

OAK RIDGE NATIONAL LABORATORY

BIG SCIENCE BIG IMPACT

 OAK RIDGE
National Laboratory



As the Southeast's only U.S. Department of Energy (DOE) Office of Science national laboratory, Oak Ridge National Laboratory (ORNL) has far-reaching impact, partnering with federal entities, numerous academic partners including the University of Tennessee, the Tennessee Valley Authority, state and local governments, and hundreds of industry partners to make the region a fertile ground for discovery and innovation that produce solutions for the nation's energy, economy, and security.





INNOVATION FOR THE NATION

Oak Ridge National Laboratory's mission is to 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.



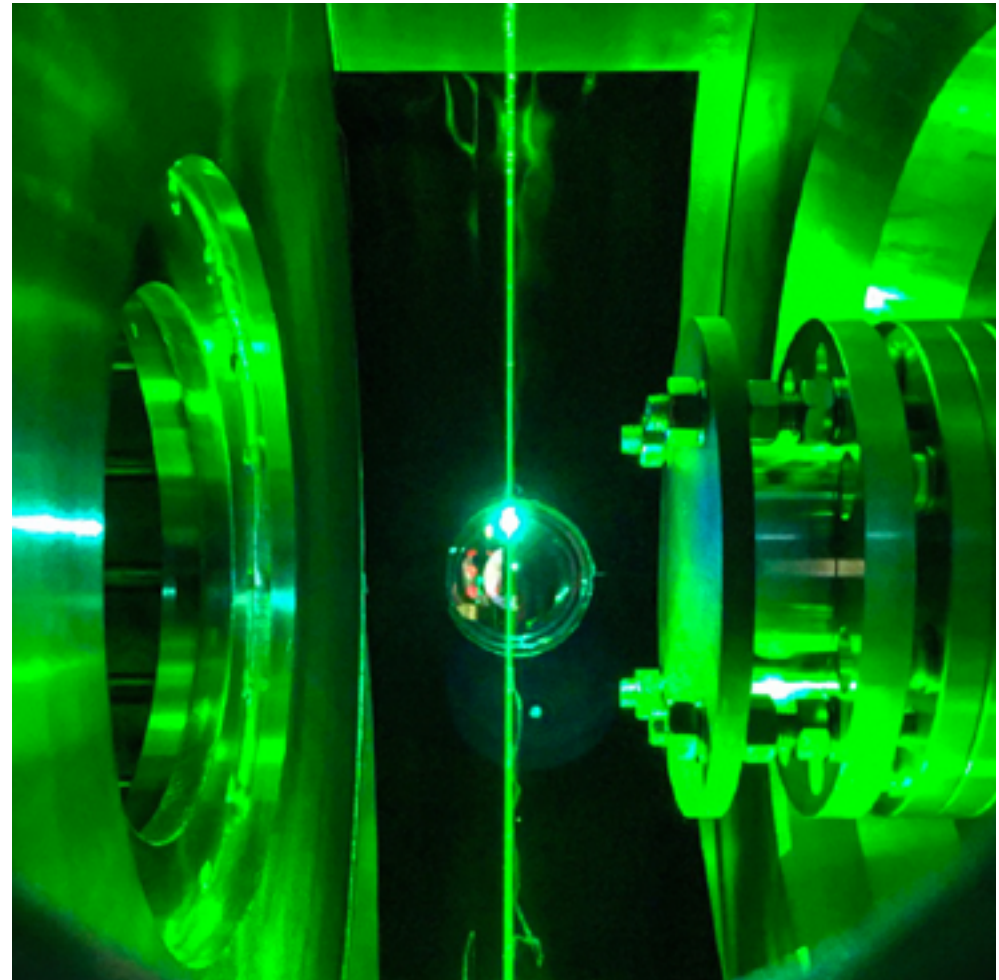
WE PARTNER

with regional utilities to pursue AI-enabled energy advancements.



Supercomputing

Advancing computing and AI for scientific discovery and continued U.S. leadership



Fusion and Fission

Delivering world-leading nuclear science and engineering

WE WORK

with partners across the United States to advance the next generation of fission and fusion energy systems to meet the increasing demands for affordable and abundant electricity.

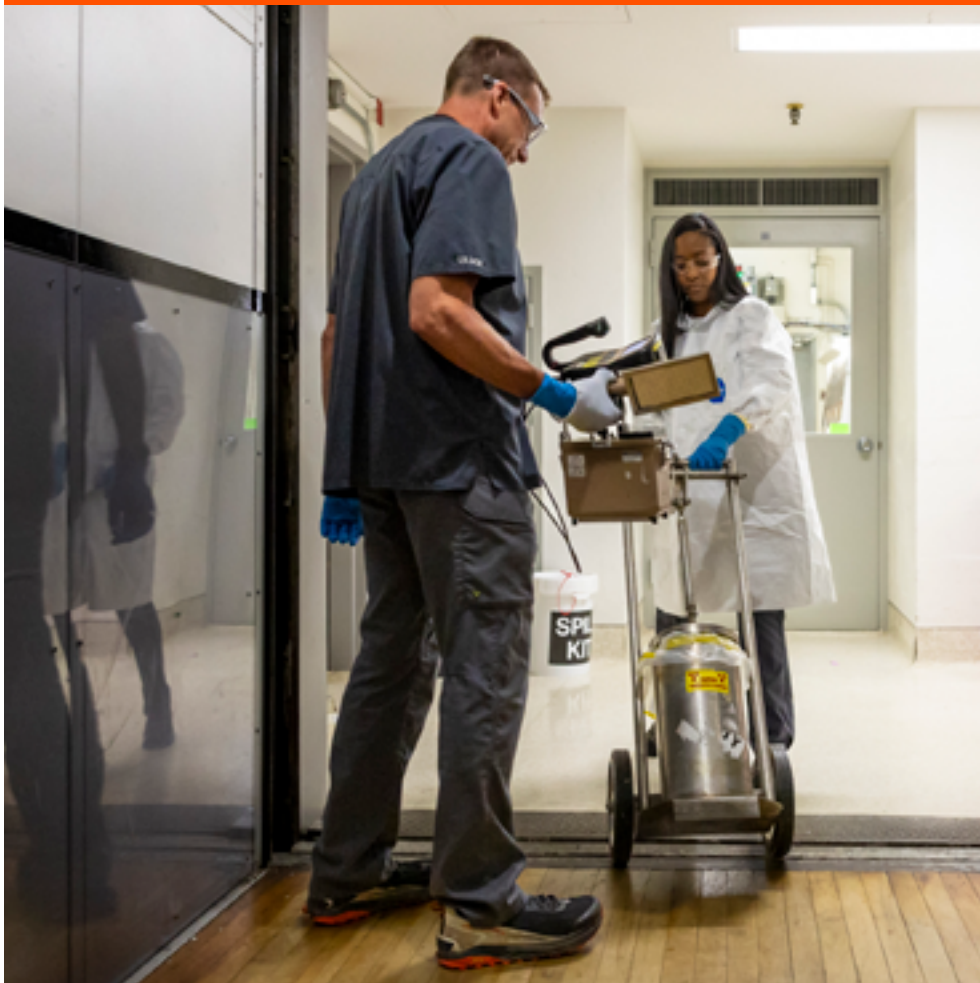
WE PRODUCE

the nation's supply of plutonium-238 for deep space missions. The isotope plutonium-238, with a half-life of 88 years, generates heat as it decays, which is converted to electricity inside the radioisotope thermoelectric generators used to power space travel.



Isotopes

Advancing isotope science and processing for a healthy, secure, and resilient future



National Security

Solving critical challenges in cybersecurity, nuclear security, and human security

WE APPLY

real-time data and analytics to help speed disaster response and to protect American interests across the globe.

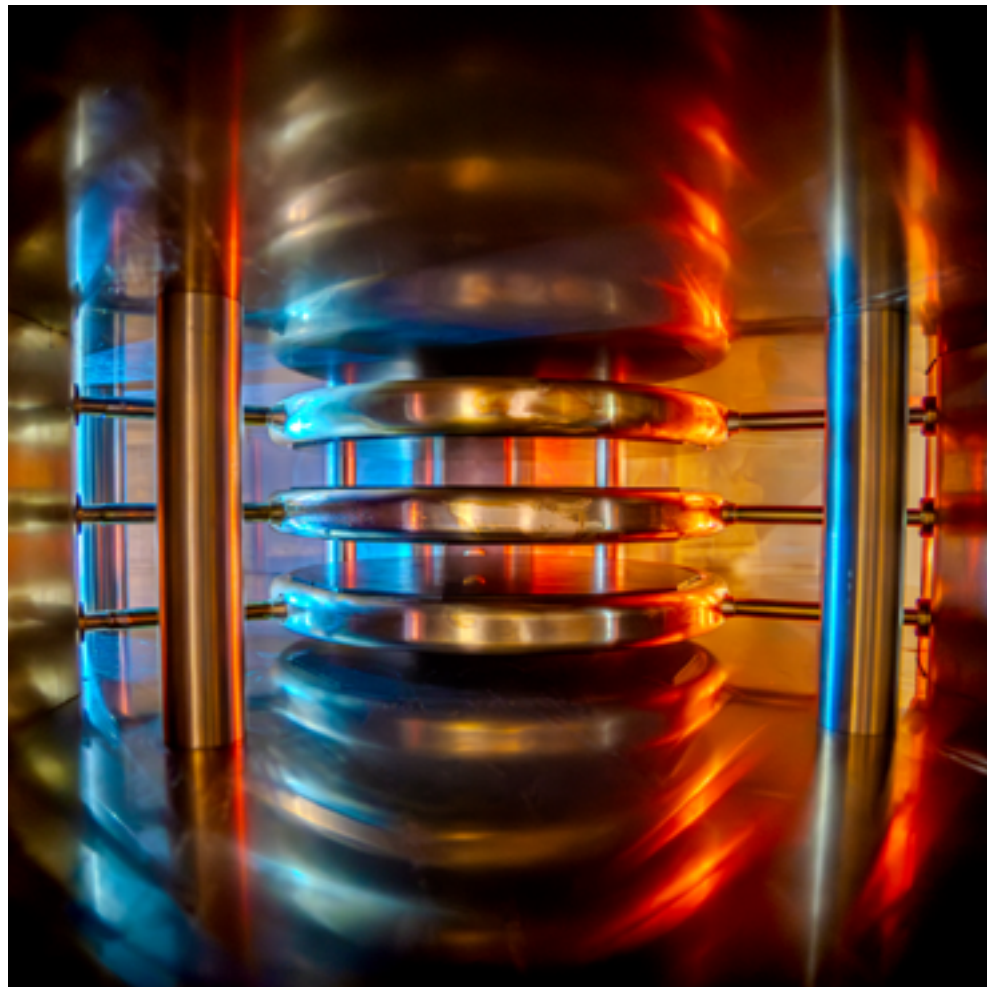
WE INVENT

cost-effective and efficient processes to recover high-value critical materials from mined ores, electronics, and wastewater from oil and gas drilling.



Materials

Conducting foundational science in chemistry, materials science, nanoscience, and physics



Neutron Science

Operating two of the world's leading neutron sources in the Spallation Neutron Source and High Flux Isotope Reactor

WE SERVE

more than 1,000 researchers annually as a critical resource for scientific discovery.

WE ADAPT

microbes with ORNL-developed tools to turn plastic waste into nylon for automotive parts, create superabsorbents and packaging materials for consumer products, and convert raw materials, such as plant biomass, into fuels and chemicals.



Biology and Environment

Advancing understanding of complexity in biological and environmental systems



Energy Science

Delivering breakthroughs for a secure, resilient, and affordable energy future

WE DEVELOP

technology to modernize the grid to support America's industry, safeguard critical infrastructure, and integrate new energy sources.

USER FACILITIES

More than 5,000 scientists from around the world conduct experiments at DOE scientific user facilities at ORNL each year.

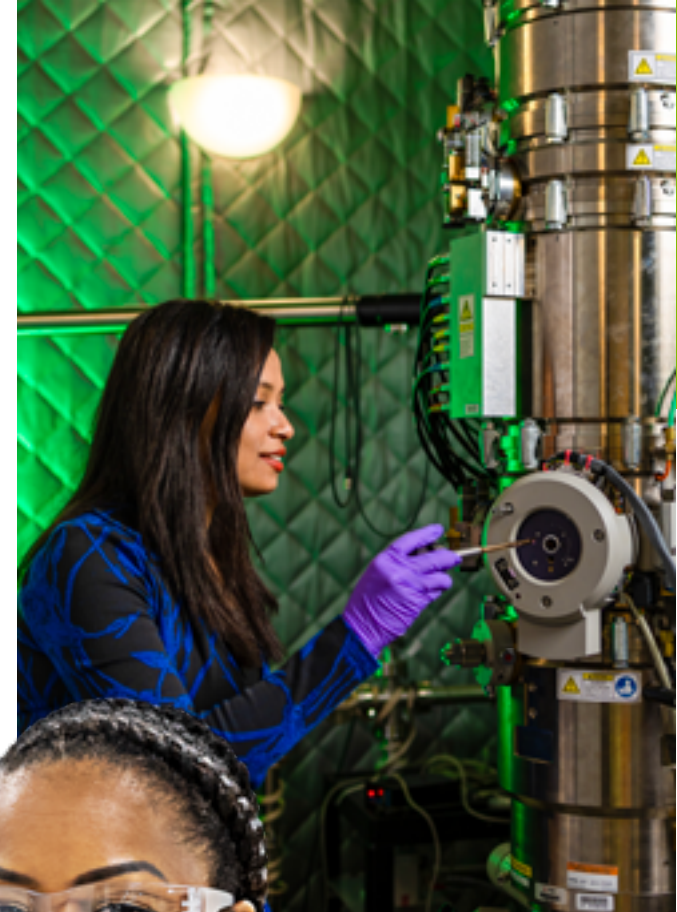
Building Technologies Research and Integration Center

Performs early-stage research and development to make energy-efficient building technologies



Carbon Fiber Technology Facility

Develops low-cost raw materials and optimal mechanical properties for carbon fiber



Center for Nanophase Materials Sciences

Enables scientists to make, examine, and simulate materials at the nanoscale



Spallation Neutron Source

Creates and uses neutrons to study the structures and behaviors of different materials



Manufacturing Demonstration Facility

Improves the efficiency, productivity, and competitiveness of American manufacturers



National Transportation Research Center

Performs early-stage research and development in transportation technologies

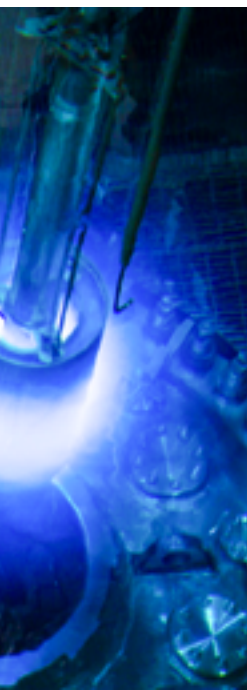


Oak Ridge Leadership Computing Facility

Accelerates scientific discovery and engineering progress through world-leading computational performance

High Flux Isotope Reactor

Produces neutrons from a steady-state neutron beam for use in studying physics, chemistry, materials science, engineering, and biology

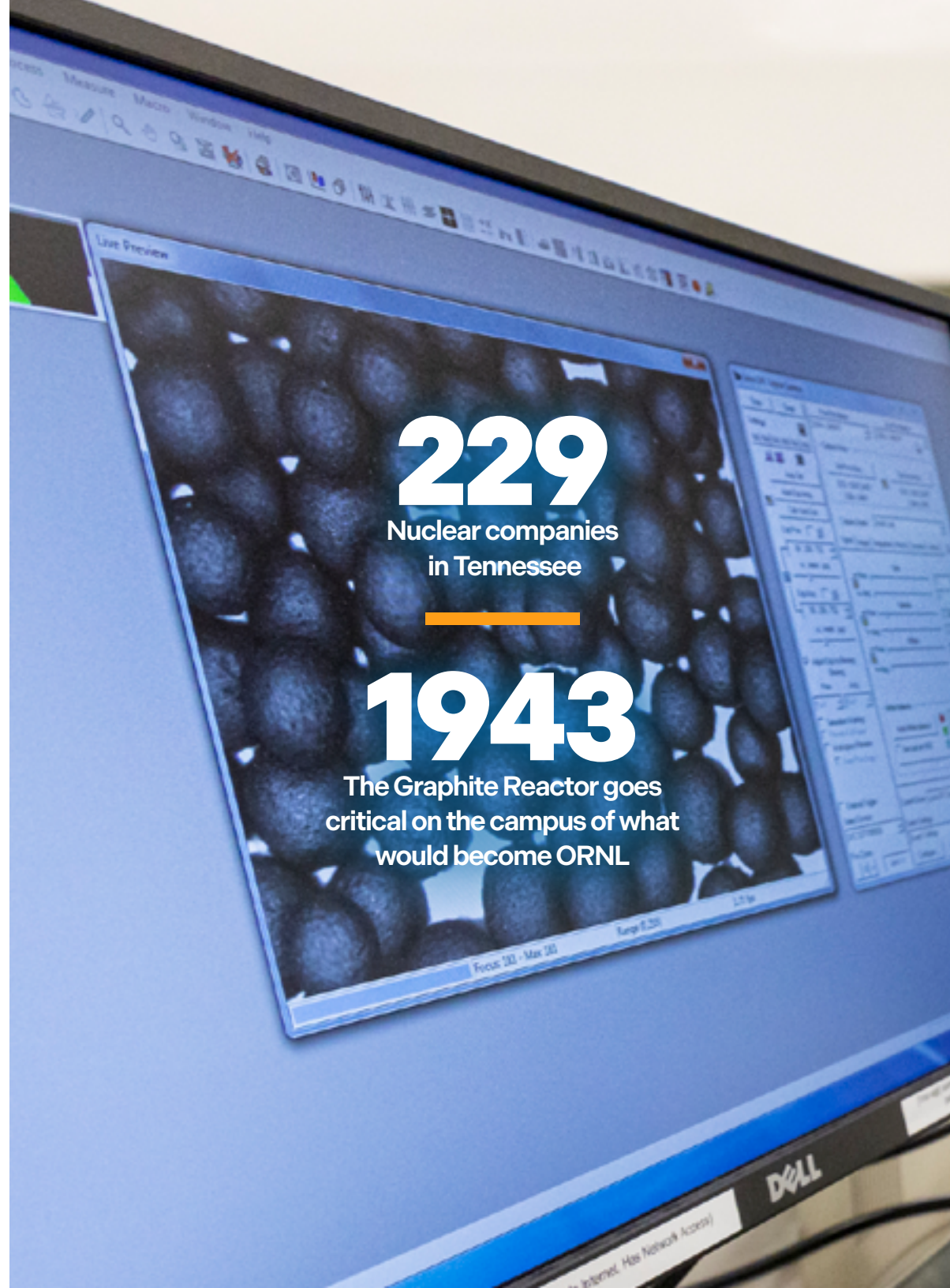


Our world-leading facilities offer powerful tools for experiments across a range of fields.

ADVANCED NUCLEAR

ORNL pioneered nuclear reactor technologies during the Manhattan Project, building the Graphite Reactor, the world's first continuously operating nuclear reactor. From groundbreaking to criticality, the Graphite Reactor changed the course of history and was central to ORNL developing strengths in materials science, national security, modeling and simulation, nuclear engineering, fusion research, and isotope production.

Today, ORNL's experts are working on tough challenges in nuclear energy, enabling new fuels, improving understanding of fusion systems, and building strong connections across the nuclear community.

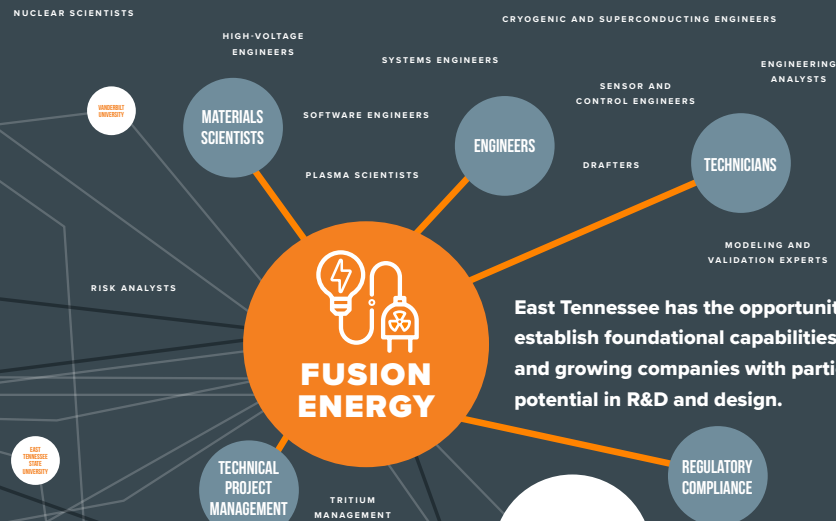
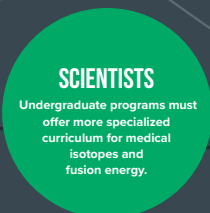
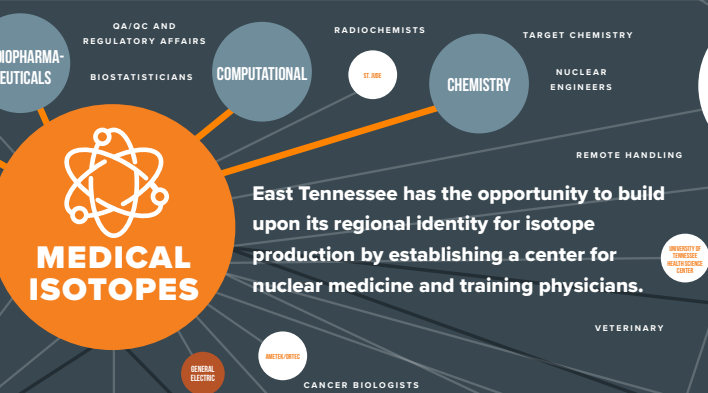




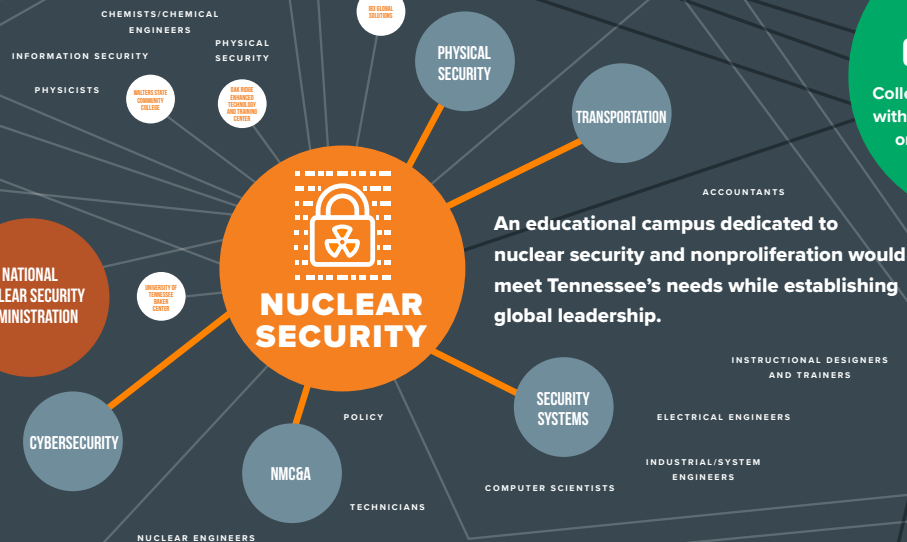
NUCLEAR IS HERE

ORNL collaborated with the East Tennessee Economic Council to help launch “Nuclear Is Here.” The effort—which has brought together industry, government officials, and higher education institutions—is focused on identifying gaps and building the necessary nuclear workforce for future efforts in fission and fusion energy, isotope and enrichment technology and production, and nuclear security (see the next page).

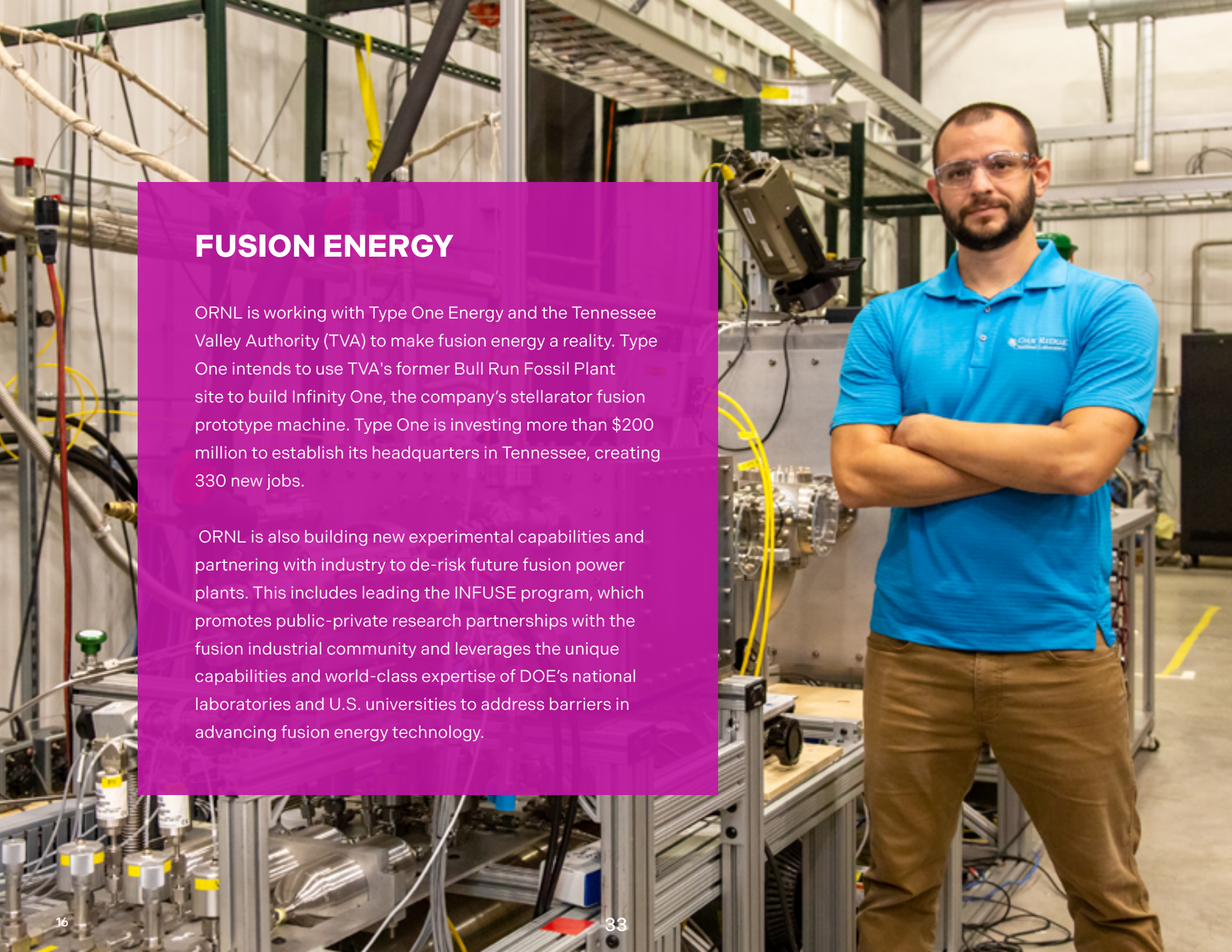
Early success has included the launch of new programs at local community colleges that will allow students to gain the necessary expertise to pursue careers in nuclear technology and chemical radiation.



NUCLEAR IS HERE



Through the establishment of centers of excellence focused on the supply chain and logistics, reactor component fabrication, and plant management services, East Tennessee can establish national leadership.

A man with a beard and safety glasses, wearing a blue polo shirt with an ORNL logo, stands with his arms crossed in a laboratory. The background shows complex scientific equipment, including pipes, wires, and metal structures.

FUSION ENERGY

ORNL is working with Type One Energy and the Tennessee Valley Authority (TVA) to make fusion energy a reality. Type One intends to use TVA's former Bull Run Fossil Plant site to build Infinity One, the company's stellarator fusion prototype machine. Type One is investing more than \$200 million to establish its headquarters in Tennessee, creating 330 new jobs.

ORNL is also building new experimental capabilities and partnering with industry to de-risk future fusion power plants. This includes leading the INFUSE program, which promotes public-private research partnerships with the fusion industrial community and leverages the unique capabilities and world-class expertise of DOE's national laboratories and U.S. universities to address barriers in advancing fusion energy technology.

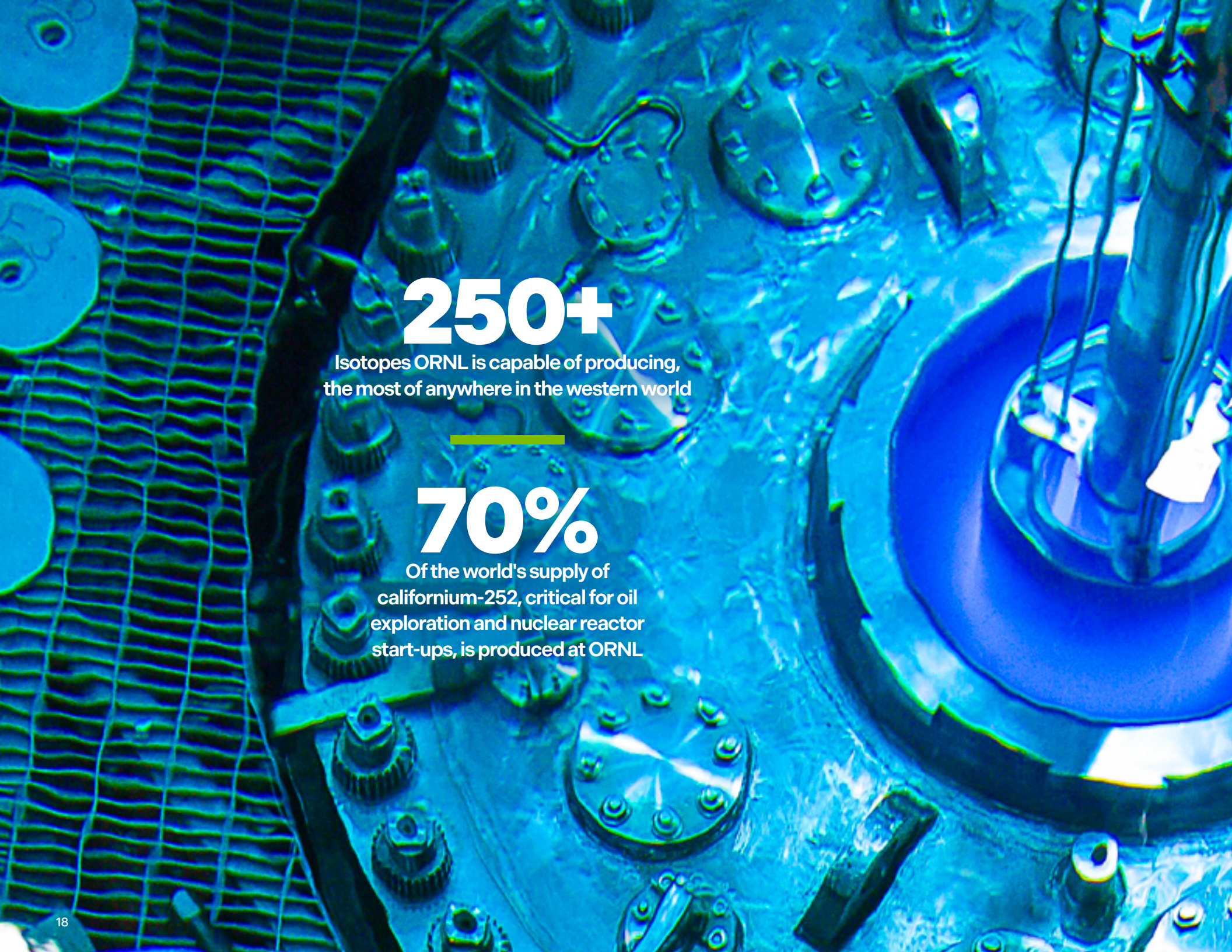


300

ORNL employees focused on
advancing fusion energy

2027

ORNL will complete the Material Plasma
Exposure Experiment, which will be
critical for developing materials for
future fusion reactors

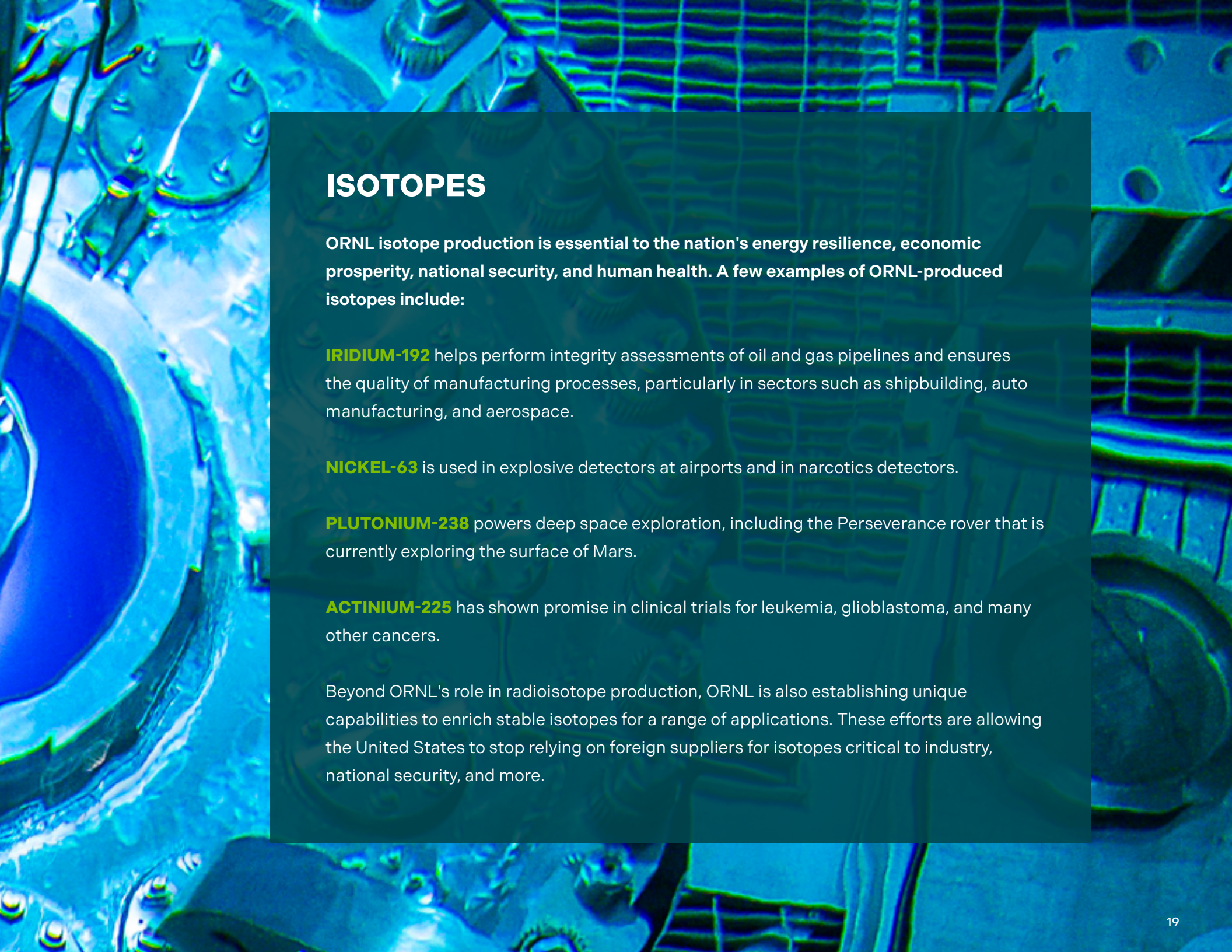


250+

Isotopes ORNL is capable of producing,
the most of anywhere in the western world

70%

Of the world's supply of
californium-252, critical for oil
exploration and nuclear reactor
start-ups, is produced at ORNL



ISOTOPES

ORNL isotope production is essential to the nation's energy resilience, economic prosperity, national security, and human health. A few examples of ORNL-produced isotopes include:

IRIDIUM-192 helps perform integrity assessments of oil and gas pipelines and ensures the quality of manufacturing processes, particularly in sectors such as shipbuilding, auto manufacturing, and aerospace.

NICKEL-63 is used in explosive detectors at airports and in narcotics detectors.

PLUTONIUM-238 powers deep space exploration, including the Perseverance rover that is currently exploring the surface of Mars.

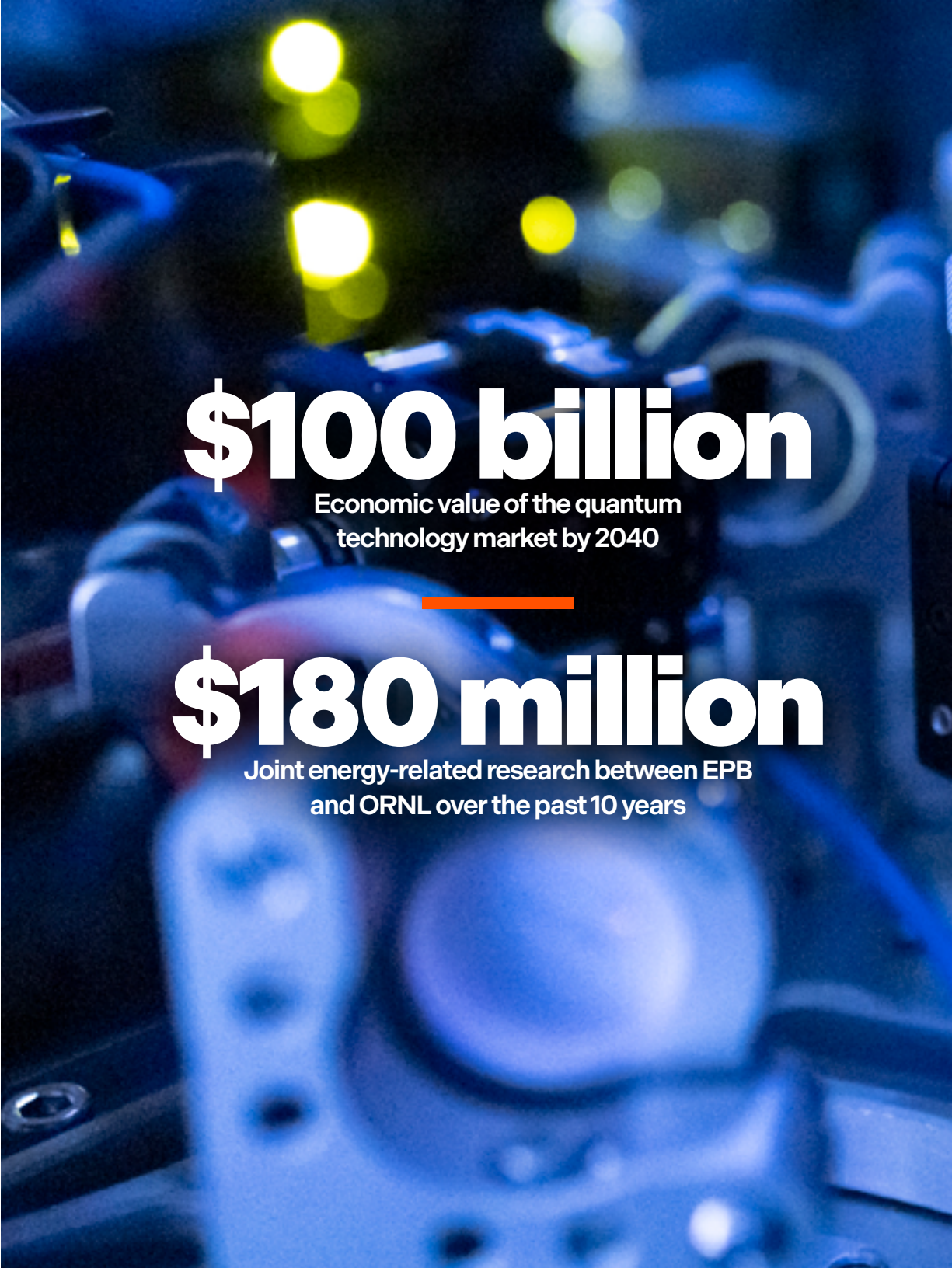
ACTINIUM-225 has shown promise in clinical trials for leukemia, glioblastoma, and many other cancers.

Beyond ORNL's role in radioisotope production, ORNL is also establishing unique capabilities to enrich stable isotopes for a range of applications. These efforts are allowing the United States to stop relying on foreign suppliers for isotopes critical to industry, national security, and more.

QUANTUM TECHNOLOGY

Technologies that exploit quantum mechanics such as entanglement, superposition, and tunneling are disrupting and transforming industries in exciting and unexpected ways. ORNL is working from atoms to applications to help chart America's quantum future and advancing quantum materials, networking, computing, and sensors.

ORNL leads the Quantum Science Center, one of five DOE quantum information centers. Together, these centers engage industry, academia, and national labs to accelerate quantum information science.

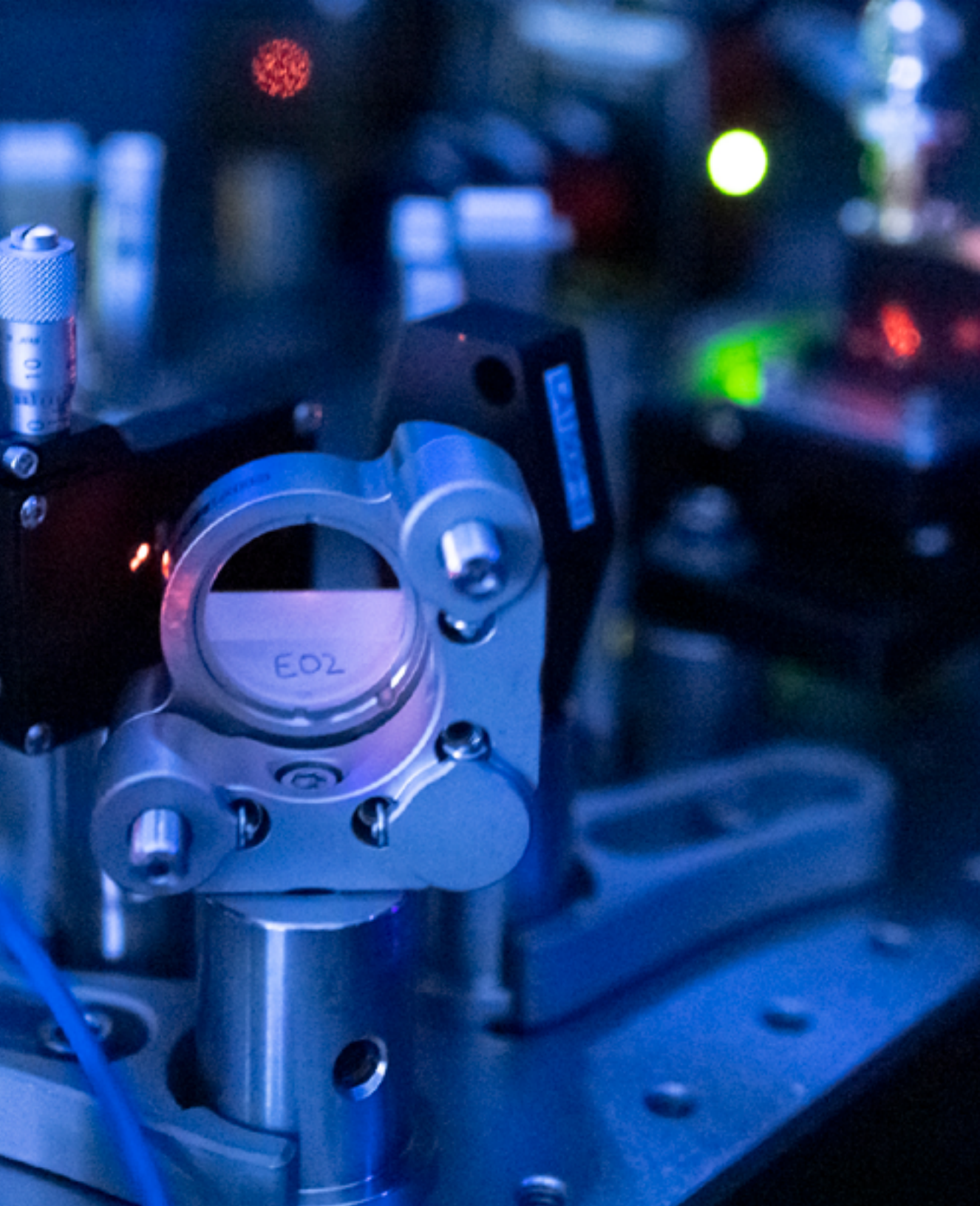


\$100 billion

Economic value of the quantum technology market by 2040

\$180 million

Joint energy-related research between EPB and ORNL over the past 10 years



The Electric Power Board (EPB) of Chattanooga and ORNL have launched a joint research effort called the Collaborative for Energy Resilience and Quantum Science to focus on enhancing the resilience and security of the national power grid while accelerating the commercialization of quantum technologies.

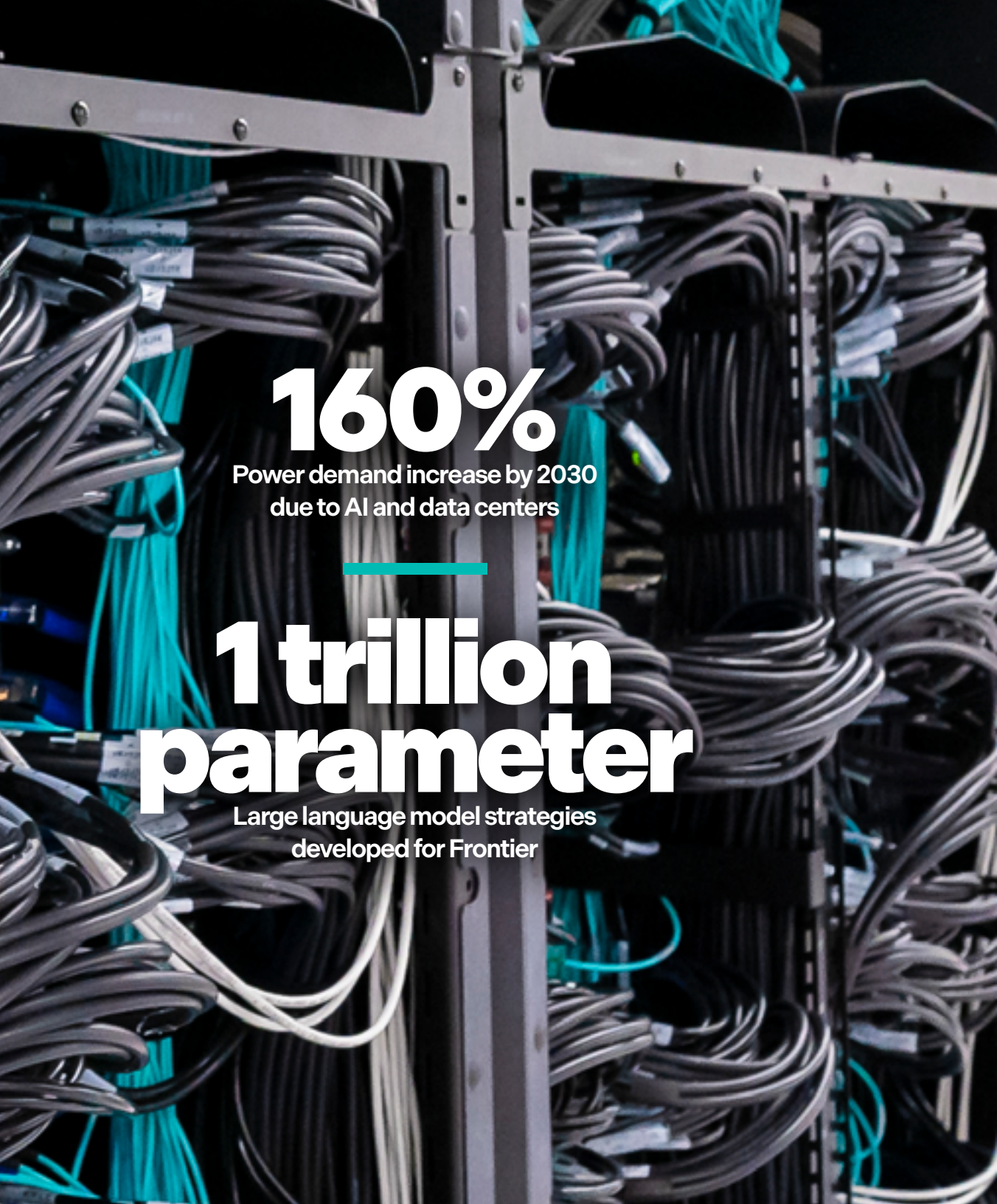
Quantum cybersecurity technology has been one of the most prominent focus areas for the joint effort. With DOE funding, EPB, ORNL, Los Alamos National Laboratory, and Qubitekk, an ORNL licensee, partnered to demonstrate quantum cryptographic technologies across a fiber optic network that EPB established between some of its electric substations. As a result of that effort, the team won an R&D 100 Award.

ARTIFICIAL INTELLIGENCE

With more than 40 years working on AI, ORNL has unique expertise and capabilities to help the nation's efforts to drive AI advancement. ORNL's AI initiative is focused on secure, trustworthy, and energy-efficient AI in the service of scientific research and national security.

ORNL has established the Center for AI Security Research, or CAISER, to address threats already present as governments and industries around the world adopt AI and take advantage of the benefits it promises in data processing, operational efficiencies, and decision-making.





160%

Power demand increase by 2030
due to AI and data centers

1 trillion parameter

Large language model strategies
developed for Frontier

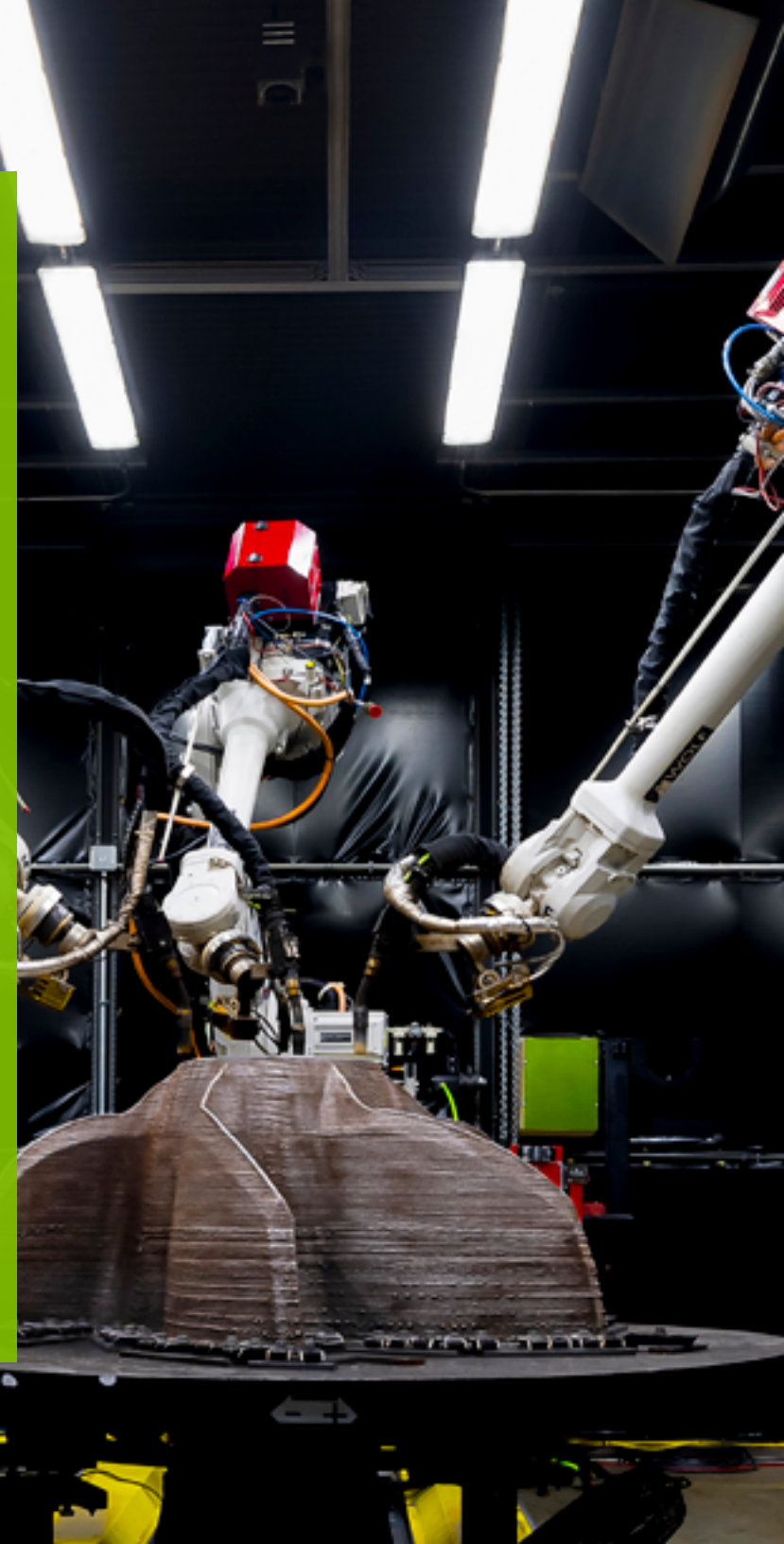
ORNL is also leveraging AI and machine learning (ML) expertise to pursue the INTERSECT initiative. INTERSECT is building interconnected “smart labs of the future” to enable:

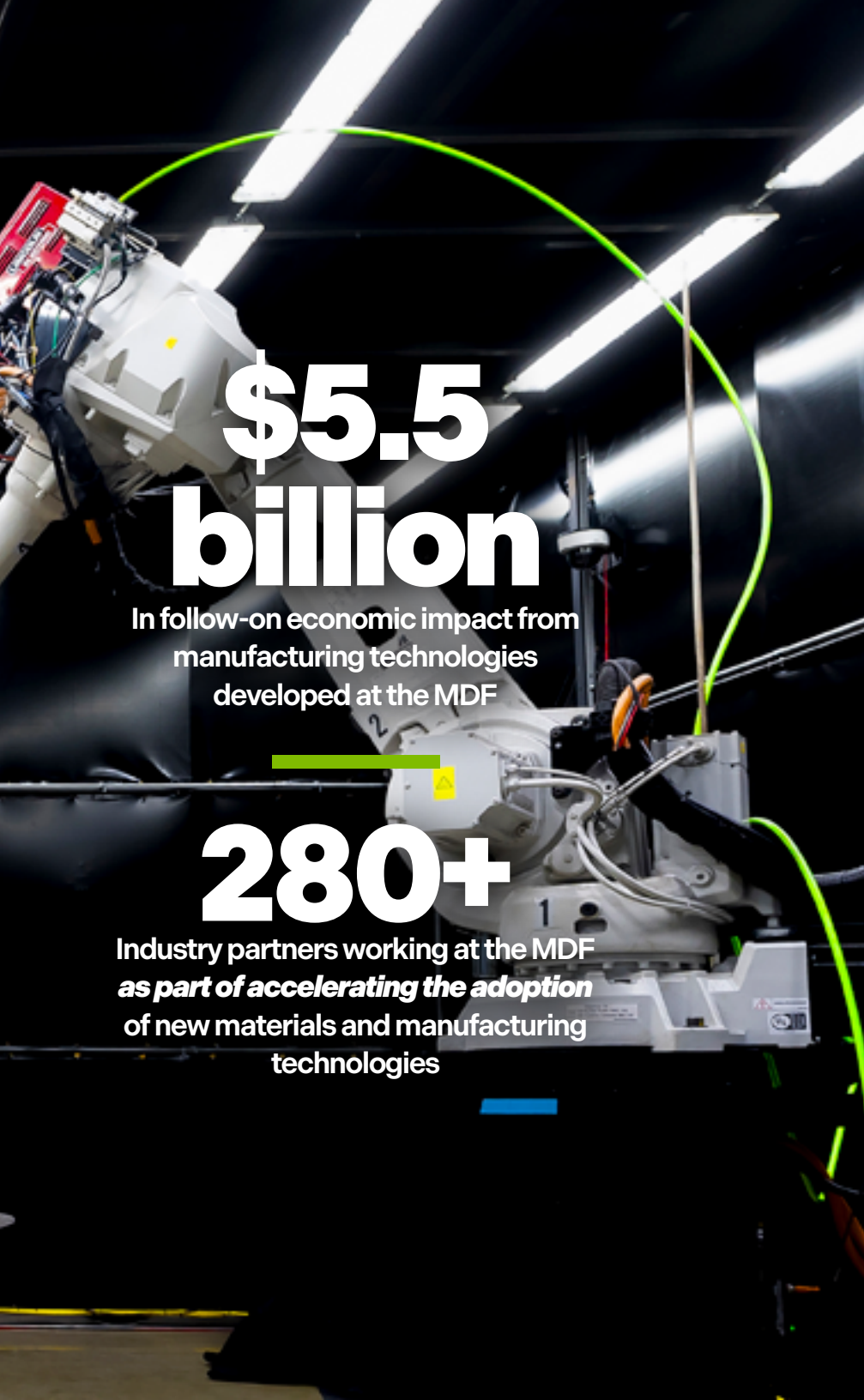
- Self-driving autonomous experiments that leverage advanced computing systems, scientific instruments, and facilities
- Multidomain and/or multimodal experiments that alter the approach to science
- Real-time data analysis and feedback optimizations using AI/ML and edge computing

ADVANCED MANUFACTURING

Thanks to materials expertise, neutron facilities, and computing power, ORNL has helped push the nation's manufacturing capabilities forward. Through continued focus, ORNL is now driving the adoption of smart manufacturing, which will integrate simulation, real-time data, advanced automation, and digital technologies to further optimize production and enhance efficiencies for manufacturing.

At the center of ORNL's capabilities is DOE's Manufacturing Demonstration Facility (MDF). Since 2012, the MDF has accelerated the use of new materials and manufacturing technologies across the United States, helping to build a resurgent manufacturing sector.



A large industrial robotic arm with a white and grey body and a red control box is positioned in a dark industrial setting. A bright green cable is draped over the arm. The background shows bright overhead lights.

\$5.5 billion

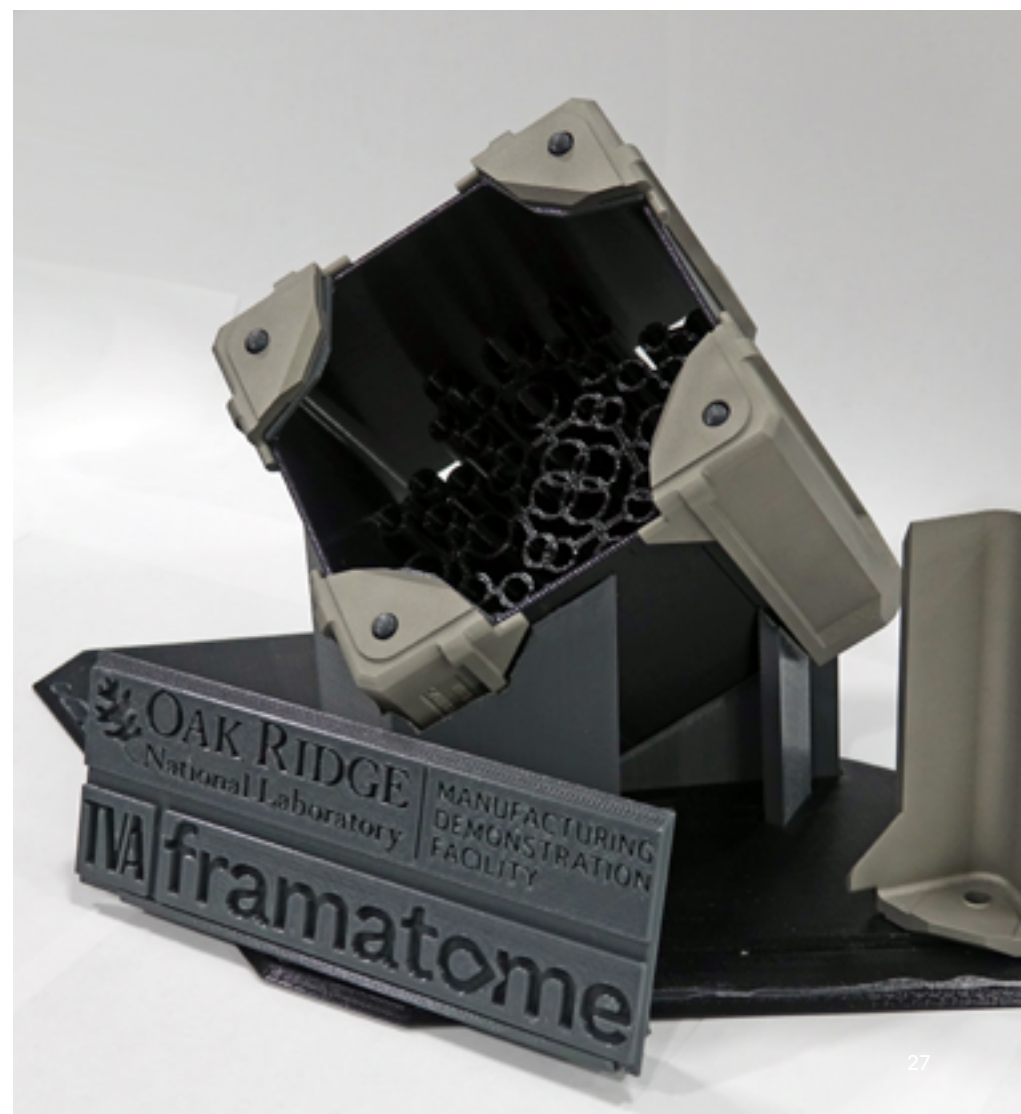
In follow-on economic impact from
manufacturing technologies
developed at the MDF

280+

Industry partners working at the MDF
as part of accelerating the adoption
of new materials and manufacturing
technologies

Four first-of-a-kind 3D-printed fuel assembly brackets, produced at the MDF, are now under routine operating conditions at the Tennessee Valley Authority's Browns Ferry Nuclear Plant Unit 2.

ORNL used additive manufacturing techniques to 3D print the channel fasteners. The fasteners will return to ORNL in 2026 for further testing and accelerate the application of advanced manufacturing for nuclear energy.



NATIONAL SECURITY

Continuing its Manhattan Project legacy, ORNL brings exceptional research and development to bear on the most pressing national security challenges, rapidly advancing science-based solutions to outpace the nation's adversaries.

CRITICAL INFRASTRUCTURE: Enabling secure, resilient operation of the nation's energy grid and other critical infrastructures

DEFENSE MANUFACTURING: Driving innovation throughout the defense manufacturing supply chain

NUCLEAR NONPROLIFERATION: Reducing nuclear risk and promoting US nuclear energy innovation

EMERGENCY RESPONSE: Supporting rapid, effective emergency response and disaster recovery efforts

TECHNOLOGY LEADERSHIP: Ensuring US leadership in emerging technologies, such as AI, quantum, and classified high-performance computing





GRID SECURITY

ORNL experts explore grid security across scales: from individual operational technology devices to massive experiments on energized systems. ORNL's research has identified novel vulnerabilities in the grid's cyber-physical supply chain and provided mitigation strategies to strengthen grid security. By better understanding the embedded systems that run the grid, their vulnerabilities, and how to mitigate them—and by sharing findings with vendors and policymakers—ORNL is helping prevent adversarial disruptions and keeping energy flowing to American homes.

~30%
of ORNL staff supported national
security missions in 2024

125M+
structures within the US mapped
and characterized, supporting rapid
emergency response

NEXT-GENERATION MATERIALS

ORNL is advancing the fundamental understanding of matter and how it can be manipulated and employed to solve problems of national importance.

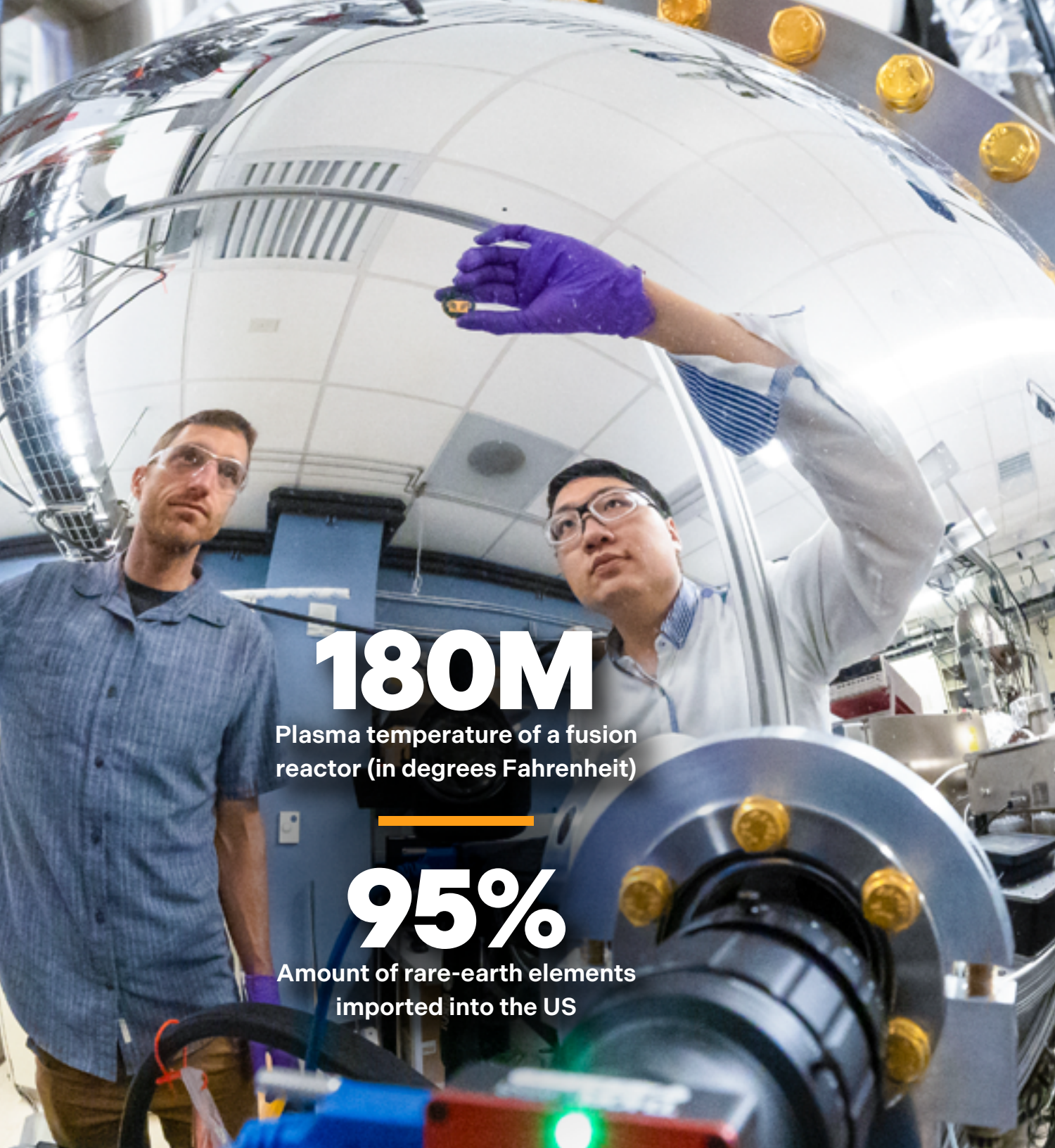
MATERIALS AT EXTREMES: Key innovations in materials and devices capable of withstanding extreme environmental conditions, such as the heat of nuclear reactors

CRITICAL MINERALS: Science and engineering that propels industry toward scalable approaches for securing affordable and domestically sourced rare-earth elements and other critical materials

ATOM-SCALE MANUFACTURING: Unique materials, interfaces, and defects that serve as platforms for disruptive applications in energy, information technology, quantum computing, and secure microelectronics

IMAGING AND CHARACTERIZATION: Extremely sensitive diagnostics and remote sensing for trace detection of elements and isotopes within suspect or novel materials



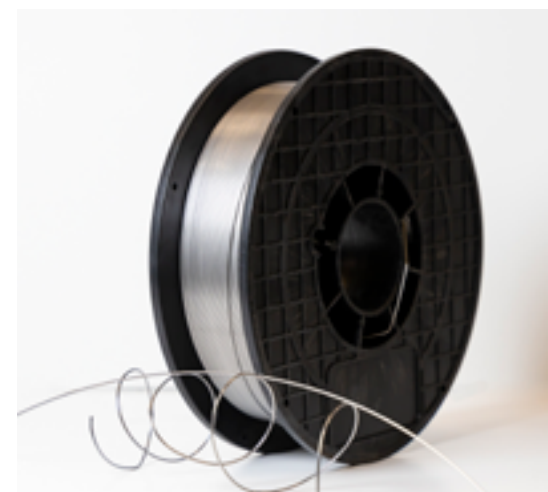
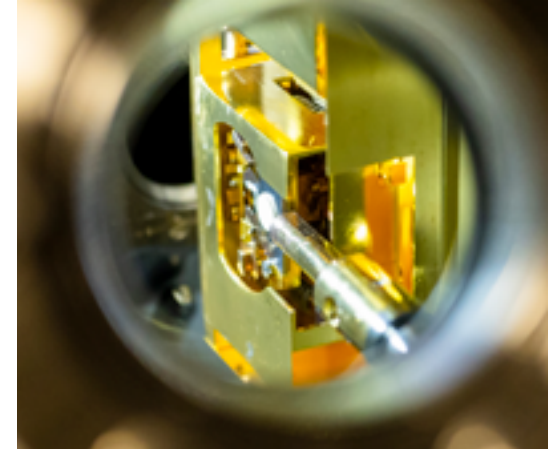


180M

Plasma temperature of a fusion reactor (in degrees Fahrenheit)

95%

Amount of rare-earth elements imported into the US



ORNL worked with the US Army to invent weld wire for tank and infrastructure repair. The invention allows for onsite welding without costly, laborious heat treatments typically used to reduce residual stresses and material distortion and has potential applications with vehicles, bridges, and pipelines.

DRIVING TECHNOLOGY TO INDUSTRY

ORNL has always been a major driver of innovation-based economic impact, supporting new and growing companies, creating jobs, and developing a skilled workforce that benefits the state and nation.

As we pursue our research mission, ORNL often develops technologies with commercial value. The transfer of lab-developed technology to U.S. industry and the support of small businesses and entrepreneurs are central to the nation's economic success.

TECHNOLOGY LICENSES



298

NEW INVENTIONS
DISCLOSED IN 2024



142

ACTIVE LICENSES



1,132

U.S. PATENTS SINCE 2010

ORNL SPINOUTS

EchoMAV develops electronic, mechanical, and communications systems for unmanned aerial vehicles.

Electro-Active Technologies is developing a modular system to convert food waste and electricity into affordable hydrogen.

General Graphene manufactures roll-to-roll, large-area, high-quality graphene and multilayer graphene sheets.

NellOne is an early-stage biopharmaceutical company pioneering advances in regenerative medicine.

Prisma Renewable Composites specializes in separating renewable energy crops into pure fractions of lignin, cellulose, hemicellulose, and other extractives for use in pulp, biopolymers, chemicals, and composite materials.

ENTREPRENEURIAL SUPPORT

Innovation Crossroads is one of four DOE Lab-Embedded Entrepreneurship Program branches. This competitive 2-year fellowship program embeds new entrepreneurs from energy technology start-ups at ORNL to work with the world's leading scientists to de-risk their technologies while receiving mentoring and business development assistance. Fellows receive a personal living stipend and a health insurance and travel allowance.

14

INNOVATION CROSSROADS
COMPANIES THAT HAVE
REMAINED IN TENNESSEE

7

INNOVATORS IN COHORT
2024, THE EIGHTH COHORT

19

START-UPS WITH
SALES

281

JOBS CREATED BY
INNOVATION
CROSSROADS
COMPANIES

\$237.7M

FOLLOW-ON FUNDING RAISED BY INNOVATION
CROSSROADS COMPANIES

45

ENTREPRENEUR-FELLOWS
WHO HAVE PARTICIPATED IN
INNOVATION CROSSROADS
SINCE ITS INCEPTION IN 2017

12

WEEKS THAT INNOVATION
CROSSROADS SPENDS WITH THE
UNIVERSITY OF TENNESSEE'S
SPARK PROGRAM

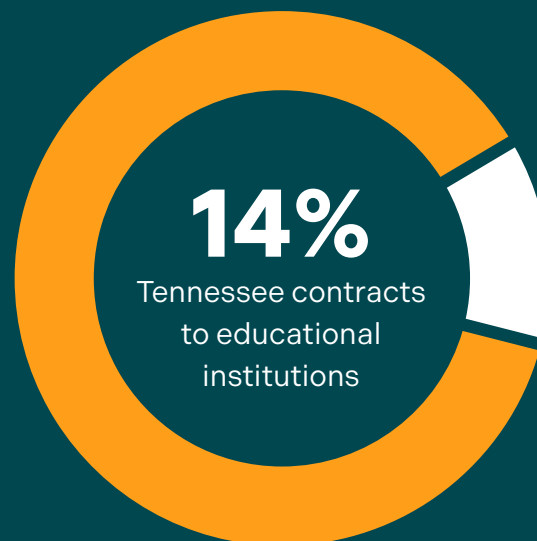
TENNESSEE RESEARCH PARTNERS

Through strategic partnership, technology commercialization, and entrepreneurship, we are driving innovation-based economic growth and opportunity in our nation, state, and community through scientific advances in energy, environment, and security.

ORNL's wide-ranging, world-leading expertise and facilities are unparalleled and provide a competitive advantage to our partners. We recognize that partnering with business incubators, start-ups, local firms, industry giants, government agencies, and universities extends the impact of our work.

Through our work to move new technologies to market, we're building supportive and resilient networks in the Oak Ridge-Knoxville area, in Tennessee, and in the United States.

OUR TENNESSEE



4M Carbon Fiber
A. O. Smith
Actinic
American Magnetics
American Nanotechnologies
Analysis and Measurement
Services Corporation
Ascend Manufacturing
Carbon Rivers
CMH Homes
Collaborative Composite
Solutions
DayLyte Batteries

**\$7
billion**

Impact of DOE's presence in
East Tennessee

**\$2.6
billion**

ORNL's annual budget

**\$289
million**

Value of contracts awarded
to Tennessee companies
and institutions

PARTNERS

Dienamic Tooling Systems
Electro-Active Technologies
Endeavor Composites
General Fusion
International Mass Timber Alliance
Magnum Venus Products
Magotteaux
Neptune Fluid Flow Systems
Prisma Renewable Composites
Quantal Security
ReMaxCo Technologies
SkyNano Technologies

Techmer PM
Tru-Design
Vitriform3D
Volunteer Aerospace
VW Group of America
Welbilt FSG Operations
Yellowstone Energy



83

**INDUSTRY, ACADEMIC, AND AGENCY
PARTNERS IN TENNESSEE ENGAGED IN
RESEARCH PROJECTS AT ORNL IN 2024**

ECONOMIC DEVELOPMENT



13

**JOB CREATION
EFFORTS UNDERWAY**

ORNL's Economic Development group develops and implements industry cluster strategies and supports entrepreneurial development programs. Our efforts with local, state, and national partners help transfer ORNL-developed technologies and know-how to the commercial marketplace, creating new companies, new jobs, and increased U.S. competitiveness.

RevV

RevV is a program for Tennessee companies that offsets the costs of working with leading-edge experts in advanced research facilities to solve complex manufacturing challenges in product development and process innovation.

The State of Tennessee sponsors the program to ensure Tennessee manufacturers maintain a competitive advantage in the global marketplace by providing access to expertise and facilities at ORNL and University of Tennessee (UT). Through RevV, ORNL and UT have helped companies across the state to tackle their toughest challenges.



\$6.3M

VALUE OF VOUCHERS
AWARDED

40

VOUCHERS
AWARDED

9,800

JOBS CREATED IN
TENNESSEE
BY RevV PARTICIPANTS

\$33B

VALUE OF INVESTMENTS
MADE BY RevV
PARTICIPANTS IN THEIR
TENNESSEE OPERATIONS

RevV SUCCESSES

Composite Applications Group strengthened the infrastructure of a local community while also building a test case for rebuilding critical infrastructure with longer-lasting composite materials.

Choice Spine worked with the Manufacturing Demonstration Facility experts to inform the design of new spinal implants and troubleshoot the manufacturing process.

Dryad Global built a maritime security software platform that is supplemented by in-depth intelligence from the company's network of analysts.

Magotteaux-Pulaski worked with the Manufacturing Demonstration Facility to develop a more durable composition and a new 3D-printing process for creating abrasion-resistant materials.

Raptor Resins, an aerospace company specializing in high-temperature resin solutions located in Celina, developed and characterized formulations for cyanate ester resin.

TENNESSEE ACADEMIC PARTNERS

We work closely with our academic partners across the state to prepare the next generation of scientists and engineers, advance groundbreaking collaborative research, and undertake special initiatives to enhance the state's economic competitiveness.



**Pellissippi State
Community College**



**Roane State Community
College**



**Tennessee State
University**



**Tennessee Technological
University**

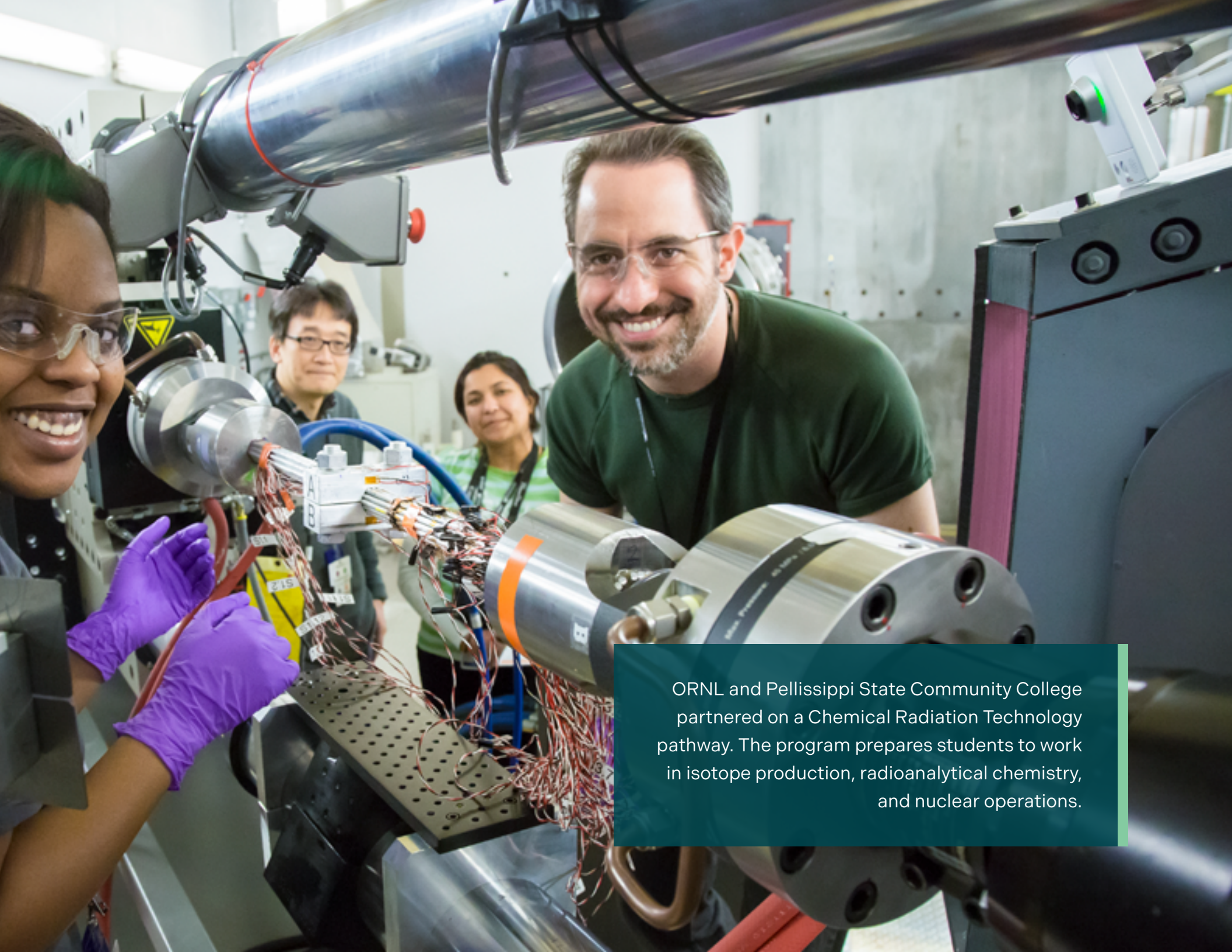


**University of Tennessee
System**



**Vanderbilt
University**





ORNL and Pellissippi State Community College partnered on a Chemical Radiation Technology pathway. The program prepares students to work in isotope production, radioanalytical chemistry, and nuclear operations.

The UT-Oak Ridge Innovation Institute

The UT-Oak Ridge Innovation (UT-ORII) Institute is leveraging University of Tennessee and ORNL capabilities and resources to accelerate collaborative discovery, innovation, and interdisciplinary graduate education and to prepare the next generation of talent in areas of critical importance to the nation and Tennessee.





Convergent Research Initiatives

A core pillar of UT-ORII's approach is support for convergent research initiatives, which focuses the partners' collaborative work in emerging areas of strength including:

Manufacturing and advanced materials

Energy storage and transportation

Circular bioeconomy systems

Radiopharmaceutical therapies

A scenic view of a lake with autumn foliage and mountains in the background. The sky is blue with white clouds. The mountains in the distance are covered in dense forest with trees showing vibrant autumn colors of red, orange, and yellow. The water in the foreground is calm, reflecting the sky and the colorful trees. In the middle ground, a small group of people is on a boat, possibly a kayak or a small rowing boat, on the water. The overall atmosphere is peaceful and scenic.

OUR COMMUNITY

The beauty, history, and complexity of Appalachia are inseparable from ORNL's identity. We actively seek projects that achieve our objectives while also providing benefits to Appalachian communities.

Our employees live throughout a region that includes the Knoxville metropolitan area, the city of Oak Ridge, and numerous small towns among the rolling hills, lakes, and rivers of East Tennessee.

The Appalachian Regional Commission and ORNL work together to conduct the High School Summer Math Science Technology Institute, providing a short-term, hands-on research experience for small groups of high school students and STEM teachers from the 13-state Appalachian region.



Our employees embody the Volunteer spirit—giving generously of their time and money to nonprofits as well as disaster response funds.



100+

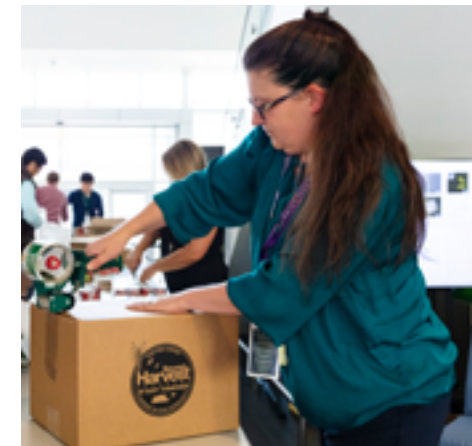
TENNESSEE NONPROFITS
SUPPORTED BY ORNL
EMPLOYEE GIVING

\$1.1M

VALUE OF ORNL EMPLOYEE
CONTRIBUTIONS, UT-BATTELLE
MATCHING FUNDS,
AND SERVICE HOURS IN 2024

3,340

HOURS DONATED TO
VOLUNTEER EAST
TENNESSEE BY ORNL
EMPLOYEES IN 2024



80 YEARS OF GLOBAL IMPACT

When the world was at war, America looked to East Tennessee. Oak Ridge National Laboratory has been serving the nation ever since.

ORNL today reflects more than 80 years of groundbreaking R&D that began with the Manhattan Project, the 1940s effort to harness the atom.



1939

Einstein's Letter

Albert Einstein writes to President Franklin Roosevelt about Germany possibly developing "extremely powerful bombs of a new type" and advises the United States to accelerate research on nuclear chain reactions.

1943

The X-10 Site

After a February ground-breaking on the X-10 site—what is now known as ORNL—the Graphite Reactor goes critical on November 4 and becomes the first continuously operated nuclear reactor.



1945

Discovery of Promethium

While working at the Graphite Reactor, Jacob Marinsky and Lawrence Glendenin produce the rare-earth element 61, promethium. Promethium-147 will later be used in nuclear-powered batteries for instruments in guided missiles.

1945

The End of World War II

Oak Ridge celebrates the war's end. As a pilot plant for plutonium production, the X-10 site built the necessary knowledge to produce the "Fat Man" nuclear bomb used in Nagasaki, Japan.



1946

First Shipment of Radioisotopes

Carbon-14 is produced at the Graphite Reactor and shipped to a hospital in St. Louis—the first official shipment of a radioisotope produced at a nuclear reactor.



1947

ORNL's First Computer

As part of supporting nuclear-powered aircraft research, ORNL obtains its first computer, a matrix multiplier to solve linear equations. It's known as SPEC—special purpose electronic computer.



1946

Pioneering Neutron Science

Ernest Wollan and Clifford Shull begin investigating neutron diffraction. Their exploration of the structures and characteristics of materials using neutron scattering becomes a foundation for conducting materials science.



1948

Electricity from Nuclear

A Graphite Reactor experiment results in the first nuclear power produced in the world as electricity. The experiment generates a small amount of energy to light a flashlight bulb.



1954

Launching the Nuclear Navy

U.S. Navy Captain Hyman Rickover approaches ORNL to assist in the development of the USS Nautilus, the Navy's first nuclear-powered submarine; it is built using Alvin Weinberg's pressurized-water reactor concept.



1956

Messenger RNA Discovery

Elliot Volkin and Larry Astrachan discover messenger RNA, which "reads" DNA's genetic code and becomes a template for mass-producing proteins.



1954

Ecology Studies at ORNL

An ecology program is established to study the effects of radiation on forest insects and the biological uptake of fission products in the laboratory.



1956

Y Chromosome Discovery

Liane Russell and colleagues discover that maleness in a mouse depends on the presence of the Y chromosome and is unrelated to the number of X chromosomes.





1965

Molten Salt Reactor Experiment

The Molten Salt Reactor Experiment goes critical using uranium-235 in June. In 1968, it becomes the first reactor to operate using uranium-233. Interest in the technology resurfaces 40 years later.

1965

High Flux Isotope Reactor

The High Flux Isotope Reactor achieves criticality. It is designed to produce super heavy elements such as californium, and its intense neutron beams also are applied to materials studies.



1971

Aquatic Ecology Laboratory

The Aquatic Ecology Laboratory is established to study data on the effects of water temperature on fish, furthering ORNL's research that influenced the Clean Water Act of 1970.

1969

ORNL on the Moon

ORNL expertise supports man's first walk on the Moon by designing a lunar rock scoop and a vacuum-sealed box for storing the collected rock samples. An ORNL team later analyzes the rocks.



1974

Adding to the Mission

ORNL adds fossil fuel and energy conservation programs to its nuclear energy mission and puts new focus on research related to buildings, appliances, transportation, advanced materials, and analysis of energy issues.



1977

Equipping NASA Spacecraft

An ORNL-developed iridium alloy is used to clad spheres of plutonium-238 oxide fuel in the Voyager 1 and 2 spacecraft, while another ORNL material provides thermal insulation of the fuel cladding.

1986

Responding to Chernobyl

ORNL takes a role in the investigation of the Chernobyl nuclear power plant accident in the Soviet Union by assembling a team to better understand the causes, course, and consequences.



1991

Investigating the Death of a President

After performing neutron activation analysis at the High Flux Isotope Reactor on hair and nail samples from President Zachary Taylor's remains, researchers refute the theory Taylor died of arsenic poisoning in 1850.





1994

Clifford Shull: Nobel Laureate

Clifford Shull wins half of the Nobel Prize in Physics for research with the late Ernest Wollan leading to neutron scattering technology that determines where atoms are in a crystal.



1995

The Intel Paragon

The Intel Paragon supercomputer, the world's fastest at the time, begins operations. The Paragon is the laboratory's first parallel computer, which puts many processors together to solve scientific problems faster.

1997

Supplying Actinium-225

ORNL sends its first shipment of actinium-225, a promising medical isotope used for treating cancers, to the National Institutes of Health. ORNL remains a major supplier of actinium-225.



2000

Cleaner Diesel for the Nation

The Environmental Protection Agency lowers diesel fuel sulfur content by citing research from ORNL and collaborators. The research enables more efficient diesel engines for cars and trucks in the United States.

2004

Indian Ocean Tsunami Response

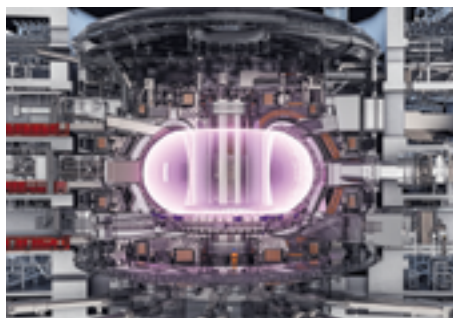
LandScan, an ORNL-developed global population database that shows the geographical distribution of population at 1-kilometer resolution, is used by relief workers following the Indian Ocean tsunami on December 26.



2006

U.S. ITER Project Office

The U.S. ITER Project Office opens at ORNL and is responsible for project management of U.S. activities to support construction of the international fusion research facility.



2006

Spallation Neutron Source

The Spallation Neutron Source becomes operational on April 28 and sends its first proton beams to the target, officially becoming a neutron source on time, on budget, on scope, and on target.



2009

Jaguar Reaches the Top

Installed in 2008, the Jaguar supercomputer is named the world's most powerful computer. Supercomputer Kraken is named third most powerful in the TOP500 ranking.



2012

Investigating the Arctic

ORNL launches the Next-Generation Ecosystem Experiment (NGEE) in the Arctic region. NGEE aims to improve understanding and representation of land processes in high-performance computer models that simulate the Earth.



2008

Removing Iraq's Radioactive Materials

ORNL's Mobile Uranium Facility team (informally dubbed the Uranium National Guard) deploys to Iraq a second time to assist the U.S. military in removing radioactive materials.



2012

We're #1, Again

The Titan supercomputer replaces the Jaguar supercomputer at ORNL. For a time, it ranks first in the TOP500 as the world's fastest supercomputer and consistently ranks as America's fastest supercomputer.

2016

Tennessee's Element

Element 117 is formally verified and officially named "tennessine." ORNL collaborated with the University of Tennessee, Knoxville; Vanderbilt University; and the Joint Institute for Nuclear Research in Russia on the discovery.



2018

Reaching the Summit

ORNL launches Summit, its third supercomputer to reach #1 in the TOP500. Compared with Titan, Summit moves data 5 to 10 times faster and stores 8 times more data.



2022

Breaking Exascale

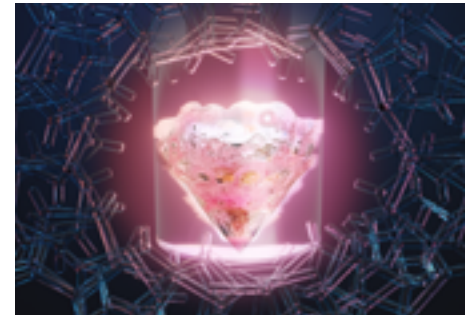
The Frontier supercomputer debuts as the world's fastest. It is the first to achieve an unprecedented level of computing performance known as exascale, a threshold of a quintillion calculations per second.



2020

Powering Mars Exploration

The Perseverance rover begins its journey to Mars, where it will use ORNL-produced plutonium-238 to power its instrumentation systems while ORNL-developed iridium cladding and carbon-bonded carbon fiber protects the plutonium fuel.



2024

Rare-Earth Element Science

After discovering promethium in 1945, ORNL continues its work with the element nearly 80 years later by understanding the makeup of promethium, which will be key for energy and materials sciences applications.





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