



AUGUST 12, 2024

Oak Ridge National Laboratory

Robert Wagner

Associate Laboratory Director
Energy Science and Technology Directorate



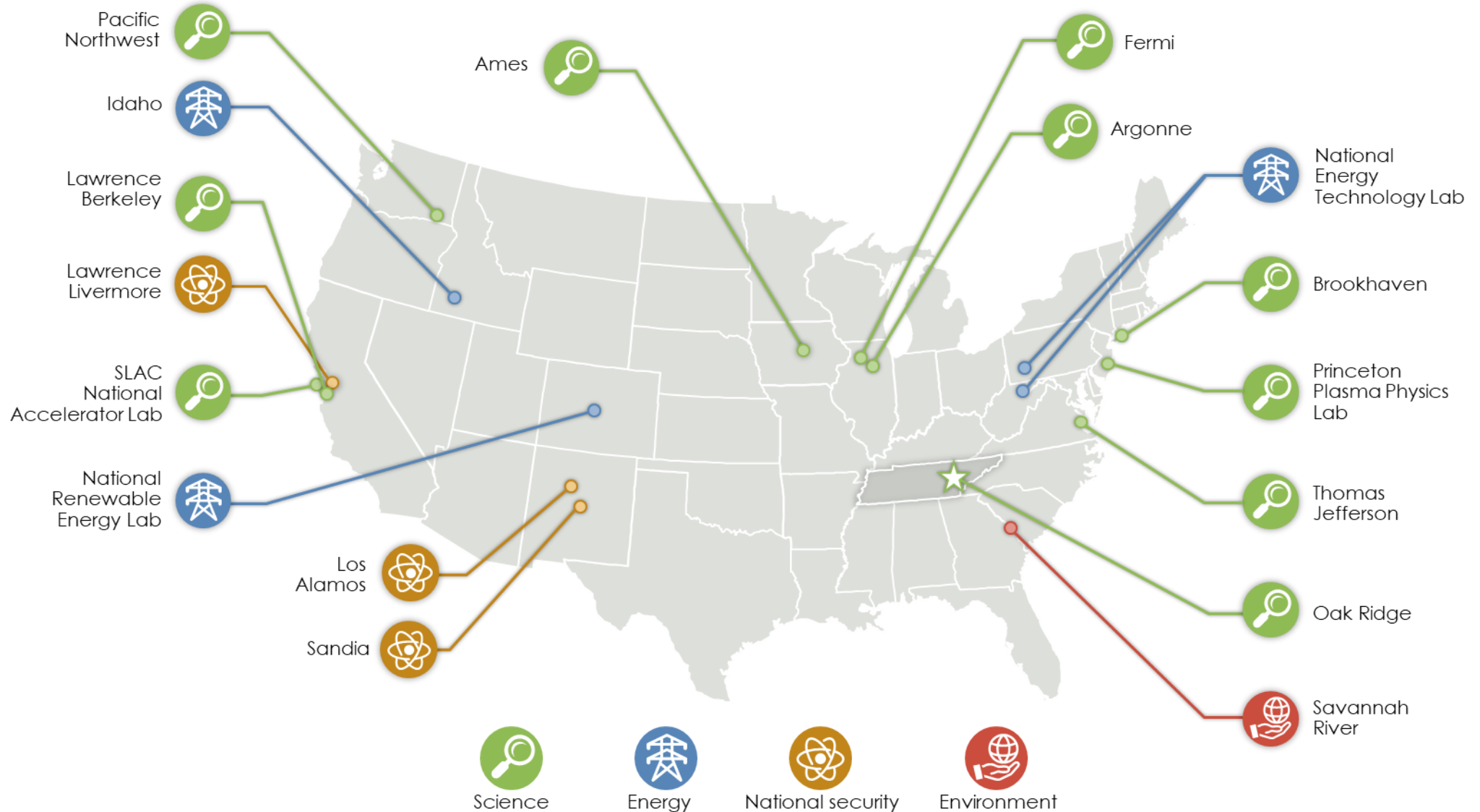
U.S. DEPARTMENT OF
ENERGY

ORNL IS MANAGED BY UT-BATTELLE LLC
FOR THE US DEPARTMENT OF ENERGY



The [mission of the Department of Energy](#) is **to ensure America's security and prosperity** by addressing its energy, environmental and nuclear challenges through transformative science and technology solutions.

We are part a culture and network of discovery and innovation





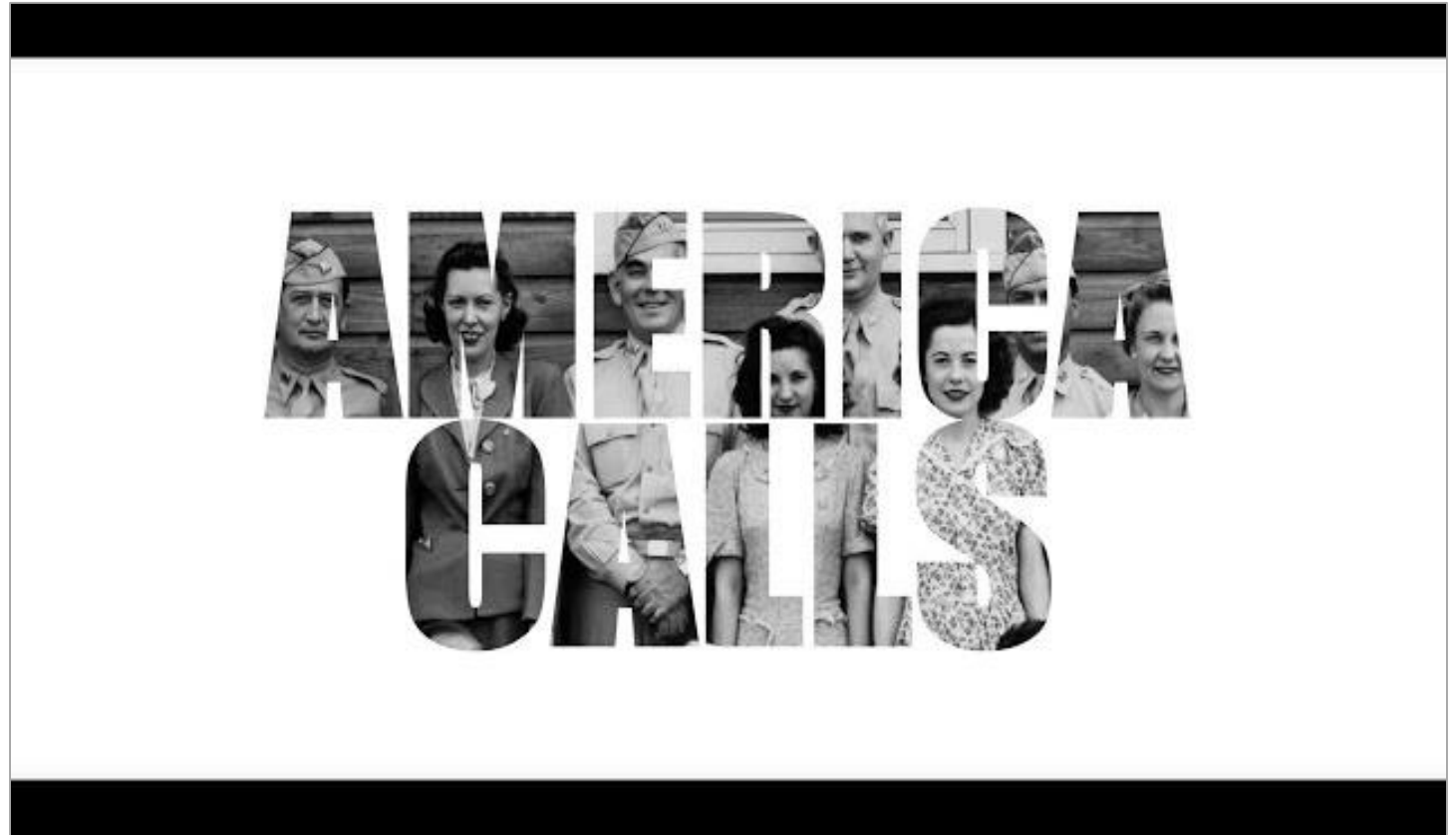
ORNL's mission

Deliver scientific discoveries and technical breakthroughs that will accelerate the deployment of solutions in clean energy and global security, and in doing so, create economic opportunity for the nation



We have a history of impact

Watch this [video](#) to learn more on who we are and our impact on history and solving current societal emergencies and future global grand challenges



Born in the Manhattan Project that helped to end World War II, the national lab established at Oak Ridge, Tennessee, in 1943 continues to serve national missions in energy, scientific discovery and national security. This video from its 75th anniversary year has been updated with images from ORNL's fight against the COVID-19 pandemic.

ORNL meets national needs through discovery and innovation

**Solving
Complex S&T
challenges**



**Protecting
the nation**



**Improving
human health**



**Understanding
and stewarding
the
environment**



**Advancing
US compet-
itiveness**

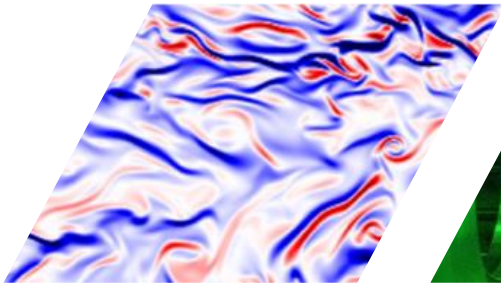


**Developing
energy
solutions**

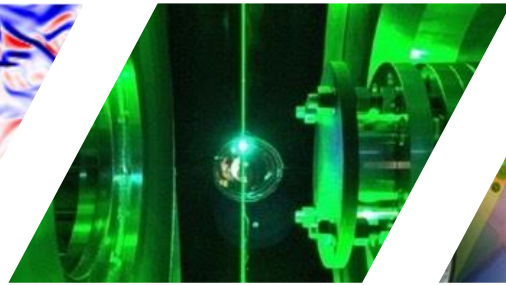


ORNL applies unique expertise to challenging problems with global impact

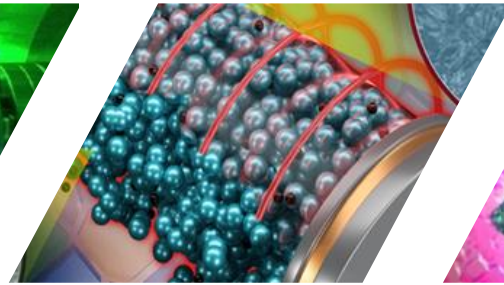
Biology and environment



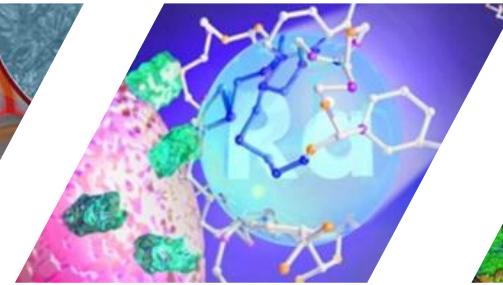
Fusion and fission



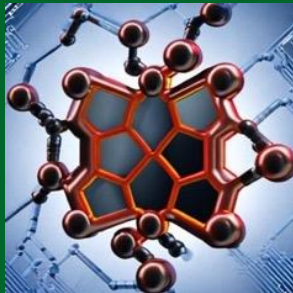
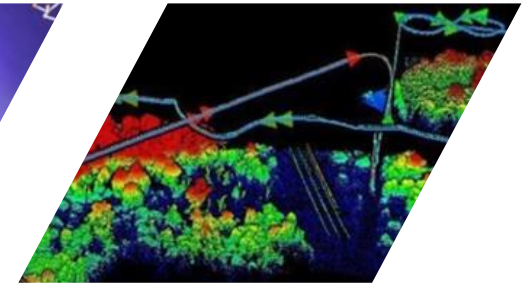
Clean energy



Isotopes



National security



Computing



Neutrons



Materials, chemistry, and nuclear physics

ORNL's distinctive user facilities and research centers enable breakthroughs that can't be made anywhere else



ORNL partners to move technologies into the marketplace and make real-world impact

High annual patent rate

91 issued in FY23;
1,046 patents since 2010

ORNL TIP (Technology Innovation Program)

invested >\$11 million
in 49 projects, resulting
in 37 commercial licenses

Innovation Crossroads (IC) and Techstars programs

65% of IC companies
have stayed in Knoxville

Battelle Distinguished Inventor Awards

97 scientists have 14+ patents



SkyNano
facility in
Louisville,
Tennessee

Fusion
risk-reduction
facility with
Type One
Energy
and TVA

ORNL's
most-licensed
tech, Peregrine,
is AI for smart
manufacturing

Quantum
partnership
with EPB in
Chattanooga

Trane
investigates
carbon capture
from gas-fired
equipment



ORNL facts and figures

24 of 25
DOE core capabilities

\$2.78B
FY23 budget authorization

>\$1B
modernization investment

>7,000
employees

Nation's most diverse energy portfolio

3,600
research guests annually

World-class research reactor

Nation's largest materials research portfolio

World's most intense neutron source

Managing major DOE projects: US ITER, exascale computing

8
DOE user facilities

>2,600
journal articles published in FY23

#1
fastest computer in the world

291
invention disclosures in FY23

91
patents issued in FY23

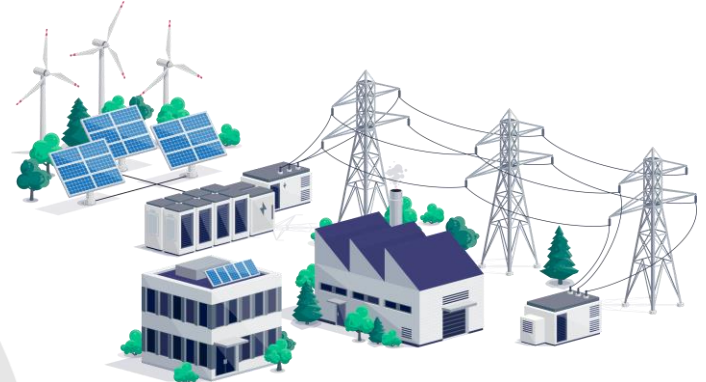
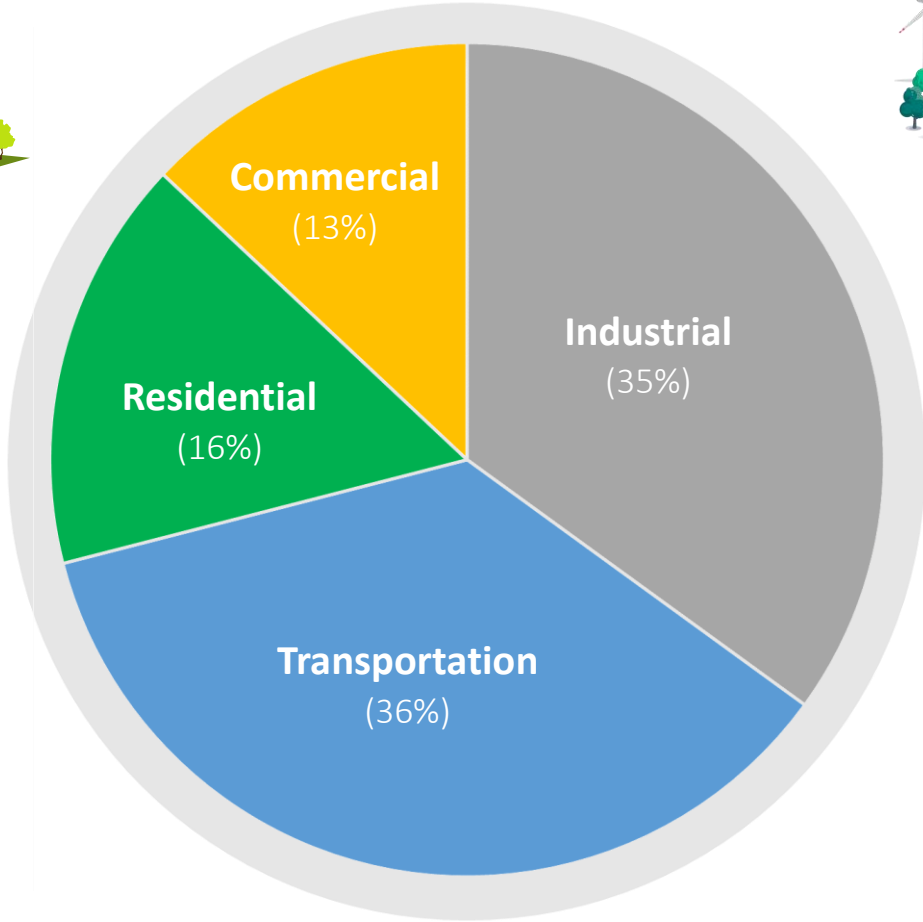
Clean
energy

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ORNL energy research touches everyday lives



100.3 quads U.S. energy consumption in 2022
(sources [LLNL](#) and [EIA](#))



Mission supports the acceleration of transformational clean, sustainable, and resilient energy solutions



1

Advance and enable sustainable US manufacturing capabilities for clean energy



2

Develop and enable smart, reliable, and integrated grid systems technologies



3

Develop and deploy energy-efficient, resilient building technologies that are low-carbon and affordable



4

Accelerate the decarbonization of mobility systems through pioneering electrification technologies, autonomous controls, and use of hydrogen and net-zero carbon fuels



Helping facilitate the energy transition in the Southeast and Appalachia

Advanced mobility

- Positioning the region as a leader in development and deployment of clean, sustainable transportation technologies
 - Collaborating with Chattanooga using advanced controls and digital twins to reduce traffic congestion and energy use



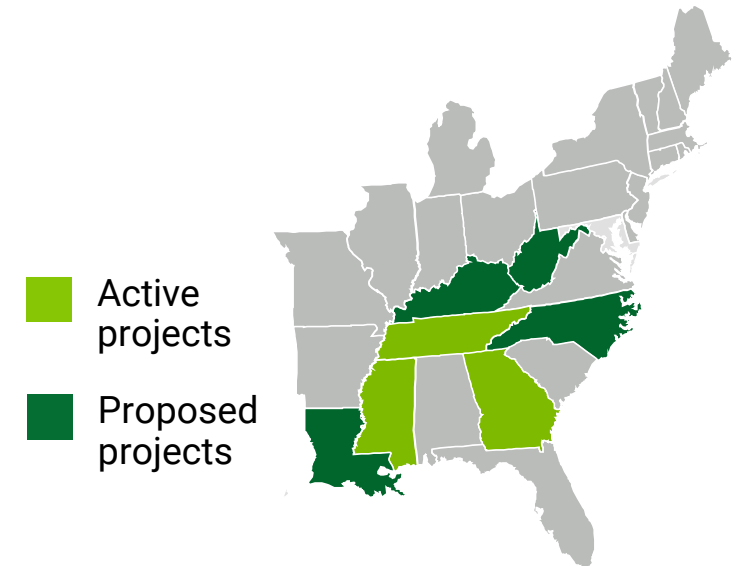
Decarbonization

- Opening new pathways for reducing emissions in buildings and manufacturing
 - Developing first net-negative carbon building for veterans housing with Knoxville's Community Development Corporation



Resilient grid

- Ensuring a resilient, sustainable, and efficient electrical grid in the region
 - Developing data strategy and analysis tools for grid operations, interdependencies, and response to events



Energy research includes five unique applied user facilities and centers



Manufacturing Demonstration Facility



National Transportation Research Center



Building Technologies Research and Integration Center



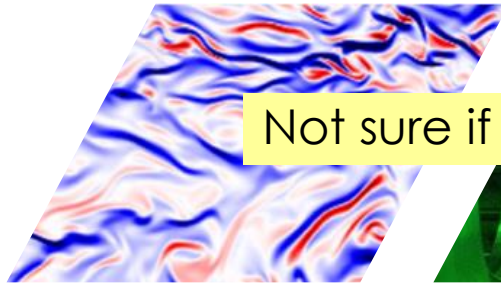
Carbon Fiber Technology Facility



Grid Research Integration and Deployment Center

The strength of ORNL energy research is the opportunity to leverage a unique portfolio of science and engineering

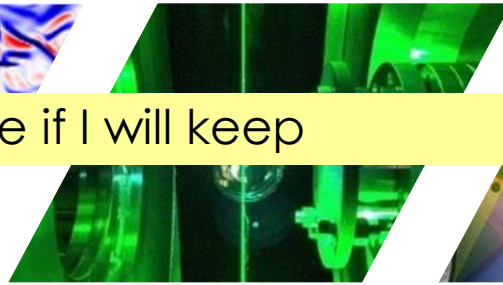
Biology and environment



125 experts



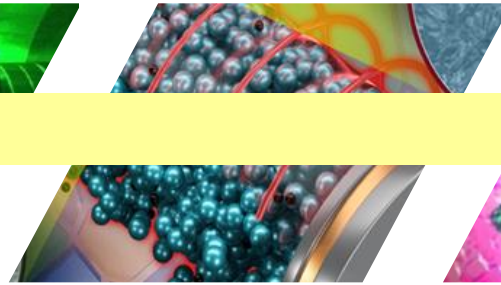
Fusion and fission



170 experts



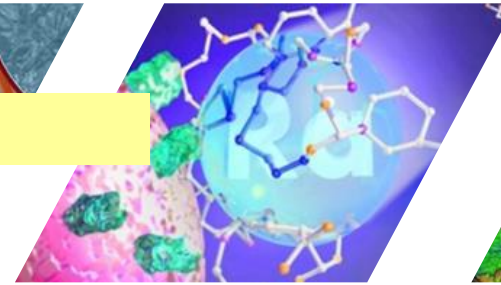
Clean energy



18 experts



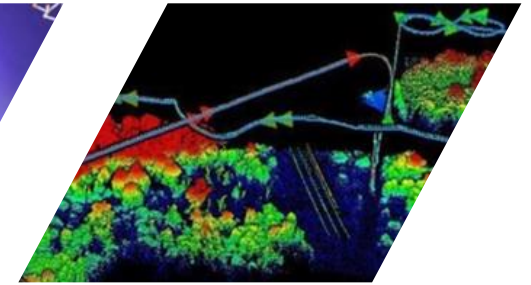
Isotopes



286 experts

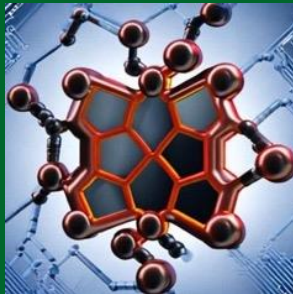


National security



Not sure if I will keep

Computing



103 experts



Neutrons



12 experts



Materials, chemistry, and nuclear physics



253 experts



Our grid research spans 12+ groups, 100+ people, and four directorates



ORNL Electromagnetic Transient (EMT) Simulation research has a history of impact

Objective is to create an ecosystem that assists industry with realizing the transition needed to perform EMT simulations for ensuring the reliability and security of the future power grid in the next 15 years

Check out our **impact** in recent news articles and podcasts

- [New software provides advanced grid simulation capabilities](#)
- [Researchers design cost-efficient utility-scale solar plant that enhances grid stability](#)
- [Researchers design cost-efficient large solar plant that enhances grid stability](#)
- [This solar + storage project could be a US grid game changer](#)
- [ORNL demonstrates power of new modeling approach to understand faults in the modern electric grid](#)
- [New Algorithms Push Toward High-Fidelity EMT Modeling for Grid Data Analysis](#)
- [Taking On Renewables' AC/DC Disconnect](#)



ORNL researchers Phani Marthi and Suman Debnath work on developing and scaling up new EMT simulation software to analyze how power electronics in the electric grid will respond to brief interruptions in power flow. Credit: Genevieve Martin/ORNL, U.S. Dept. of Energy

[Learn more about ORNL EMT Research](#)

Highlights of the 2023 EMT Simulation Workshop



2023

- **Organized:** DOE (SETO-OE)-NERC-ORNL
- **Date:** 24-25 August 2023
- **Registration:** 90
- **Speakers:** 23
- **Topics:** Modeling, Simulation Tools, Applications
- **Presentations:** <https://emtworkshop.ornl.gov/presentations/>
- **Outcome:** Gaps and challenges presented to DOE

Charge for the 2024 workshop



2024

Workshop Charge

What will be the most effective mechanism to assist industry with making this national-scale transition to use EMT simulations?

Thank you

