OAK RIDGE National Laboratory

October 2025

Oak Ridge National Laboratory Overview

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Electrification and Energy infrastructures Division

U.S. DEPARTMENT of ENERGY

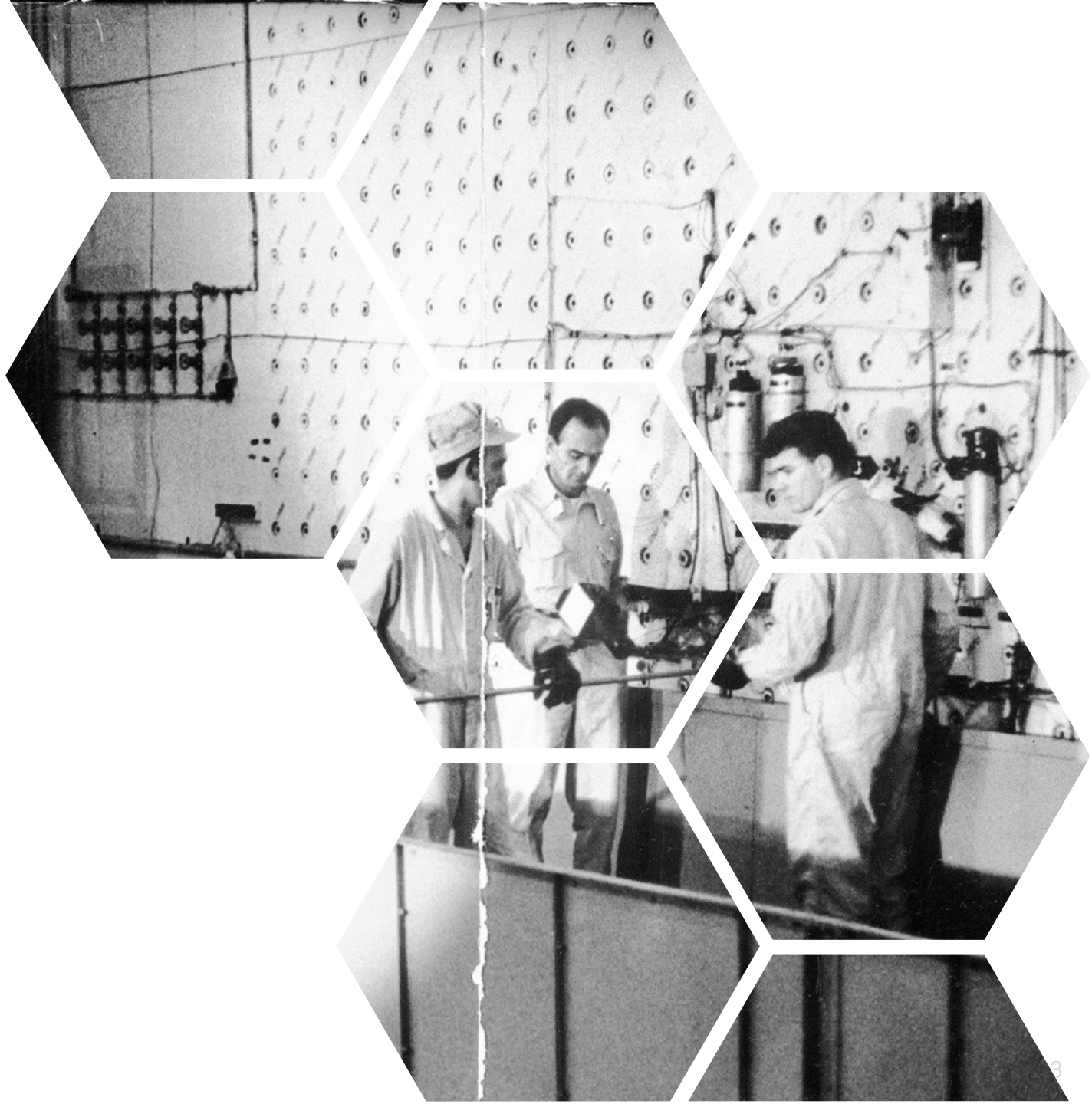
ORNL IS MANAGED BY UT-BATTELLE LLC
FOR THE US DEPARTMENT OF ENERGY


OAK RIDGE NATIONAL LABORATORY
BIG SCIENCE
BIG IMPACT
Ts
Tennessine
CRAY
OAK RIDGE National Laboratory
ENERGY
Hewlett Packard Enterprise
AMD
FRONTIER
OAK RIDGE National Laboratory

ORNL began in 1943 with the world's first continuously operating nuclear reactor

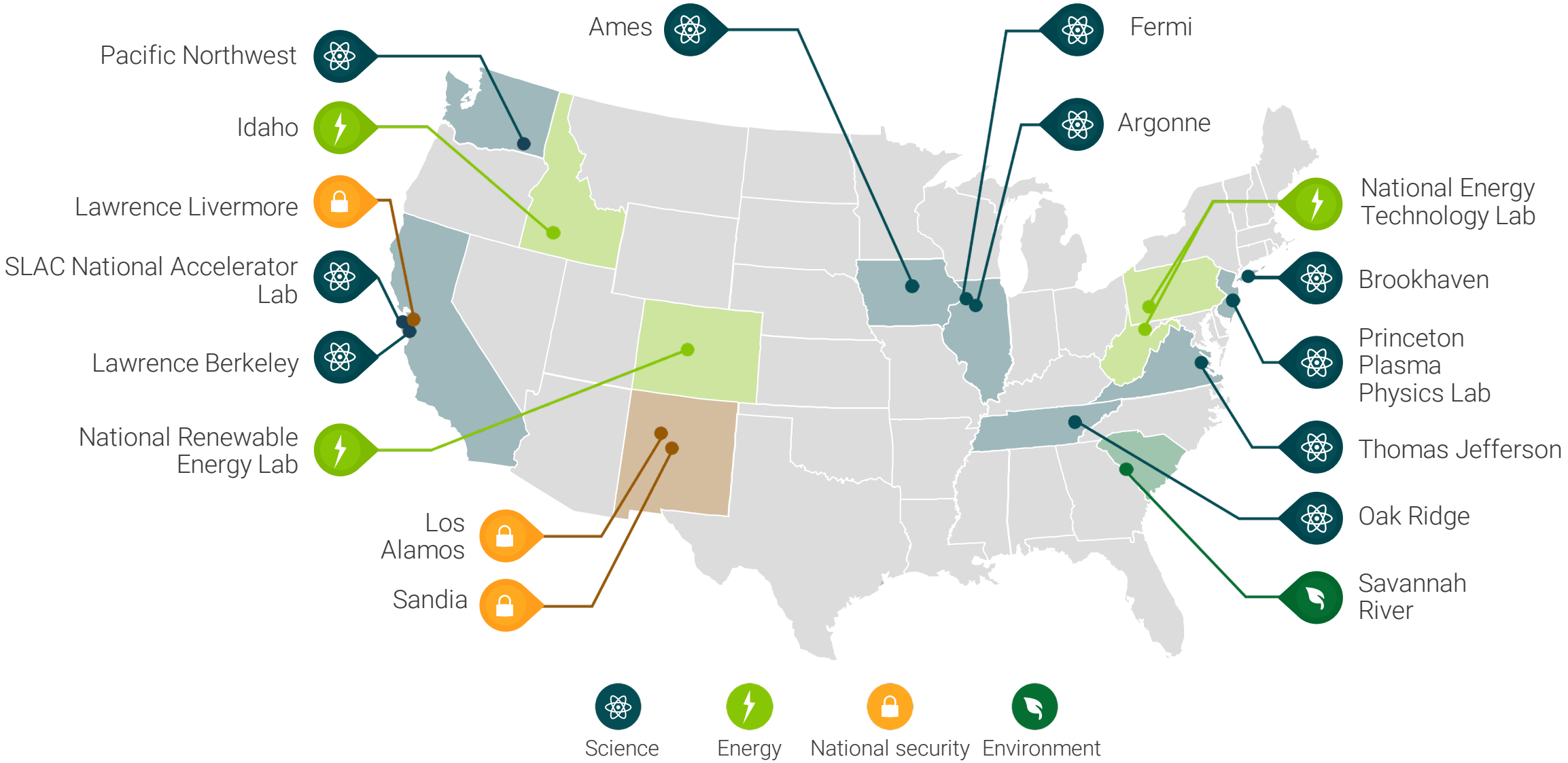
MISSION

Demonstrate that gram quantities of plutonium could be chemically separated from irradiated uranium



OAK RIDGE National Laboratory

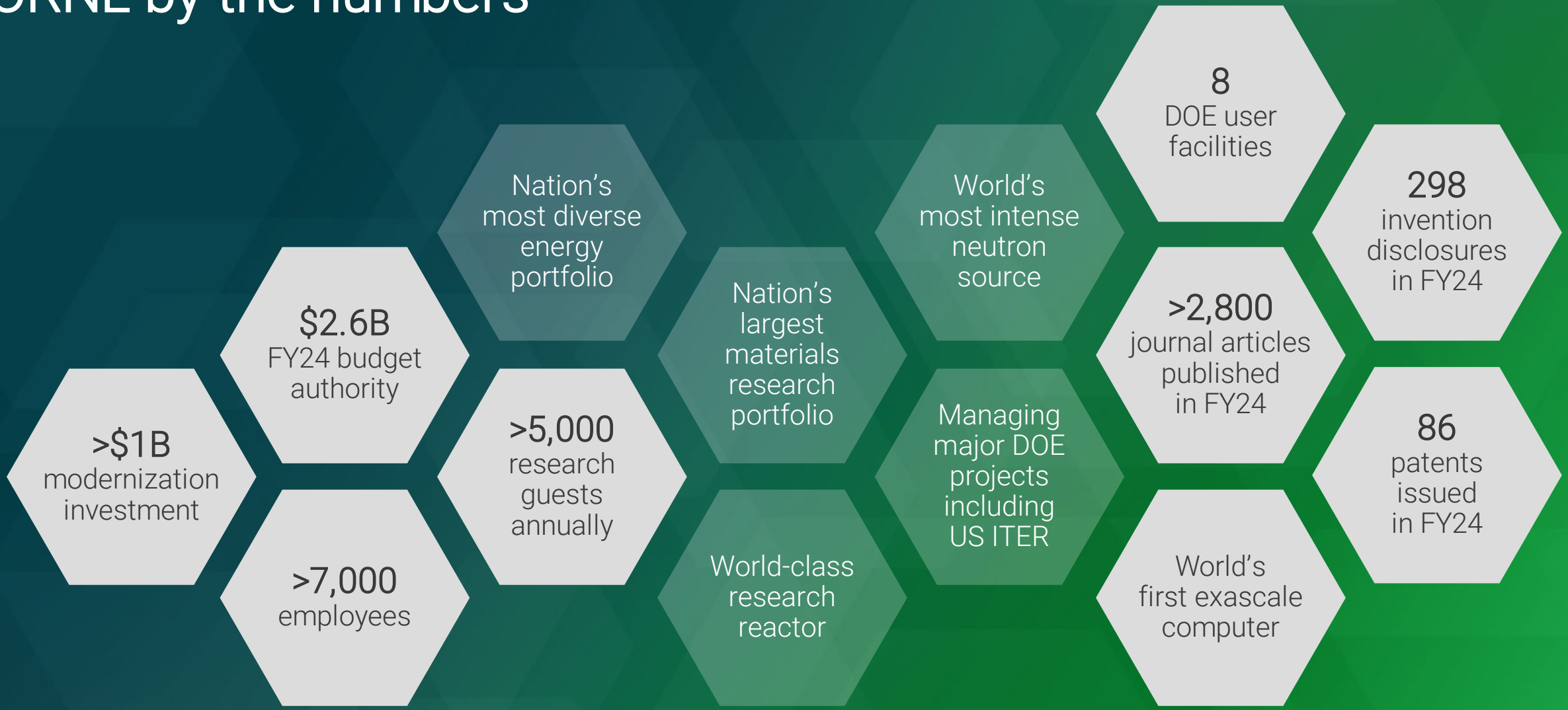
The Department of Energy stewards 17 national laboratories



ORNL’s mission today

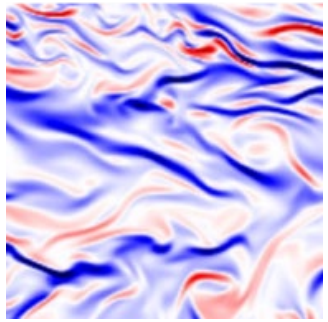
Deliver scientific discoveries and technical breakthroughs that will accelerate the deployment of solutions in energy and national security and, in doing so, create economic opportunity for the nation.

ORNL by the numbers

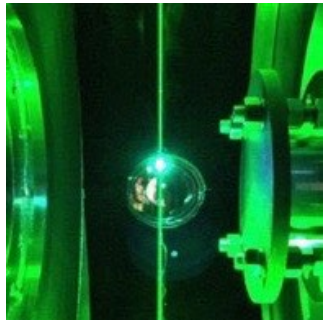


ORNL’s foundational expertise yields solutions to challenging problems with global impact

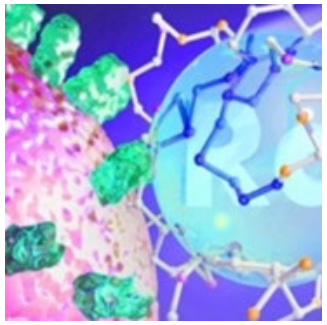
Biology and environment



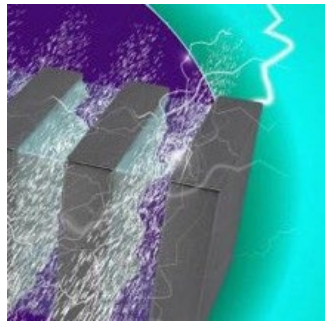
Fusion and fission



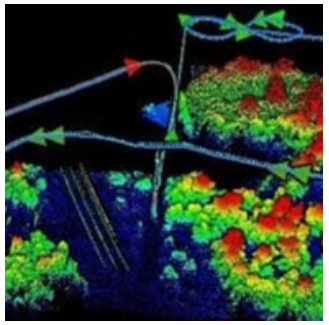
Isotopes

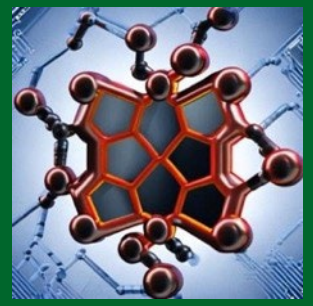


Energy science and technology



National security





Computing, AI, and quantum

Neutrons

Materials, chemistry, and nuclear physics

Our research portfolio aligns well with DOE priorities

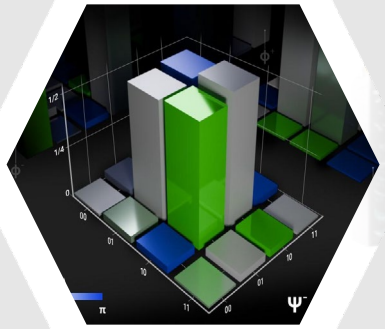
ORNL tagline: Big Science. Big Impact.

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

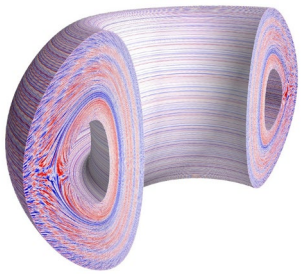
ORNL delivers exascale **computing** from system to ecosystem

World's first exascale computer

Enable autonomous facilities across DOE



Provide support for multiple agencies



Advance quantum information science

Advance artificial intelligence

Energy-smart computing

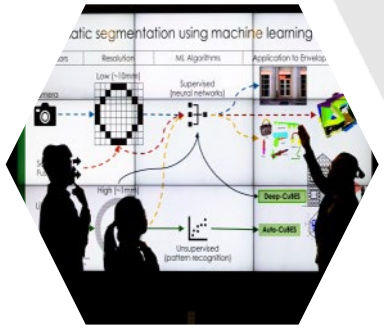
Frontier
supercomputer

ORNL breakthroughs transform **energy systems** to accelerate innovation

Resilient buildings, efficient transportation

Reliable, secure power grid

Energy supply chains



Smart, advanced manufacturing

MDF
Impeller printed with stainless-steel alloy

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ORNL's distinctive user facilities bring thousands of R&D partners to Tennessee each year

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

With over 7,000 staff members, ORNL is like a small city

- Fire department
- Police department (Protective Force)
- Cafeterias
- Maintenance and repair services
- Waste management
- Shipping and receiving
- Parcel and mail delivery
- Roads and grounds maintenance
- 24/7 electrical, steam, sewer, and other utilities

If you're asked what ORNL does, you can say that the lab …

Produces 250 isotopes to kill cancer, power NASA, secure ports, and more

Applies trustworthy AI to scientific discovery

Designs high-speed wireless charging systems

Makes lighter, stronger materials to save billions of dollars

Runs one-of-a-kind research facilities for scientists worldwide

Helps keep the power grid reliable, resilient, and secure

Advances affordable and reliable nuclear energy

Models black holes, exploding stars, and the birth of the universe

3D-prints critical components for energy infrastructure

Studies how diseases and medicines behave

Develops ways to recover, reuse, or use fewer rare earth minerals

Seeks physics beyond the Standard Model

Helps companies bring innovations to market

Transfers innovation to industry for competitiveness

Demonstrates essential steps toward fusion energy

Improves biofuels for airplanes and industrial use

Builds and operates the world's fastest supercomputers

Explores quantum power and potential

Invests time and talent in our communities

Builds self-driving labs for faster discoveries

Keeps citizens and infrastructure safe

Equips teams to deliver scientific breakthroughs

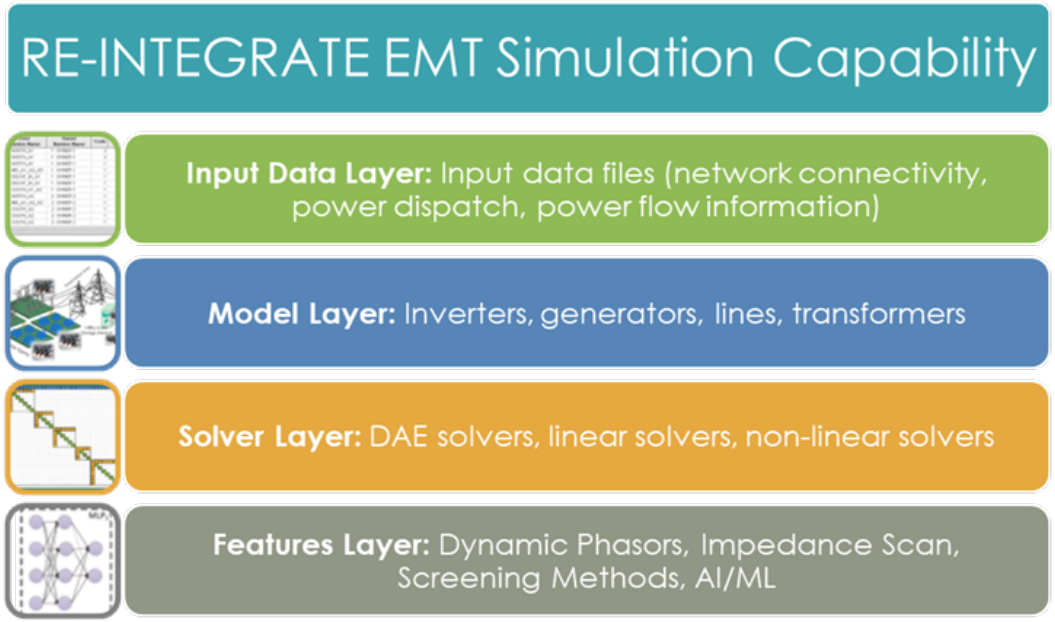
Builds safer, longer-lasting batteries

Helps to train the next generation of scientists

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

ORNL Electromagnetic Transient (EMT) Simulation Research

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 decade to accommodate changes in generation and load



Highlights of the 2024 EMT Simulation Workshop

- **Date:** 12-13 August 2024
- **Registration:** 130
- **Speakers:** 26
- **Topics:** EMT simulation research, education & workforce development, EMT testbeds, modeling and applications
- **Outcome:** Gaps and challenges presented to DOE of bringing the ecosystem together to solve challenges in EMT simulations (models, input data structures, solvers, applications, training & education)

Charge for the 2025 workshop

Workshop Charge

Please join us in identifying the most important challenges and problems that need to be solved for efficient and scalable use of EMT simulations with new changes happening with large loads as well as learn more about EMT simulations (training).

Thank you