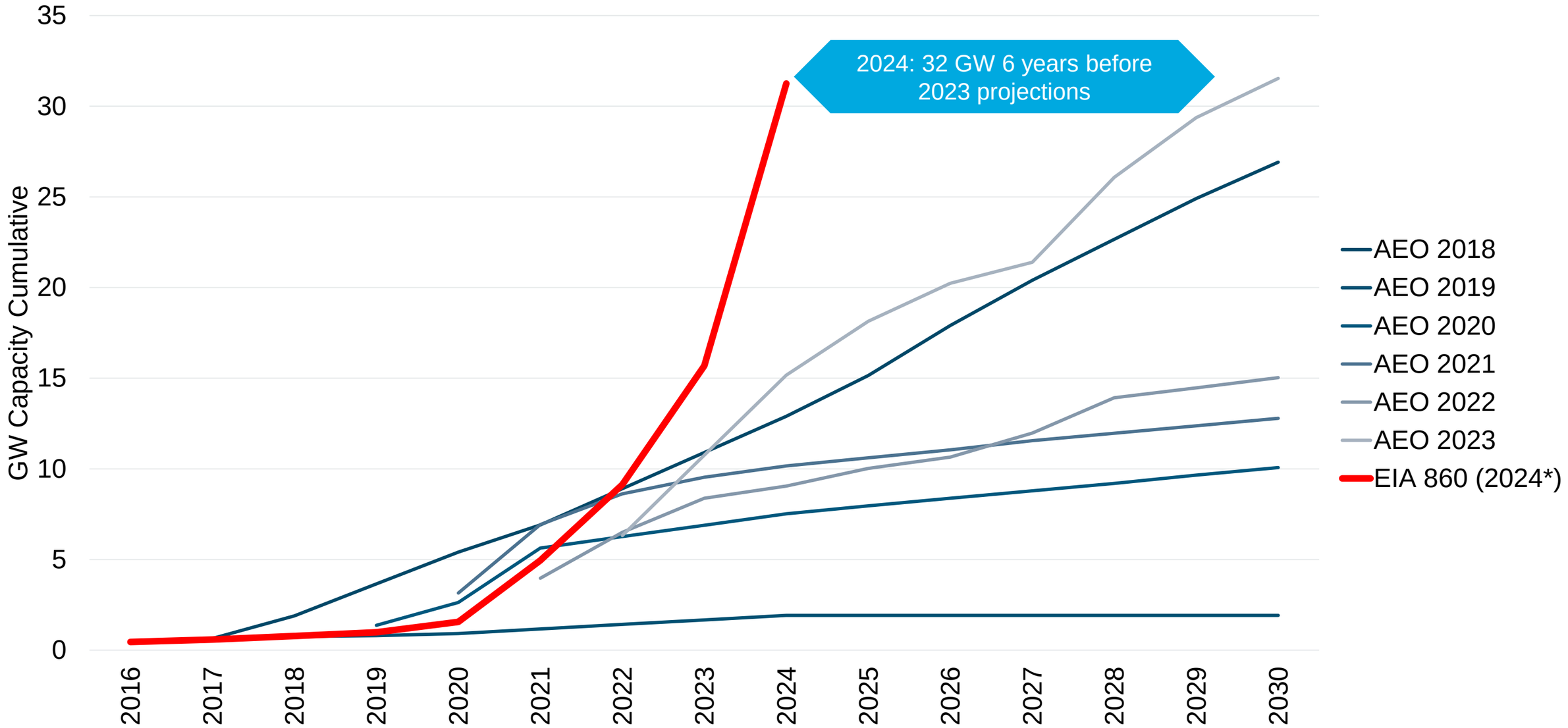
U.S. DEPARTMENT OF ENERGY | Office of ELECTRICITY

Where's Your Million-Dollar* Nugget?

October 9, 2024

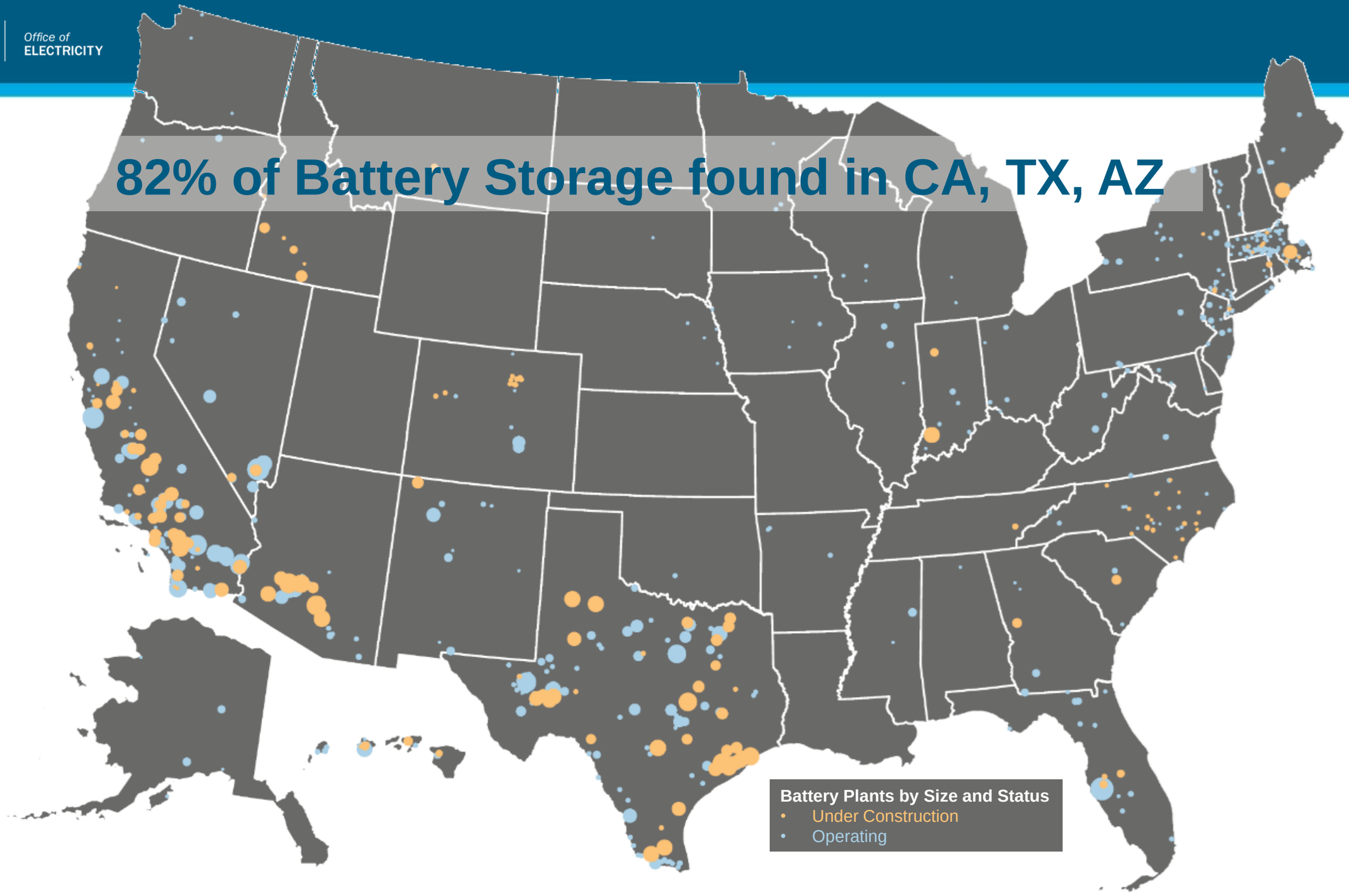
Eric Hsieh
Deputy Assistant Secretary for Energy Storage

EIA AEO Storage Capacity: Projected vs Actual



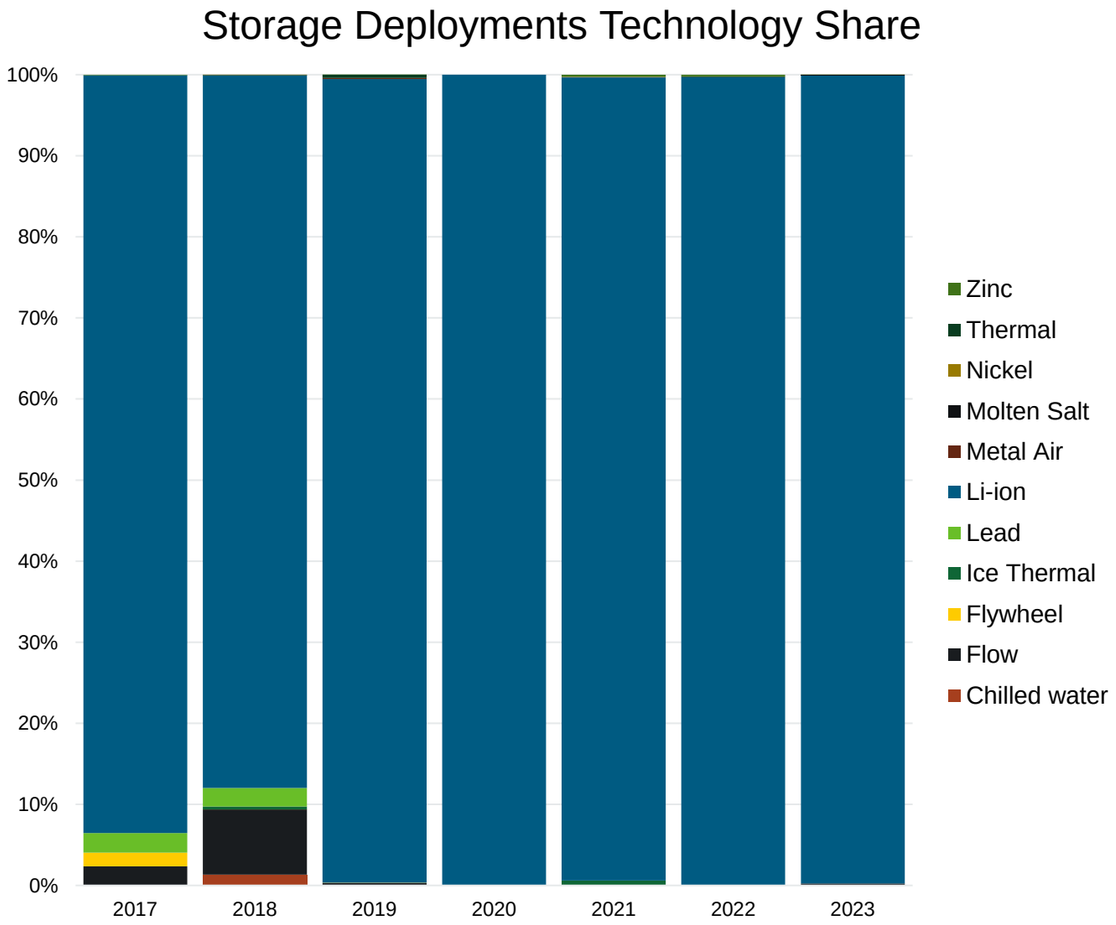
*EIA Annual Energy Outlook and Form 860 Data, as noted. *2024 data includes projects under construction*

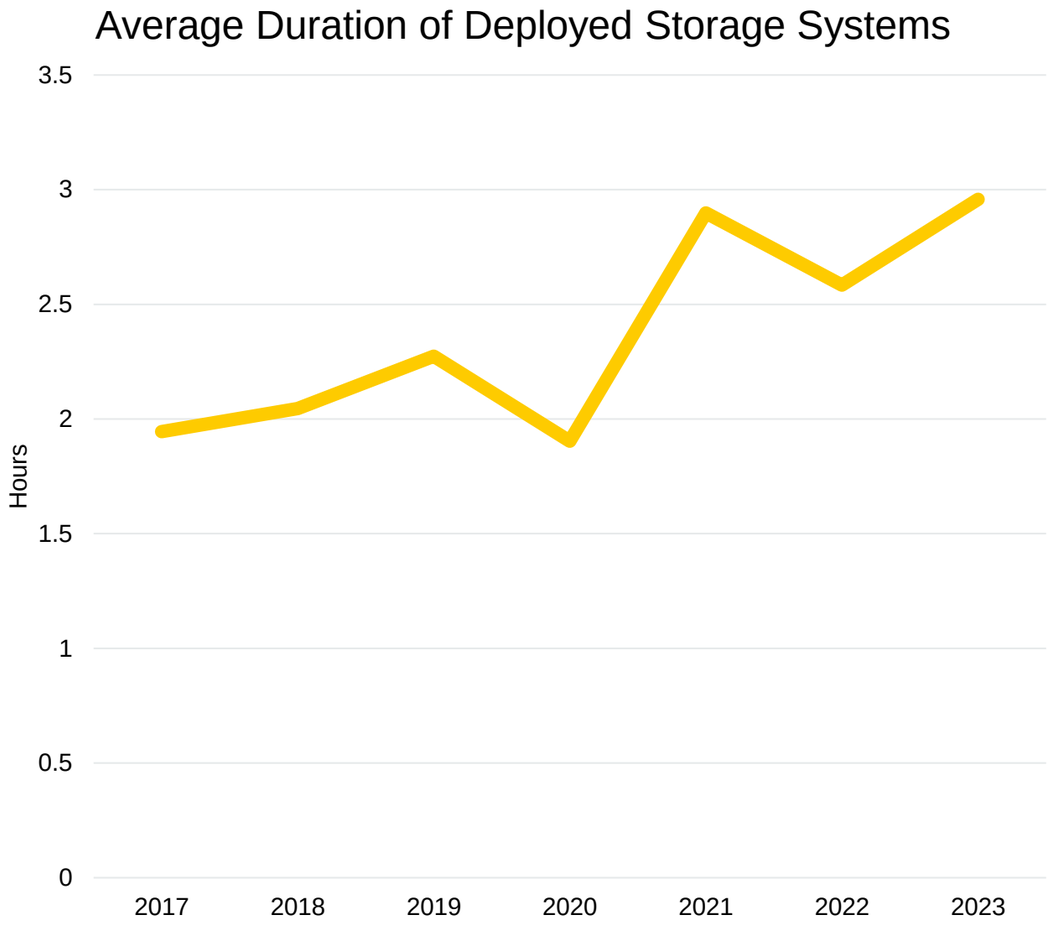
82% of Battery Storage found in CA, TX, AZ



Adapted from EIA Form 860 Data, as of June 2024.

Most Commercial ESS: Lithium; Under 4 hours





Adapted from IHS/S&P Storage Project Dashboard, as of April 2024.

The Expanding Storage Community

>75 LDES Companies (Westly/Pitchbook)

>100 Storage Vendors (EPRI)

>1200 Storage Startups (Tracxn)

6100 Hospitals

3000 Utilities

19,500 Incorporated Places

130,000 Primary and Secondary Schools

350,000 Places of Worship

Data from Westly Group, EPRI, Traxcn, U.S. Census, EIA, Department of Education, American Hospital Association, and U.S. Religion Census

OE Opportunities: Go Beyond Business-As-Usual

ESS Deployment Trends

- Geographically concentrated
- Almost exclusively lithium
- Mostly under 4 hours duration

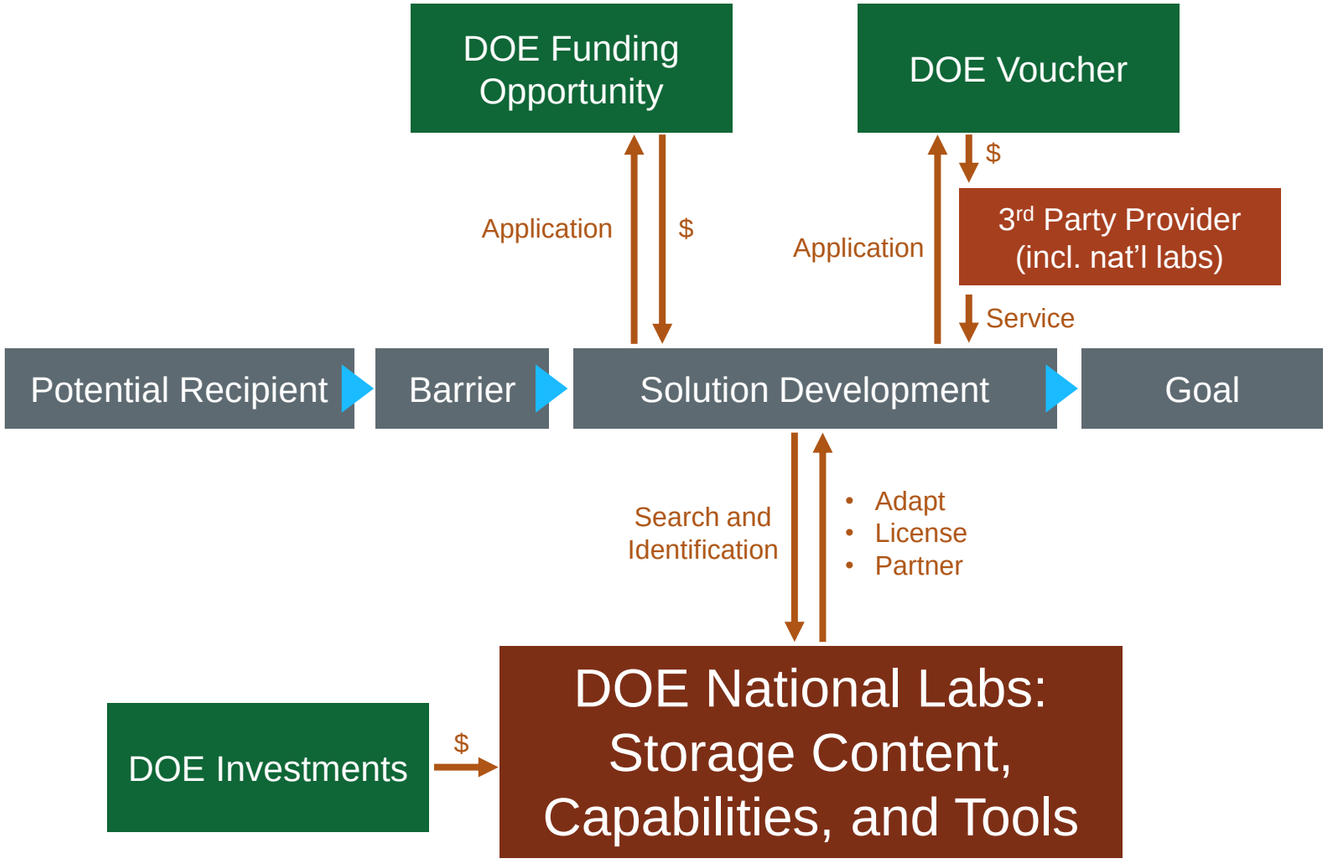
Office of Electricity "Focus Areas"

- Increase storage accessibility to more users
- Diversify away from lithium
- Leapfrog to 10-24+ durations

$15M	Technology Liftoff	3 Consortia
$15M	Demo and Validation	3 Teams
$15M	Critical Facilities Energy Resilience	3 Teams
$9M	Energy Storage for Social Equity	14 Communities
$1M	Innovator and Community Vouchers	Up to 14 Recipients
$8M	Aligning Manufacturability & Preproduction Design^	4 Teams
$200k	Beyond the Meter Energy Storage Integration Prize*	2 Teams
$300k	Energy Storage Innovations Prize Round 2^	10 Awardees

*Currently Open Opportunities ^Pre-Announcement or Notice of Intent Issued

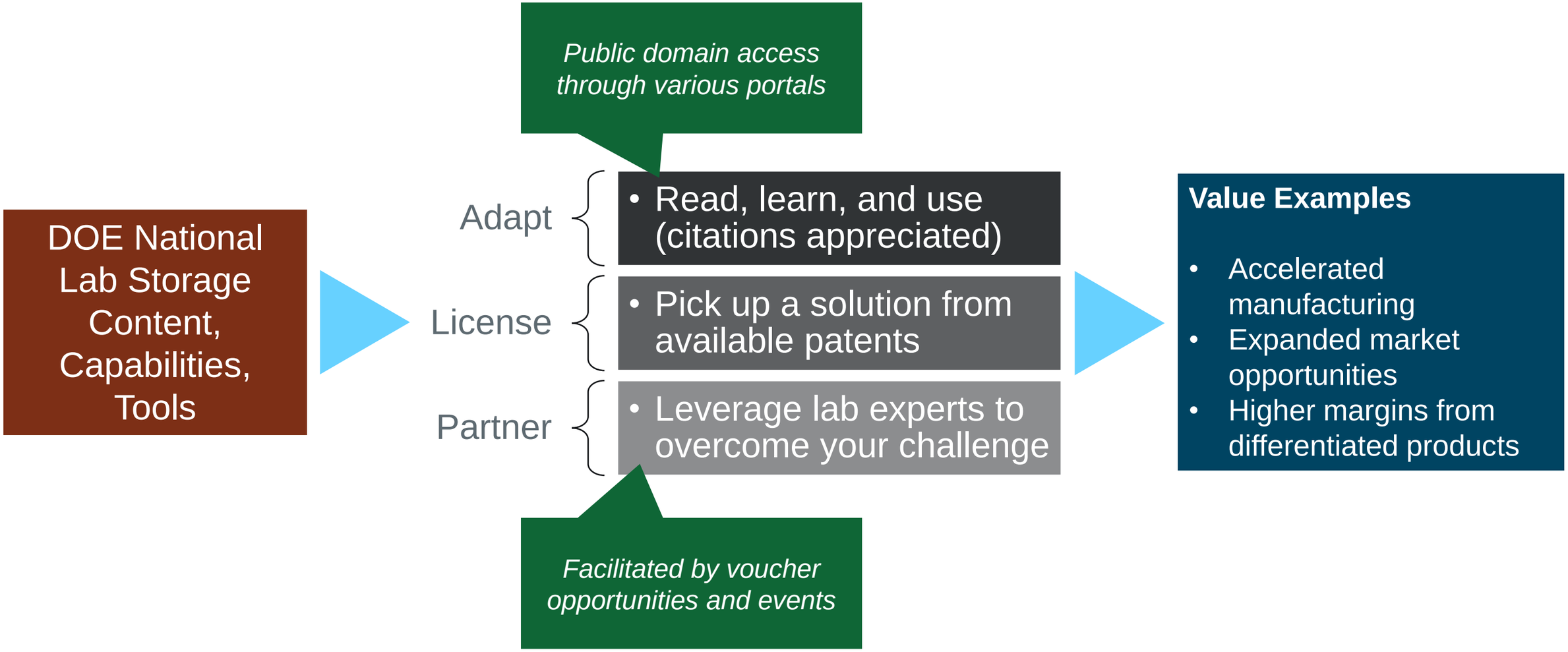
Solution Pathways: Familiar to Novel



	Funding Opportunity	Voucher	Lab Content, Capabilities, and Tools
Potential # of Recipients, Per Opportunity	1s-10s	10s-100s	1000s+
Timing	At DOE Schedule	At DOE Schedule	Recipient-Driven
Application Complexity	High	Low-Medium	Zero-Medium
Scope	DOE Defined	Mutually Defined	Self- or Mutually-Defined
Financial Support	Direct to Recipient	In-Kind	In-Kind, Variable
FY2020-FY2024 OE Investment	~$100M	~$1M	~$330M

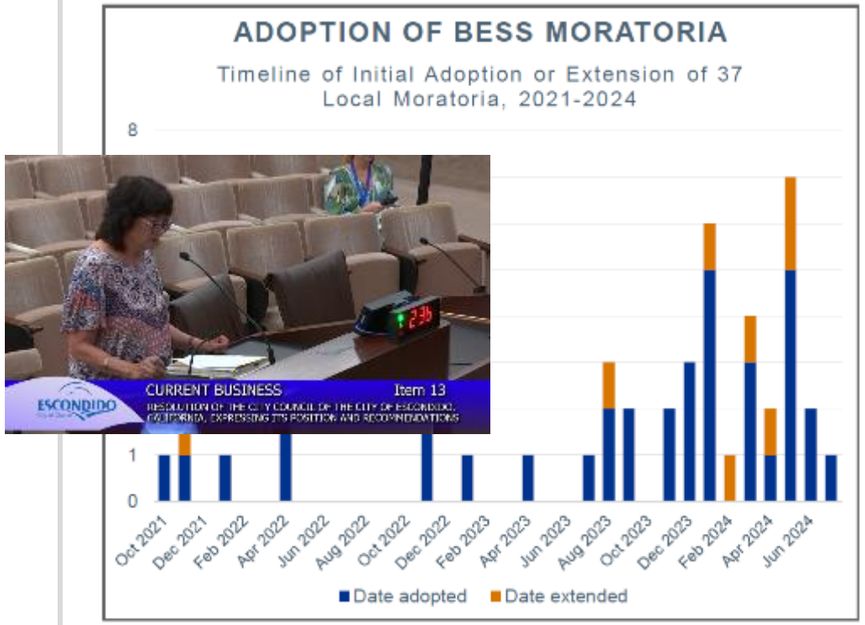
Energy Storage Content Creators: OE's $330M Investment

Pathways that Transform Content into Value



Adapt: Moratoria vs. Inspiration

Entity	Barrier	Solution Adaptation	Goal
Project Developer			*More Developable Sites*



Devyn W. Powell, Jeremy B. Twitchell, Prathit B. Dave, “Tracking Local Moratoria and Other Key Considerations for Battery Energy Storage Siting” 2024 DOE Office of Electricity Peer Review


THE GRADES ARE IN | HOW DID SAINTS DEFENSE DO? 1C

SINCE 1837

The Times-Picayune

THE NEW ORLEANS ADVOCATE

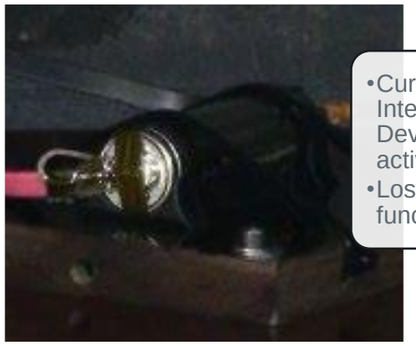
NOLA.COM | FRIDAY, NOVEMBER 17, 2023 $2.00

‘This is an inspiration’


Ribbon cutting at seventh Community Lighthouse with Together LA leaders & US Energy Secretary Jennifer Granholm *(November 2023)*

ES4SE program described in Jennifer Yoshimura, Adrienne Rackley, Henry Guan, “Energy Storage For Social Equity (ES4SE) Initiative,” 2023 DOE Office of Electricity Peer Review

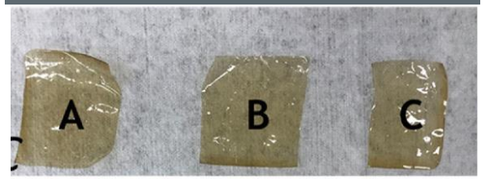
Adapt: Battery Wear – Unused vs. Aged Cells

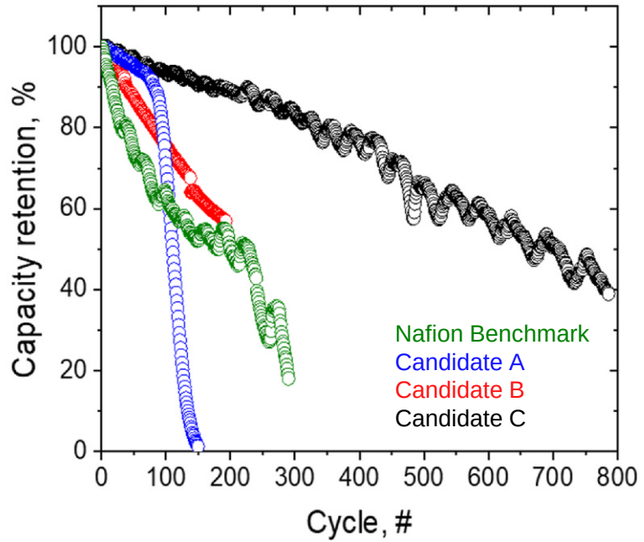
Entity	Barrier	Solution Adaptation	Goal
Insurer	Battery Safety Gaps Standards only call for safety tests on unused cells Limited testing to assess how cell safety profiles change over time	Uncycled LFP  •Current Interrupter Device activation •Loss of functionality LFP – 80% SOH  •CID activation •Loss of functionality •**Electrolyte leakage**	*More Accurate Premiums*

Yuliya Preger, “Impact of Aging on the Safety of Lithium-ion Batteries,” 2024 DOE Office of Electricity Peer Review

License: Environmental Sustainability and Performance

Entity	Barrier	Licensed Solution	Goal
Vendor using PFAS-based separator	*Restrictions or increased costs of PFAS materials*	*Lab IP on non-PFAS polymer-based separators that exceed benchmark performance*	*Lower cost, higher-performing, environmentally-friendly solution*





Information on specific licensing mechanisms available at https://www.energy.gov/gc/laboratory-partnering

Cy Fujimoto, “” The Evolution of Membrane Development at Sandia National Labs,” SAND2024-08353O, ” 2024 DOE Office of Electricity Peer Review

Partner: Competitive Analysis of Lithium vs. New Technology

Entity	Barrier	Voucher Solution	Goal
Vendor with extremely promising LDES technology	*Incomplete analysis on comparative advantages or market opportunity*	*Utilize lab one or more analytical tools/models (with staff expertise) to rapidly benchmark technologies*	*Clear target market and differentiation from lithium*

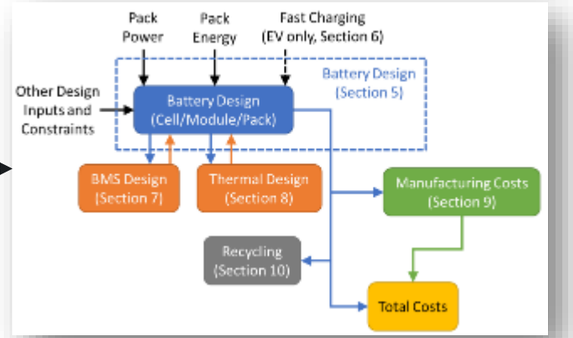
ESGC Summit Voucher Recipients

Quest

ESET™

EverBatt

BatPac



USDOE, “Storage Acceleration Voucher Selectees Unveiled at Energy Storage Grand Challenge,” August 9, 2024

Partner: Testing, Validation, Projection via GSL and ROVI

Entity	Barrier	Facility Solution	Goal
LDES vendor planning for first KW or MW pilot	*Time, cost, or availability of independent validation*	*GSL: performance testing up to 100kW systems* *ROVI: faster-than-real-time performance projections*	*Credible performance results and financial-grade performance projections*

GRID STORAGE LAUNCHPAD

Candidate System

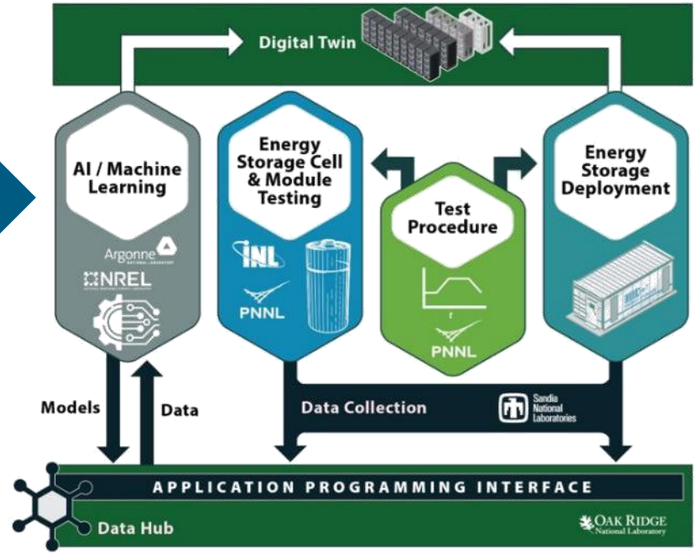
1-100 KW system in the GSL Testing and Validation program

Performance results under realistic grid conditions

Field and test data to ROVI

Multi-year performance projections

RAPID OPERATIONAL VALIDATION INITIATIVE



How to find your million-dollar* nugget

These resources… → …will help you find the right match… → …to accelerate your solution.

- Lab Partnering Service
- Model Selection Platform
- Projects, Publications, and Events

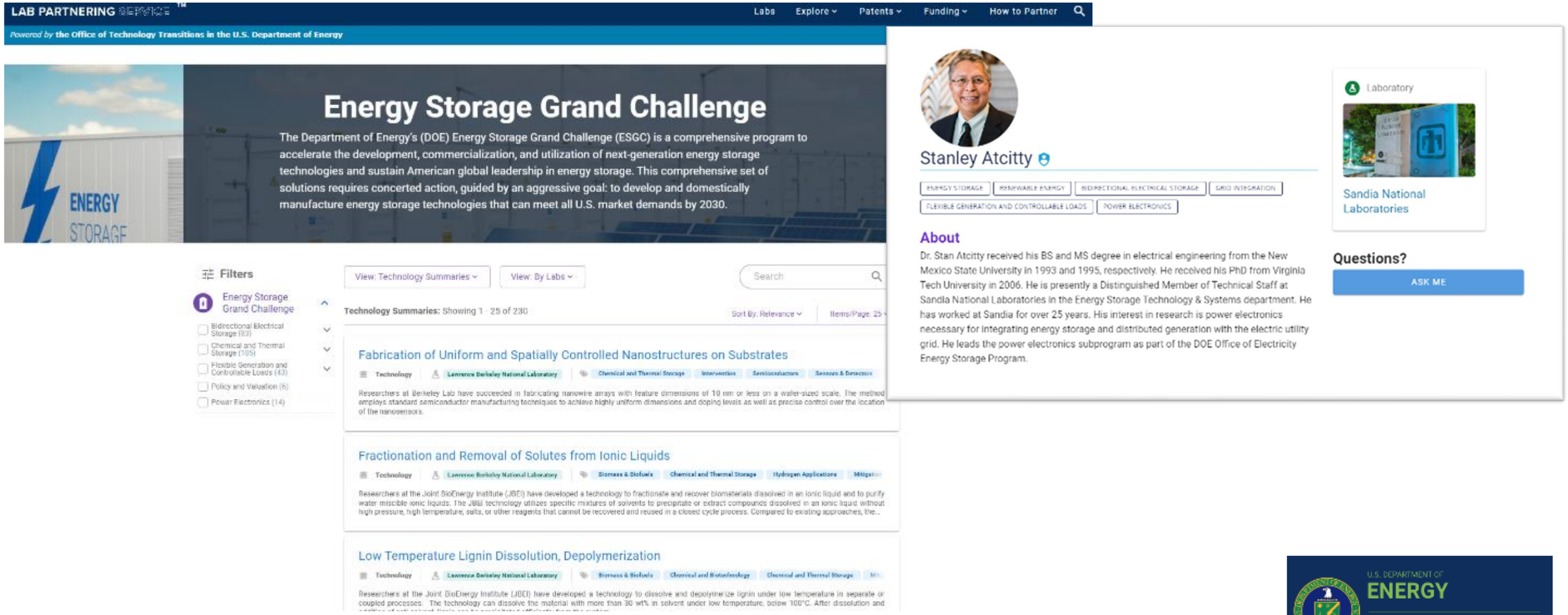
DOE National Lab Storage Content, Capabilities, and Tools

Value Examples

- Faster time to manufacturing
- Expanded market opportunities
- Higher margins from differentiated products

**payback value not guaranteed*

Lab Partnering Service: Capabilities, Facilities, and Experts



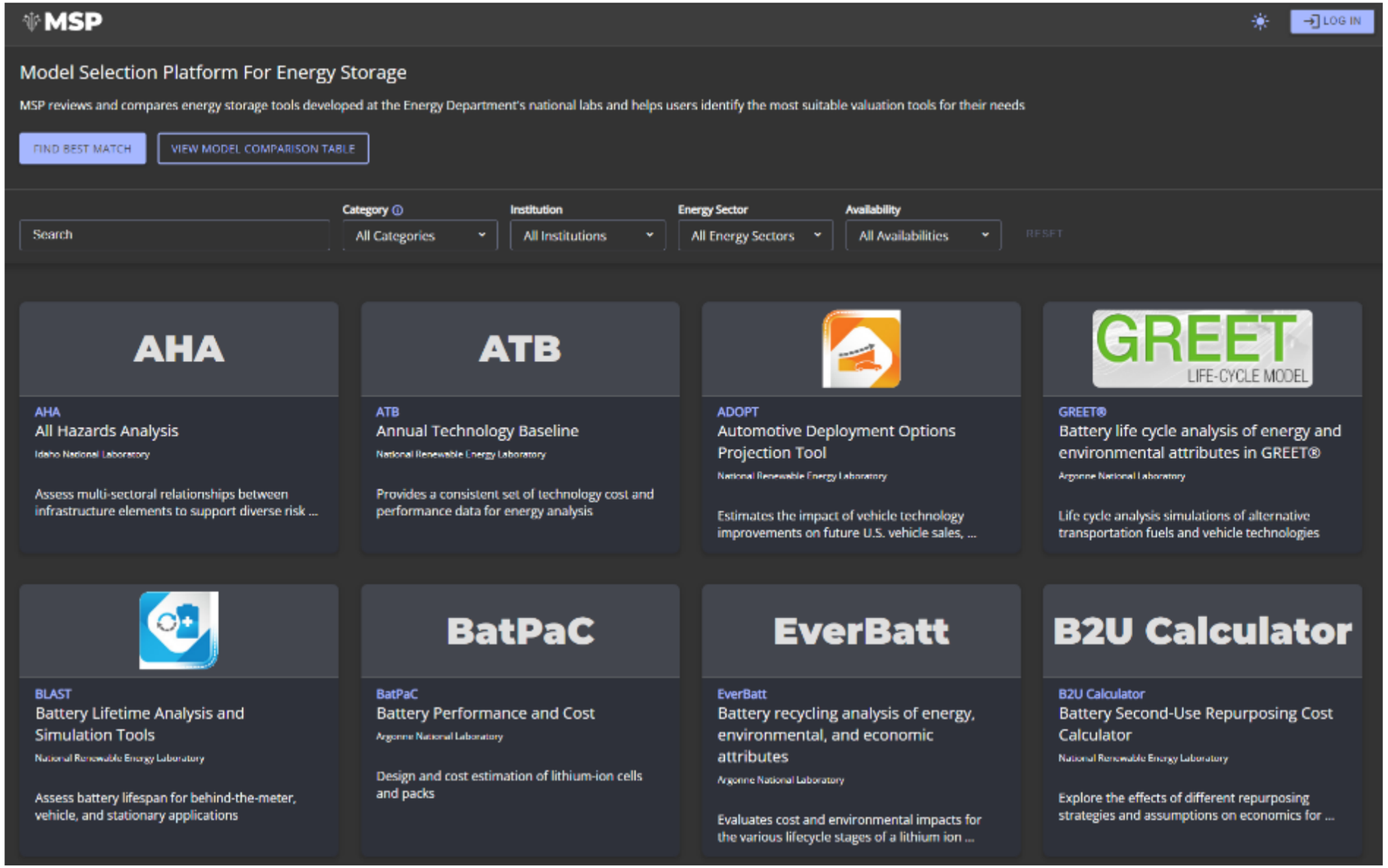
https://esgc.labpartnering.org

U.S. DEPARTMENT OF ENERGY
Office Of TECHNOLOGY TRANSITIONS

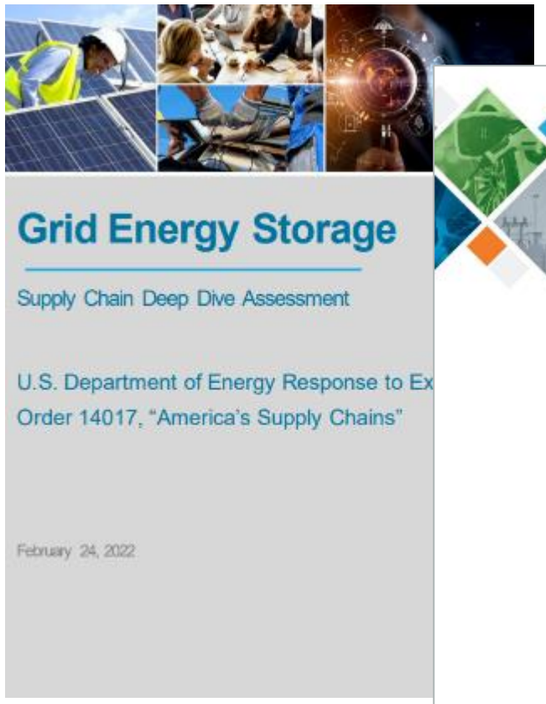
Model Selection Platform

A few screening questions to find the best model (out of >60 choices) for your scenario

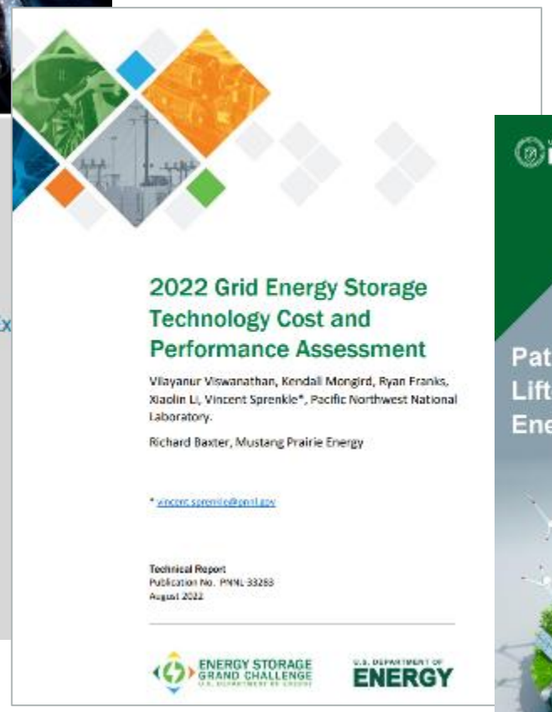
https://msp.pnnl.gov/



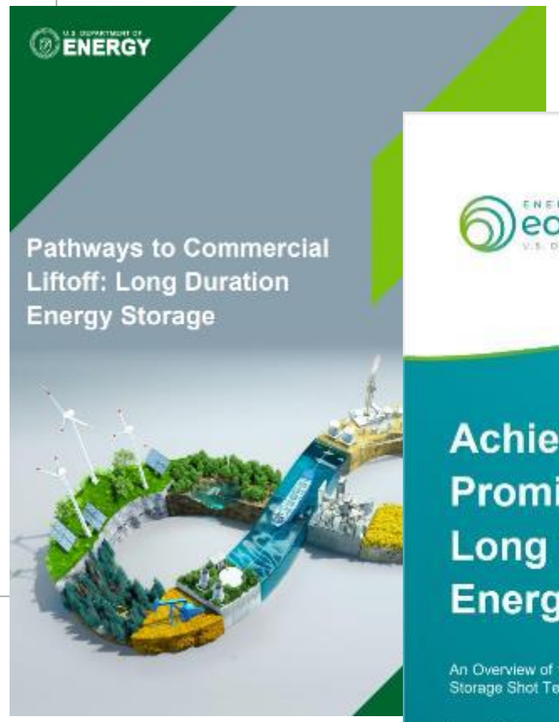
Access to Additional DOE Resources



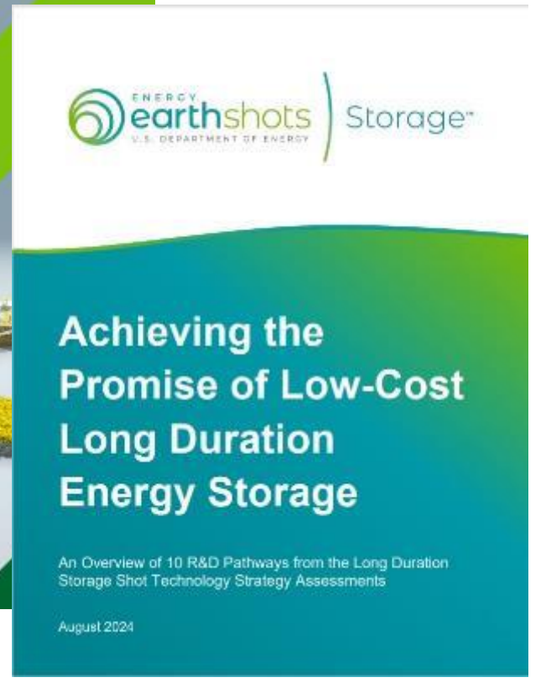
[Grid Energy Storage Supply Chain Deep Dive Assessment](#)
February 2022



[2022 Grid Energy Storage Technology Cost and Performance Assessment](#)
August 2022



[Pathways to Commercial Liftoff: Long Duration Energy Storage](#)
March 2023



[Achieving the Promise of Low-Cost Long Duration Energy Storage](#)
August 2024

- [Battery Safety and Reliability Methods](#), [Codes](#), [Standards](#)
- [Community Capacity Building and Deployment Assistance](#)
- [Capacity-Building for Regulators](#) (including MI, LA, VT, GU)
- DOE Office of [Electricity Storage Peer Review Archive](#) (2010-2024)

[https://www.energy.gov/energy-storage-grand-challenge/](#)

Engage and Connect with DOE

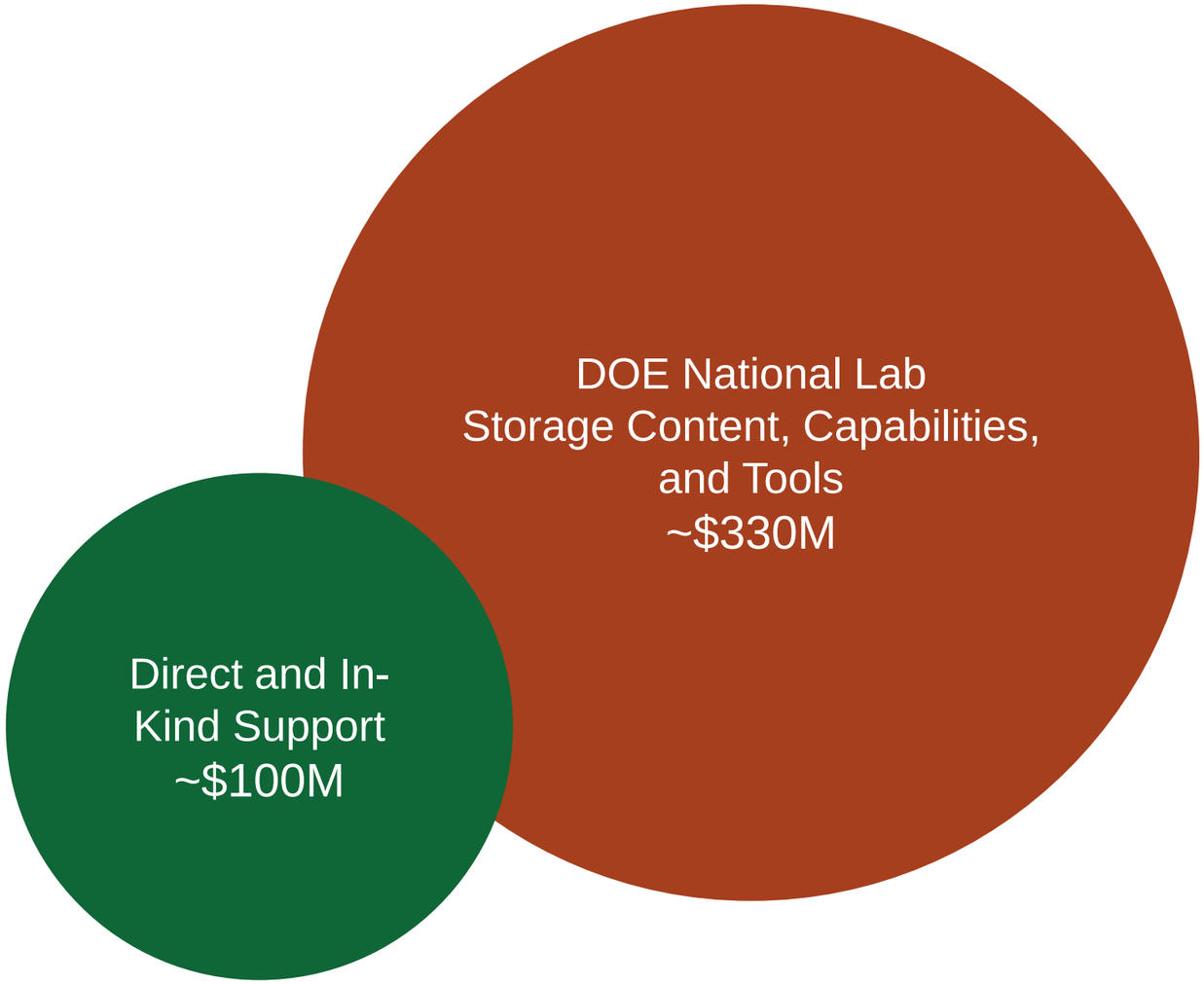
- Outreach takes many forms
  - Informal input at DOE events (e.g., ESGC Summit, OE Peer Review)
  - Feedback for ESGC Roadmap
  - EAC Public Hearing (November, 2024)
  - Targeted listening sessions
  - **Formal Requests for Information (RFIs)**
  - Mini-solicitations (e.g. prizes)
  - LDES Consortium
- https://www.energy.gov/oe/office-electricity
  - News and blogs
  - OE Activities
  - Sign up for OE Updates
  - Sign up for Funding Updates

THE NATIONAL CONSORTIUM FOR THE ADVANCEMENT OF LONG DURATION ENERGY STORAGE TECHNOLOGIES

LinkedIn X Web

OE Storage Investments: FY2020-FY2024

- DOE support is much more than direct financial assistance
- Examining OE's public storage content and expertise can increase your odds of finding your million-dollar* nugget



payback value not guaranteed

Thank you

Icons for Use


BATTERY STORAGE CHARGE


BATTERY STORAGE FULL


BATTERY


BATTERY RENEWABLE


ADVANCED ANALYTICS


COMPONENT


COMMUNICATION


COMMUNICATION


CONTAINER COAL


BATTERY


COMPONENT 2


COMPUTER RESEARCH DATA


ENERGY STORAGE


EXPAND


ENERGY ALERT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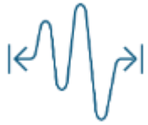
CONTINUOUS


LASER


GRID MANAGE

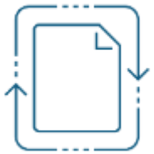

LONG DURATION STORAGE


PEOPLE


PLANT REWNABLE


POWER GRID


POWER PLANT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