NETL's Regional Summary

PENNSYLVANIA

The U.S. Department of Energy's (DOE) National Energy Technology Laboratory (NETL) in Pittsburgh, Pennsylvania, plays a vital role in advancing energy innovation to support the nation's economic, environmental and manufacturing priorities. Approximately 700 NETL employees based in Pittsburgh are dedicated to developing and deploying cutting-edge technologies that manage carbon throughout its full life cycle, protect energy infrastructure, and strengthen U.S. energy security.

The Pittsburgh site serves as a hub for integrated energy solutions, focusing on advancements in carbon technologies, artificial intelligence and machine learning (AI/ML), rare earth elements and critical minerals, and energy infrastructure resilience. NETL researchers leverage state-of-the-art computational modeling, advanced materials engineering and strategic industry partnerships to address pressing national energy challenges. Key research efforts include carbon storage technologies, novel AI-driven energy systems analysis, high-performance materials for extreme environments, and advanced manufacturing techniques to support domestic supply chains.

Through collaborations with industry, government agencies and academia — including Carnegie Mellon University and the University of Pittsburgh — NETL is accelerating the transition of innovative energy technologies from the lab to large-scale deployment. These efforts strengthen regional industries, drive sustainable economic growth, and ensure a more secure and efficient energy future for the nation.

R&D Collaborations

NETL collaborates with industry, academia, national laboratories and government agencies to advance energy innovation. These partnerships leverage NETL's expertise, facilities and research capabilities to tackle critical energy challenges. Through these partnerships, stakeholders can:

- Work with NETL on research and development (R&D) projects.
- Access NETL's facilities, equipment and research services.
- Establish agreements that define collaboration terms and maximize research impact.
- Secure and license NETL's intellectual property.

Air Products · Ansys · PCC · CorePower Magnetics · Pennsylvania Department of Environmental Protection · PQ · Naval Nuclear Laboratory · Penn State · covestro · Liberty Coating Circle of Excellence

NETL is a U.S. Department of Energy (DOE) national laboratory dedicated to advancing the nation's energy future by creating innovative solutions that strengthen the security, affordability and reliability of energy systems and natural resources. With laboratories in Albany, Oregon; Morgantown, West Virginia; and Pittsburgh, Pennsylvania, NETL creates advanced energy technologies that support DOE's mission while fostering collaborations that will lead to a resilient and abundant energy future for the nation.

U.S. DEPARTMENT of ENERGY | NETL NATIONAL ENERGY TECHNOLOGY LABORATORY

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www.NETL.doe.gov

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Regional Economic Impact

In 2024, NETL conducted an economic analysis to quantify the laboratory's impacts on Pennsylvania, highlighting its contributions to job creation and overall economic growth in the region.

Economy

$276M
Total Economic Impact (direct, indirect and induced)

$178M
Total Expenditures

Jobs

1,689
Jobs (direct, indirect and induced full-time equivalent jobs)

652
Federal Employment and Site-Support Contractor (full-time equivalent jobs)

DOE Program Execution

NETL uniquely functions as a DOE field office supporting DOE offices in all aspects of program execution. In 2024, NETL supported nearly 100 research activities in Pennsylvania.

$252.4M
DOE Share (Cost Plan)

$427.9M
Total Award Value (Cost Plan)

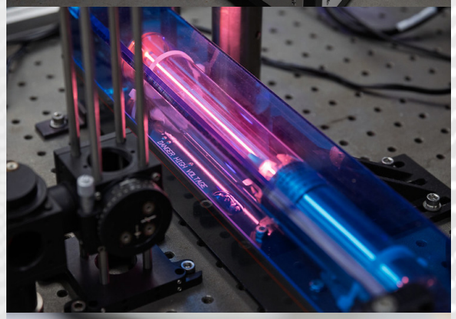
$175.6M
Performer Share (Cost Plan)

Facilities

The Carbon Materials Manufacturing Facilities help companies and researchers develop innovative carbon-based products that can achieve a 10-100x improvement in energy efficiency of computer microelectronics and a 15-25% increase in the mechanical strength of construction composites. Equipment like nanostructure fabrication tools and advanced material characterization instruments has helped achieve scientific breakthroughs. These range from revolutionizing high-tech products to enabling the discovery that nanostructured carbon additives made from charred coal waste can be used to develop low-cost, abundant composites that enhance cement for construction materials.

The Advanced Sensors Development Laboratories support the design and deployment of novel and cost-effective materials and devices for advanced sensing applications in energy systems, including harsh environments associated with advanced energy and resource recovery systems. With expertise such as fabricating long single-crystal fiber optics and developing distributed interrogated techniques, these laboratories help researchers and industry professionals focused on advancing manufacturing processes, modernizing the grid and improving the overall reliability of fossil energy systems. For example, advanced sensors can detect and predict corrosion in natural gas pipelines, improving safety and efficiency.

The **Core Flow Laboratory** leverages NETL's leadership in understanding deep subsurface processes related to energy extraction and storage to develop experimental studies on fluid flow and real rock and materials properties under real conditions. Current R&D, focused on enabling in situ critical minerals and enhanced oil recovery from shale resources, builds on NETL's expertise in unconventional natural gas and oil reservoirs. Research has led to new U.S.-based lithium resources that extends our knowledge of Marcellus shale chemical properties. Additionally, researchers have developed new surfactant technologies to enable increased hydrocarbon production from shale reservoirs.



Research Breakthroughs

Extracting Rare Earth Elements from Mine Drainage Treatment Waste

NETL researchers characterized critical minerals and materials (CMMs) in 100+ acid mine drainage treatment wastes in collaboration with University of Pittsburgh students and Hedin Environmental, a mine water treatment company. Using NETL's patented process, Targeted Rare Earth Extraction (TREE), they recovered meaningful supplies of rare earth elements (REEs), cobalt, and functional materials that manufacturers use in computers, advanced energy technologies and more. The highly effective TREE process presents the potential to recover 1,102 tons of REEs from mine drainage treatment wastes annually in Appalachia alone.

Advanced Sensors for Energy Infrastructure

NETL's researchers are skilled in developing advanced sensor technologies. Two of these technologies, developed in partnership with the University of Pittsburgh, earned R&D 100 Awards. In 2023, the Transformer Watchman was selected for its cutting-edge ability to monitor dissolved gases, acoustics and temperatures of transformers simultaneously and continuously to warn of any potential dangers. In 2024, the R&D 100 Awards recognized UltraSonic Photonics, a technology that uses a combination of fiber optic sensing and ultrasonic, acoustic, nondestructive evaluation to supply 24/7 monitoring of infrastructure and equipment and to issue alerts and warnings before a failure occurs.

Coal-Derived Carbon Material Revolutionizes High-Tech Products

NETL researchers developed a coal-derived carbon material that improves the performance and efficiency of computer microelectronic devices in collaboration with the University of Illinois at Urbana-Champaign, Oak Ridge National Laboratory and Taiwan Semiconductor Manufacturing Company. This new thin carbon material was used to fabricate a memory device called a "memristor," which stores data, and a field effect transistor which processes data in computers. Using coal as a manufacturing feedstock addresses the need for domestic advanced computing materials while bolstering America's manufacturing competitiveness.

Community Involvement

Western Pennsylvania Science Bowl (WPASB)

The DOE National Science Bowl is a nationwide academic competition that tests students' knowledge and promotes science, technology, engineering and math (STEM) education. For more than 30 years, NETL has hosted and offered volunteers among our workforce for the WPASB regional middle school and high school competitions, held annually in partnership with the Community College of Allegheny County, to select students from the region to participate in the annual National Science Bowl in Washington, D.C.

In 2025, 274 students and educators from 23 high schools and 13 middle schools competed in the WPASB, which 61 NETL volunteers staffed.

NETL Energy Zone Exhibit

NETL is proud to sponsor the NETL Energy Zone at the Carnegie Science Center, an energy exhibit that includes a variety of hands-on, minds-on activities designed to help children think early about careers in energy science and engineering. These fun, quiz-style games educate visitors of all ages about energy use and production. The NETL Energy Zone has welcomed more than 1.5 million guests since 2010.

Carnegie Science Center SciTech Days

In 2024, NETL staff collaborated with the Carnegie Science Center to showcase the lab's STEM careers to middle school and high school students from Pennsylvania and West Virginia. This event included flash workshops, demonstrations, interviews and career conversations.

NETL STEM Education and Outreach Program

NETL continues to demonstrate a commitment to STEM education and supports all levels of learning through our STEM Education and Outreach Program. NETL's workforce provides students with hands-on learning experiences, career path discussions, and presentations to heighten their awareness of, and interest in, careers in STEM fields.