NATIONAL ENERGY TECHNOLOGY LABORATORY
PITTSBURGH, PENNSYLVANIA

July 2026

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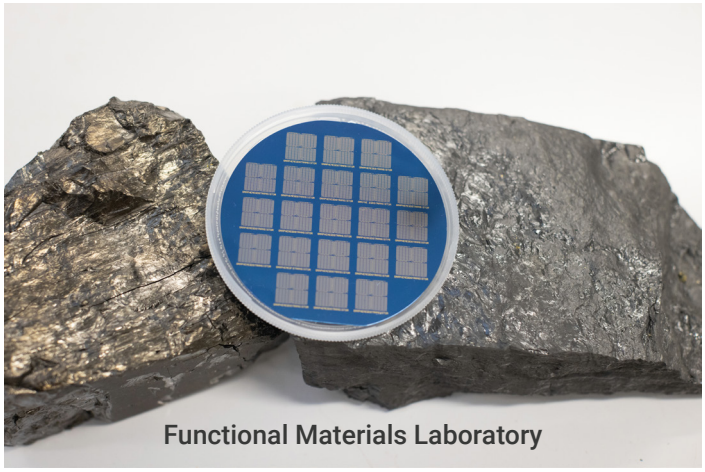
The history of NETL's Pittsburgh site stretches back to 1910, when the newly created Bureau of Mines in the U.S. Department of the Interior opened the Pittsburgh Experiment Station in Bruceton, Pennsylvania, about 12 miles south of Pittsburgh. The station's original purpose was to investigate the use of electricity and mining methods that would lower the number of fatal explosions and fires in America's underground coal mines. Additional facilities, including an experimental mine and laboratories, were established near the South Park suburb. The remote location allowed underground explosion testing to be duplicated and studied, leading to safer mining procedures and a more thorough understanding of the causes of mine explosions.

In the 1920s and 1930s, when politically inspired explosions occurred in several of our nation's cities, coal mine explosive experts from the Pittsburgh research facility were called in as crime scene experts to assist with investigations. In addition, energy researchers at the Pittsburgh Bureau of Mines research facility used their experience with gas monitoring in coal mines to further develop ventilation procedures that would eventually be used to assist in the construction of Pittsburgh's Liberty Tunnel in the early 1920s. This major transportation artery was a safe and reliable venue for early drivers and is still in use today.



Functional Materials Laboratory

Analytical Laboratory

During World War II, Bureau of Mines researchers applied their growing expertise in explosives to a range of assignments that put Pittsburgh at the forefront of the war effort. They appraised captured German and Japanese weaponry; analyzed the sensitivity of various explosives to friction, impact, heat, and electricity; and analyzed the shock waves produced by explosions. While scientists elsewhere worked on the Manhattan Project to develop a nuclear weapon, experts in Pittsburgh participated in the design of a trigger for the atomic bomb.

In the decades following World War II, researchers again turned their attention to improving mining safety. The Pittsburgh station explored the revolutionary concept of methane control. As part of this research program, Pittsburgh researchers verified that methane was a ubiquitous byproduct of the biological and physical processes that formed coal. Bureau researchers also initiated one of the earliest American methane-drainage experiments, which aimed to remove methane before it could endanger miners.

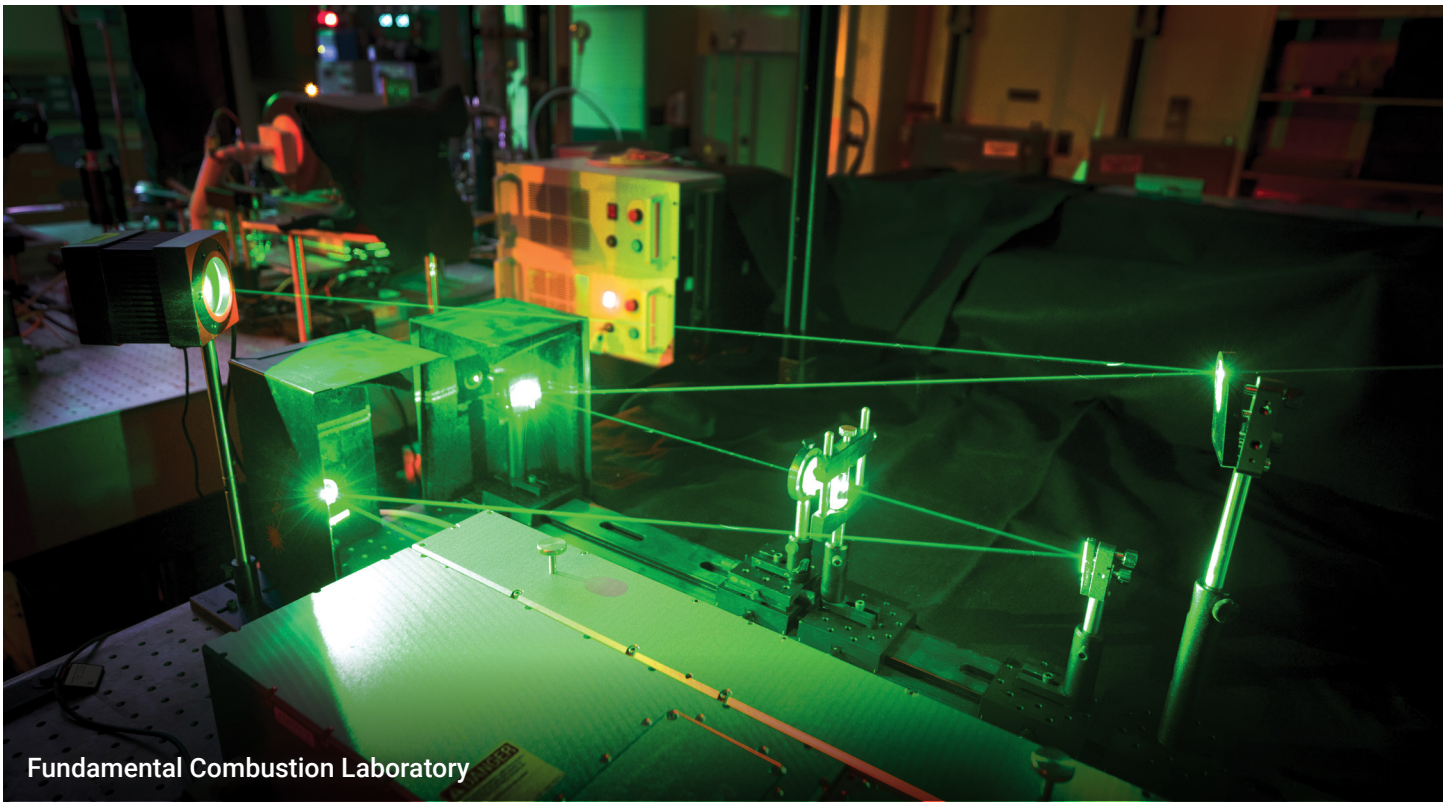
In the 1970s, the U.S. Energy Research and Development Administration was formed, incorporating the federal government research centers in Morgantown, West Virginia; Bartlesville, Oklahoma; and Pittsburgh, Pennsylvania. The centers oversaw federally funded contracts for hydrocarbons research and development (R&D) as they continued research on coal, oil, and natural gas technologies.

By 1977, the U.S. Department of Energy (DOE) was formed. The facilities near Pittsburgh, along with some other large coal production research facilities, became known as the Pittsburgh Energy Technology Center (PETC). Researchers at PETC pioneered work on energy innovations related to coal-fired power systems. This included providing workable technologies to address acid rain, a significant environmental issue resulting from the sulfur dioxide and nitrogen oxides in coal-fired flue gas combining with atmospheric water to form acids. In addition, PETC had great success in developing technologies to reduce mercury emissions at power plants, which spearheaded the Laboratory's second century of service.

In 1996, researchers at the Morgantown and Pittsburgh centers were united in a new Federal Energy Technology Center (FETC), and then, in 2005, FETC was joined by a third laboratory in Albany, Oregon. These government-owned, government-operated facilities now comprise DOE's NETL.

In April 2026, the Oil & Gas Center of Excellence opened at NETL's Pittsburgh site. The center builds on decades of R&D at NETL and facilitates partnerships across national laboratories, industry, academia, and other stakeholders to enable secure, efficient, and low-impact oil and gas systems through integrated research aligned with DOE priorities and industrial needs. To address those priorities and needs, Pittsburgh's site is a hub for oil and gas R&D, with approximately 525 Pittsburgh-based NETL personnel who are dedicated to advancing the nation's energy future by creating solutions that strengthen the affordability, reliability, and security of energy systems and natural resources. The Pittsburgh site plays a key role in advancing applied energy technologies that support DOE's mission.

Graphite Manufacturing Facility

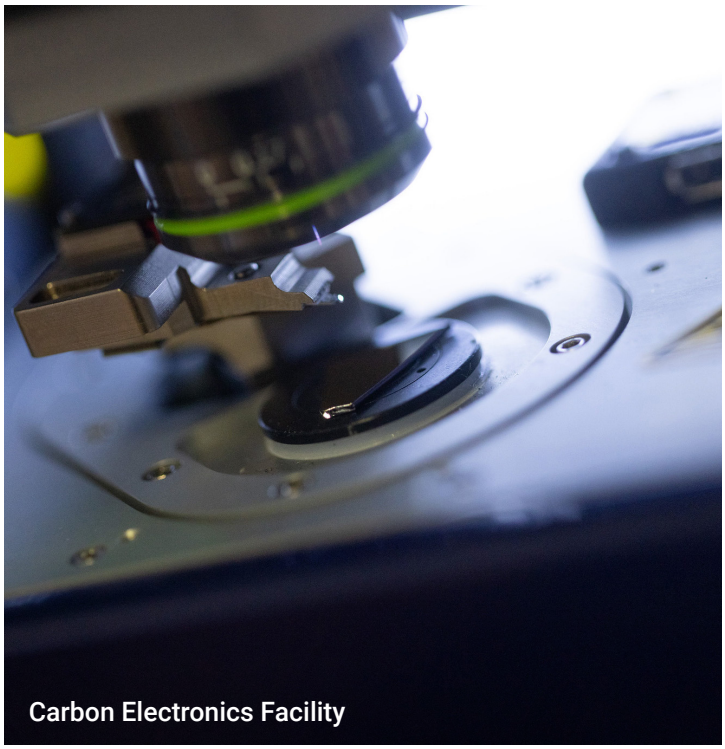


Fundamental Combustion Laboratory

NETL researchers use computational tools, engineering expertise, and strategic partnerships to address national energy challenges, including manufacturing high-value carbon materials, engineering fluid flow in the subsurface, assessing the impact of oil and gas development on pre-existing infrastructure, developing functional materials for gas separation, and advancing critical mineral recovery.

Collaborations with industry, government agencies, and academia, including Carnegie Mellon University and the University of Pittsburgh, help accelerate the transition of innovative solutions from the lab to real-world applications.

Geomechanics and Flow Lab



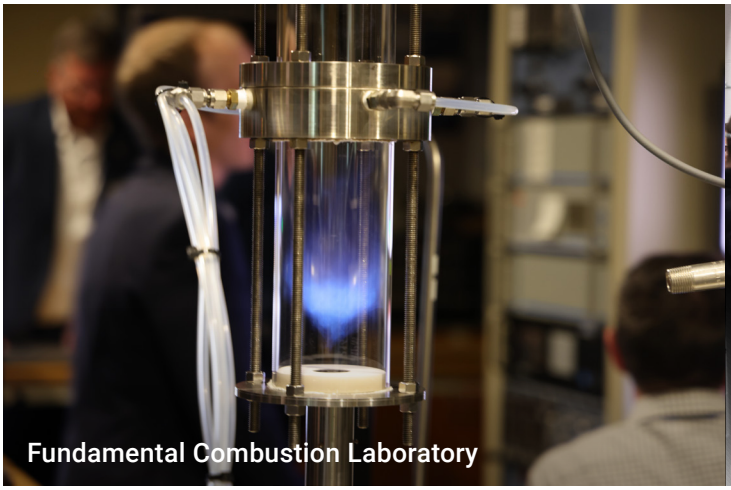
Carbon Electronics Facility

RESEARCH IN ACTION

NETL researchers have leveraged decades of computer modeling expertise to design a key component of an emerging class of combustion technology called rotating detonation engines (RDEs), which could enable "pressure gain combustion," a long-sought advancement that could significantly improve efficiency, reduce fuel consumption, and lower nitrogen oxides emissions of next-generation gas turbines.

NETL researchers used high-fidelity computational fluid dynamics (CFD) simulations to redesign the injector that feeds fuel and air into the detonation chamber. Earlier injector concepts experienced startup instabilities that made it difficult to generate and sustain the detonation waves that are central to RDE operation. By applying CFD to explore how geometry, flow distribution, and fuel-mixing behavior influence wave formation, the NETL team developed a novel-aero strut injector configuration that sustains detonation waves but with a lower pressure drop across the injector, leading to increased performance.

The project underscores NETL's commitment to harnessing advanced modeling, experimental tools, and engineering expertise to solve high-impact energy challenges. By demonstrating how CFD can accelerate hardware innovation — reducing trial-and-error development and enhancing performance understanding — the team has provided a model for future research in combustion, materials, and hybrid energy systems.



Fundamental Combustion Laboratory

Gas Separations Center

NETL is a U.S. Department of Energy (DOE) national laboratory dedicated to innovating and accelerating the nation's energy solutions in hydrocarbons, geothermal energy, and critical minerals production. The Lab further strengthens its impact by engaging with industry, academia, and other stakeholders through four strategically located Centers of Excellence: Coal, Critical Minerals & Advanced Alloys, Oil & Gas, and Geothermal. With research sites in Albany, Oregon; Morgantown, West Virginia; and Pittsburgh, Pennsylvania, NETL operates as one laboratory to create advanced energy technologies that support DOE's mission and enable affordable, reliable, and secure energy to fuel human prosperity.