# Energy and Transportation Science

The Energy and Transportation Science Division at Oak Ridge National Laboratory is the largest division within the Energy and Environmental Sciences Directorate dedicated to energy efficiency. ETSD is focused on developing and deploying technology for energy independence and environmental sustainability.

Encompassing multiple scientific research areas and facilities, ETSD's research and development spans a wide variety of missions, broadly directed in the areas of building technologies, sustainable transportation, and advanced manufacturing.

Three Department of Energy national user facilities within ETSD—the Manufacturing Demonstration Facility, the Building Technologies and Research Integration Center, and the Carbon Fiber Technology Facility—focus on energy efficiency to deliver innovative solutions for applications in advanced manufacturing, energy-saving homes and buildings, sustainable transportation, and low-cost carbon fiber.

## Translating Science into Solutions

**Applied catalysis and emissions**—Develops emissions control catalysts and strategies to enable near-zero emissions from high efficiency powertrains, advanced combustion engines, and alternative fuels

**Building envelope and urban systems**—Conducts cutting-edge research on the development and integration of new materials for roofs, walls and window systems; energy modeling and optimization tools; and systems integration for buildings and communities

**Building equipment**—Develops and deploys some of the most energy-efficient building equipment technologies on the market today with research focusing on improving the energy efficiency of heating, cooling, water heating, and refrigeration

**Building integration and controls**—Develops novel control strategies for smart homes and a neighborhood-level microgrid including solar photovoltaic, battery storage systems, and natural gas–fired power generation with integrated research involving modeling, sensing, controls, grid communications, and optimization

**822** Journal publications*

**351** Invention disclosures*

**80** Patent applications*

**55** Issued patents*

*past 5 years

"There is enthusiasm for science and new ideas here. This division serves as a bridge to other lab organizations and will continue to grow by strengthening our capabilities."

**Xin Sun,** ***Director, Energy and Transportation Science Division***

OAK RIDGE National Laboratory

U.S. DEPARTMENT OF ENERGY

**82**
Cooperative research and development agreements*

**210**
Staff

**51**
Strategic Partnership Projects*

*past 5 years

**Chemical process science**—Enables scale-up of clean energy solutions in bioenergy, fossil energy, carbon dioxide capture and utilization, and chemical manufacturing through catalyst innovations, separations, process intensification, and multi-scale modeling

**Energy efficiency research and analysis**—Maximizes the energy performance of buildings and industrial processes by accelerating technologies adoption in residential, commercial, and industrial sectors through applications research, and technical assistance

**Fuels and engines**—Conducts research on innovative internal combustion engine, fuel, and lubricant technologies working closely with emissions and catalysis research to ensure comprehensive solutions in addressing the challenges of the transportation industry

**Machining and machine tool**—Develops technologies to include subtractive manufacturing capabilities in existing additive machines to enable integrated net-shape advanced manufacturing systems

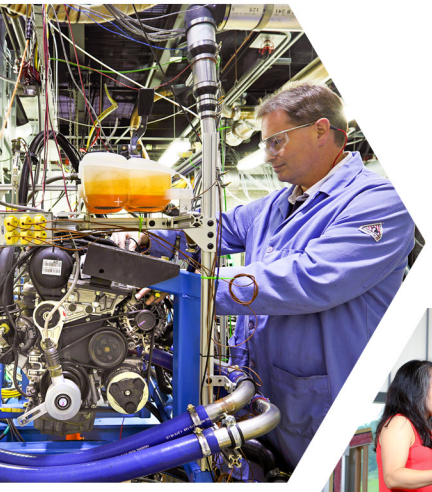
**Manufacturing science**—Develops a suite of modeling and experimental capabilities that link to manufacturing processes within the primary focus areas of metallic materials and polymer matrix composites

**Manufacturing systems**—Collaborates with equipment manufacturers to advance state-of-the-art systems and revolutionize the way products are designed and built using additive manufacturing technology

**Roll-to-roll manufacturing**—Develops new materials and technologies to advance energy storage solutions, focusing on cobalt-free batteries, solid-state batteries, lithium-ion battery recycling and roll-to-roll processes

**Transportation analytics and decision sciences**—Addresses the future challenges of transportation demand using the historical performance of the transportation system and multiple metrics to predict future performance under various scenarios and to search for optimal pathways to sustainable futures

**Vehicle systems**—Conducts virtual and advanced hardware-in-the-loop research to accelerate development of transportation technologies from component-level to full traffic network including electrification and connected and automated vehicles

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