

Energy and Environmental Sciences



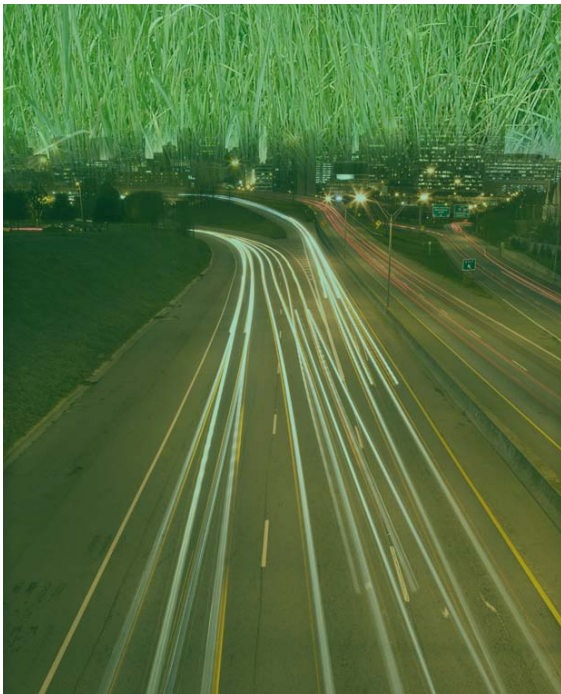
relating to the most fundamental needs of modern societies and economies – energy, and environmental improvement and sustainability.

The Directorate is organized into several divisions and programs. **Divisions** are discipline-focused organizations that provide the resources – staff, facilities, and supporting management – needed to accomplish research and development. **Programs** are mission-focused organizations that coordinate multidisciplinary projects, drawing resources from across Laboratory divisions.

The **Biosciences Division** overall objective is to advance science and technology to better understand complex biological systems and their relationship with human health and the environment. We have significant expertise in bioenergy production, computational biology, biophysics, microbial genomics, structural biology, and plant biology.

The **Energy and Transportation Science Division** develops and deploys knowledge and technology that support the transformation of energy systems to enable America's energy independence and security, global economic leadership, and environmental sustainability. Our challenge to reduce the nation's energy use and transition to alternative energy sources, while supporting continued prosperity and mitigating environmental consequences, is particularly urgent due to the rapid growth in the economies and increased demand for resources from some of the world's largest developing nations.

The **Environmental Sciences Division** conducts research, develops technology, and performs analyses to understand and assess responses of environmental systems at the environment-human interface and the consequences of alternative energy and environmental strategies. We seek to



Oak Ridge National Laboratory's Energy and Environmental Sciences (EES) Directorate conducts the translation of basic science to applied research and development that directly contributes to national goals of increasing energy production, improving energy transmission, reducing energy consumption, and understanding consequences of energy consumption to the environment.

Directorate researchers are solving big and difficult problems. What are the consequences of climate change? How can we stabilize carbon dioxide? How will we power U.S. and world economies in a carbon-constrained world? What sort of energy distribution will we need? Our scientists and engineers work together to address these and other concerns



understand how natural and anthropogenic factors (e.g., global and regional change, environmental stress, energy production and use) interact to influence environmental systems and society. By integrating field and laboratory methods with new theory, modeling, data systems, policy analysis, and evaluation, we are creating solutions to complex environmental challenges.

The ***Measurement Science and Systems Engineering Division*** performs applied research and development in nationally important areas of energy and security. Our mission is to provide pathways for the translation of basic science to engineering applications. This is accomplished through the creation and realization of foundational capabilities and technologies in electronics, sensors, signals processing, and integrated systems.

The ***Energy Efficiency and Electricity Technologies Program*** develops sustainable energy technologies to expand energy resource options, develop next generation electric delivery technologies, and improve efficiency in energy production and use. Research focus areas include distributed energy, industrial energy efficiency, buildings and building equipment, advanced grid component research and grid modeling, and renewable energy resources including hydrogen, solar energy, biomass, and hydropower.

The ***Energy Materials Program*** conducts manufacturing and materials research offering affordable, rapid, adaptable, energy efficient manufacturing solutions focused on improving the energy efficiency of the nation's industries and supporting development of new products. Our focus areas include additive manufacturing, advanced materials processing and characterization, magnetic fields, pulse thermal processing, energy storage and

production, robotics and carbon fiber technology. From concept to commercialization, ORNL's facilities and expertise enable the deployment of innovative manufacturing and materials technologies, and the laboratory's aggressive commercialization program provides technology-based solutions to industries engaged in virtually every sector of the nation's economy.

The ***Sustainable Transportation Program*** draws upon ORNL's multidisciplinary capabilities to conduct research toward a central mission to reduce mobility-related energy consumption, displace petroleum use with sustainable options, and mitigate greenhouse gas emissions from mobile sources. The varying scale and complexity of transportation modes and applications drives a need for the *integrated, co-development* of more efficient vehicles, renewable fuels, and intelligent systems for efficient operations. Our focus areas include materials for lighter vehicles, advanced engines and emission controls, fuels, vehicle electrification technologies, and modeling that provides knowledge (grounded in science) to inform decision-makers. To find solutions, we employ ORNL's portfolio of specialized facilities and capabilities, from advanced vehicle technology and materials laboratories to supercomputing, neutron science, and biological research assets. Through active government-industry collaborations, such as FreedomCar & Fuel Partnership and 21st Century Truck Partnership, we are helping bring to life the innovations manufacturers need to build the vehicles America wants and needs.

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