"We're looking at the next generation of energy storage. It only takes one new material to catalyze a whole new family of battery technologies."

Nancy Dudney,
Physical Chemistry Scientist

Batteries and Beyond

Energy storage technologies are critical to enhancing the nation's power grid capabilities, advancing the electrification of vehicles, and guaranteeing a secure, reliable electrified future for a prosperous economy. Oak Ridge National Laboratory (ORNL) translates scientific discoveries into early-stage technologies and works closely with industry to develop energy storage solutions that boost energy efficiency, increase energy security, and create economic opportunity. Capabilities span from world-leading high-performance computing to materials discovery, scaling, prototyping, manufacturing, multiscale evaluation, battery recycling, and integration of energy storage systems.

Advancing Energy Storage Solutions

Megawatt-scale storage for the grid—Creating systems that can store large amounts of electricity to stabilize the power grid.

Fast-charging for electric vehicles—Developing new battery technologies and wireless charging that can power a vehicle as quickly as fueling up at the pump.

Roll-to-roll manufacturing—Boosting America's competitiveness through new production processes and technologies.

Cobalt-free cathodes—Demonstrating the effectiveness of new materials to enable high-performance Li-ion batteries without cobalt.

Beyond batteries—Novel approaches ranging from transactive controls to geothermal energy storage to technology that stores electricity in pressure vessels.

DOE Battery Manufacturing Facility at ORNL

PROTOTYPING
new technologies

INTEGRATING
energy storage systems

IMPROVING
battery safety and performance

DEVELOPING
storage solutions for vehicles and grid

EVALUATING
materials from nanoscale to pilot scale

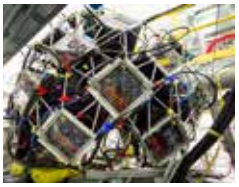
Comprehensive Capabilities

Rapid prototyping

The DOE Battery Manufacturing Facility at ORNL is the nation's most comprehensive roll-to-roll research facility, capable of prototyping new materials and processes with scalable results.

Materials synthesis and characterization

Deep expertise in synthesis and evaluation of new materials, including polymers, electrolytes, and the study of material interfaces.

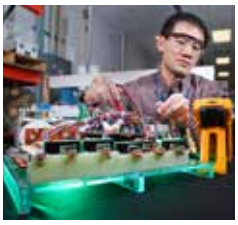


Neutron science

Two of the world's most powerful sources of neutrons for research, providing a nondestructive view inside energy storage devices.

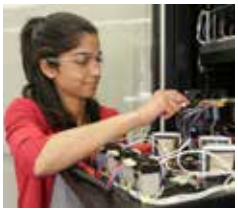
High-performance computing

World's fastest supercomputer for open science, using artificial intelligence to accelerate research and development.



Power electronics and controls

Development of new controls, devices, and systems, including transactive controls and wireless charging technologies.



Grid monitoring and analysis

Dynamic modeling of interconnections, cyber-aware advanced sensors, and secure communications and controls.

Recent Impacts

- New method creates electrolytes that solidify on impact, preventing batteries from catching fire.
- Open access Virtual Integrated Battery Environment platform simulates battery performance from cells to packs.
- Fast formation protocol shortens battery production step by six times and improves capacity retention.
- Novel components advance low-cost, redox flow battery for megawatt-scale energy storage.
- Electron beam instantly adheres cathode coatings for Li-ion batteries without solvents.
- New system, GLIDES, provides low-cost, efficient, flexible way to store electricity mechanically in pressurized vessels.

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