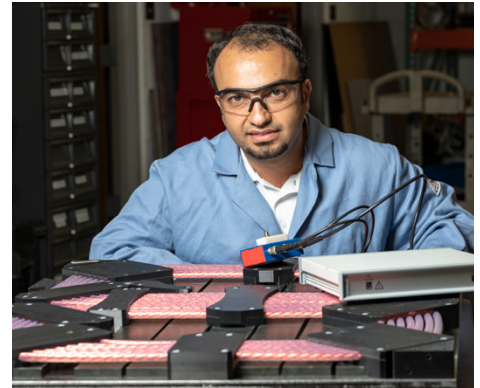




Energy Science and Technology



The Energy Science and Technology Directorate (ESTD) plays a pivotal role in America's transition to a clean, efficient, flexible, and secure energy future. Our researchers deliver breakthroughs in energy from generation to distribution and storage to end use in support of Department of Energy missions. ESTD offers a unique culture of entrepreneurship for translating science into solutions for the most critical problems facing society at the nexus of energy and security.

Our scientists and engineers work with many of America's best innovators and businesses to research, develop, and deploy cutting-edge technologies and to break down market barriers in sustainable transportation, smart power systems, and energy efficiency for homes, buildings, and manufacturing. Accelerating the clean energy technology development to deployment cycle will help provide affordable and reliable energy to support a thriving economy.

We bring a multidisciplinary focus to increase understanding of integrated and complex systems and to resolve some of the biggest challenges in energy. We are developing new materials for automobiles, buildings, and wind turbines, innovating manufacturing processes to drive U.S. economic competitiveness, and devising controls for a secure and resilient power grid.

338

Scientists and engineers

3

Research divisions

\$305 million

FY 2020 revenue

4

National user facilities

3

Governor's chairs



"By utilizing DOE's national user facilities and our scientific expertise, we're building a portfolio of world class applied energy research and technology and leading transformational scientific breakthroughs in clean energy."

Xin Sun, Interim Associate Laboratory Director

Our Research

Buildings and Transportation Science—Delivers scientific discoveries to accelerate transformative buildings- and transportation-related technical solutions to ensure a safe, secure, and sustainable energy future.

- **Propulsion Science** - Drives development of combustion, electric, and hybridized propulsion systems to enable a low carbon transportation future.
- **Vehicle and Mobility Systems Research** - Accelerates development of advanced vehicles and mobility systems through autonomous vehicles, systems integration, and decision science.
- **Building Technologies Research** - Develops and integrates advanced building equipment and dynamic envelope materials to enable affordable, efficient, and resilient buildings.

Manufacturing Science—Develops advanced manufacturing technologies through research and scale up of processes and technical capabilities enabling new materials, systems, and products.

- **Energy Efficient Manufacturing Science** - Scale up of fiber and composite processing technologies for fabrication of functional components in energy applications.
- **Precision Manufacturing and Machining** - Designs and implements next generation manufacturing systems through integration of robotics, automation, controls, and machine tools.
- **Secure and Digital Manufacturing** - Develops a digital manufacturing platform and cyber-secure ecosystem by integrating manufacturing systems enabled by data analytics, process control, and secure communications.

Electrification and Energy Infrastructure—Generates innovative capabilities for electric energy devices and systems to improve reliability, sustainability, and efficiencies of energy storage systems, electric grid protections and controls, and power electronics.

- **Electrification** - Develops innovative energy storage technology solutions and charging infrastructures at scale for transportation and grid.
- **Energy Systems Integration and Controls** - Advances energy systems integration and controls to improve the efficiency and resiliency of systems-of-systems architectures.
- **Energy Sensing, Analytics and Communications** - Creates sensing and communications solutions through advanced sensors, computational sensing, and analytics.
- **GRID Research Integration and Deployment Center** - Develops solutions to advance dynamic and efficient interaction of a secure, resilient electric delivery system, buildings, and vehicles.

By the numbers
2015–2020

1,486 journal publications

625 invention disclosures

190 patent applications

185 issued patents

50 patent licenses

123 cooperative research and development agreements

92 strategic partnership projects

National User Facilities



The **Building Technologies Research and Integration Center** develops breakthroughs to improve the energy efficiency and environmental compatibility of residential and commercial buildings, focusing on building envelopes, equipment, building systems integration, energy storage and building-to-grid interactions, sensors, transactive controls, and data and model-based analyses and simulations.



The **Carbon Fiber Technology Facility** provides a platform for evaluating new processing technologies and identifying high-potential, low-cost raw materials including textile, lignin, polymer, and hydrocarbon-based precursors. With the CFTF capabilities, ORNL is developing low-cost carbon fiber materials with desired structural properties and co-optimizing feedstocks and processing conditions.



The **Manufacturing Demonstration Facility** houses integrated capabilities that drive the development of new materials, software, and systems for various advanced manufacturing technologies. The MDF leverages a range of equipment and expertise designed to deliver results that generate energy efficiency improvements in the manufacturing sector, efficiently use domestic energy resources, and support the secure production of clean energy products.



The **National Transportation Research Center** helps industry, academia, and other agencies accelerate the development and deployment of efficient and secure transportation technologies. Research focuses on electrification, efficiency of combustion and emissions, connected and autonomous vehicles, materials, data and decision science for future transportation systems.

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