



U.S. DEPARTMENT OF
ENERGY

Energy Efficiency &
Renewable Energy



Sustainable energy for a cleaner environment, stronger economy, and more secure future.

Oak Ridge National Laboratory is the U.S. Department of Energy's largest science and energy laboratory. With 4,400 employees and 3,900 research guests annually, the lab has six major mission roles: neutron science, energy, high-performance computing, systems biology, materials science at the nanoscale, and national security.

ORNL delivers key support to DOE's Office of Energy Efficiency and Renewable Energy (EERE) programs through three broad areas of research and development – sustainable mobility, sustainable manufacturing, and sustainable electricity. These three also support the efforts of other DOE offices and government agencies.

Sustainable Electricity

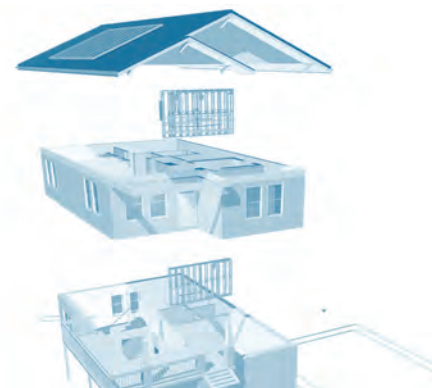
Sustainable electricity is aligned under ORNL's Energy Efficiency and Electricity Technologies Program. This program addresses challenges in renewable generation, electricity distribution and end-use in buildings to ensure our nation's energy security through cost effective solutions while mitigating and reducing environmental impacts.

Sustainable Manufacturing

Sustainable manufacturing is aligned under ORNL's Office of Energy Materials, which partners with industry to develop and implement real world energy solutions. Sustainable manufacturing draws on the laboratory's world class leadership in materials science RD&D to develop and implement the materials, processing, devices, and implementation strategies needed to increase industrial energy efficiency.

Sustainable Mobility

Sustainable mobility research and development helps bridge basic science with technology maturation and application. Efforts address issues related to the vehicle and fuel, the mobility of passengers and freight, and the country's transportation infrastructure, with more than half supporting EERE programs.



ORNL EERE Research Programs

ORNL R&D for the **Vehicle Technologies Program** conducts significant research concerning fuels, engines, and emissions; energy storage; advanced structural and propulsion system materials; power electronics and electric motors; and policy analysis. Through active partnerships with industry, ORNL is helping bring to life the innovations manufacturers need to build vehicles Americans need and want.



ORNL supports EERE's **Biomass Program** by working with industry, academia, and national labs on a balanced portfolio of research in biomass feedstocks and conversion technologies. Through research, development, and demonstration efforts geared toward the development of integrated biorefineries, it is helping transform the nation's renewable and abundant biomass resources into cost competitive, high performance biofuels, bioproducts, and biopower.



Supporting EERE's **Fuel Cell Technologies Program**, ORNL is helping deliver technology breakthroughs that will enable the widespread use of hydrogen as an energy carrier. ORNL is active in developing materials, components, and processes for fuel cell systems, materials for hydrogen delivery, new methods for hydrogen production, novel technologies for hydrogen storage, evaluation of education needs, and R&D efforts for modeling the transition to a hydrogen economy.



ORNL's research in the **Building Technologies Program (BTP)** supports the DOE goals of achieving zero energy homes by 2020 and zero energy buildings of all kinds by 2025. Net-zero energy implies buildings that annually produce as much energy as they consume.

The goals are achieved if components and integration techniques are commercially available at affordable prices by the target years so zero energy is feasible for the private sector to implement.



The **Federal Energy Management Program (FEMP)** facilitates the Federal Government's implementation of sound, cost-effective energy management and investment practices to enhance the nation's energy security and environmental stewardship. FEMP relies on ORNL to support FEMP's activities in the areas of financed energy projects, quality assurance for energy savings performance contracts, energy-efficient technology evaluations, industrial facility energy assessments, technical guidance and assistance, training, and utility partnerships.

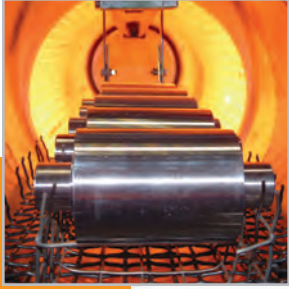


Sustainable Mobility
\$63.8M

ORNL FY09 EERE Funding \$109.4M

Basic
Research

Translational
R&D



The ORNL **Industrial Technologies Program** partners with Industry to develop and implement real world energy solutions. Our mission is to improve our nation's energy security, climate, environment, and economic competitiveness by transforming the way U.S. industry uses energy. We are leaders in nanomanufacturing, energy efficient processes, combined heat and power, and in advanced materials and processing for energy efficiency, energy storage and renewable energy systems. ORNL also works directly with industry in best practices for energy management through Save Energy Now.



The **Solar Technologies Program** at ORNL is focused on conducting research, development, and deployment for the Department of Energy in collaboration with private industry, universities, utilities, and state and regional organizations. ORNL expertise includes photovoltaic material synthesis, characterization, and processing, as well as solar tracking devices, sensors and controls, electronics, and systems integration. The program has developed various collaborative research relationships including cost-share commitments with industry and utilities such as General Atomics, Ascent Solar, Novacentrix, Wal-Mart, and the Tennessee Valley Authority.



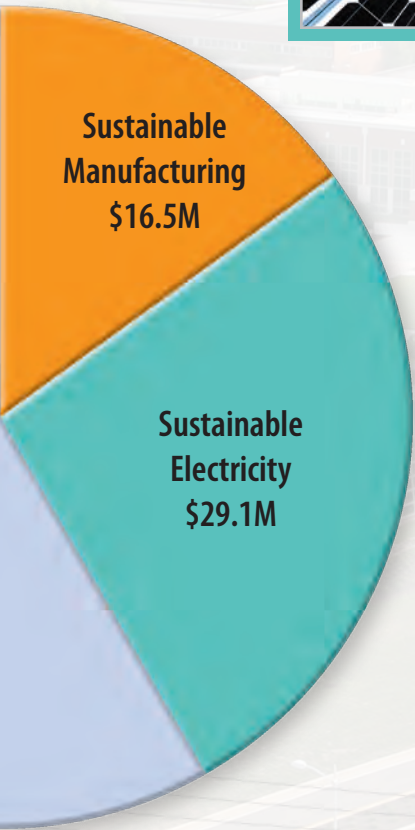
The ORNL **Weatherization and Intergovernmental Program** activities include research, training and analysis in support of DOE's Weatherization Assistance program including support for the National Energy Audit and Manufactured Home Energy Audit (NEAT and MHEA) software tools. In addition, ORNL is leading a multi-year evaluation of DOE's State Energy Program. ORNL also provides technical assistance to recipients of DOE's Energy Efficiency and Community Block Grants, and State Energy Program to help states and local communities adopt energy efficiency technologies. The technical assistance covers alternative financing, building energy efficiency, and technology deployment activities.



ORNL's **Geothermal Technologies Program** conducts research and development to support Enhanced Geothermal Systems whereby water is injected into the ground and heated by subsurface fractured rocks. ORNL has expertise in geo-chemical analysis, materials in extreme environments, downhole tools and system modeling. Additionally, ORNL's GTP expertise has helped many building owners develop and implement ground source heat pumps cost effectively through optimal integration to their facilities.



The ORNL **Wind and Hydropower Technologies Program** works to improve the environmental performance of wind and hydropower systems. ORNL expertise includes resource assessments, turbulent flow field measurement and analysis, material development and testing for turbine blades and rotors, interconnection and reliability analysis, optimization modeling for multi-generation sources, and quantification of biological responses to environmental stresses. The Program collaborates with other DOE national laboratories and numerous academic and industrial partners.



ORNL ARRA Funding \$143.2M
(As of Dec. 2009)

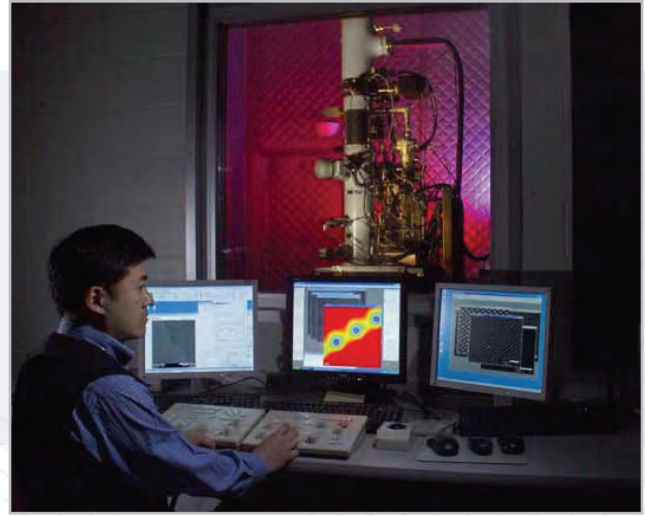


National User Facilities

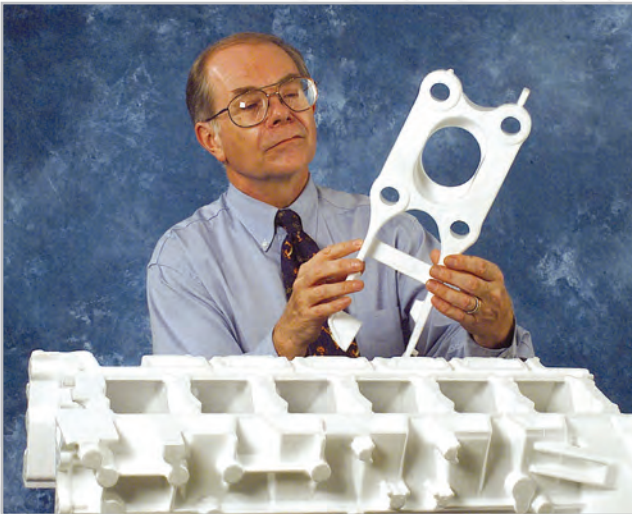
National User Facilities offer scientific researchers access to unique equipment housed in state-of-the-art facilities, and onsite experts to help visiting researchers to take advantage of and make best use of the capabilities. Researchers also have the opportunity to collaborate with world-renowned ORNL scientists and engineers who can help them advance their scientific research and publish their results.



The **Building Technologies Research and Integration Center (BTRIC)** identifies, develops, and deploys energy-efficient components and integration techniques with industry partners - including envelopes, HVAC, refrigeration and appliances.



The six user centers in the **High Temperature Materials Laboratory (HTML)** are dedicated to solving materials problems that limit the efficiency and reliability of systems for power generation and energy conversion, distribution, storage and use.



The goal of the **Metals Processing Laboratory Users Facility (MPLUS)** is to provide access to the specialized technical expertise and equipment needed to solve metals processing issues that limit the development and implementation of emerging metals processing technologies.



The **National Transportation Research Center (NTRC)** houses about half of ORNL's transportation R&D programs and laboratories. Its research centers focus on fuels, engines, and emissions, power electronics and electric machines, heavy vehicle safety research, transportation analysis, and high-risk/high-value packaging.

Bringing Technology to Life



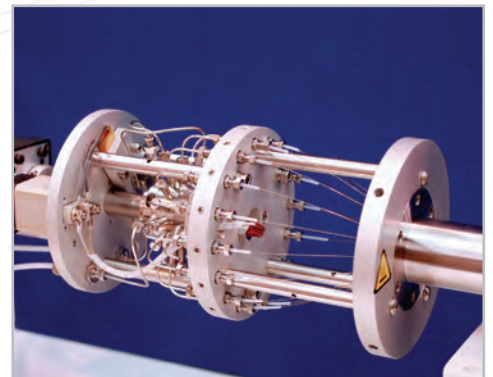
Zero Energy Building Research Alliance

- ORNL partners with over 600 companies
- 567 active international patents
- 128 active technology licenses
- 84 new companies created around ORNL expertise since April 2000



The prestigious R&D 100 Awards have been helping companies provide the important initial push a new product needs to compete successfully in the marketplace. The winning of an R&D 100 Award provides a mark of excellence known to industry, government, and academia as proof that the product is one of the most innovative ideas of the year.

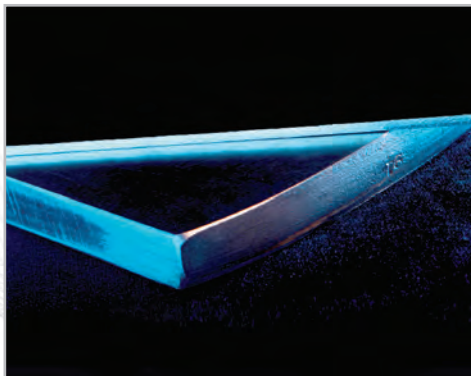
In recent years, ORNL has received 148 with the EERE program boasting 61.



SpaciMS: Spatially resolved capillary inlet mass spectrometer.



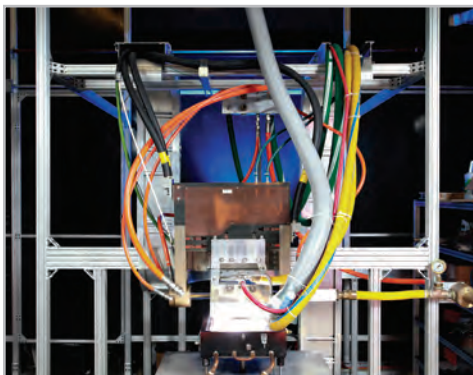
Fire-resistive phase change material.



Alumina-forming austenitic, dubbed AFA, stainless steel.



Superconducting "Wires" by Epitaxial Growth on SSIFFS.



Pulse Thermal Processing, enabling low cost manufacturing of energy production, PV, and storage devices, batteries.



MELCOT: Methodology for Estimating the Life of Power Line Conductor-Connector Systems Operating at High Temperatures.



Thermomagnetic processing technology, lowering materials processing energy consumption while increasing mechanical properties.

Contact Information:

Dana Christensen, Associate Laboratory Director

Energy and Engineering Sciences Directorate
Oak Ridge National Laboratory
PO Box 2008 MS6248
Oak Ridge, TN 37831
Phone: (865) 574-9599
Fax: (865) 576-6118
Email: christensend@ornl.gov

Sustainable Electricity

Tom King kingtjrr@ornl.gov

Sustainable Manufacturing

Craig Blue blueca@ornl.gov

Sustainable Mobility

Ray Boeman boemanrg@ornl.gov

Program

ORNL Contact

Biomass

Robin Graham grahamrl@ornl.gov

Building Technologies

Patrick Hughes hughespj1@ornl.gov

Federal Energy Management

Julia Kelley kellyjs@ornl.gov

Geothermal Technologies

Patrick Hughes hughespj1@ornl.gov

Fuel Cell Technologies

David Stinton stintondp@ornl.gov

Industrial Technologies

Craig Blue blueca@ornl.gov

Solar Technologies

Chad Duty dutyc@ornl.gov

Vehicle Technologies

Ray Boeman boemanrg@ornl.gov

Weatherization and Intergovernmental

Julia Kelley kellyjs@ornl.gov

Wind and Hydropower Technologies

Brennan Smith smithbt@ornl.gov

