

Storage Connections Across DOE

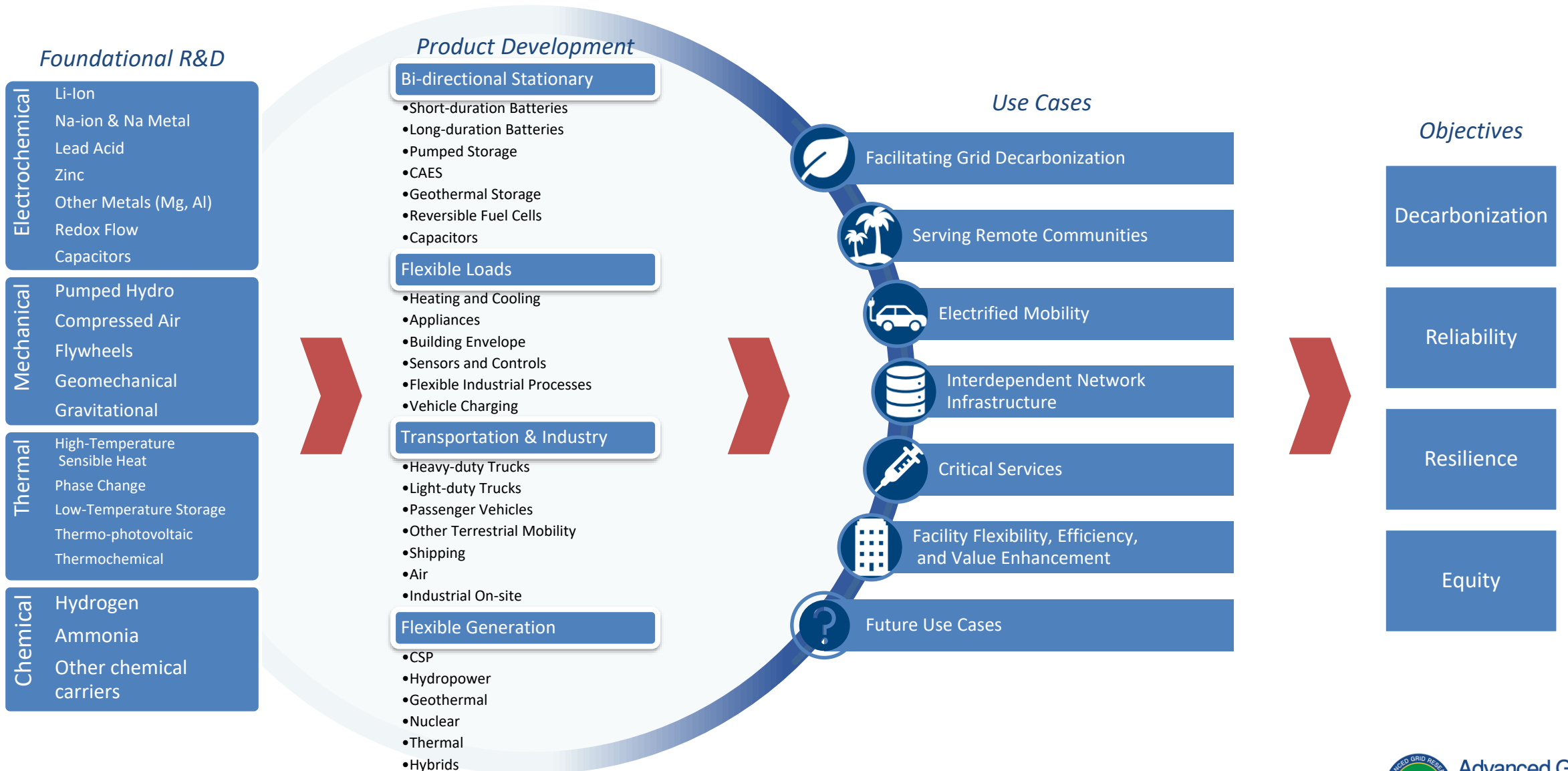
2021 BESAC Meeting

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Director, Grid Components and Systems

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Energy Storage Grand Challenge: Use Case Framework



Use Cases Quantify Diverse Storage Beneficiaries

The Use Cases form a technology neutral framework to ensure that storage technologies can cost effectively meet real needs.

Use Cases incorporated into the Long Duration Storage Earthshot



Facilitating Grid Decarbonization

Ensure grid flexibility and the continued reliability, resilience, and security in a decarbonized electric power system.

\$0.03-\$0.05/kWh Levelized Cost of Storage



Serving Remote Communities

Support communities not connected to the bulk power and may be subject to high energy costs, supply disruption, and disaster events.

\$65/MWh Delivered Energy Cost



Electrified Mobility

Support electrification of the transportation sector by minimizing grid impacts and promoting low-cost, high performance EVs.

\$60/kWh manufactured battery cell cost



Independent Network Infrastructure

Infrastructure that is interdependent with the electric grid and requires reliable electricity delivery to maintain effective operations.

\$77/yr storage capex



Critical Services

Maintain operations in facilities critical to public health/safety during major outage events

\$77/kW-year storage capex

\$1392/kW-year backup generator offset



Facility Flexibility, Efficiency, and Value Enhancement

Optimize energy production and/or usage to optimize value and enable flexible, efficient operations for the facility owner

\$52/kW-yr residential & commercial

\$20-\$52/kW-yr large facilities.



Future Use Cases

LONG DURATION STORAGE SHOT TARGET



Reduce storage costs by
90% from a 2020
Li-ion baseline...



...in storage systems that
deliver **10+**
hours of duration



...in **1** decade

[Video Link: https://www.energy.gov/sites/default/files/2021-10/LD%20Storage%20Shot%20Animation.mp4](https://www.energy.gov/sites/default/files/2021-10/LD%20Storage%20Shot%20Animation.mp4)

Affordable grid storage for clean power – any time, anywhere



U.S. DEPARTMENT OF
ENERGY

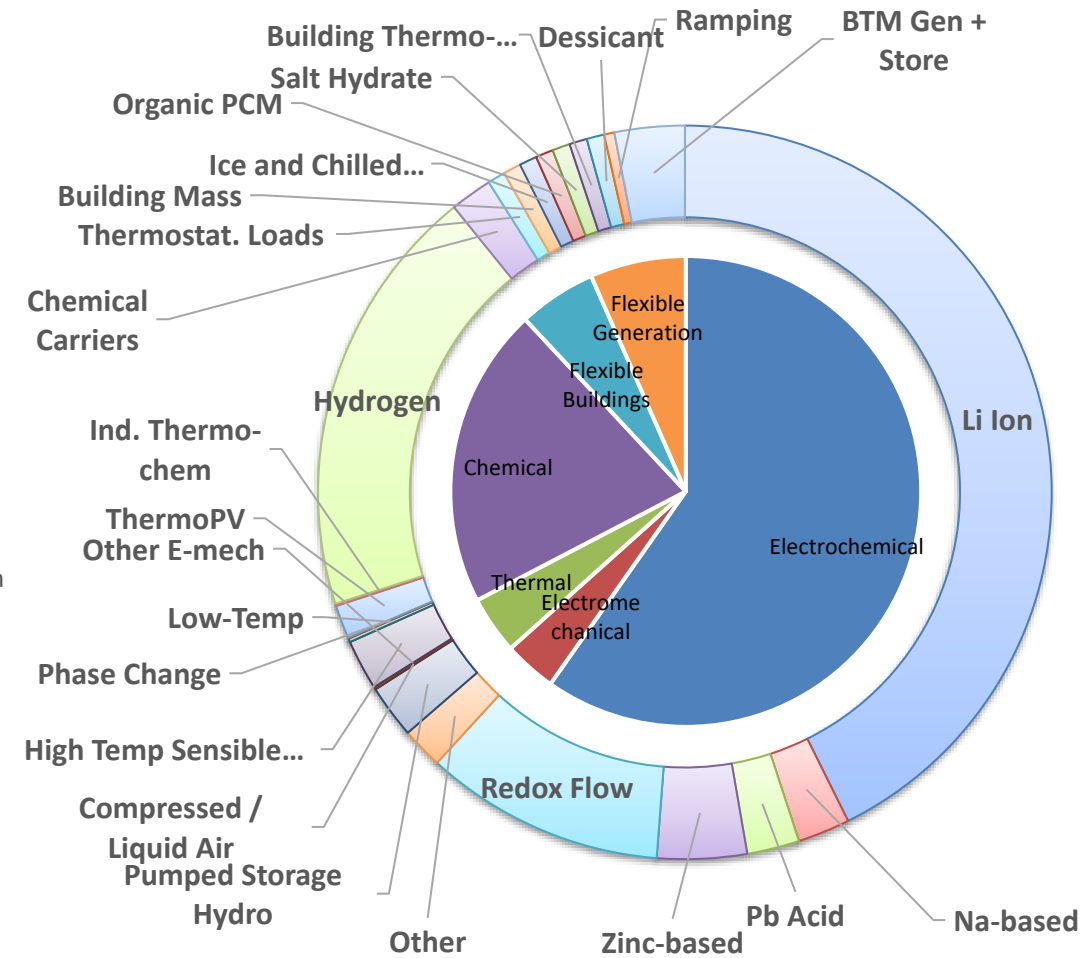
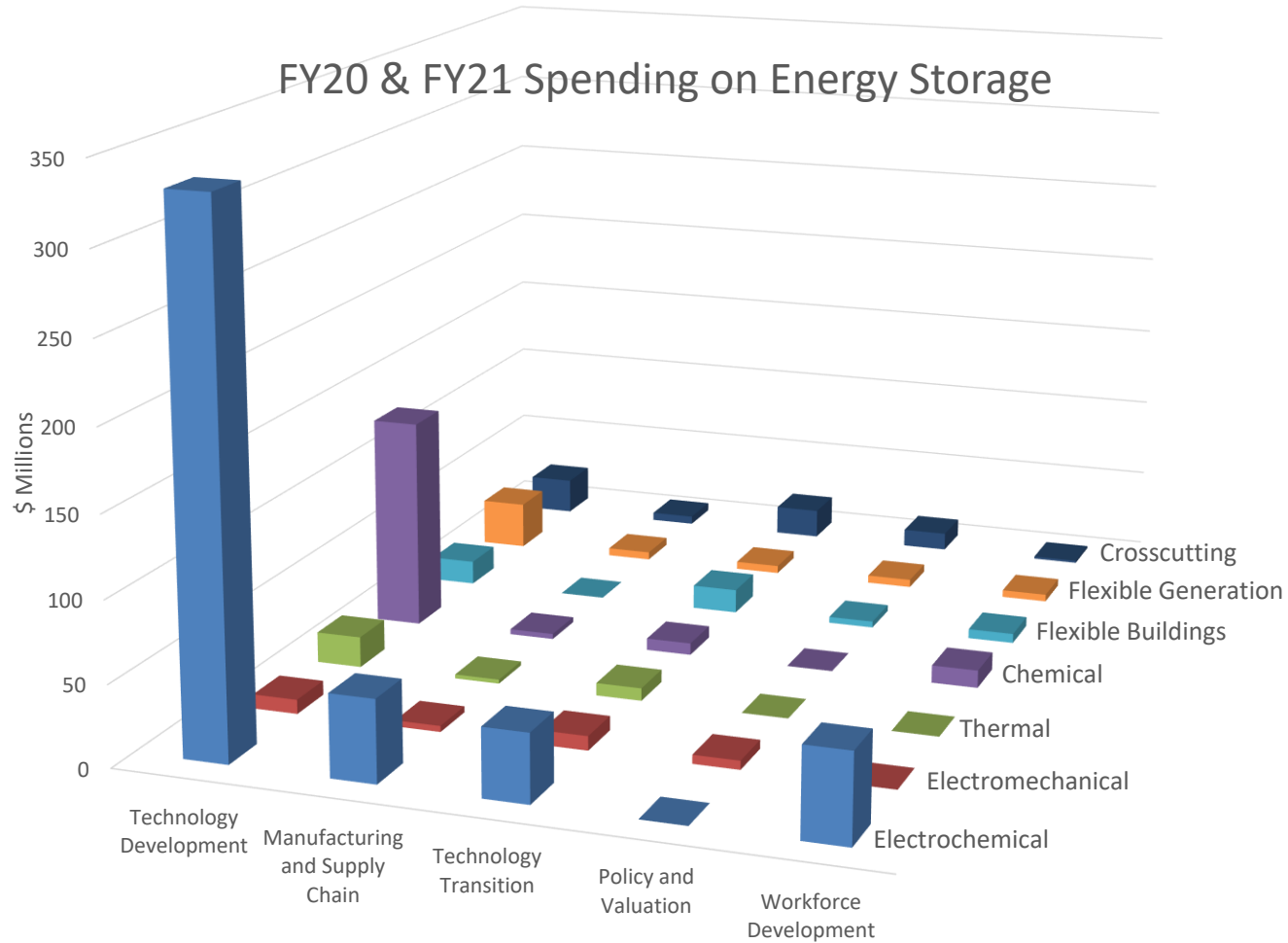
Office of the
**UNDER SECRETARY
FOR SCIENCE AND ENERGY**

Performance Requirements Vary by Storage Use Case

Facilitating an Evolving Grid	●	●	●	●	●	●	●	●	●	○	●	●	●	●
Serving Remote Communities	○	●	●	●	●	○	●	●	○	●	●	●	○	●
Electrified Mobility	●	●	○	○	●	○	●	●	○	●	●	●	●	●
Interdependent Network Infrastructure	●	●	●	○	●	●	●	●	●	○	○	●	●	○
Critical Services	●	●	●	●	●	●	●	●	○	●	●	●	●	●
FFE&EV: Commercial & Residential Buildings	○	●	●	○	●	○	●	●	○	●	●	●	○	●
FFE&EV: Energy Intensive or Generation Facilities	○	●	●	○	●	●	○	●	○	●	●	○	○	○
GOALS	Load Response Short	Load Response Mid	Load Response Long	Black Start Capable	Power Quality	Reliable	Robust	Long Lifetime	Scalable	Compact	Safe	Efficient	Flexible	Modular



DOE Storage Investment by Technology and ESGC Track

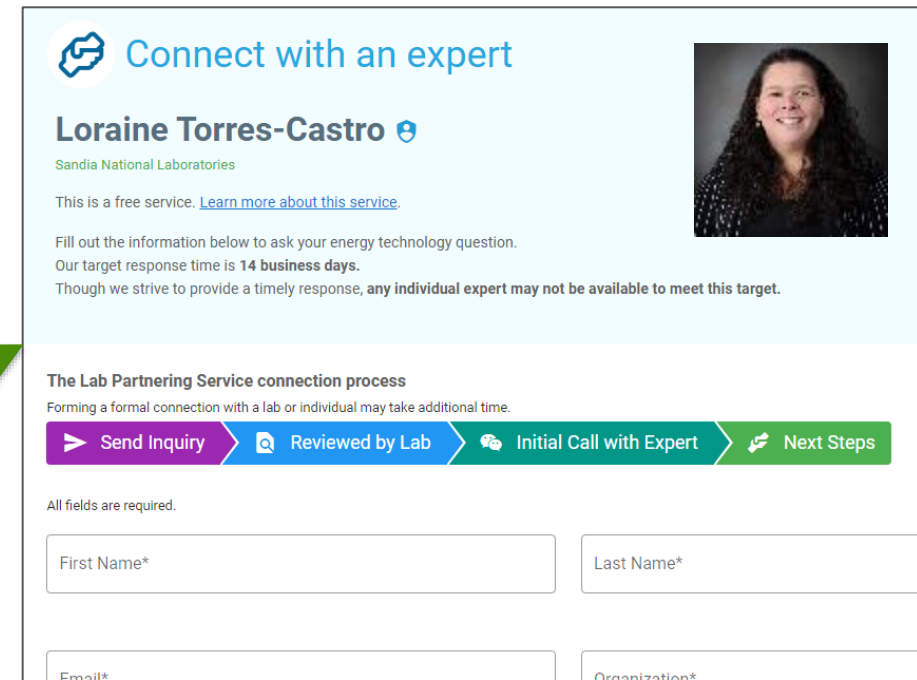
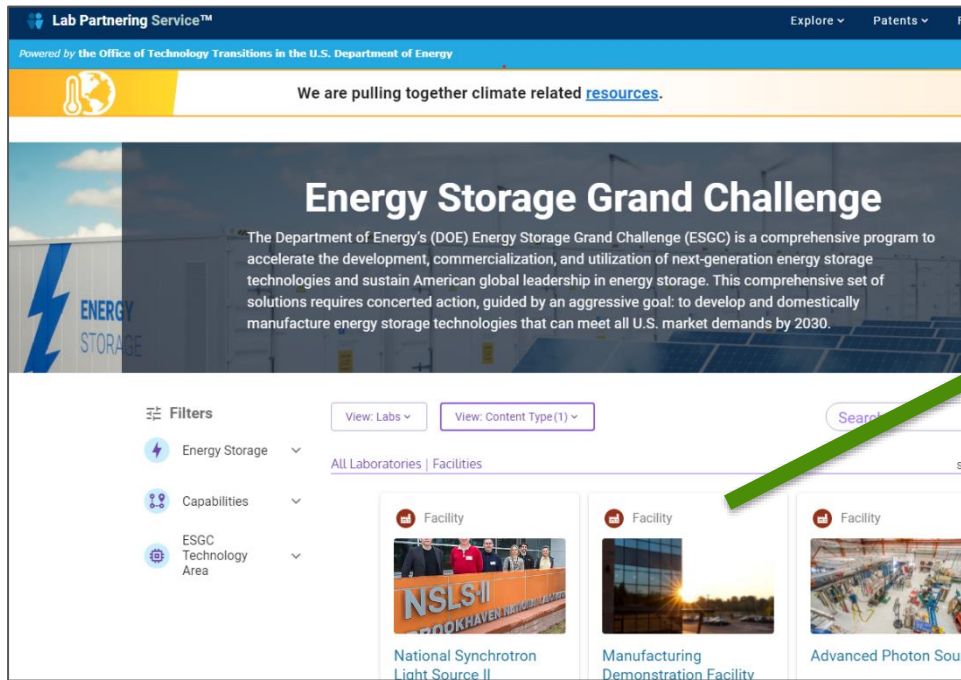


Coordinated Funding Opportunities

Office	Title	Amount	Status
OE	SBIR: Predicting Performance of Power Electronics Technologies; Energy Storage and Power Conversion System For Energy Equity	\$2M**	Open: Letters of Intent Due 1/3/22 Applications Due 2/22/22
EERE, OE, OP, IE, FECM, ED	Local Energy Action Program (Communities LEAP)	\$16M**	Applications Due 12/17/21
OE	https://www.pnnl.gov/projects/energy-storage-social-equity-initiative	\$9M	Closed: Applications Due 12/3/21
EERE: AMO	Structured Electrode Manufacturing for Lithium-ion Batteries	\$3M	Closed: Submissions under review
EERE: AMO & OE	Flow Battery Systems Manufacturing FOA	\$17.9M*	Selections announced 9/23/21
NE & EERE: HFTO	Advance Technologies Integrating Hydrogen and Nuclear Power	\$20M**	Closed: Submissions under review
EERE: VTO	Accelerate Advanced Vehicle Technologies Research (batteries and electrification sub-topic)	\$35M*	Selections announced July 2021
EERE: VTO	SBIR: Electric Drive Vehicle Batteries	~\$2M	Selections announced June 2021
OE	SBIR: Safety Technologies For Grid Scale Energy Storage Systems	\$1.1M	Selections announced July 2021
OTT	Energy Program for Innovation Clusters (EPIC)	\$9M	Selections announced May 2021
EERE: FCTO, AMO	Hydrogen and Fuel Cells R&D 2021 (High Temperature Electrolyzer Manufacturing subtopic)	\$8.3M*	Selections announced July 2021
EERE: BTO & OE	Connected Communities	\$61M**	Selections announced October 2021
EERE: AMO	Critical Materials FOA: Next-Generation Technologies and Field Validation	\$17.7M*	Selections announced 1/20/21
FECM	Energy Storage for Fossil Power Generation	\$7.6M*	Projects awarded in April 2021

Storage Summit: Launch of storage lab partnering portal

- New portal highlights storage capabilities across the national lab complex
- Hundreds of experts, facilities, capabilities
 - Connect directly with labs to accelerate R&D and commercialization
- <http://esgc.labpartnering.org>



Major Energy Storage Developments in 2021

- In July, [Form Energy unveiled its new long-duration iron-air battery](#). A 1MW/150MWh version of the system is scheduled to be deployed by Great River Energy in Minnesota in 2023.
- On 9/4, [battery modules at Vistra Corp's 300 MW Moss Landing facility overheated](#), triggering fire sprinklers and causing the plant to drop offline. Vistra Corp, Fluence, and LG Chem are investigating the incident.
- On 9/10, [The Wall Street Journal](#) reported that big investors “are charging into startups touting experimental new battery technologies that would make it possible for renewable energy sources to produce most of the country’s electricity.” DOE, the article added, has “set a goal of reducing the cost of grid-scale long-duration energy storage by 90% within the decade.”
- On 9/15, [Illinois enacted a 100% clean energy policy](#), committing to 50% renewables by 2040 and 100% carbon-free electricity by 2045. The legislation includes a Coal to Solar and Storage Initiative that will make US\$280.5 million available to energy storage projects installed at the sites of certain retiring coal plants.
- On 10/12, [ESS, which makes giant batteries out of iron, salt and water, started trading on the NYSE](#).

Form Energy received support from DOE through both [JCESR](#) and [ARPA-E](#)

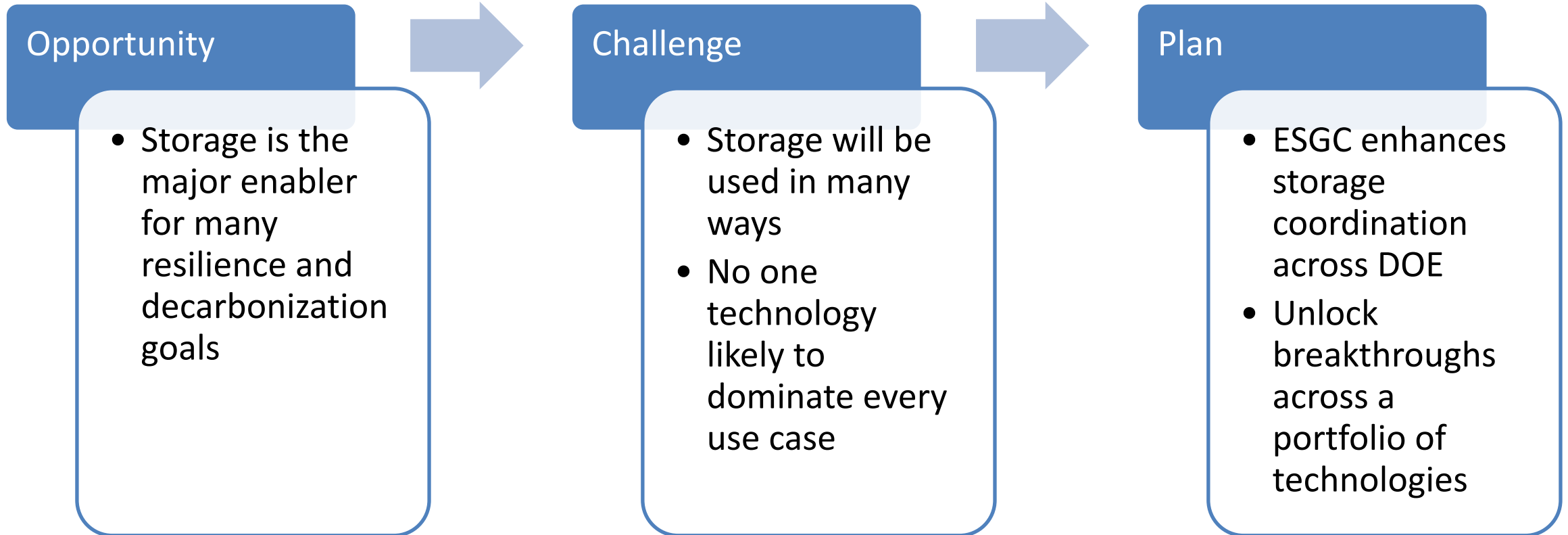
DOE/OE's Storage Safety program provides extensive industry engagement ([domestic](#) and [international](#)) on ESS safety issues.

Imre Gyuk talks to the WSJ's [Future of Everything](#) podcast about the [Long Duration Storage Earthshot](#)

The storage program provides technical and [policy support work](#) to states, including to Illinois and throughout the Midwest region

ESS received early support from DOE through [ARPA-E](#)

The Path Forward



Unified Storage Portal: <https://www.energy.gov/energy-storage-grand-challenge>