

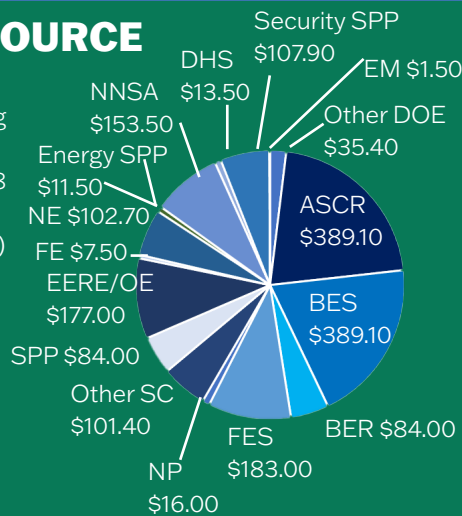
# AT A GLANCE: OAK RIDGE NATIONAL LABORATORY



Oak Ridge National Laboratory (ORNL) is the largest multiprogram science and energy laboratory in the DOE system. Its mission is to deliver scientific discoveries and technical breakthroughs that accelerate the development and deployment of solutions in clean energy and national security, creating economic opportunity for the Nation. Established in 1943 as part of the Manhattan Project, ORNL pioneered plutonium production and separation, then focused on nuclear energy and later expanded to other energy sources and their impacts. Today, the laboratory manages one of the Nation's most comprehensive materials programs; two of the world's most powerful neutron science facilities, the Spallation Neutron Source and the High Flux Isotope Reactor; unique resources for fusion and fission energy and science; production facilities for life-saving isotopes; leadership-class computers including Summit, the Nation's fastest; and a diverse set of programs linked by an urgent focus on clean energy, Earth system sustainability, and national security.

## FUNDING BY SOURCE

FY 2019 Costs (in \$M)  
 Total Laboratory Operating Costs: \$1,824.6 million  
 DOE/NNSA costs: \$1,607.8 million  
 SPP (Non-DOE/Non-DHS) costs: \$203.4 million  
 SPP as % of Total Laboratory Operating Costs: 11.9%  
 DHS costs: \$13.5 million



## CORE CAPABILITIES

- Accelerator S&T
- Advanced Computer Science, Visualization, and Data
- Applied Materials Science and Engineering
- Applied Mathematics
- Biological and Bioprocess Engineering
- Biological Systems Science
- Chemical Engineering
- Chemical and Molecular Science
- Climate Change Science and Atmospheric Science
- Computational Science
- Condensed Matter Physics and Materials Science
- Cyber and Information Sciences
- Decision Science and Analysis
- Earth Systems Science and Engineering
- Environmental Subsurface Science
- Large-Scale User Facilities/Advanced Instrumentation
- Mechanical Design and Engineering
- Nuclear Engineering
- Nuclear Physics
- Nuclear and Radio Chemistry
- Plasma and Fusion Energy Science
- Power Systems and Electrical Engineering
- Systems Engineering and Integration

## FACTS

Location: Oak Ridge, Tennessee  
 Type: Multiprogram Laboratory  
 Contractor: UT-Battelle, LLC  
 Responsible Site Office: ORNL Site Office  
 Website: ornl.gov

## PHYSICAL ASSETS

4,421 acres  
 272 buildings  
 \$7.3 billion replacement plant value  
 4.85 million GSF in buildings  
 1.1 million GSF in leased facilities  
 1.4 million GSF in 63 excess facilities

## HUMAN CAPITAL

4,856 FTE employees  
 194 joint faculty  
 323 postdoctoral researchers  
 556 undergraduate students  
 532 graduate students  
 2,928 facility users  
 1,691 visiting scientists

## MISSION UNIQUE FACILITIES

- Building Technologies Research and Integration Center
- Carbon Fiber Technology Facility
- Center for Nanophase Materials Sciences
- Center for Structural Molecular Biology
- Grid Research, Integration and Deployment Center
- High Flux Isotope Reactor
- Manufacturing Demonstration Facility
- National Transportation Research Center
- Oak Ridge Leadership Computing Facility
- Spallation Neutron Source

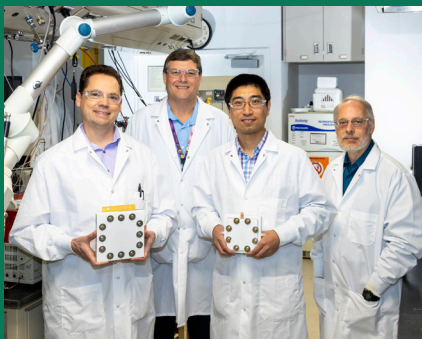


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## ACCOMPLISHMENTS



**Unique Facility: High Flux Isotope Reactor (HFIR)** - Operating at 85 MW, HFIR is the most powerful reactor-based source of neutrons in the United States. More than 500 researchers from around the world use the thermal and cold neutrons and specialized instruments at HFIR each year for fundamental and applied research on the structure and dynamics of matter, with application in physics, chemistry, materials science, engineering, and biology. Discoveries enabled by HFIR lead to improvements in products including solar cells, hard drives, drugs, and biofuels. HFIR also produces isotopes for medical, industrial, and research uses as well as new element discovery. It is the western world's only supplier of californium-252, a versatile isotope used to start up new reactors, detect impurities in coal and cement, and provide port security. HFIR also produced plutonium-238 for NASA's Mars Rover. Additionally, HFIR is used for studies of the effects of radiation on materials.



**Tech-to-Market Highlight: Laboratory Technology Converts Carbon Dioxide Into Ethanol** - ReactWell, LLC, licensed Voltanol, a novel ORNL waste-to-fuel technology that converts carbon dioxide directly into ethanol using tiny spikes of carbon and copper to turn the greenhouse gas into a sustainable liquid. It is being incorporated into the company's existing process, allowing refineries to upgrade their feedstock or to convert biomass to oil while removing a refinery's need to purchase or produce additional hydrogen, resulting in significant savings in capital investments and long-term operating costs. Another key benefit: The ORNL catalyst uses no rare earth elements, which are expensive and can be difficult to acquire. In addition to recycling carbon dioxide that would otherwise be released, ORNL's technology can offer a useful alternative to batteries for long-term or portable storage of renewable electricity.



**Research Highlight: Artificial Intelligence for Breakthrough Science** - As home to the Nation's most powerful supercomputer, ORNL is pioneering the application of AI to diverse fields through its lab-wide AI Initiative. Experts in data science apply algorithms in both machine learning (allowing computers to learn from data and predict outcomes) and deep learning (which use neural networks inspired by the human brain to uncover patterns of interest in datasets) to accelerate breakthroughs across the scientific spectrum. For instance, AI extracts new insights from mountains of health data (e.g., medical tests) to help providers diagnose and treat problems ranging from PTSD to cancer. In additive manufacturing, AI enables consistency in 3D printing of specialized aerospace components by instantly locating defects and adapting in real time. Through partnerships with power companies, ORNL has used AI in many other areas, including complex materials and structures, and improving the security and reliability of power grids.