AT A GLANCE:

AMES NATIONAL LABORATORY

Ames National Laboratory delivers critical materials solutions to the nation. Ames Laboratory creates materials, inspires minds to solve problems, and addresses global challenges. We conduct fundamental and applied research that helps the world to better understand fundamentals of chemistry, physics, and materials science. We translate that knowledge into new and unique materials, processes, and technologies that advance the nation's energy and economic competitiveness and enhance national security. Our values are Creativity, Collaboration, and Community.

FACTS

LOCATION:	AMES, IOWA
TYPE:	SINGLE-PROGRAM LABORATORY
CONTRACTOR:	IOWA STATE UNIVERSITY
RESPONSIBLE SITE OFFICE:	AMES SITE OFFICE (AMSO)
WEBSITE:	AMESLAB.GOV

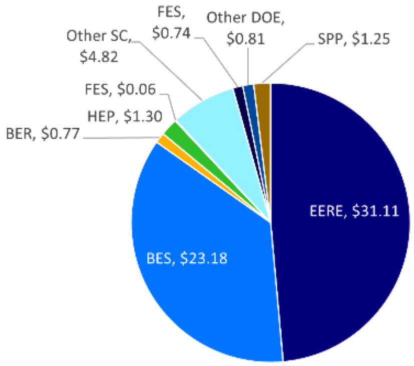
FUNDING BY SOURCE (FY23 COSTS)

Operating Costs: $64.04 M

DOE Costs: $62.79 M

SPP (Non-DOE/DHS) Costs: $1.25 M

SPP/DHS as % Total Operating Costs: 1.95%



FY23 Cost Data, $M

PHYSICAL ASSETS (FY23 DATA)

10 Acres and 16 Buildings

340,968 GSF in Buildings

Replacement Plant Value: $133 M

MISSION UNIQUE FACILITIES

Materials Preparation Center

Sensitive Instrument Facility

Solid State NMR Laboratory

Advanced Magnet Facility

Powder Synthesis & Development

HUMAN CAPITAL (FY23 DATA)

306 Full-Time Equivalent Employees (FTEs)

480 Paid Staff and Students

39 Joint Faculty

47 Postdoctoral Researchers

41 Undergraduate Students

86 Graduate Students

70 Staff Contributors

CORE CAPABILITIES

Applied Materials Science and Engineering

Chemical and Biological Sciences

Condensed Matter Physics and Materials Science

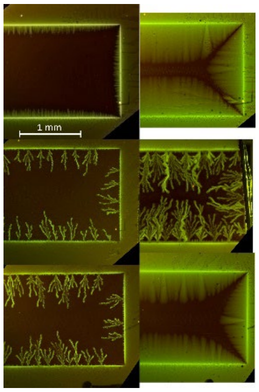
AT A GLANCE:

AMES NATIONAL LABORATORY

ACCOMPLISHMENTS

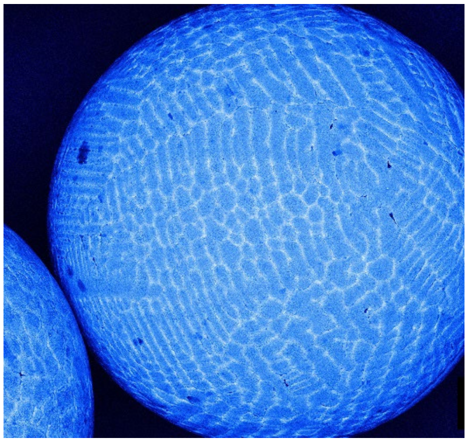
R&D TESTBED: ADVANCED MAGNET FACILITY

The Advanced Magnet Facility (AMF) addresses critical materials challenges and supports alternative energy technologies as a fully integrated research and development testbed for permanent magnet synthesis. The AMF works with partners from universities, national laboratories, and industry to rapidly transition lab-scale research into mid-scale magnet synthesis. The AMF serves as a national resource to accelerate commercial adoption of new materials and processes. The AMF offers the following capabilities at pilot scale: strip casting and gas atomization, hydrogen decrepitation, advanced jet milling with integrated classifiers, pulsed magnetizer, cold isostatic pressing, and vacuum sintering.



IMPROVING QUANTUM COMPUTING CIRCUITS PERFORMANCE

A team of researchers, led by scientist Lin Zhou of Ames National Laboratory, has made important progress toward understanding the role of surface oxides in improving quantum computing circuits performance. Surface oxides are a primary cause of decoherence, or loss of quantum properties in quantum circuits. Using a variety of techniques to analyze material down to the atomic level, the researchers are using the data collected to establish connections between specific defects in a device and coherence loss. The team is part of a larger effort by the Superconducting Quantum Materials and Systems Center to improve quantum computers.



ALLOY POWDERS FOR HIGH-TEMPERATURE ENVIRONMENTS

A longtime partnership between Ames National Laboratory and Linde Advanced Materials Technologies (formerly Praxair Surface Technologies, Inc.) continues to advance industrial additive manufacturing. Linde recently licensed seven Ames Lab patents that are related to a new low-cost way of making metallic alloy powders. These powders can be used to build structural parts that can withstand high-temperature environments better than materials using other manufacturing methods. Linde has partnered with Ames Lab on a variety of projects since 2019. The partnership started when Praxair and Ames Lab researchers improved the Lab's close-coupled gas atomization die technology through a Technology Commercialization Fund project. More recently, Linde partnered with Ames Lab to optimize their atomizer design and operations via an HPC4EI award. Ames Lab researchers used their expertise in 2D and 3D computational fluid dynamics modeling to study the atomizer.

AT A GLANCE:

ARGONNE NATIONAL LABORATORY

Argonne National Laboratory accelerates science and technology to drive U.S. prosperity and security. Argonne supports the U.S. Department of Energy mission through groundbreaking scientific discoveries and transformative solutions to critical national challenges. Argonne researchers solve the deepest mysteries in the physical and life sciences; promote energy security; protect the nation from diverse threats; advance critical emerging technologies, such as artificial intelligence and quantum information science; and help secure domestic supply chains for critical materials. Argonne builds on its discoveries to benefit the nation and its citizens, amplifying its impact through extensive collaborations with academia, other national laboratories, and industry. The laboratory provides powerful tools for science, engineering, and computation to thousands of scientists across the nation each year, including the upgraded Advanced Photon Source and Aurora exascale computer.

FACTS	
LOCATION:	LEMONT, ILLINOIS
TYPE:	MULTIPROGRAM LABORATORY
CONTRACTOR:	UCHICAGO ARGONNE, LLC
RESPONSIBLE SITE OFFICE:	ARGONNE SITE OFFICE
WEBSITE:	ANL.GOV

FUNDING BY SOURCE (FY23 COSTS)

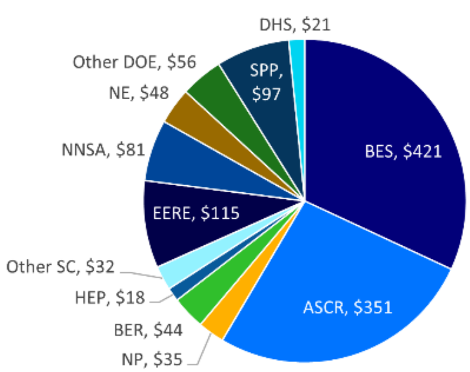
Operating Costs: $1,321 M

DOE Costs: $1,203 M

SPP (Non-DOE/DHS) Costs: $97 M

DHS Costs: $21 M

SPP/DHS as % Total Operating Costs: 9%



FY23 Cost Data, $M

PHYSICAL ASSETS (FY23 DATA)

1,517 Acres and 157 Buildings

5.2 M GSF in Buildings

Replacement Plant Value: $4.1 B

0.02 M GSF in 12 Excess Facilities

0.3 M GSF in 5 Leased Facilities

MISSION UNIQUE FACILITIES

Advanced Photon Source

Argonne Leadership Computing Facility

Argonne Tandem Linear Accelerator System

Atmospheric Radiation Measurement user facilities

Center for Nanoscale Materials

Intermediate Voltage Electron Microscope

HUMAN CAPITAL (FY23 DATA)

3,994 Full-Time Equivalent Employees (FTEs)

474 Joint Faculty

353 Postdoctoral Researchers

415 Undergraduate Students

275 Graduate Students

7,135 Facility Users

2,030 Visiting Scientists

CORE CAPABILITIES

Accelerator and Detector Science and Technology

Advanced Computer Science, Visualization, and Data

Applied Materials Science and Engineering

Applied Mathematics

Biological and Bioprocess Engineering

Biological Systems Science

Chemical and Molecular Science

Chemical Engineering

Computational Science

Condensed Matter Physics and Materials Science

Cyber and Information Sciences

Decision Science and Analysis

Earth, Environmental, and Atmospheric Science

Isotope Science and Engineering

Large-Scale User Facilities/R&D Facilities/Advanced Instrumentation

Mechanical Design and Engineering

Microelectronics

Nuclear and Radio Chemistry

Nuclear Engineering

Nuclear Physics

Particle Physics

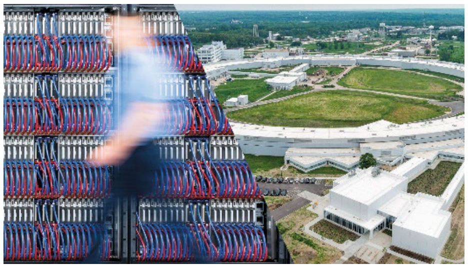
Power Systems and Engineering

Systems Engineering and Integration

AT A GLANCE:

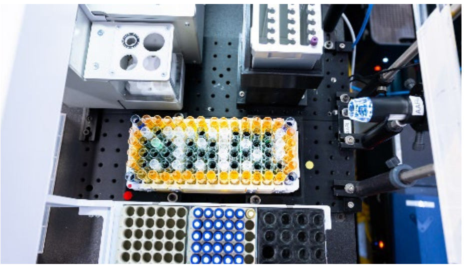
ARGONNE NATIONAL LABORATORY

ACCOMPLISHMENTS



TRANSFORMATIONAL SCIENCE WITH AURORA AND THE UPGRADED ADVANCED PHOTON SOURCE

Argonne is home to two new powerhouse tools that will be transformational for research. One is an addition to the Argonne Leadership Computing Facility (ALCF), called Aurora, a next-generation supercomputer. The other is the upgraded Advanced Photon Source (APS), a world-leading light source. Together, the two will transform how science is carried out, empowering researchers to make discoveries at unprecedented speeds. No other research laboratory hosts a comparable duo of tools, each boosting the power of the other. Aurora is one of the nation's first exascale computers. It is 100 times faster than other systems at the ALCF. The APS is essentially a powerful microscope, using X-rays—a billion times brighter than those in your dentist's office—to peer deep inside materials. Recently upgraded, the APS generates X-ray beams that are up to 500 times brighter than those produced pre-upgrade.



SUPERCHARGING SCIENCE WITH ARTIFICIAL INTELLIGENCE AND AUTONOMOUS DISCOVERY

Autonomous discovery integrates automation, robotics, and artificial intelligence (AI) to accelerate discovery and solve challenges across the Department of Energy mission space, such as quantum information science, energy storage, microelectronics, biology, and extreme weather. Scientists are thus free to use their creative energies to interpret and act on the most compelling results. Argonne researchers are finding innovative ways to apply autonomous discovery, leading the way to pivotal breakthroughs in several areas. The lab is accelerating the characterization of qubits for quantum information science, conducting AI-guided discovery of new molecules for next-generation batteries, exploring new treatments for drug-resistant bacteria, and using some of the world's fastest supercomputers to process large datasets and analyze this data using AI models.

HELPING U.S. INDUSTRY STRENGTHEN THE NATION'S BATTERY SUPPLY CHAIN

Electric vehicles (EVs) are on track to make up half of all new vehicle sales by 2030. EV batteries contain many valuable minerals and materials. The U.S currently does not produce enough of these materials to manufacture EV batteries without relying on imports. The demand for critical battery components, such as lithium and graphite, is projected to increase by as much as 4,000% in the coming decades. Battery recycling can help address these issues by providing a domestic supply of battery materials. It also has the added benefit of reducing supply chain disruptions and encouraging the production of batteries made in the United States. Argonne is working with Nevada-based American Battery Technology Company (ABTC) to test and optimize new advanced separation and processing technologies at an ABTC battery recycling facility. Once optimized, the new technologies will work more effectively and cost less, while using less water and having less environmental impact.

AT A GLANCE:

BROOKHAVEN NATIONAL LABORATORY

Brookhaven National Laboratory and its staff are driven by a common vision: To accelerate pathways to scientific discovery and technological innovations that will transform the world. The Lab's world-class scientists, engineers, technicians, and professionals collaborate with researchers across the country and around the world. They are exploring new forms of matter to gain a deeper understanding of the universe, developing ways to study and control electronics and material properties down to the nanoscale, advancing emergent information science through state-of-the-art research facilities and capabilities, and solving environmental and societal challenges. Brookhaven Lab is managed for the U.S. Department of Energy's (DOE) Office of Science by Brookhaven Science Associates (BSA), a partnership among Stony Brook University and Battelle. The BSA board includes representatives from Columbia, Cornell, Harvard, MIT, Princeton, and Yale. Brookhaven Lab is home to seven Nobel-Prize-winning discoveries and countless advances for science and technology.

FACTS

LOCATION:	UPTON, NEW YORK
TYPE:	MULTIPROGRAM LABORATORY
CONTRACTOR:	BROOKHAVEN SCIENCE ASSOCIATES
RESPONSIBLE SITE OFFICE:	BROOKHAVEN SITE OFFICE
WEBSITE:	BNL.GOV

FUNDING BY SOURCE (FY23 COSTS)

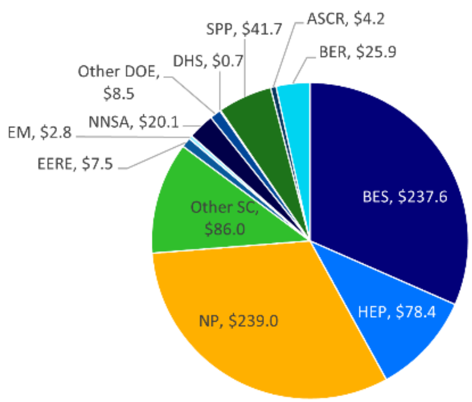
Operating Costs: $752.3 M

DOE Costs: $709.9 M

SPP (Non-DOE/DHS) Costs: $41.7 M

DHS Costs: $0.7 M

SPP/DHS as % Total Operating Costs: 5.6%



FY23 Cost Data, $M

HUMAN CAPITAL (FY23 DATA)

2,754 Full-Time Equivalent Employees (FTEs)

150 Joint Faculty

174 Postdoctoral Researchers

312 Undergraduate Students

261 Graduate Students

3,583 Facility Users

2,734 Visiting Scientists

PHYSICAL ASSETS (FY23 DATA)

5,322 Acres and 316 Buildings

4.8 M GSF in Buildings

Replacement Plant Value: $6.93 B

200,016 GSF in 28 Excess Facilities

MISSION UNIQUE FACILITIES

Accelerator Test Facility

Brookhaven Linac Isotope Producer

Center for Functional Nanomaterials

National Synchrotron Light Source II

Relativistic Heavy Ion Collider

CORE CAPABILITIES

Accelerator and Detector Science and Technology

Advanced Computer Science, Visualization, and Data

Applied Materials Science and Engineering

Applied Mathematics

Biological System Science

Chemical and Molecular Science

Chemical Engineering

Computational Science

Condensed Matter Physics and Materials Science

Earth, Environmental, and Atmospheric Science

Isotope Science and Engineering Large-Scale User Facilities/R&D Facilities/ Advanced Instrumentation

Mechanical Design and Engineering

Microelectronics

Nuclear and Radio Chemistry

Nuclear Engineering (emerging)

Nuclear Physics

Particle Physics

Power Systems and Electrical Engineering (emerging)

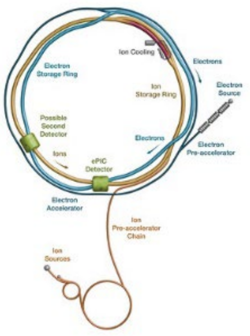
Systems Engineering and Integration

AT A GLANCE:

BROOKHAVEN NATIONAL LABORATORY

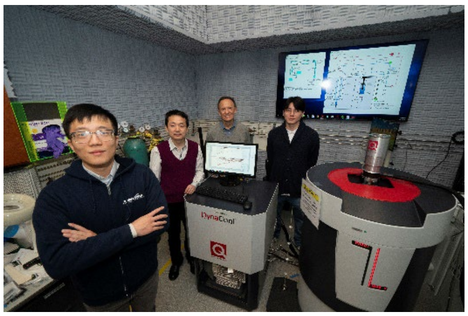
Brookhaven National Laboratory

ACCOMPLISHMENTS



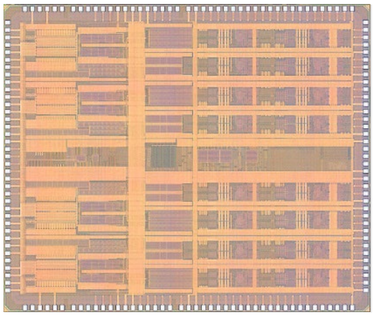
THE ELECTRON-ION COLLIDER

Brookhaven is building a one-of-a-kind nuclear physics research facility in partnership with Thomas Jefferson National Accelerator Facility, DOE, and New York State. The Electron-Ion Collider (EIC) will reuse key infrastructure from Brookhaven Lab’s Relativistic Heavy Ion Collider and serve as a 3D “microscope” for studying the behavior of quarks and gluons—the building blocks of the protons, neutrons, and atomic nuclei that make up all visible matter in the universe. Scientists from across the nation and around the world will use the EIC to study the properties of these building blocks of matter and unlock the secrets of the strongest force in nature. This exploration and the technologies developed to enable it could yield widespread benefits in energy systems, electronics, medicine, and other fields.



MAGNESIUM PROTECTS TANTALUM, A PROMISING MATERIAL FOR MAKING QUBITS

Brookhaven Lab scientists have discovered that adding a layer of magnesium improves the properties of tantalum, a superconducting material that shows great promise for building qubits, the basis of quantum computers. The research team found that a thin layer of magnesium keeps tantalum from oxidizing, improves its purity, and raises the temperature at which it operates as a superconductor. All three may increase tantalum’s ability to hold onto quantum information in qubits. This work provides valuable insights and new materials design principles that could help pave the way to the realization of large-scale, high-performance quantum computing systems.



APPLICATION-SPECIFIC INTEGRATED CIRCUITS

Several companies have licensed Brookhaven Lab intellectual properties that cover application-specific integrated circuits (ASICs) that were originally conceived by laboratory scientists for detectors in nuclear and particle physics experiments. These physics experiments generally require hundreds of integrated circuits produced within specified constraints of low noise, high precision, and high speed while maintaining low power consumption and low cost—attributes attractive to many industrial applications. Licensees of Brookhaven’s intellectual properties are incorporating such ASICs in products designed for imaging and monitoring applications in the security, nuclear power, and medical industries.

AT A GLANCE:

FERMI NATIONAL ACCELERATOR LABORATORY

Fermilab's mission is to be the frontier laboratory for particle physics discovery. The accelerator complex powers research into the fundamental nature of the universe and is the only one in the world to produce both low- and high-energy neutrino beams for science and also enable precision science experiments. The construction of the Long-Baseline Neutrino Facility and Deep Underground Neutrino Experiment, along with the world's most intense neutrino beams made possible by the Proton Improvement Plan II (PIP-II) project, will be the first international mega-science project based at a DOE national laboratory. Fermilab integrates U.S. researchers into the global particle physics community through its experiments and programs in neutrino, collider, precision, and cosmic science. The laboratory's scientific R&D advances accelerator, detector, computing, and quantum technology for use in science and society.

FACTS

LOCATION:	BATAVIA, ILLINOIS
TYPE:	SINGLE-PROGRAM LABORATORY
CONTRACTOR:	FERMI RESEARCH ALLIANCE, LLC (UNTIL DEC. 31, 2024); BEGINNING JAN. 1, 2025, THE CONTRACTOR WILL BE FERMI FORWARD DISCOVERY GROUP, LLC
RESPONSIBLE SITE OFFICE:	FERMI SITE OFFICE
WEBSITE:	FNAL.GOV

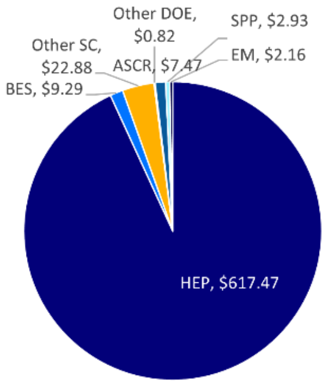
FUNDING BY SOURCE (FY23 COSTS)

Operating Costs: $665.26 M

DOE Costs: $662.33 M

SPP (Non-DOE/DHS) Costs: $2.9 M

SPP/DHS as % Total Operating Costs: 0.4%



FY23 Cost Data, $M

PHYSICAL ASSETS (FY23 DATA)

6,800 Acres and 372 Buildings

3.612 M GSF in Buildings

Replacement Plant Value: $3.05 B

28,913 GSF in 10 Excess Facilities

25,005 GSF in Leased Facilities

MISSION UNIQUE FACILITIES

Fermilab Accelerator Complex

HUMAN CAPITAL (FY23 DATA)

2,137 Full-Time Equivalent Employees (FTEs)

27 Outgoing Joint Appointees

9 Incoming Joint Appointees

123 Postdoctoral Researchers

188 Undergraduate Students

62 Graduate Students

2,395 Facility Users

1,721 Visiting Scientists

CORE CAPABILITIES

Accelerator S&T

Advanced Computer Science, Visualization, and Data

Large-Scale User Facilities/Advanced Instrumentation

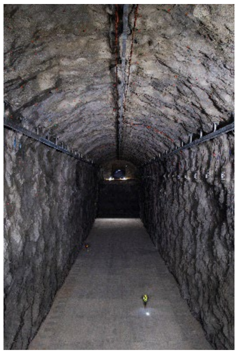
Particle Physics

AT A GLANCE:

FERMI NATIONAL ACCELERATOR LABORATORY

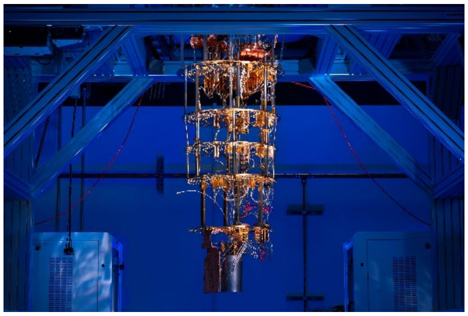
Fermilab

ACCOMPLISHMENTS



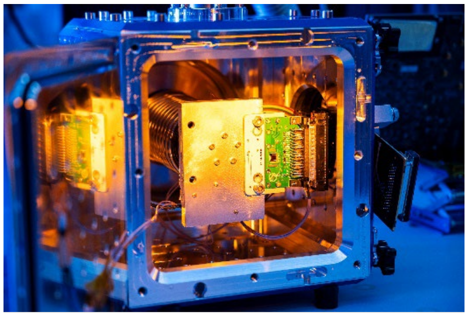
THE DEEP UNDERGROUND NEUTRINO EXPERIMENT (DUNE)

Fermilab is building the world's most comprehensive neutrino experiment, DUNE, to advance the DOE High Energy Physics program and explore the mysteries of neutrinos. More than 1,400 scientists from over 35 countries are part of the DUNE collaboration that is seeking to answer some of the biggest questions around our understanding of the universe. DUNE will be installed in the Long-Baseline Neutrino Facility, under construction in the United States. Crews recently completed excavation of DUNE's underground caverns in Lead, South Dakota, and prototype detectors have successfully seen accelerator-made neutrinos for the first time. The neutrinos for DUNE will be supplied by a new accelerator being built at Fermilab by the PIP-II project.



SUPERCONDUCTING QUANTUM MATERIALS AND SYSTEMS (SQMS) CENTER

The SQMS Center, led by Fermilab, is one of five research centers funded by the U.S. Department of Energy as part of a national initiative to develop and deploy the world's most powerful quantum computers and sensors. SQMS brings together more than 550 experts from 35 partner institutions—national laboratories, academia and industry—in a mission-driven, multidisciplinary collaboration that integrates deep expertise in quantum information science, material science, applied and theoretical superconductivity, computational science, particle and condensed matter physics, cryogenics, microwave devices and controls engineering, industry applications and more. SQMS Center researchers have recently achieved reproducible improvements in superconducting transmon qubit lifetimes with record values of 0.6 milliseconds. The result was achieved through an innovative materials technique that eliminated a major loss source in the devices.



MICROELECTRONICS

Fermilab is at the forefront of microelectronics technology, driving progress that supports high-energy physics research and fosters innovations for broader industry. Fermilab engineers have made substantial strides across several key areas. Collaborating extensively with industry, they advanced quantum cryoelectronics to tackle scaling challenges. They used custom AI- on-chip designs to demonstrate ultrafast on-sensor data processing and developed tools and methodologies for easy implementation. Through incremental assembly design kit development and creation of multi-project wafer programs, Fermilab supports the 3D heterogeneous integration ecosystem. They used silicon photonics to enhance high-bandwidth communication for detectors and demonstrated ultrasensitive skipper-in-CMOS devices that have furthered precision sensing technology.

AT A GLANCE:

IDAHO NATIONAL LABORATORY

As the nation's nuclear energy laboratory and a leader in cyber-physical security, INL leverages fundamental science, applied research, engineering, and partnerships to deliver impactful outcomes. For over 75 years, INL has addressed energy, environmental, and nuclear challenges through transformative science and technologies. Leveraging its 890-square-mile site, INL boasts unparalleled facilities for fuel development, irradiation, and post-irradiation examination. Its capabilities extend to advanced R&D in renewable energy, cybersecurity, grid modernization, and advanced manufacturing. Under the DOE Office of Nuclear Energy, INL advances innovative nuclear technologies, such as microreactors, and ensures the safe operation of the existing fleet. INL also supports the Departments of Defense and Homeland Security in national security challenges, including critical infrastructure protection and nuclear nonproliferation. INL's R&D in integrated energy systems expands nuclear energy's role in low-emission energy generation, aiming to change the world's energy future and secure our nation's critical infrastructure.

FACTS

LOCATION:	IDAHO FALLS, IDAHO
TYPE:	MULTIPROGRAM LABORATORY
CONTRACTOR:	BATTELLE ENERGY ALLIANCE
RESPONSIBLE SITE OFFICE:	IDAHO OPERATIONS OFFICE (DOE-ID)
WEBSITE:	INL.GOV

FUNDING BY SOURCE (FY23 COSTS)

Operating Costs: $1,823 M

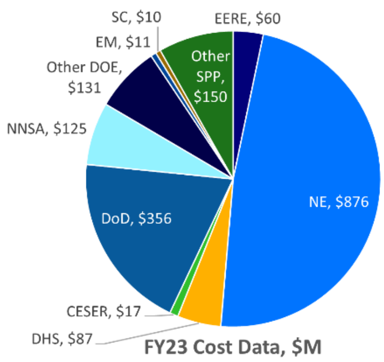
DOE Costs: $1,212 M

SPP (Non-DOE/DHS) Costs: $501 M

CRADA: $4 M

DHS Costs: $104 M

SPP/DHS as % Total Operating Costs: 33%



PHYSICAL ASSETS (FY23 DATA)

569,178 Acres and 336 Buildings Operating or in Standby and DOE-Owned (651 total DOE-owned real property assets)

2,374,897 GSF in DOE-Owned and -Operated Buildings

Replacement Plant Value (RPV) for All DOE-Owned Assets in Any Condition: $6,490,459,435; Owned Buildings/Trailers RPV in Any Condition = $3,225,412,719

1,332,286 GSF in Leased Facilities

MISSION UNIQUE FACILITIES

- Transient Reactor Test Facility
- Irradiated Materials Characterization Laboratory
- Fuel Manufacturing Facility
- Experimental Fuels Facility
- Space and Security Power Systems Facility
- Critical Infrastructure Test Range Complex
- Biomass Feedstock National User Facility
- Wireless Security Institute
- Cybercore Integration Center
- Advanced Test Reactor
- Specific Manufacturing Capability

HUMAN CAPITAL (FY23 DATA)

6,475 Full-Time Equivalent Employees (FTEs)

69 Joint Faculty

112 Postdoctoral Researchers

687 Undergraduate Students

19 Graduate Students

996 Facility Users

52 Visiting Scientists

CORE CAPABILITIES

- Advanced Computer Science, Visualization, and Data
- Applied Materials Science and Engineering
- Biological and Bioprocess Engineering
- Chemical and Molecular Science (emerging)
- Chemical Engineering
- Computational Science (emerging)
- Condensed Matter Physics and Materials Science (emerging)
- Cyber and Information Sciences
- Decision Science and Analysis
- Earth, Environmental Subsurface Science
- Isotope Science and Engineering
- Large-Scale User Facilities/R&D Facilities/Advanced Instrumentation
- Mechanical Design and Engineering
- Nuclear and Radiochemistry
- Nuclear Engineering
- Plasma and Fusion Energy Sciences
- Power Systems and Electrical Engineering and Integration
- Systems Engineering and Integration

AT A GLANCE:

IDAHO NATIONAL LABORATORY

ACCOMPLISHMENTS

TREAT: PIONEERING NUCLEAR FUEL SAFETY AND INNOVATION

The Transient Reactor Test (TREAT) Facility at Idaho National Laboratory is a vital national asset in reestablishing U.S. leadership in nuclear research. TREAT fosters the development of new methods to provide baseload and load-following electrical power. Transient testing is crucial for developing robust, safer nuclear fuels and bringing innovative reactor technologies to market. This testing involves short bursts of intense neutron flux on test specimens to study performance under off-normal conditions and hypothetical accidents. After testing, the materials are analyzed at a post-irradiation examination facility to advance fuel design and qualification. TREAT's real-time monitoring capabilities, including a hodoscope for detecting fast neutron signatures, enable detailed analysis. Its air-cooled design safely accommodates multi-pin test assemblies, studying fuel melting, metal-liquid reactions, and transient behaviors. TREAT supports the development of accident-tolerant fuels for light-water reactors and advanced reactors, ensuring nuclear power remains a key source of emission-free baseload energy.

INL BOOSTS HALEU PRODUCTION FOR NEXT-GEN REACTORS

To address next-generation advanced reactor fuel requirements, INL researchers have fabricated high-assay low-enriched uranium (HALEU) uranium dioxide pellets. These efforts, including recovering HALEU from spent fuels and scrap materials, meet critical near-term needs for advanced reactors and support broader, long-term, front-end fuel cycle requirements. HALEU production fosters new fuel cycle technologies and capabilities for advanced reactor systems and the management of existing and future radiological waste. HALEU offers significant advantages over conventional light-water reactor fuel, such as longer reactor cycle times, reduced waste production, and less downtime for refueling. Developing a domestic HALEU supply is crucial for the U.S. to achieve carbon reduction goals by enabling advanced reactors to power the nation.

NEW LICENSES ENHANCE CRITICAL INFRASTRUCTURE SECURITY

Securing the nation's critical infrastructure from advanced, persistent cyber threats is essential to U.S. national security. Idaho National Laboratory's award-winning Consequence-driven, Cyber-informed Engineering (CCE) methodology helps infrastructure owners and operators prioritize consequences and perform security assessments aligned with the latest threat information, leading to engineering solutions that prevent critical function losses. In fiscal year 2024, the laboratory licensed the CCE methodology to three additional companies, bringing total commercial licenses to 11 since 2020. The new licensees include QED Secure Solutions LLC, known for its specialized cybersecurity services in sectors like avionics, oil and natural gas, water/wastewater, building automation, electric power, medical devices, information technology, and weapon systems. Advanced Technologies and Laboratories International, Inc., which offers innovative scientific and technical solutions with a strong foundation in cyber and information technology, and CI-Discern, a veteran-owned firm dedicated to enhancing critical infrastructure security and resilience.

AT A GLANCE:

LAWRENCE BERKELEY NATIONAL LABORATORY

BERKELEY LAB

Lawrence Berkeley National Laboratory (Berkeley Lab) specializes in integrative science and technology, taking advantage of its world-renowned expertise in materials, chemistry, physics, biology, earth and environmental sciences, mathematics, computing, and applied energy technologies. Its solution-inspired research addresses national needs and advances the frontiers of science and technology through advanced instrumentation and user facilities, large-team science, and core research programs. Its five national user facilities provide 16,000 researchers each year with capabilities in research computing and data sciences, chemical sciences, materials synthesis and characterization, and genomic science. Since the Lab's founding in 1931, Berkeley Lab's research and scientists have been recognized with 16 Nobel Prizes.

FACTS

LOCATION:	BERKELEY, CALIFORNIA
TYPE:	MULTIPROGRAM LABORATORY
CONTRACTOR:	UNIVERSITY OF CALIFORNIA
RESPONSIBLE SITE OFFICE:	BERKELEY SITE OFFICE
WEBSITE:	LBL.GOV

FUNDING BY SOURCE (FY23 COSTS)

Costs: $1,301.34 M

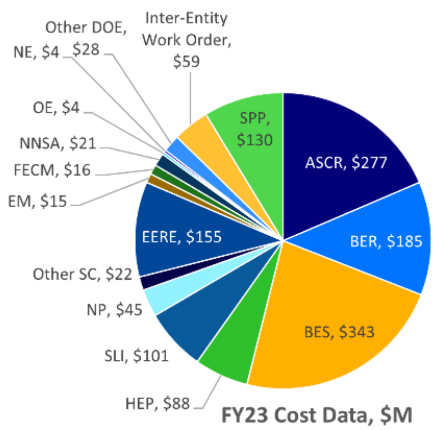
Total Operating Costs: $1,160.54 M

Total DOE Costs: $1,171.12 M

SPP (Non-DOE/DHS) Costs: $111.20 M

DHS Costs: $1.47 M

SPP/DHS as % Total Operating Costs: 8.5%



HUMAN CAPITAL (FY23 DATA)

3,804 Full-Time Equivalent Employees (FTEs)

224 Joint Faculty (Total Joint, Regular, and Shared Faculty)

509 Postdoctoral Researchers

177 Undergraduate Students

250 Graduate Students

16,350 Facility Users

1,996 Visiting Scientists and Engineers

PHYSICAL ASSETS (FY23 DATA)

202 Acres, 97 Buildings, 21 Trailers

1.7 M GSF in DOE-Owned and -Operated Buildings

Replacement Plant Value: $1.49 B

315,471 GSF in Contractor-Leased Facilities

MISSION UNIQUE FACILITIES

88-Inch Cyclotron

Agile BioFoundry

Advanced Biofuels Process Demonstration Unit

Advanced Light Source

Advanced Quantum Testbed

BELLA (Berkeley Laboratory Laser Accelerator)

Biological and Environmental Program Integration Center

Dark Energy Spectroscopic Instrument

Energy Sciences Network

FLEXLAB (Integrated Building and Grid Technologies Testbed)

Joint Genome Institute

LZ (Large Underground Xenon and ZonEd Proportional Scintillation in Liquid Noble Gasses Experiment)

National Energy Research Scientific Computing Center

PuRe Data Resources (The Materials Project, DOE Systems Biology Knowledgebase, Particle Data Group)

CORE CAPABILITIES

Accelerator and Detector Science and Technology

Advanced Computer Science, Visualization, and Data

Applied Materials Science and Engineering

Applied Mathematics

Biological and Bioprocess Engineering

Biological Systems Science

Chemical and Molecular Science

Chemical Engineering

Computational Science

Condensed Matter Physics and Materials Science

Cyber and Information Sciences

Decision Science and Analysis

Earth and Energy Systems and Infrastructure Analysis and Engineering

Earth, Environmental, and Atmospheric Science

Isotope Science and Engineering

Large-Scale User Facilities/R&D Facilities/Advanced Instrumentation

Mechanical Design and Engineering

Microelectronics

Nuclear and Radio Chemistry

Nuclear Physics

Particle Physics

Plasma and Fusion Energy Science

Power Systems and Electrical Engineering

Systems Engineering and Integration

AT A GLANCE:

LAWRENCE BERKELEY NATIONAL LABORATORY

BERKELEY LAB

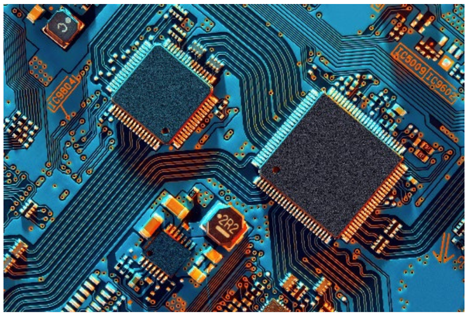
ACCOMPLISHMENTS

ACCELERATING SCIENCE WITH AI

Berkeley Lab's capabilities in advanced computation and scientific networking, its deep data management and integration capabilities, and its broad expertise across scientific domains put it at the forefront of the nation's urgent need to accelerate scientific discovery with artificial intelligence. Lab capabilities in applied math, statistics, and data—including the Center for Advanced Mathematics for Energy Research Applications—offer fundamental new mathematics required to capitalize on advances in AI. The Lab's five DOE national user facilities, including the National Energy Research Scientific Computing Center and the Energy Sciences Network, provide high-performance computing and networking infrastructure for efficient partnerships and collaborations involving large datasets in many scientific domains essential for rapid progress in AI discovery.

UNDERSTANDING DARK ENERGY

One of the greatest mysteries in modern physics is dark energy: the unknown ingredient that makes up the bulk of our cosmos and is causing the accelerated expansion of the universe. Berkeley Lab leads the Dark Energy Spectroscopic Instrument (DESI) project—an international collaboration of 450 researchers representing 70 institutions—in creating the largest 3D map of the cosmos ever made. This map provides an unprecedented view of how our universe evolved over the past 11 billion years. Early data from DESI has revealed surprising hints that dark energy, traditionally thought to behave as a cosmological constant, might actually evolve over time. With the experiment set to map 40 million galaxies and quasars, these findings could lead to groundbreaking discoveries that reshape our fundamental understanding of the universe.



ADVANCING MICROCHIP MANUFACTURING

The Center for X-Ray Optics (CXRO), a research facility that leverages the Advanced Light Source at Berkeley Lab, develops world-leading capabilities for advanced semiconductor manufacturing. For nearly 30 years, CXRO scientists and engineers have worked side by side with leading chipmakers and industry consortia to develop extreme ultraviolet (EUV) lithography techniques that have pushed feature sizes, densities, and energy efficiencies well beyond the limits of conventional visible-light lithography—with more than $150 million in total industry investment in the EUV program at the Lab. Today, the CXRO continues to work with chipmakers to pioneer the next generation of EUV lithography techniques that will enable the fabrication of smaller, faster, higher-density chips with features at the scale of just a few atoms and further extend the forefront of semiconductor manufacturing.

AT A GLANCE:

LAWRENCE LIVERMORE NATIONAL LABORATORY

Lawrence Livermore National Laboratory

Science and technology on a mission is the hallmark of Lawrence Livermore National Laboratory (LLNL). In service to the Department of Energy/National Nuclear Security Administration and other federal agencies, LLNL develops and applies world-class science and technology (S&T) to ensure the safety, security, and reliability of the nation's nuclear deterrent. LLNL also applies S&T to confront dangers ranging from nuclear proliferation and terrorism to energy shortages and climate change that threaten national security and global stability.

As a national security laboratory, LLNL harnesses operational excellence and strategic partnerships to meet its mission and applies the talents of our multidisciplinary staff, premier facilities, and core competencies to the nation's pressing issues. Through strategic support of S&T, LLNL translates innovations into national security and global stability.

FACTS

LOCATION:	LIVERMORE, CALIFORNIA
TYPE:	MULTIDISCIPLINARY NATIONAL SECURITY LABORATORY
CONTRACTOR:	LAWRENCE LIVERMORE NATIONAL SECURITY, LLC (LLNS)
RESPONSIBLE SITE OFFICE:	LIVERMORE FIELD OFFICE
WEBSITE:	LLNL.GOV

FUNDING BY SOURCE (FY23 COSTS)

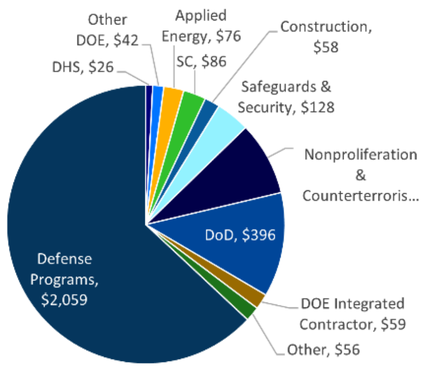
Operating Costs: $3.24 B

DOE/NNSA Costs: $2.8 B (includes DOE/IC)

SPP (Non-DOE/DHS) Costs: $410 M

DHS Costs: $22 M

SPP/DHS as % Total Operating Costs: 12.6%



FY23 Cost Data, $M

PHYSICAL ASSETS (FY23 DATA)

7,617 Acres (DOE-Owned) and 506 Buildings/Trailers

6.5 M GSF in Operational Buildings

Replacement Plant Value: $30 B

0.61 M GSF in 58 Non-Operational Buildings/Trailers

43,897 GSF Leased

HUMAN CAPITAL (FY23 DATA)

9,291 Full-Time Equivalent Employees (FTEs)

12 Joint Faculty

321 Postdoctoral Researchers

144 Undergraduate Students

162 Graduate Students

CORE CAPABILITIES

Advanced Materials and Manufacturing

Bioscience and Bioengineering

Earth and Atmospheric Sciences

High-Energy-Density Science

High-Performance Computing, Simulation, and Data Science

Lasers and Optical Science and Technology

Nuclear, Chemical, and Isotopic Science and Technology

MISSION UNIQUE FACILITIES

Advanced Manufacturing Laboratory

Center for Micro-and Nanotechnology

Center for Accelerator Mass Spectrometry

Contained Firing Facility

Electron Beam Ion Trap

Forensic Science Center

High Explosives Applications Facility

Livermore Computing

Polymer Enclave

National Atmospheric Release Advisory Center

National Ignition Facility

Select Agent Center

AT A GLANCE:

LAWRENCE LIVERMORE NATIONAL LABORATORY

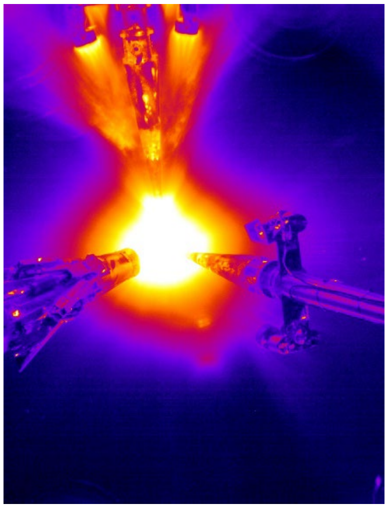
Lawrence Livermore National Laboratory

ACCOMPLISHMENTS

ONE OF THE WORLD'S PREMIER HIGH-PERFORMANCE COMPUTING FACILITIES

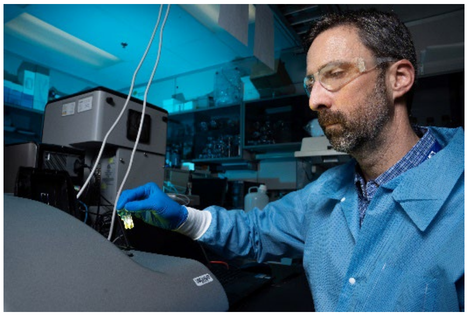
Lawrence Livermore is home to Livermore Computing (LC), a premier high-performance computing facility. LC boasts more than 3.28 exaflops of peak computing power and numerous TOP500 systems, including the #1-ranked, 2.79-exaflop El Capitan system, the 294+-petaflop Tuolumne system, and the 125-petaflop Sierra system. These flagship supercomputers are GPU-enabled and produce multiphysics simulations in 3D at never-before-seen resolutions for a variety of mission-critical needs. LLNL is also working with industry partners, including Cerebras Systems and SambaNova, to integrate cutting-edge artificial intelligence hardware with top-tier high-performance computers to improve the fidelity of models and manage the growing volumes of data for speed, performance, and productivity gains. LC platforms are supported by our LEED-certified, innovative facilities for infrastructure, power, and cooling; a storage infrastructure, including three varieties of file systems and the world's largest TFinity tape archive; and highest-quality customer service. Our software ecosystem showcases our leadership of many large, open-source efforts, from TOSS with Lustre and ZFS to the R&D-100-Award-winning Flux, SCR, and Spack.

ACHIEVING FUSION IGNITION



LLNL is home to the National Ignition Facility (NIF), the world's highest-energy laser system. NIF's 192 lasers can fire 2.2 megajoules (MJ) of ultraviolet energy into a hohlraum—a cylinder the size of a pencil eraser—compressing and heating a tiny hydrogen-filled capsule suspended in the hohlraum until the hydrogen atoms fuse and release an immense amount of energy. As the premier facility creating conditions relevant to understanding the operation of modern nuclear weapons, NIF is a crucial element of the U.S. Stockpile Stewardship Program, producing experimental data that validates 3D weapon simulation codes, improving understanding of important weapon physics, and investigating questions remaining from underground nuclear tests. On December 5, 2022, NIF made scientific history with an experiment that achieved fusion ignition in a laboratory for the first time. The shot generated 3.15 MJ of fusion energy from an input of 2.05 MJ of laser energy. This feat has been repeated five times, including setting a record fusion yield of 5.2 MJ. Fusion ignition provides new opportunities for stockpile stewardship applications and lays the groundwork for laser fusion energy. LLNL scientists and engineers are pushing on all fronts to increase NIF's capabilities to address challenges, including higher energy and power limits, next-generation optics, improved targets with tighter specifications, and better diagnostics.

EVOQ AND LLNL: INNOVATING AUTOIMMUNE DISEASE TREATMENT



EVOQ Therapeutics has harnessed advanced biomedical technology developed at LLNL to create innovative treatments and vaccines for autoimmune diseases. Their work focuses on using nanolipoprotein particles technology and has been shown to be 30 times more effective at delivering antigens to the lymph nodes. This technology has garnered industry recognition, with LLNL researchers receiving multiple awards for their contributions to technology transfer and collaboration. EVOQ's partnerships with major pharmaceutical companies highlight the importance of innovation in healthcare, demonstrating how cutting-edge research can lead to real-world applications. By leveraging LLNL's expertise, EVOQ is not only advancing medical treatments, but also setting a precedent for successful collaborations between research institutions and the biotech industry. This partnership is crucial for accelerating development of new therapies, ultimately improving patient outcomes and showcasing the vital role of technology in addressing complex health challenges.

AT A GLANCE:

LOS ALAMOS NATIONAL LABORATORY

Los Alamos National Laboratory was established in 1943 to conduct scientific research for the Manhattan Project. Located about 35 miles northwest of Santa Fe, New Mexico, the Laboratory is a multiprogram, federally funded research and development center for the National Nuclear Security Administration of the United States Department of Energy. Deterrence, national security, and technological and scientific competition between nation states have come to the forefront of the Laboratory's national security mission. The institution's priority roles continue to be serving as a nuclear weapons design agency; a nuclear weapons production agency; addressing nuclear threats; and performing national security science, technology, and engineering research and development. Through these roles, the Laboratory sustains the majority of the U.S. nuclear weapon stockpile and the nation's Plutonium Center of Excellence, to support plutonium basic research and production capabilities.

FACTS

LOCATION:	LOS ALAMOS, NEW MEXICO
TYPE:	FEDERALLY FUNDED RESEARCH AND DEVELOPMENT CENTER
CONTRACTOR:	TRIAD NATIONAL SECURITY, LLC
RESPONSIBLE SITE OFFICE:	NNSA LOS ALAMOS FIELD OFFICE
WEBSITE:	LANL.GOV

FUNDING BY SOURCE (FY23 COSTS)

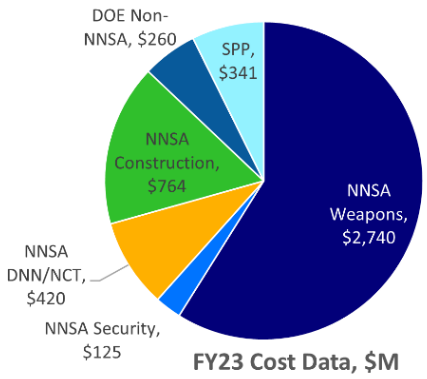
Operating Costs: $3,999 M

DOE Costs: $238 M

SPP (Non-DOE/DHS) Costs: $278 M

DHS Costs: $6 M

SPP/DHS as % Total Operating Costs: 6.95% (SPP)



PHYSICAL ASSETS (FY23 DATA)

25,508.87 Acres and 899 Buildings

8,545,816 GSF in Buildings

Replacement Plant Value: $41,110,000

147,875 GSF in 40 Excess Facilities

564,856 GSF in Leased Facilities

MISSION UNIQUE FACILITIES

Center for Explosives Science

Chemistry and Metallurgy Research Facility

Dual-Axis Radiographic Hydrodynamic Test Facility

Electron Microscopy Lab

Ion Beam Materials Lab

Metropolis Center for Modeling & Simulation

Quantum Institute

SIGMA Complex for Materials Manufacturing & Machining

Strategic Computing Complex

Weapons Neutron Research Facility

Atmospheric Radiation Measurement

Center for Integrated Nanotechnologies

Nonproliferation & International Security Facility

Plutonium Science & Manufacturing Facility

Proton Radiography

Los Alamos Neutron Science Center

National High Magnetic Field Laboratory

HUMAN CAPITAL (FY23 DATA)

11,591 Full-Time Equivalent Employees (FTEs)

33 Joint Faculty

479 Postdoctoral Researchers

839 Undergraduate Students

693 Graduate Students

1,109 Facility Users

623 Visiting Scientists

CORE CAPABILITIES

Advanced Computing Architecture

Modeling and Simulation

Advanced Materials Science, Engineering, Production, and Manufacturing

Advanced Sensor, Diagnostic, and Tools Development

Chemical and Biological Science/Engineering

Cyber and Intelligence Design, Engineering, and Fielding of Weapons

Earth, Atmospheric, and Space Science/Engineering

HED Science and Applications of Laser and Accelerator ST&E

Nuclear Physics, Chemistry, and Special Nuclear Materials

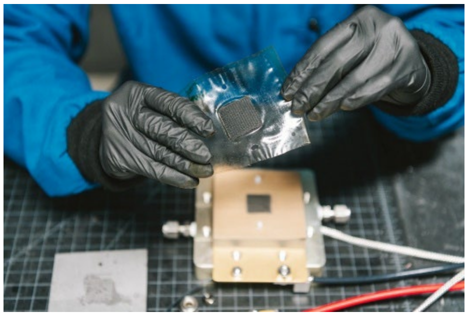
AT A GLANCE:

LOS ALAMOS NATIONAL LABORATORY

ACCOMPLISHMENTS

PLUTONIUM FACILITY (PF-4)

Building 4 of the TA-55 Plutonium Facility is the only full-service plutonium fabrication facility in the United States. It has the capability to fabricate both metal and ceramic products and to recycle and purify large quantities of plutonium for future work.



ION PAIR MEMBRANE ELECTRODE ASSEMBLIES: REVOLUTIONARY FUEL CELL BREAKTHROUGH ACHIEVED

Researchers have developed a new high-temperature proton exchange membrane fuel cell for clean energy production. These Ion Pair Membrane Electrode Assemblies deliver more power, greater durability, and higher tolerance to hydrogen fuel impurities than traditional fuel cells. This reduces cost by about one-third when compared to conventional fuel cells.

MERCURY BIO

Los Alamos is helping Santa Fe, New Mexico-based Mercury Bio through a TRGR that was set up in July 2023. “What we’re doing is trying to enable a technology that does not exist,” said Mercury Bio CEO Bruce McCormick, explaining the company’s goal of developing a novel drug delivery method that could target specific cells within the body. “Roughly 85 percent of diseases are untreatable, and that’s simply because we don’t have a way to access the cells causing the disease.” One focus of the TRGR has been using Laboratory supercomputers and artificial intelligence to design and model synthetic proteins that do not exist in nature. These novel proteins might be the key to reaching and destroying cancer cells. “A company like Mercury Bio, and most companies for that matter, won’t typically have access to equipment like supercomputers,” says Sandrasegaram Gnanakaran of the Lab’s Theoretical Biology and Biophysics group, who is also the principal investigator on the TRGR partnership. “This is the first case I’m aware of where, at the Lab, we are using artificial intelligence to design completely new proteins.”

AT A GLANCE:

NATIONAL ENERGY TECHNOLOGY LABORATORY

The National Energy Technology Laboratory (NETL)'s mission is to drive innovative solutions for a clean and secure energy future by advancing carbon management and resource sustainability technologies. NETL's advanced technology development is crucial to U.S. energy innovation. Through research and development, partnerships, and initiatives, NETL enables production of the clean, reliable, and affordable energy required to increase domestic manufacturing, improves our nation's energy infrastructure, enhances electrical grid reliability and resilience, expands domestic energy production, educates future scientists and engineers, promotes workforce revitalization, and supports U.S. energy and national security goals. As the only government-owned and -operated laboratory in the DOE complex, NETL and its predecessor laboratories support DOE goals by maintaining nationally recognized technical competencies and collaborating with partners in industry, academia, and other research organizations to nurture emerging technologies.

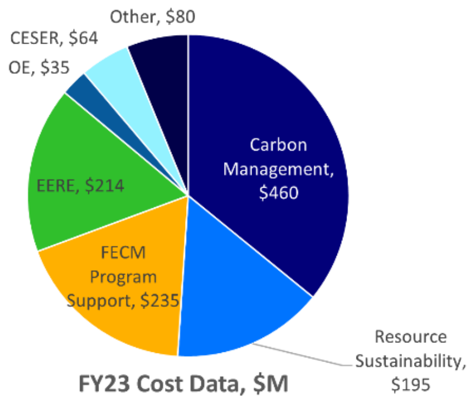
FACTS

LOCATION:	PITTSBURGH, PENNSYLVANIA; MORGANTOWN, WEST VIRGINIA; ALBANY, OREGON; HOUSTON, TEXAS
TYPE:	SINGLE-PROGRAM LABORATORY (*THE ONLY GOVERNMENT-OWNED AND OPERATED LABORATORY AMONG THE 17 NATIONAL LABORATORIES)
CONTRACTOR:	GOVERNMENT-OWNED AND -OPERATED
RESPONSIBLE SITE OFFICE:	N/A
WEBSITE:	NETL.DOE.GOV

FUNDING BY SOURCE (FY23 COSTS)

Operating Costs: $20 M

DOE Costs: $1.1 B (total deployment)



PHYSICAL ASSETS (FY23 DATA)

240.8 Acres and 126 Buildings

1,119,532 GSF in Buildings

Replacement Plant Value: $905,219,069

12,658 GSF in 4 Excess Facilities

2,083 GSF in 1 Leased Facilities

MISSION UNIQUE FACILITIES

Pittsburgh, Pennsylvania:

Carbon Capture Materials Synthesis Laboratory

Subsurface Experimental Laboratory

Center for Data Analytics and Machine Learning

Direct Air Capture Center

Albany, OR:

Advanced Alloys Signature Center

Severe Environment Corrosion Erosion Research Facility

Magnetohydrodynamics Laboratory

Metals Fabrication Laboratory/Metals Melting Facility

Morgantown, WV:

Center for High Performance Computing (Joule 3.0 Supercomputer)

Reaction Analysis and Chemical Transformation Facility

Solid Oxide Fuel Cell Manufacturing and Test Laboratory

Center for Advanced Imaging and Characterization

HUMAN CAPITAL (FY23 DATA)

696 Full-Time equivalent employees (FTEs)

30 Joint Faculty

23 Postdoctoral Researchers

48 Undergraduate Students

31 Graduate Students

CORE CAPABILITIES

Computational Science and Engineering

Energy Conversion Engineering

Strategic Systems Analysis and Engineering

Materials Engineering and Manufacturing

Geological and Environmental Systems

Program Execution and Integration

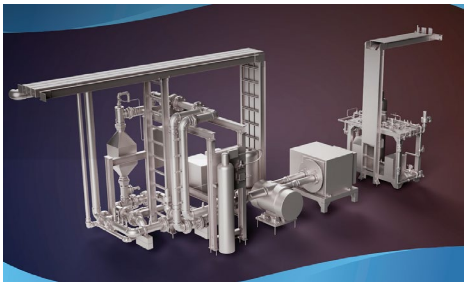
AT A GLANCE:

NATIONAL ENERGY TECHNOLOGY LABORATORY

ACCOMPLISHMENTS

CENTER FOR ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING (CAML)

The CAML will house a new data center to expand the existing research computing capabilities, primarily in the artificial intelligence and machine learning sectors. Additionally, a new visualization center will provide new opportunities for researchers to utilize virtual reality, augmented reality, and shared virtual reality in both their research as well as in showcasing their findings to stakeholders. A new backup generator will ensure that the data center, as well as certain lab equipment throughout the building, will provide safeguards against power outages. The CAML is planned to be ready for users during the first quarter of 2025.



DIRECT AIR CAPTURE CENTER

The NETL Direct Air Capture (DAC) Center is a one-of-a-kind facility dedicated to supporting private sector technology maturation by leveraging national laboratory competencies and knowledge through collaborative research efforts. With testing beginning in 2023, the DAC Center aims to accelerate the commercialization of innovative DAC technologies that are technically and economically viable to achieve our nation’s goal of net-zero emissions by 2050. NETL’s DAC Center will support rapid development and commercialization pathways for technologies that remove carbon dioxide (CO_2) from the atmosphere. Featuring one-of-a-kind facilities that empower innovators from government, academia, and the private sector, the DAC Center will test emerging technologies that have achieved proof-of-concept but have not reached full pilot scale (technology readiness levels 3 to 6) to expedite development.

TRANSFORMER WATCHMAN

NETL works with entrepreneurs, companies, universities, and others to move lab-developed technologies to commercialization. Sensible Photonics is a partner that licensed NETL intellectual property. NETL won an R&D 100 Award for the Transformer Watchman, with Sensible Photonics as a partner, in 2023, as well as for UltraSonic Photonics in 2024. The Transformer Watchman is an innovative sensor technology that can protect the nation's energy infrastructure by preventing electric service downtime. This technology is an impactful achievement that combines high performance with cost-effectiveness for large-scale commercial adoption, making it an essential contribution to national security. UltraSonic Photonics has been advanced as a groundbreaking development that makes extensive use of artificial intelligence and machine learning to learn the characteristics of different forms of degradation in critical infrastructure.

AT A GLANCE:

NATIONAL RENEWABLE ENERGY LABORATORY

National Renewable Energy Laboratory (NREL) is DOE's primary national laboratory for renewable energy and energy efficiency research and development. The laboratory delivers impactful scientific discoveries, innovations, and insights that transform clean energy technologies, systems, and markets. Also, the laboratory's research focuses on engineering of energy efficiency, sustainable transportation, and renewable power technologies and provides the knowledge to integrate and optimize energy systems. Finally, NREL's mission space delivers foundational knowledge, technology and systems innovations, and analytic insights to catalyze a transformation to a renewable and sustainable energy future.

FACTS

LOCATION:	GOLDEN, COLORADO
TYPE:	SINGLE-PROGRAM LABORATORY CONTRACTOR
CONTRACTOR:	ALLIANCE FOR SUSTAINABLE ENERGY, LLC
RESPONSIBLE SITE OFFICE:	GOLDEN FIELD OFFICE
WEBSITE:	NREL.GOV

FUNDING BY SOURCE (FY23 COSTS)

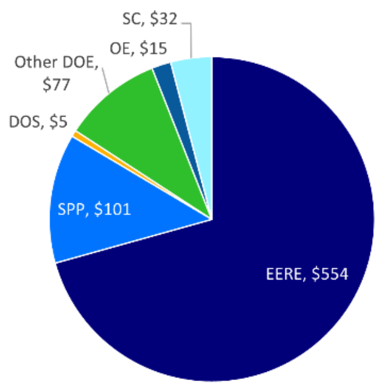
Operating Costs: $783.5 M

DOE Costs: $667.4 M

SPP (Non-DOE/DHS) Costs: $101.6 M

DHS Costs: $4.5 M

SPP/DHS as % Total Operating Costs: 13% (SPP)



FY23 Cost Data, $M

PHYSICAL ASSETS (FY23 DATA)

483 Acres, 92 Buildings, and 5 Trailers (owned)

1,298,776 GSF in Buildings/Trailers (owned)

Replacement Plant Value: $864,381,216

199,852 GSF in Leased Facilities (6 buildings, whole or partial)

639 Acres (leased)

MISSION UNIQUE FACILITIES

- Battery Thermal and Life Test Facility
- Controllable Grid Interface Test System
- Distributed Energy Resources Test Facility
- Energy Systems Integration Facility
- Facility Field Test Laboratory Building
- High-Flux Solar Furnace
- Hydrogen Infrastructure Testing and Research Facility
- Integrated Biorefinery Research Facility
- Outdoor Test Facility
- Renewable Fuels and Lubricants Laboratory
- Research and Innovation Laboratory
- Science & Technology Facility
- Solar Energy Research Facility
- Thermal Test Facility
- Thermochemical Process Development Unit
- Thermochemical Users Facility
- Vehicle Testing and Integration Facility
- Wind Dynamometer Test Facilities
- Wind Structural Testing Laboratory
- Wind Turbine Field Test Sites

HUMAN CAPITAL (FY23 DATA)

3,185 Full- and Part-Time Employees (includes regular, limited-term, and interns)

211 Postdoctoral Researchers

168 Graduate Students

74 Undergraduate Students

78 Joint Appointments

39 Facility Users

1 Visiting Scientist

CORE CAPABILITIES

- Computer Science and Analysis
- Advanced Computer Science, Visualization, and Data
- Computational Science
- Decision Science and Analysis
- Innovation and Application
- Biological and Bioprocess Engineering
- Chemical Engineering
- Mechanical Design and Engineering
- Power Systems and Electrical Engineering
- Foundational Knowledge
- Applied Materials Science and Engineering
- Applied Mathematics
- Biological Systems Science
- Chemical and Molecular Science
- System Integration
- Systems Engineering and Integration
- Large-Scale User Facilities

AT A GLANCE:

NATIONAL RENEWABLE ENERGY LABORATORY

ACCOMPLISHMENTS

UNIQUE FACILITIES: CENTERS FOR BIOENERGY, ENERGY SYSTEMS INTEGRATION, PHOTOVOLTAICS, AND WIND

NREL is home to three national research centers—the National Bioenergy Center, the National Center for Photovoltaics, and the National Wind Technology Center, which is located at NREL's Flatirons Campus. The laboratory is developing the latter, which offers specialized facilities and provides technical support critical to the development of primarily wind energy, to allow for testing at the 20-megawatt (MW) scale. Other unique facilities at NREL include the 185,000-square-foot Energy Systems Integration Facility, which is the only facility that can conduct integrated MW-scale testing of the components and strategies needed to reliably move significant amounts of clean energy onto the electrical grid.

RESEARCH HIGHLIGHT: ELECTRONS TO MOLECULES, CIRCULAR ECONOMY, AND INTEGRATED ENERGY PATHWAYS

NREL's research vision centers around three critical objectives. Electrons to molecules explores the use of renewable, affordable electricity as the driving force for the conversion of low-energy molecules (e.g., water) to generate other molecules that could be used as chemicals, materials, fuels, or energy storage. A circular economy for energy materials focuses on reducing waste and preserving resources through the design of materials and products with reuse, recycling, and upcycling in mind from the start. Integrated energy pathways focuses on replacing today's outdated grid with a modern, intelligent infrastructure that, for one, looks to expand our options for mobility. One highlight, among many, from NREL's research vision is being made possible with funding from DOE's Office of Clean Energy Demonstrations (OCED). OCED selected NREL to provide technical assistance with integrating distributed energy resources in Colorado, Massachusetts, and Virginia to make the electric grids safer and more responsive, resilient, and affordable.

TECH-TO-MARKET HIGHLIGHT: RECORD YEAR FOR PARTNERSHIPS

NREL is the only national laboratory dedicated to the research, development, commercialization, and deployment of renewable energy and energy efficiency technologies. The laboratory accelerates the commercialization of energy technologies through licensing and partnerships with industry. NREL just closed the books on the best partnership year in its history, inking 340 new, high-impact agreements. The laboratory now has more than 1,105 active partnership agreements with 767 unique active partners across commercial, non-commercial, and government organizations in 49 U.S. states and 34 countries. Since 2000, NREL has executed more than 320 royalty-bearing license and option agreements and has approximately 900 patented or patent-pending technologies—plus 250 software solutions available for licensing.

AT A GLANCE:

OAK RIDGE NATIONAL LABORATORY

Oak Ridge National Laboratory (ORNL) is DOE's largest multiprogram science and energy laboratory. Its mission is to deliver scientific discoveries and technical breakthroughs that accelerate innovation and the development and scale-up of solutions in 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 Frontier, the first supercomputer to reach exascale; and a diverse set of programs linked by an urgent focus on fundamental knowledge creation, resilience, and economic and national security.

FACTS

LOCATION:	OAK RIDGE, TENNESSEE
TYPE:	MULTIPROGRAM LABORATORY
CONTRACTOR:	UT-BATTELLE, LLC
RESPONSIBLE SITE OFFICE:	ORNL SITE OFFICE
WEBSITE:	ORNL.GOV

FUNDING BY SOURCE (FY23 COSTS)

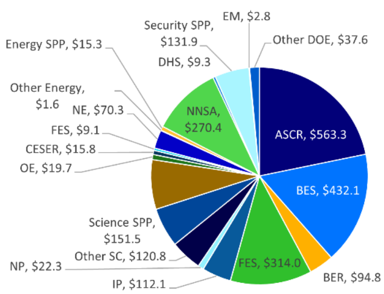
Operating Costs: $2,584.7 M

DOE Costs: $2,276.9 M

SPP (Non-DOE/DHS) Costs: $240.7 M

DHS Costs: $9.3 M

SPP/DHS as % Total Operating Costs: 9.7%



FY23 Cost Data, $M

HUMAN CAPITAL (FY23 DATA)

6,467.1 Full-Time Equivalent Employees (FTEs)

51 Outgoing Joint Appointees; 50 Incoming Joint Appointees

264 Postdoctoral Researchers

136 Undergraduate Students

230 Graduate Students

3,672 Facility Users

1,648 Visiting Scientists

PHYSICAL ASSETS (FY23 DATA)

4,421 Acres and 285 Buildings

4.77 M GSF in Buildings

Replacement Plant Value: $9.1 B

1.15 M GSF in 52 Excess Facilities

0.84 M GSF in Leased Facilities

MISSION UNIQUE FACILITIES

Advanced Plant Phenotyping Laboratory

Building Technologies Research and Integration Center

Carbon Fiber Technology Facility

Center for Nanophase Materials Sciences

Center for Structural Molecular Biology

Domestic Uranium Enrichment Centrifuge Experiment

Grid Research Integration and Deployment Center

High Flux Isotope Reactor

Irradiated Material Examination and Testing Facility

Manufacturing Demonstration Facility

National Transportation Research Center

Oak Ridge Leadership Computing Facility

Radiochemical Engineering Development Center

Stable Isotope Production Facility

Spallation Neutron Source

CORE CAPABILITIES

Accelerator and Detector Science and Technology

Advanced Computer Science, Visualization, and Data

Applied Materials Science and Engineering

Applied Mathematics

Biological and Bioprocess Engineering

Biological Systems Science

Chemical and Molecular Science

Chemical Engineering

Computational Science

Condensed Matter Physics and Materials Science

Cyber and Information Sciences

Decision Science and Analysis

Earth and Energy Systems and Infrastructure Analysis and Engineering

Earth, Environmental, and Atmospheric Science

Isotope Science and Engineering

Large-Scale User Facilities/Advanced Instrumentation

Mechanical Design and Engineering

Microelectronics

Nuclear and Radiochemistry

Nuclear Engineering

Nuclear Physics

Plasma and Fusion Energy Sciences

Power Systems and Electrical Engineering

Systems Engineering and Integration

AT A GLANCE:

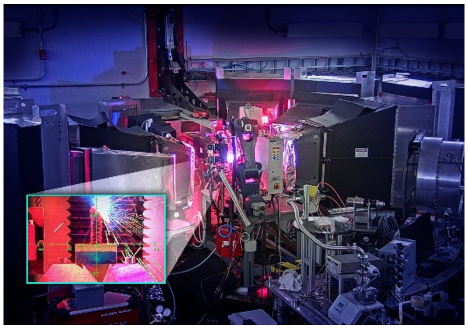
OAK RIDGE NATIONAL LABORATORY

ACCOMPLISHMENTS

FRONTIER: THE WORLD'S FIRST EXASCALE COMPUTER

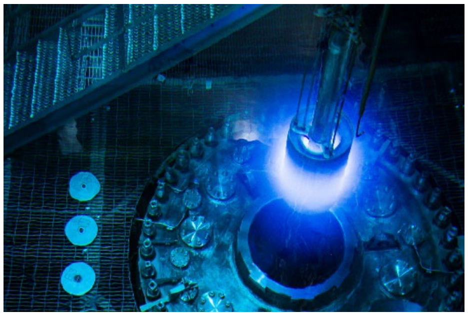
Beginning operations in 2022, Frontier became the first supercomputer to break the exascale barrier, equivalent to more than a billion billion calculations per second. It also joined three other ORNL supercomputers since 2006 to rank as the world's fastest. Researchers across the United States are now using Frontier to analyze, predict, and mitigate natural disasters; design and assess new materials for producing, transmitting, and storing energy; optimize small modular nuclear reactors; and advance the understanding of human biology to drive drug discovery. Frontier's leading capabilities have enabled some of the world's largest simulations ever, including one by GE Aerospace to explore new open fan engine architecture for next-generation commercial aircraft engines. ORNL researchers are using the supercomputer as part of an artificial intelligence initiative, developing software and workflows to train a trillion-parameter large language model that could assist a new generation of AI models for scientific research.

GETTING A CLOSER LOOK AT 3D PRINTING



ORNL scientists developed OpeN-AM, a 3D-printing platform that uses neutrons to see the additive manufacturing process at the atomic level, allowing for unprecedented insight into material behavior during manufacturing. The system, demonstrated using the VULCAN beamline at the lab's Spallation Neutron Source (SNS), has potential implications for automotive, aerospace, energy, and tool manufacturing industries. When combining infrared imaging and computer modeling with neutrons from SNS, the platform can measure how atoms move in response to stress, whether it is temperature or load. Residual stresses are stresses that remain even after a load or the cause of the stress is removed; they can deform a material or, worse, cause it to fail prematurely. Such stresses are a major challenge in additively manufacturing accurate components with desirable properties and performance. The technology will allow manufacturers to tailor components with stress in mind, allowing for lighter and more complex shapes.

REESTABLISHING DOMESTIC PRODUCTION OF IRIDIUM-192 FOR INDUSTRY USE



As part of an agreement between the Department of Energy Isotope Program and Massachusetts-based QSA Global Inc., ORNL established production of iridium-192 (Ir-192), which is used to assess the integrity of oil and gas pipelines and to ensure manufacturing quality in shipbuilding, vehicles, aerospace, and other sectors. The isotope has unique properties ideal for non-destructive testing to detect structural damage to metal parts such as castings, forgings, and weld defects. Ir-192 has not been produced in the United States for more than 20 years, and the nation has relied on foreign sources to meet demands. ORNL's unique expertise and facilities make it one of the only places in the world capable of producing Ir-192. The lab's High Flux Isotope Reactor has the necessary neutron flux to produce the isotope, and its Irradiated Material Examination and Testing facility packages and prepares the material for eventual shipping to QSA.

AT A GLANCE:

PACIFIC NORTHWEST NATIONAL LABORATORY

Pacific Northwest National Laboratory (PNNL) advances the frontiers of knowledge, taking on some of the world's greatest science and technology challenges. Distinctive strengths in chemistry, Earth sciences, biology, and data sciences are the heart of PNNL's science mission, enabling innovations for energy resiliency and national security. From grid modernization to energy storage, cybersecurity, and nonproliferation, staff at PNNL accept great challenges for one purpose: to create a world that is safer, more prosperous, and more secure.

PNNL stewards the Environmental Molecular Sciences Laboratory, a DOE user facility focused on deeper understanding of environmental processes from the molecular to the Earth system levels. PNNL also manages the Atmospheric Radiation Measurement Program, a unique, distributed DOE scientific user facility that provides the scientific community with essential data collected at its fixed and mobile research sites worldwide. PNNL's newest facilities, the Energy Sciences Center and the Grid Storage Launchpad, enable the acceleration of energy research.

FACTS

LOCATION:	RICHLAND, WASHINGTON
TYPE:	MULTIPROGRAM LABORATORY
CONTRACTOR:	BATTELLE
RESPONSIBLE SITE OFFICE:	PACIFIC NORTHWEST SITE OFFICE
WEBSITE:	PNNL.GOV

FUNDING BY SOURCE (FY23 COSTS)

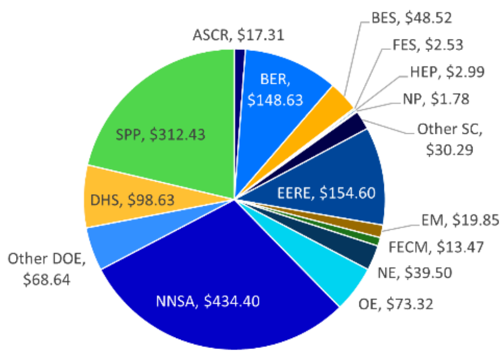
Operating Costs: $1,466.9 M

DOE Costs: $1,055.8 M (includes NNSA)

SPP (Non-DOE/DHS) Costs: $312.4 M

DHS Costs: $98.6 M

SPP/DHS as % Total Operating Costs: 28%



FY23 Cost Data, $M

PHYSICAL ASSETS (FY23 DATA)

594 DOE, 187 Battelle (including 117 in Sequim) Acres DOE and 88 Total Buildings and Trailers (56 DOE-owned) Buildings

1,441,103 GSF in Buildings

Replacement Plant Value: $1,997,474,319

1,050,659 GSF in Leased Facilities

MISSION UNIQUE FACILITIES

Atmospheric Radiation Measurement User Facility

Bioproducts, Sciences, and Engineering Laboratory

Electricity Infrastructure Operations Center

Energy Sciences Center

Environmental Molecular Sciences Laboratory

Grid Storage Launchpad

PNNL-Sequim (marine and coastal research)

Radiochemical Processing Laboratory

HUMAN CAPITAL (FY23 DATA)

6,089; 4,815 Full-Time Equivalents (FTEs; without limited-term employees [LTEs]), 5,522 FTEs (with LTEs)

120 Outgoing and 95 Incoming Joint Faculty

303 Postdoctoral Researchers

564 Undergraduate Students

539 Graduate Students

312 Facility Users

227 Visiting Scientists

CORE CAPABILITIES

Accelerator and Detector Science and Technology

Advanced Computer Science, Visualization, and Data

Applied Materials Science and Engineering

Applied Mathematics

Biological and Bioprocess Engineering

Biological Systems Science

Chemical and Molecular Science

Chemical Engineering

Computational Science

Condensed Matter Physics and Materials Science

Cyber and Information Sciences

Decision Science and Analysis

Earth and Energy Systems and Infrastructure Analysis and Engineering

Earth, Environmental, and Atmospheric Science

Isotope Science and Engineering

Large-Scale User Facilities/Advanced Instrumentation

Mechanical Design and Engineering

Microelectronics

Nuclear and Radio Chemistry

Nuclear Engineering

Nuclear Physics

Particle Physics

AT A GLANCE:

PACIFIC NORTHWEST NATIONAL LABORATORY

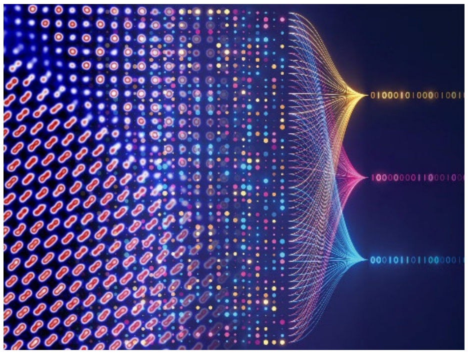
ACCOMPLISHMENTS

GRID STORAGE LAUNCHPAD

The Grid Storage Launchpad (GSL) was dedicated in 2024, expanding the nation's ability to advance next-generation breakthroughs in energy storage materials and technologies. This Department of Energy facility will address crosscutting challenges in grid and transportation storage technologies needed for a clean, reliable, and resilient energy future. The GSL brings together all stages of the battery development cycle, from fundamental materials discovery to advanced characterization, device prototyping, and up to 100-kilowatt-scale testing and validation. With a mission to validate, accelerate, collaborate, and educate, researchers at GSL will work closely with industry partners who wish to demonstrate and deploy energy storage technologies. In the 100-kilowatt test chambers, for example, large-scale energy storage technologies will be tested under realistic operating conditions, making sure they meet future grid demands. GSL's educational labs will help train the energy storage workforce of the future, including installers, assembly personnel, code enforcement officials, and regulatory planners.

AN ELECTRIFYING IMPROVEMENT IN COPPER CONDUCTIVITY

Researchers at PNNL discovered they could dramatically enhance the performance of electrical wires by adding just the right amount of graphene to electrical-grade copper. Conventional wisdom shows adding materials to pure metals increases their temperature coefficient of resistance, meaning they will heat up faster when electrical current passes through them. However, scientists achieved an 11 percent decrease in this property without a corresponding reduction in electrical conductivity at room temperature. Scientists created first-of-their-kind physics models to guide development of the materials. Then, they produced the aluminum-graphene composite at an industry-relevant scale using Shear Assisted Processing and Extrusion (ShAPE™)—a patented advanced manufacturing technique developed at PNNL. ShAPE™ enabled the material microstructure responsible for the performance improvement using low-cost graphene. A patent is also pending for this work, which could be applied to reconductoring transmission lines, as well as more efficient motors to power electric vehicles and industrial equipment.



AI AND ELECTRON MICROSCOPES: A POWERFUL COMBINATION FOR ADVANCING SCIENTIFIC DISCOVERY

AutoEM is a revolutionary platform developed by researchers at PNNL that uses artificial intelligence to accelerate scientific discovery by bringing human-like reasoning into the control of advanced electron microscopes. Using AutoEM, researchers can automate complex and time-consuming tasks, conducting reproducible, high-speed experimentation nearly 1,000 times faster than before. PNNL researchers worked closely with microscope manufacturer JEOL to create a special language that allows AutoEM's "brain" to communicate with JEOL's microscope hardware. By doing so, AutoEM can identify patterns in electron microscope images without human intervention, allowing for more accurate and consistent materials science. AutoEM enables precise control and feedback that opens the door to experiments never thought possible. This innovation is enabling transformative discoveries in clean energy, quantum computing, medicine, and manufacturing. It was recognized with an R&D 100 Award and the "Deal of Distinction" award from the Licensing Executives Society.

AT A GLANCE:

PRINCETON PLASMA PHYSICS LABORATORY

The U.S. Department of Energy's Princeton Plasma Physics Laboratory (PPPL) is a collaborative national center managed by Princeton University. The Lab has three major missions: to develop the scientific knowledge and advanced engineering to enable fusion to power the U.S. and the world, to advance the science of nanoscale fabrication and sustainable manufacturing for technologies of tomorrow, and to further the development of the scientific understanding of the plasma universe from laboratory to astrophysical scales.

FACTS	
LOCATION:	PRINCETON, NEW JERSEY
TYPE:	SINGLE-PROGRAM LABORATORY
CONTRACTOR:	PRINCETON UNIVERSITY
RESPONSIBLE SITE OFFICE:	PRINCETON SITE OFFICE
WEBSITE:	PPPL.GOV

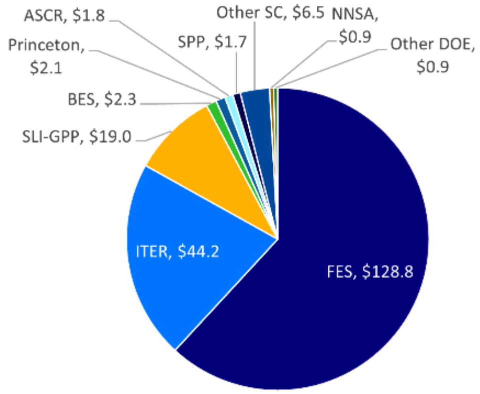
FUNDING BY SOURCE (FY23 COSTS)

Operating Costs: $139.6 M

DOE Costs: $153.4 M

SPP (Non-DOE/DHS) Costs: $1.8 M

SPP/DHS as % Total Operating Costs: 1.3%



FY23 Cost Data, $M

PHYSICAL ASSETS (FY23 DATA)

90.7 Acres, 30 Buildings, and 2 Trailers

912,000 GSF in Buildings and Infrastructure

Replacement Plant Value: $874 M

13,181 GSF in 2 Excess Facilities

MISSION UNIQUE FACILITIES

Facility for Laboratory Reconnection Experiments

Laboratory for Plasma Nanosynthesis & Nanofabrication

Lithium Tokamak Experiment-β (LTX-β)

Magnetic Reconnection Experiment

National Spherical Torus Experiment-Upgrade

Princeton Collaborative Low Temperature Plasma Research Facility

HUMAN CAPITAL (FY23 DATA)

752 Full-Time Equivalent Employees (FTEs)

28 Postdoctoral Researchers

42 Graduate Students

~308 Facility Users

31 Visiting Scientists

CORE CAPABILITIES

Plasma and Fusion Energy Sciences

Systems Engineering and Integration

Large-Scale User Facilities/Advanced Instrumentation

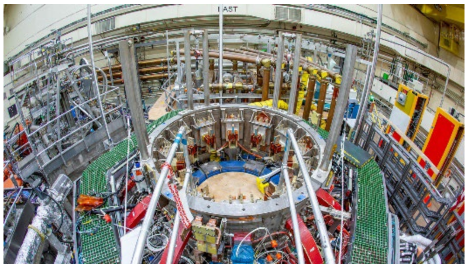
Mechanical Design and Engineering

Power Systems and Electrical Engineering

AT A GLANCE:

PRINCETON PLASMA PHYSICS LABORATORY

ACCOMPLISHMENTS

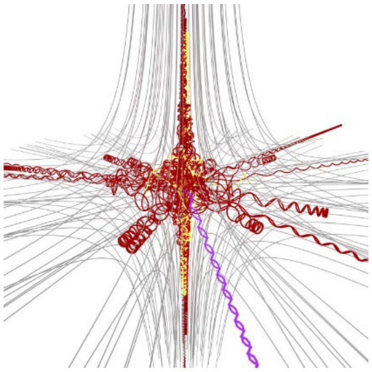


NATIONAL SPHERICAL TORUS EXPERIMENT-UPGRADE (NSTX-U)

NSTX-U is an experimental fusion system, known as a tokamak, that uses magnetic fields to confine plasma in a spherical vessel. It will advance the science needed to reliably generate electricity from fusion, helping to confirm whether a compact, spherical shape can sustain the high-pressure plasmas needed for fusion with less energy at lower costs than traditional, doughnut-shaped designs. The system uses beams of high-energy neutral particles and high-power radio waves to heat plasmas to 100 million degrees: seven times hotter than the sun. Its compact design makes it an ideal candidate to serve as the model for a fusion pilot plant followed by a commercial fusion reactor. NSTX-U experiments will define the necessary magnetic field strength for future devices, deepen our understanding of the needed heating systems and operating conditions, and enable engineering solutions that can withstand the heat and pressure required for fusion.

AI FOR FUSION: ACHIEVING A STABLE, HIGH-PERFORMANCE PLASMA

A key objective for fusion scientists is keeping plasma, the fuel of fusion, stable in what is known as high-performance mode. To achieve fusion energy production on a commercial scale, instabilities must be eliminated, as they affect performance and can damage the inside of the vessel holding the plasma. Researchers at PPPL use machine learning, a form of artificial intelligence, to improve control over fusion reactions. One approach, which optimizes the fusion system's suppression response in real-time, achieved the highest fusion performance while eliminating instabilities at the edge of the plasma. The research team demonstrated this feat at two different fusion facilities—each with its own set of operating parameters.



DEVELOPING A COMMERCIAL SOLUTION TO PROTECT ESSENTIAL MIRRORS USED IN SEMICONDUCTOR MANUFACTURING

Some semiconductor chip manufacturing requires extreme ultraviolet (EUV) light to create the fine details on the chips. This process involves using lasers to shoot at tiny droplets of tin. The lasers shrink the wavelength of light into the EUV range, but the exploding tin droplets release charged particles. These particles can damage important mirrors used during manufacturing. Companies currently try to protect the mirrors by placing a protective gas in front of them, but this is expensive and can also block some of the light. Scientists at PPPL have developed a new solution, creating a space in front of the mirrors where magnetic fields cancel each other out so particles are guided away from the reflective surfaces into a collection area. This patent-pending solution improves efficiency by reducing the need to clean and replace damaged mirrors.

AT A GLANCE:

SANDIA NATIONAL LABORATORIES

Sandia is the largest U.S. national laboratory and the premier engineering lab responsible for design, development, systems integration, and qualification of non-nuclear components in the nuclear weapons stockpile. In partnership with the National Nuclear Security Administration, its labs and sites, the Department of Defense (DOD), and DOD contractors, Sandia ensures components work together and with military delivery systems for a safe, effective, reliable nuclear deterrent. Beyond nuclear deterrence, major missions include National Security Programs, Global Security, Energy and Homeland Security, and Advanced Science and Technology. A federally funded research and development center, Sandia applies threat intelligence to address and anticipate national needs. The Labs' nuclear deterrence mission is based on science and engineering, with expertise in microelectronics research and development and manufacturing, materials, physical and biological sciences, radiation effects and high energy density physics, advanced manufacturing, advanced computing and modeling, data analytics, cyberscience, and more. Transferred Sandia technology generated economic impact of $140+ billion from 2000−2023.

FACTS

LOCATION:	ALBUQUERQUE AND CARLSBAD, NEW MEXICO; LIVERMORE, CALIFORNIA; AMARILLO, TEXAS; TONOPAH, NEVADA; KAUAI, HAWAII; MINNEAPOLIS, MINNESOTA
TYPE:	MULTIPROGRAM LABORATORIES
CONTRACTOR:	NATIONAL TECHNOLOGY AND ENGINEERING SOLUTIONS OF SANDIA LLC
RESPONSIBLE SITE OFFICE:	SANDIA FIELD OFFICE
WEBSITE:	SANDIA.GOV

FUNDING BY SOURCE (FY23 COSTS)

Operating Costs: $4,603 M

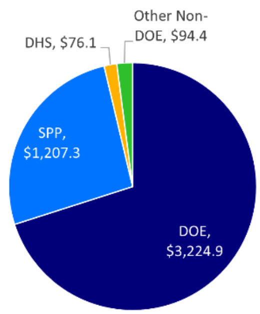
DOE Costs: $3,224.9 M

SPP (Non-DOE/DHS) Costs: $1,207.3 M

DHS Costs: $76.1 M

Other Non-DOE: $94.4 M

SPP/DHS as % Total Operating Costs: 27.9%



FY23 Cost Data, $M

PHYSICAL ASSETS (FY23 DATA)

20,500 Acres and 1,030 Buildings

7,955,623 GSF in Buildings

Replacement Plant Value: $15,358,067,041

39,739 GSF in 25 Excess Facilities

369,659 GSF in 19 Leased Facilities

MISSION UNIQUE FACILITIES

Center for Integrated Nanotechnologies

Microsystems Engineering, Science, and Applications

Combustion Research Facility

National Solar Thermal Test Facility

Z Pulsed-Power Facility

Weapons Evaluation Testing Laboratory

Ion Beam Laboratory

Battery Abuse Testing Laboratory

Distributed Information Systems Lab

Thermal Test Complex

Mechanical Shock Facility

Rocket Sled Test Facility

HUMAN CAPITAL (FY23 DATA)

14,368 Full-Time Equivalent Employees (FTEs)

944 Limited-Term Employees

1 Joint Faculty

315 Postdoctoral Researchers

549 Undergraduate Students

541 Graduate Students

CORE CAPABILITIES

Systems Engineering and Integration

Advanced Computing, Quantum Engineering, Modeling, and Simulation

Extreme-Environment Testing at Unique Facilities

Advanced Microelectronics

Nanotechnologies and Microsystems

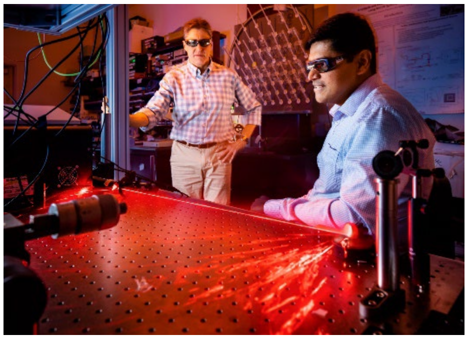
AT A GLANCE:

SANDIA NATIONAL LABORATORIES

ACCOMPLISHMENTS

MICROSYSTEMS ENGINEERING, SCIENCE, AND APPLICATIONS (MESA) COMPLEX

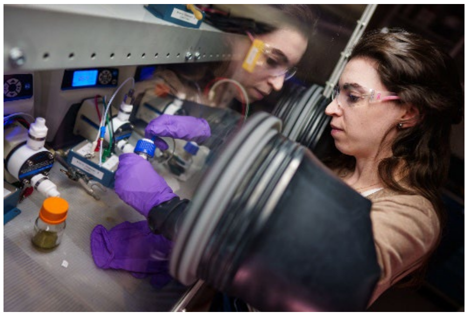
The nation's nuclear deterrents demand microelectronics that satisfy stringent requirements for power, reliability, and extreme environments, including radiation. Sandia's MESA complex meets this demand as the primary U.S. foundry for custom components that meet those specifications. MESA designs, develops, manufactures, integrates, and qualifies silicon and compound semiconductor-based microsystems for national security that cannot or should not be made in industry—either because of stringent production and security requirements for high-consequence systems or because the low volumes and many different types of parts required are not profitable for the private sector. Sandia's wide-ranging microelectronics science and engineering, enabled by rare facilities and tools and world-class researchers, makes broad contributions to national security. The Labs partner with government, academia, and industry on microelectronics research and development. Sandia bridges the "valley of death" where industry development stalls, maturing microelectronics tech from low to medium and high technology readiness levels.



ULTRAFAST BEAM-STEERING BREAKTHROUGH

In a major breakthrough, Sandia demonstrated the ability to dynamically steer light pulses from conventional, so-called incoherent light sources. This ability to control light using a semiconductor device could allow low-power, relatively inexpensive sources like LEDs or flashlight bulbs to replace more powerful laser beams in new technologies, such as holograms, remote sensing, self-driving cars, and high-speed communication. A feat previously considered impossible, Sandia's proof-of-principle work paves the way for developments in the fields of nanophotonics and ultrafast optics.

BOOSTING BATTERY RESEARCH



Sandia designed lithium-sulfur flow batteries that may one day be less expensive, hold more energy, and operate even more safely than traditional lithium-ion batteries. Lithium and sulfur are two of the most energy-dense materials for batteries, and sulfur is inexpensive. The design allows physical separation of the anode and cathode, making the battery safer and less likely to lose charge when sitting idle. The Department of Energy's Boost program facilitated a partnership between Sandia and New Mexico startup Gridflow that aims to get big, safe, stationary lithium-sulfur flow batteries to market faster. Applications include grid-scale batteries and household backups.

Sandia has earned more than 150 R&D 100 Awards and moves its technology to the marketplace for the benefit of the U.S. economy.

AT A GLANCE:

SAVANNAH RIVER NATIONAL LABORATORY

Savannah River National Laboratory (SRNL) is leading research and development for the DOE Offices of Environmental Management and Legacy Management, the Weapons and Nonproliferation programs of the National Nuclear Security Administration, additional DOE offices, and other sponsors. As a multipurpose, applied science and technology national laboratory, SRNL is focused on delivering high-quality scientific and technology solutions, while creating modern support infrastructure that enables expansion in new programs and technical areas. SRNL puts science to work to protect our environment, serve our national defense, secure our clean energy future, and reduce emerging nuclear threats. SRNL aspires to be the nation's premiere national laboratory in applied science and engineering, delivering solutions to environmental, energy, and security challenges.

FACTS

LOCATION:	AIKEN, SOUTH CAROLINA
TYPE:	MULTIPROGRAM LABORATORY
CONTRACTOR:	BATTELLE SAVANNAH RIVER ALLIANCE, LLC
RESPONSIBLE SITE OFFICE:	DOE-SR
WEBSITE:	SRNL.GOV

FUNDING BY SOURCE (FY23 COSTS)

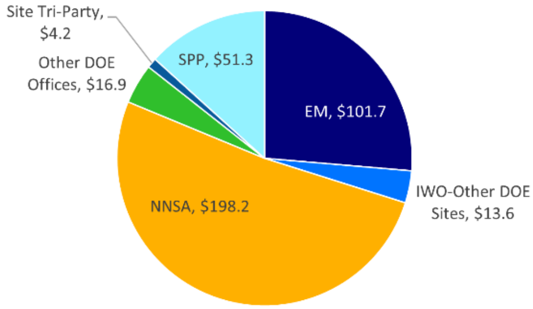
Operating Costs:
$436.2 M

DOE/NNSA/Other DOE Sites Costs:
$385.1 M

SPP (Non-DOE/DHS) Costs:
$49.4 M

DHS Costs:
$1.7 M

SPP/DHS as % Total Operating Costs: 11.7%



FY23 Cost Data, $M

PHYSICAL ASSETS (FY23 DATA)

39 Acres and 64 Buildings

~820,000 GSF in Buildings

Replacement Plant Value: $3.5 B

~200,000 GSF of Radiologically Controlled Labs in 15 Nuclear Facilities

~73,000 GSF in Leased Facilities

MISSION UNIQUE FACILITIES

Shielded Cells Facility

Mobile Plutonium Facility

Mobile Melt Consolidate

Advanced Manufacturing Collaborative

HUMAN CAPITAL (FY23 DATA)

~1,400 Full-Time Equivalent Employees (FTEs)

~15 Joint University Faculty

~45 Postdoctoral Researchers

~80 Undergraduate Students

~20 Graduate Students

CORE CAPABILITIES

Accelerating Remediation, Minimizing Waste, and Reducing Risk

Enabling Next-Generation Nuclear Materials Processing and Disposition

Creating Manufacturing Solutions for EM, NNSA, and Energy Security

Assuring Production and Supply of Strategic Materials and Components

Sensing, Characterizing, Assessing, and Deterring Nuclear Proliferation

Securing Connected Control Systems and Associated Data

AT A GLANCE:

SAVANNAH RIVER NATIONAL LABORATORY

ACCOMPLISHMENTS

ADVANCED MANUFACTURING FACILITY

SRNL scientists and engineers excel at solving applied technical challenges and welcome opportunities to partner with start-ups, entrepreneurs, established manufacturers, and academia to improve U.S. industrial competitiveness. SRNL's Advanced Manufacturing Collaborative (AMC) will be a cornerstone capability for the development of manufacturing solutions and is specifically designed to lower the barrier to partnership. Scheduled to open in mid-2025, the AMC covers more than 60,000 square feet, including Bench Labs, High Bay Labs, Computational Labs, and Industrial Engineering Labs, and will house approximately 100 SRNL scientists and engineers. Program areas within the AMC include additive manufacturing, biomanufacturing, materials design and processing, automation, artificial intelligence, and operational technology cybersecurity. Whether working with SRNL through a Cooperative Research and Development Agreement or a Strategic Partnership Program, partners at the AMC will have ready access to SRNL's researchers and its network of academic and industry partners to drive industrial competitiveness, gain economic advantage, solve technical problems, and enable manufacturing innovation.

U.S. SUPPORT TO THE INTERNATIONAL ATOMIC ENERGY AGENCY (NA24)

The analysis of particulate material collected on environmental test swipe samples taken within nuclear facilities is a key component of nuclear safeguards inspections and verification activities. SRNL leads an NA-241 program in collaboration with Pacific Northwest National Laboratory, Los Alamos National Laboratory, and National Institute of Standards and Technology to prototype microparticle reference materials. SRNL shipped 50 silicon planchets loaded with monodisperse, micrometer, mixed uranium, and plutonium reference particles. The characterization report with analytical values was issued in Quarter 1 FY24. These particles have homogeneous isotope amounts and elemental fractions and will enable calibrations and research and development on single particle analysis instrumentation.

ADVANCED LONG-TERM ENVIRONMENTAL MONITORING SYSTEM

The goal of ALTEMIS is to successfully develop, implement and deploy a new approach for robust monitoring of residual contaminants at complex groundwater sites. The approach includes incorporating in situ, real-time early warning systems; deploying spatially integrative monitoring methods; and developing modeling approaches to improve the success and quality of monitoring, while reducing overall cost. Since inception at the Savannah River Site's F Area, ALTEMIS has been deployed to Moab, Utah, and Sellafield, United Kingdom.

AT A GLANCE:

SLAC NATIONAL ACCELERATOR LABORATORY

SLAC National Accelerator Laboratory explores how the universe works at the biggest, smallest, and fastest scales and invents powerful tools used by researchers around the globe. As world leaders in ultrafast science and bold explorers of the physics of the universe, we forge new ground in understanding our origins and building a healthier and more sustainable future. Our discovery and innovation help develop new materials and chemical processes and open unprecedented views of the cosmos and life's most delicate machinery. Building on more than 60 years of visionary research, we help shape the future by advancing areas such as quantum technology, scientific computing, and the development of next-generation accelerators. Our connections and partnerships with Stanford University, the DOE, leading research centers, and Bay Area industry accelerate our progress.

FACTS

LOCATION:	MENLO PARK, CALIFORNIA
TYPE:	MULTIPROGRAM LABORATORY
CONTRACTOR:	STANFORD UNIVERSITY
RESPONSIBLE SITE OFFICE:	SLAC SITE OFFICE
WEBSITE:	SLAC.STANFORD.EDU

FUNDING BY SOURCE (FY23 COSTS)

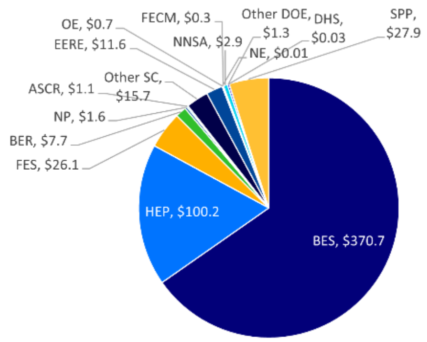
Operating Costs: $568 M

DOE Costs: $540 M

SPP (Non-DOE/DHS) Costs: $28 M

DHS Costs: $0.03 M

SPP/DHS as % Total Operating Costs: 4.9%



FY23 Cost Data, $M

PHYSICAL ASSETS (FY23 DATA)

426 Acres and 170 Buildings

2.2 M GSF in Buildings

Replacement Plant Value: $3.5 B

6,134 GSF in 4 Excess Facilities

MISSION UNIQUE FACILITIES

Facility for Advanced Accelerator Experimental Tests

Linac Coherent Light Source

NIH Common Fund Stanford-SLAC CryoEM Center

NIH Common Fund Stanford-SLAC CryoET Specimen Preparation Center

Stanford-SLAC Cryogenic Electron Microscopy Facilities

Stanford Synchrotron Radiation Lightsource

Megaelectronvolt Ultrafast Electron Diffraction Instrument

Also leading DOE contributions to the construction and operation of the Vera C. Rubin Observatory, as well as the joint DOE-National Science Foundation next-generation dark matter experiment SuperCDMS-SNOLAB.

HUMAN CAPITAL (FY23 DATA)

1,798 Full-Time Equivalent Employees (FTEs)

47 Joint Faculty

134 Postdoctoral Researchers

97 Undergraduate Students

273 Graduate Students

1,456 Facility Users

13 Visiting Scientists

CORE CAPABILITIES

Large-Scale User Facilities/R&D Facilities/Advanced Instrumentation

Accelerator and Detector Science and Technology

Advanced Computer Science, Visualization, and Data

Applied Materials Science and Engineering

Biological Systems Science

Chemical and Molecular Science

Condensed Matter Physics and Materials Science

Mechanical Design and Engineering

Microelectronics

Particle Physics

Plasma and Fusion Energy Science

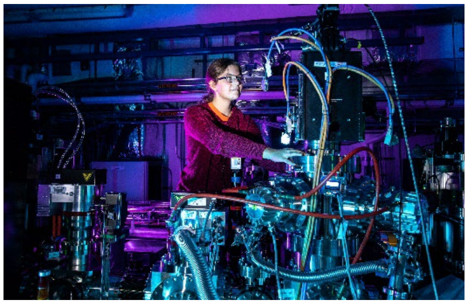
Systems Engineering and Integration

AT A GLANCE:

SLAC NATIONAL ACCELERATOR LABORATORY

ACCOMPLISHMENTS

WORLD-LEADING TOOLS FOR DISCOVERY

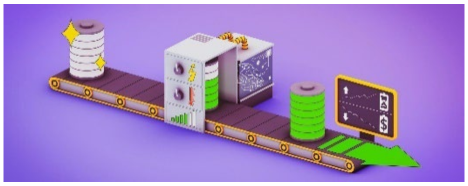


By inventing powerful new technologies, SLAC opens unprecedented views into the natural world—from atoms and molecules to the vast cosmos. Together with international partners, the lab builds and operates some of the premier research facilities on the planet, including the world's most powerful X-ray laser, the Linac Coherent Light Source (LCLS). LCLS transforms the ability of scientists to explore atomic-scale, ultrafast phenomena that are key to technologies of the future, from quantum materials to clean energy and medicine. The only facility of its kind in the U.S., LCLS preserves global leadership in the field of X-ray and ultrafast science. Another national treasure recently built at SLAC is the world's largest digital camera for astrophysics and cosmology, the Legacy Survey of Space and Time (LSST) Camera. SLAC will jointly operate the Vera C. Rubin Observatory, where, mounted on a telescope, the camera will capture an unparalleled 10-year time-lapse record of our universe.

DATA CHALLENGES OF THE FUTURE

SLAC's LCLS X-ray laser will generate up to a terabyte of data per second, while the LSST Camera will capture 20 terabytes of data every night for 10 years. These revolutionary new data-intensive science projects have uniquely positioned SLAC to pursue innovation in computing research and development, including new AI tools, edge computing methods that use specially engineered chips to perform data processing close to the source, and a new computing hub for data-rich studies: the SLAC Shared Science Data Facility (S3DF). S3DF is a distinct model for tackling the unique combination of datasets generated by these diverse projects and could help inform how computing is done at national scales. The lab is also building tools and expertise to make computing more energy efficient, and our research and development of detectors and accelerators are key to future facilities for science and technology around the world.

OPTIMIZING BATTERY MANUFACTURING



A SLAC-Stanford Battery Center collaboration, with researchers from the Toyota Research Institute (TRI), Stanford, and MIT, is providing valuable insights for battery manufacturers looking to speed up the process of bringing new developments to the market and improve their products. In a series of studies funded through a cooperative research agreement with TRI, the team developed nanoscale X-ray movies of battery charging and discharging processes and discovered how to use artificial intelligence to speed up battery testing and quickly zero in on charging methods that work best. They also found that giving batteries their first charge at unusually high currents increased their average lifespan by 50 percent, while decreasing the initial charging time from 10 hours to just 20 minutes. They used scientific machine learning to pinpoint specific changes in the battery electrodes that account for this increase in lifespan and performance.

AT A GLANCE:

THOMAS JEFFERSON NATIONAL ACCELERATOR FACILITY

Jefferson Lab

Thomas Jefferson National Accelerator Facility (TJNAF)'s expanding mission provides the nation with unprecedented capabilities to further human understanding of the tiniest constituents of matter through the Department of Energy (DOE)'s Nuclear Physics program, while developing advanced computing capabilities to fully exploit the power of data across DOE's Office of Science. Nuclear physics research at TJNAF reveals the fine details of the constituents of matter, from the familiar protons, neutrons, and electrons in the atom, to the lesser-known quarks and gluons inside the atom's nucleus. Additionally, TJNAF is leading development of a new capability in data-intensive computing for the Advanced Scientific Computing Research program: the High Performance Data Facility. Throughout its history, TJNAF's technical and research successes have made possible a wide array of applications, from powerful free-electron lasers for research, to compact accelerators for environmental applications, to life-saving advances in nuclear medicine.

FACTS	
LOCATION:	NEWPORT NEWS, VIRGINIA
TYPE:	SINGLE-PROGRAM LABORATORY
CONTRACTOR:	JEFFERSON SCIENCE ASSOCIATES, LLC
RESPONSIBLE SITE OFFICE:	THOMAS JEFFERSON SITE OFFICE
WEBSITE:	JLAB.ORG

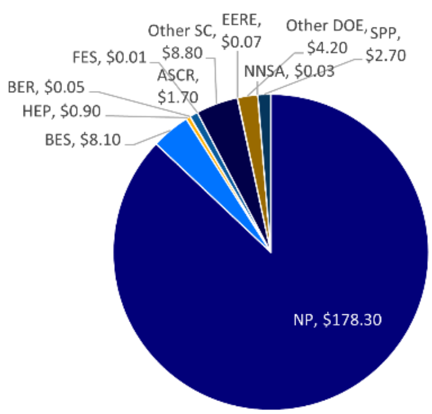
FUNDING BY SOURCE (FY23 COSTS)

Operating Costs: $204.8 M

DOE Costs: $202.1 M

SPP (Non-DOE/DHS) Costs: $2.7 M

SPP/DHS as % Total Operating Costs: 1.3%



FY23 Cost Data, $M

PHYSICAL ASSETS (FY23 DATA)

169 Acres and 69 Buildings

885,835 GSF in Buildings

Replacement Plant Value: $943 M

86,705 GSF in Leased Facilities

MISSION UNIQUE FACILITIES

Continuous Electron Beam Accelerator Facility

HUMAN CAPITAL (FY23 DATA)

873 Full-Time Equivalent Employees (FTEs)

22 Joint Faculty

35 Postdoctoral Researchers

20 Undergraduate Students

56 Graduate Students

1,904 Facility Users

1,770 Visiting Scientists

CORE CAPABILITIES

Nuclear Physics

Large-Scale User Facilities/Advanced Instrumentation

Accelerator Science and Technology

Advanced Computer Science, Visualization, and Data

Mechanical Engineering and Design

Systems Engineering and Integration

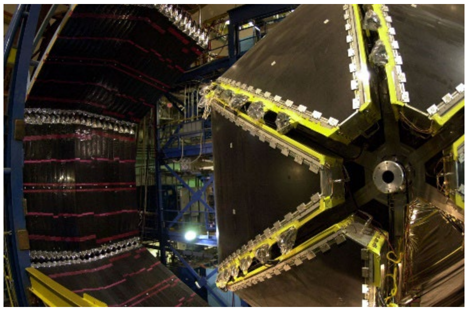
AT A GLANCE:

THOMAS JEFFERSON NATIONAL ACCELERATOR FACILITY

ACCOMPLISHMENTS

CONTINUOUS ELECTRON BEAM ACCELERATOR FACILITY (CEBAF)

The centerpiece of TJNAF's research program is the CEBAF—an electron accelerator based on superconducting radiofrequency (SRF) technology—which produces a stream of charged electrons that scientists use to probe the nucleus of the atom. CEBAF delivers discoveries in nuclear physics by accelerating intense 12 GeV (billion electron-Volt) polarized electron beams for collision with unique nuclear targets. The experimental outcomes, strengthened with a strong nuclear theory and data science component, are helping to unlock the mysteries of the atom's nucleus, its protons and neutrons, and their underlying quarks and gluons. As the first large-scale application of SRF technology in the world, CEBAF is the world's most advanced particle accelerator for investigating the quark structure of the atom's nucleus. The laboratory remains a world leader in CEBAF-enabled SRF accelerator technology—and continues to advance accelerator technology, as well as expand its applications through and beyond scientific research.



EXPLORING THE STRENGTH OF THE STRONG FORCE

One of the four fundamental forces at work in our universe, the strong force, helps make all visible matter possible. For instance, it makes the protons and neutrons that build the nucleus of the atom by binding together smaller particles called quarks. Protons and neutrons also obtain most of their mass primarily through these strong force interactions. Now, researchers at TJNAF have experimentally extracted the strength of the strong force using data from CEBAF and other particle accelerators worldwide. This quantity describes how tightly the strong force binds together subatomic particles across a full range of different distances. This first experimental verification of strong force coupling firmly supports theories explaining how most of the ordinary matter is generated in our universe.

NOVEL DETECTOR TECHNOLOGIES IMPROVE BREAST CANCER IMAGING AND CANCER TREATMENT

Breast cancer is the second most common cancer among women in the U.S. Alongside mammography, a breast cancer screening technique called molecular breast imaging reduces false positive screening results in all women and can also spot cancers too small to see via mammography alone. Built with TJNAF technologies originally developed for studying the tiniest particles inside matter, molecular breast imaging systems deployed in dozens of clinics nationwide are saving women's lives. And now, TJNAF researchers have partnered with SmartBreast Corp. to improve these systems with even better image quality and more precise tumor location. A new TJNAF-developed device called a variable-angle slant hole collimator upgrades existing systems to capture a clear, well-defined image of cancer tumors from multiple angles, enabling up to six times more contrast in images of tumors, while maintaining the same or better image quality and halving radiation dose to patients.