Lab Support for Liftoff
Long Duration Energy Storage (LDES)

U.S. DEPARTMENT OF ENERGY

The U.S. Department of Energy's (DOE) 17 National Labs are well-positioned to support technologists, entrepreneurs, startups, and established firms in launching the LDES sector. Two areas where the labs' capabilities are particularly relevant are highlighted in this addendum.

LDES Capabilities

Technology Performance and Cost

DOE labs possess numerous capabilities to support technology performance improvements (e.g., Round-trip Efficiency (RTE)) and cost reductions (e.g., $/kW, Levelized Cost of Storage (LCOS)). This category includes technology testing and design, system-level integration capabilities, and manufacturing testing capabilities to reduce LDES cost and improve performance beyond what is currently commercially available.

Mechanical Storage	Bidirectional Electrical Storage	Chemical & Thermal Storage
Uses mechanical force to convert and store electrical energy (e.g., pumped water, compressed air, spinning flywheels, emerging gravity storage systems).	Absorbs electric energy, stores it, and dispatches it as electricity (e.g., electrochemical storage systems).	Harnesses chemical or thermal energy for conversion to or from electricity (e.g., sensible and latent heat technologies, hydrogen).

Supply Chain Planning and Development

Additionally, DOE labs offer capabilities related to the supply chain formation of LDES to support the expansion of LDES manufacturing and deployment capacity, and workforce development.

Resource Flexibility	Power Electronics
Technologies and systems that enhance the flexibility of production or consumption of resources (e.g., thermostatically controlled loads, ice and chilled water, building mass, and other thermal storage).	The broad set of technologies (e.g., materials, components, subsystems, and systems) necessary for the control and conversion of electricity.

Lab Resources

National Lab expertise, facilities, licensable technologies, and software span a wide range of LDES categories. These include experts who can answer technical questions, facilities that can assist in testing and de-risking technology, and licensable technologies developed with DOE funding that can address a firm's technology challenges. Additionally, open-source and proprietary software options are available to enhance an organization's technology offerings.

	Technology Performance & Cost			Supply Chain Planning & Development	
	Mechanical Storage	Bidirec. Elec.	Chemical & Thermal	Flexible Generation	Power Electronics
Experts		✓	✓	✓	✓
Facilities	9	77	44	32	39
Licensible Technologies	✓	✓	✓	✓	✓
Software	✓	✓	✓	✓	✓

Visit Lab Partnering Service (labpartnering.org) to access these resources and more!

APPENDIX: FACILITIES

Argonne National Laboratory

- Advanced Photon Source
- Argonne Leadership Computing Facility
- Advanced Mobility Technology Laboratory
- Laboratory Computing Resource Center
- Battery Post-Test Facility
- Cell Analysis Modeling & Prototyping Facility
- Center for Energy & Economic Systems Analysis (CEEESA)
- Center for Nanoscale Materials
- Electrochemical Analysis & Diagnostics Laboratory
- Electrochemical Discovery Lab (EDL)
- Heat Transfer Laboratory
- Laboratory Computing Resource Center
- Materials Engineering Research Facility
- ReCell Center
- Smart Energy Plaza (SEP)

Brookhaven National Laboratory

- Center for Functional Nanomaterials
- Center for Mesoscale Transport Properties
- Laboratory for Biomolecular Structure
- National Synchrotron Light Source II
- Northeast Solar Energy Research Center

Idaho National Laboratory

- Battery Test Center
- Dynamic Energy Transport & Integration Laboratory (DETAIL)
- Electric Vehicle Infrastructure Laboratory
- Microgrid Test Bed
- Microreactor Applications Research Validation & Evaluation (MARVEL)

Lawrence Berkeley National Laboratory

- A-Lab
- Energy Conversion Group (ECG)
- Energy Storage Assembly Facility
- Energy Storage Testing Facility
- Facility for Low-Energy Experiment in Buildings (FLEXLAB)
- National Energy Research Scientific Computing Center (NERSC)
- The Materials Project
- Thermal Energy Labs

Lawrence Livermore National Laboratory

- Advanced Manufacturing Laboratory
- Center for National Security Applications of Magnetic Resonance
- Cryo-compressed Hydrogen Facility (CCHF)
- Design Optimization Laboratory
- Dynamic Transmission Electron Microscope (DTEM) Lab
- GEOSX
- Laboratory for Energy Applications for the Future (LEAF)
- Non-Destructive Characterization Laboratory
- Skyfall Test Bed

National Energy Technology Laboratory

- Advanced Alloy Signature Center (AASC)
- Carbon Materials Manufacturing Facility (CaMMF)
- Hybrid Performance Lab
- Magnetohydrodynamic Lab
- Reaction Analysis & Chemical Transformation (ReACT) Facility
- Solid Oxide Fuel Cell Experimental Laboratory

National Renewable Energy Laboratory

- Battery Thermal Characterization Laboratory
- Behind the Meter Storage Lab
- Cell Fabrication & Breakdown Laboratory
- Energy Systems Integration Facility
- Nanogrid Laboratory
- Thermal Energy Storage Materials & Processes Lab

Oak Ridge National Laboratory

- Battery Manufacturing Facility (BMF)
- Building Technologies Research & Integration Center
- Carbon Fiber Technology Facility
- Center for Nanophase Materials Sciences (CNMS)
- Grid Research Integration & Deployment Center
- High Flux Isotope Reactor
- High Temperature Materials Laboratory (HTML)
- Manufacturing Demonstration Facility
- Nanofabrication Research Laboratory
- Nation Transportation Research Center (NTRC)
- Building Technologies Research & Integration Center
- Oak Ridge Leadership Computing Facility
- Powerline Conductor Accelerated Test Facility
- Spallation Neutron Source (SNS)

Pacific Northwest National Laboratory

- Advanced Battery Facility (ABF)
- Advanced Building Controls Laboratory
- Bioproducts & Engineering Laboratory (BSEL)
- Building Operations Control Center
- Center for Hydrogen Safety
- Clean Energy & Transactive Campus
- Electricity Infrastructure Operations Center EIOC
- Environmental Molecular Sciences Laboratory (EMSL)
- GridLAB-D
- Grid Storage Launchpad
- Lab Homes
- Redox Flow Prototyping Laboratory
- Reliability Test Laboratory
- VOLTTRON

Sandia National Laboratories

- Advanced Dielectric Laboratories (ADL)
- Advanced Materials Laboratory
- Advanced Power Electronic Conversion Systems Laboratory
- Advanced Power Sources Laboratory
- Battery Abuse Testing Laboratory
- Battery Energy Storage Test Laboratory
- Battery Test Facility
- Center for Integrated Nanotechnologies
- Combustion Research Facility
- Control & Optimization of Networked Energy Technologies Lab
- Distributed Energy Technologies Laboratory
- Energy Storage Controls & Analytics Laboratory (ESCAL)
- Energy Storage Test Pad & Energy Storage Analysis Lab
- Geomechanics Laboratory
- Grid Storage Management & Security (GSMS) Laboratory
- Hydrogen Effects on Materials Laboratory
- Hydrogen Transport & Trapping Laboratory
- Integrated Materials Research Laboratory (IMRL)
- MESAFab Complex
- Micro & Nano Technology Laboratory (MaNTL)
- Microsystems & Engineering Science Applications
- National Solar Thermal Test Facility
- Secure Scalable Microgrid Testbed
- Thermal Test Complex

Stanford Linear Accelerator Center

- Cryo-EM (Cryogenic Electron Microscopy)
- Grid Integration Systems & Mobility (GISMo)
- Linac Coherent Light Source (LCLS)
- Stanford Synchrotron Radiation Light Source SSRL
- SUNCAT Center for Interface Science & Catalysis

The Grid Storage Launchpad (GSL) is a $75 million national grid energy storage research and development (R&D) facility on the Pacific Northwest National Laboratory (PNNL)-Richland campus (located in Richland, Washington). The GSL will accelerate development of next-generation grid energy storage technologies that are safer, more cost effective, and more durable. This will be achieved through standardized testing and validation of technologies from basic materials to 100 kW-scale battery systems for grid and transportation applications. In addition to grid-scale energy storage, researchers at GSL can also develop, test, and scale smaller protype batteries, such as coin cells, pouch batteries, and prism batteries to improve understanding of battery performance and provide commercial-scale insights.

Visit pnnl.gov/grid-storage-launchpad-pnnl to learn more.

LDES NATIONAL CONSORTIUM

The LDES National Consortium is a lab-led forum that brings together stakeholders from National Laboratories, industry, and community groups to develop and implement strategies and activities to accelerate the commercialization and scale-up of LDES technologies.

Visit ldesconsortium.sandia.gov to learn more.

Argonne NATIONAL LABORATORY
Brookhaven National Laboratory
INL Idaho National Laboratory
BERKELEY LAB
Lawrence Livermore National Laboratory
NETL NATIONAL ENERGY TECHNOLOGY LABORATORY
NREL NATIONAL RENEWABLE ENERGY LABORATORY
OAK RIDGE National Laboratory
Pacific Northwest NATIONAL LABORATORY
Sandia National Laboratories
SLAC NATIONAL ACCELERATOR LABORATORY