

Grid Research Integration and Deployment Center

Integrated Electrification
Research





Advancing the Integrated, Modern Grid

The Grid Research Integration and Deployment Center (GRID-C) at Oak Ridge National Laboratory combines multiple electrification research activities across the utility, buildings, and vehicle space into one 52,000 sq. ft. facility. The combination of innovative research and development in power and energy systems, vehicle and buildings science, power electronics, energy storage, sensors and controls, data science and modeling, and cybersecurity enables breakthroughs to support a resilient and secure power grid from the first instant of electricity generation to end use.

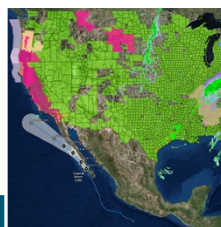
ORNL's mission at GRID-C is to develop technological solutions to advance the dynamic and efficient interaction of the electric delivery system, buildings, and vehicles.

The unique, multipurpose research environment at GRID-C is available to industry, academic, and government partners who wish to access its state-of-the-art capabilities and world-class expertise to mutually develop innovative technologies for grid security, resilience, and reliability.



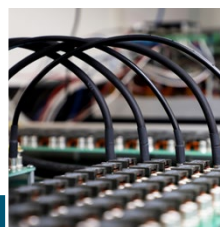
Sensors and Data Analytics

Monitoring of grid assets, including low-cost, high-fidelity sensors; private communications network architecture and technology; and data analytics using machine learning algorithms.



Modeling and Simulation

Developing large-scale grid models to study contingencies and solutions. Digital twin live simulation of the grid fed by real-time data to automatically detect anomalies and support resilience.



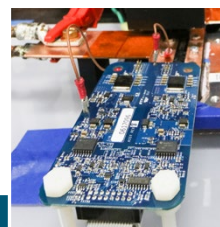
Microgrids and Energy Storage

Researching microgrid controls and battery-based energy storage systems, including solid state and redox flow batteries and secondary vehicle battery systems for low-cost, efficient storage. Developing battery materials and manufacturing processes.



Power Electronics and Advanced Devices

Developing high-efficiency, high-power-density, low-cost power electronics to ease the integration of renewables, energy storage, and smart devices into the bulk system.



Buildings- and Vehicles-to-Grid

Creating transactive systems to harness consumer energy loads for grid stability. Fifty-node neighborhood emulation to test energy management systems. High-power charging hardware and grid interface controls. Unique test bed for fast, in-motion wireless vehicle charging.



Cyber and Cyber-Physical Systems

Developing solutions for protection of grid assets. Threat monitoring and defense using hardware and software innovations, including adoption of trusted IoT devices. Unique low-voltage, software-defined cybersecurity test beds fed by real-time data.

Grid Operations Analytics Laboratory

Cyber-physical security, sensors, modeling, and data analytics test bed simulating a control room operation.

DarkNet

Secure, resilient communications architecture for the grid.

Grid Monitoring and Advanced Controls

Cyber-physical grid protection and controls; sensors R&D platform.

Grid Systems Integration

Microgrid/distributed energy resources, and energy storage research.

Second Floor

First Floor

Battery Manufacturing Facility

Open-access DOE lab featuring materials synthesis, scale-up, roll-to-roll manufacturing, and prototyping vehicle and grid-level battery systems.

Roll-to-roll Manufacturing

Buildings-to-Grid

Home and neighborhood emulation, transactive controls, and grid integration test beds.

Extreme-fast Charging

Extreme-fast wireless vehicle charging ecosystem and grid integration test bed.

Distribution Grid

Distributed energy resources and energy storage.

Transmission Grid

High- to low-voltage test beds for low-cost, trusted transmission and distribution power electronics, transformers, protective relays, and more.


Working with ORNL

More than 100 industry partners and 17 universities annually work with ORNL to advance and commercialize power grid technologies. Industry and academic partners can leverage ORNL's world-class grid research, development, and testing capabilities through user agreements and collaborations approved by DOE. For more information on how to work with ORNL, visit www.ornl.gov/partnerships.



DOE's GRID-C

The Grid Research Integration and Deployment Center at ORNL combines electrification research activities across the utility, vehicles, and buildings areas into one 52,000 sq. ft. facility. This multidisciplinary environment enables the most impactful innovation across the electric ecosystem.



For more information, contact

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