NATIONAL ENERGY TECHNOLOGY LABORATORY
PITTSBURGH, PENNSYLVANIA

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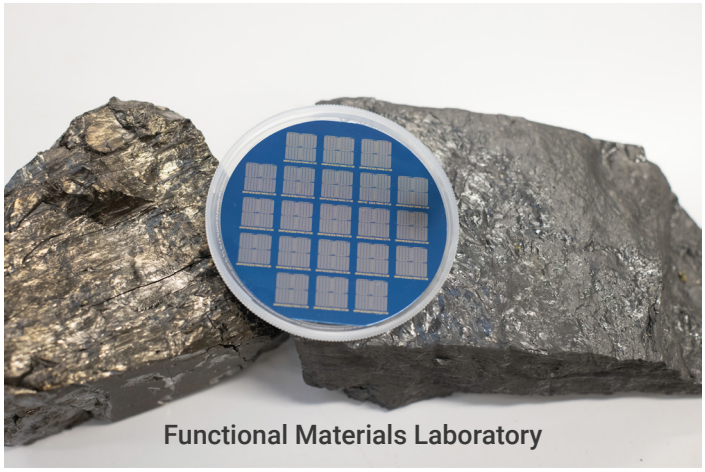
The history of NETL's Pittsburgh site stretches back to 1910, when the newly created Bureau of Mines in the U.S. Department of the Interior opened the Pittsburgh Experiment Station in Bruceton, Pennsylvania, about 12 miles south of Pittsburgh. The station's original purpose was to investigate the use 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

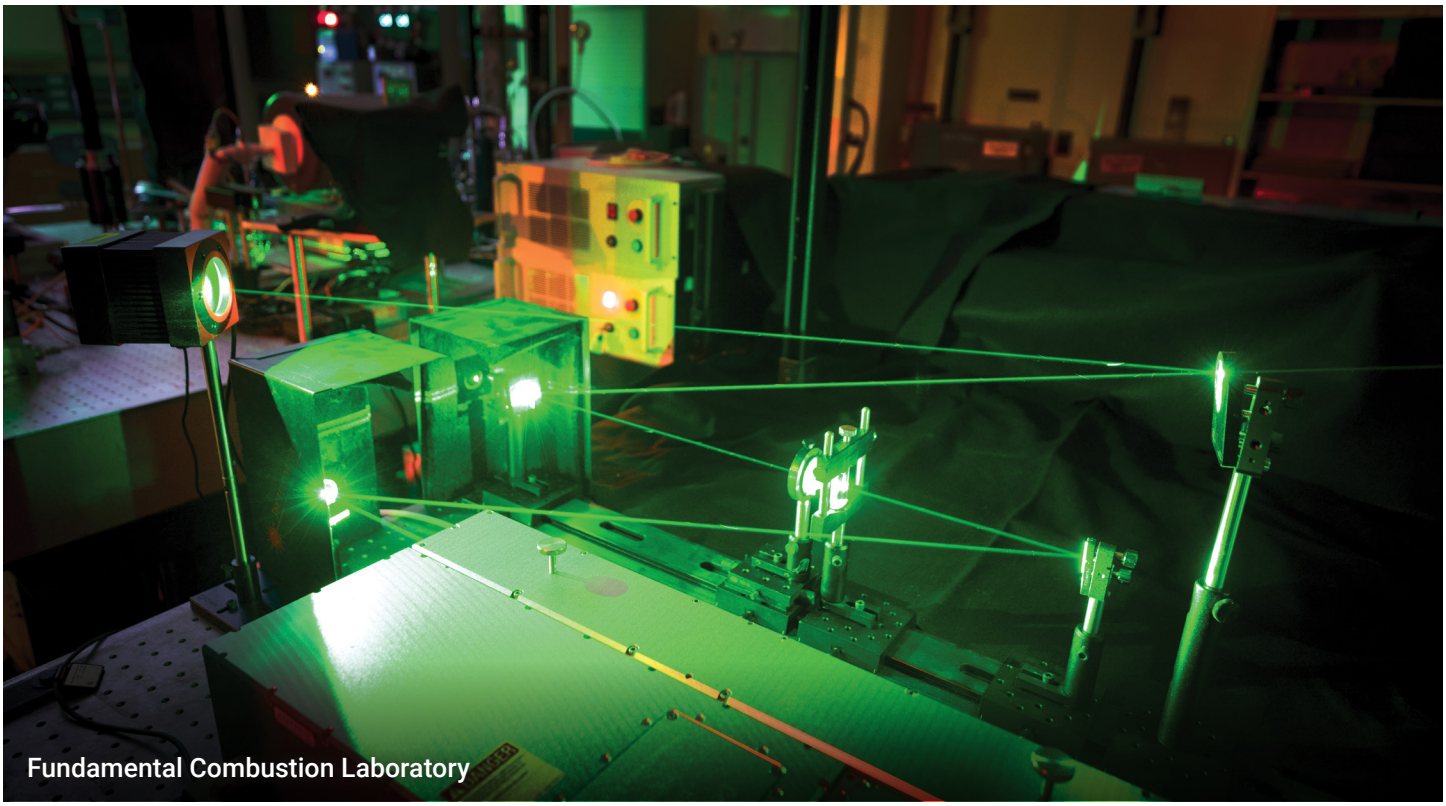
During World War II, Bureau of Mines researchers applied their growing expertise in explosives to a range of assignments that put Pittsburgh on the forefront of the war effort. Researchers went to work in the experimental mine and in laboratories to improve the safety of explosives handling and storage. 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. The trigger designed would start the chain reaction causing a fission-type atomic bomb to explode.

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 federal government research centers in Morgantown, West Virginia; Bartlesville, Oklahoma; and Pittsburgh, Pennsylvania (Bruceton site). The centers oversaw federally funded contracts for fossil energy research and development as they continued research on coal, oil and natural gas technologies.

By 1977, the U.S. Department of Energy (DOE) was formed. The facilities on the Bruceton site's R&D plateau, along with some other large coal production research facilities, became known as the Pittsburgh Energy Technology Center (PETC). Researchers at PETC pioneered work on environmental issues and 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 and a new focus: the challenges of global climate change.


Graphite Manufacturing Facility



Fundamental Combustion Laboratory

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

Today, approximately 700 Pittsburgh-based NETL personnel are dedicated to advancing the nation's energy future by creating solutions that strengthen the security, affordability and reliability of energy systems and natural resources. The Pittsburgh site plays a key role in advancing applied energy technologies that support DOE's mission.

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.

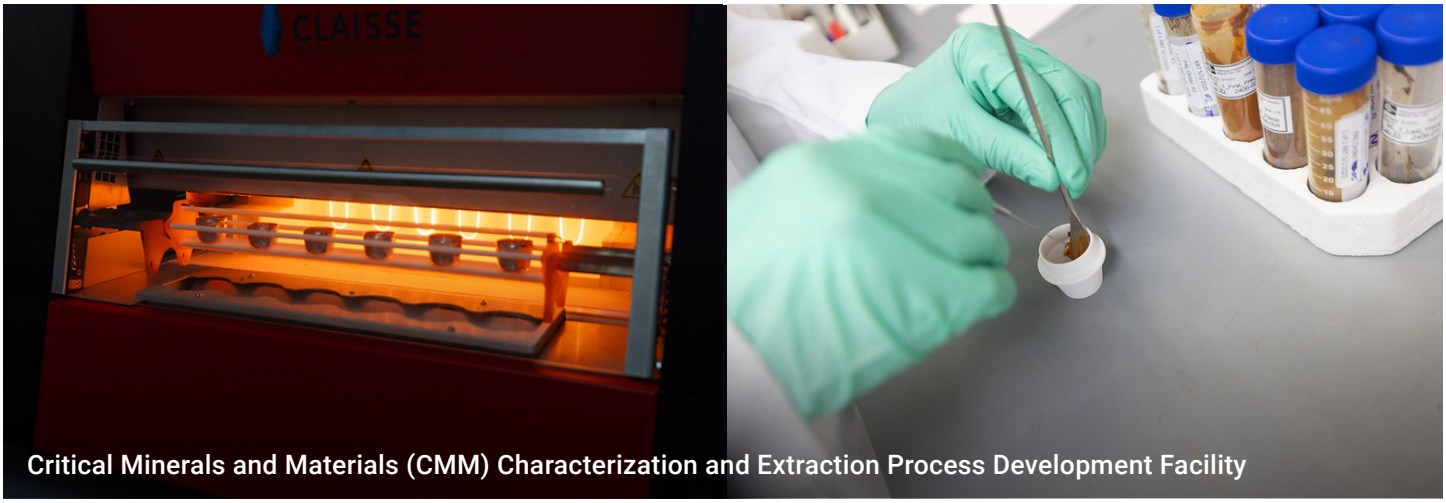
Conference Center

RESEARCH IN ACTION

NETL Pittsburgh's Critical Minerals and Materials (CMM) Characterization and Extraction Process Development Facility is one of a range of technical facilities dedicated to reinforcing America's energy leadership. Research is focused on recovering CMMs and rare earth elements (REEs) from domestic U.S. coal and coal-utilization byproducts. CMMs and REEs are prominent in advanced and emerging technologies, ranging from computer chips, smart phones, and batteries to medical devices. NETL is developing processes to provide reliable and competitive domestic supplies of CMMs and REEs that help reduce U.S. reliance on foreign sources — work that improves the resilience of critical technology supply chains.

For example, NETL researchers:

- Successfully demonstrated advanced characterization techniques for efficient and economical recovery of critical minerals from unconventional feedstocks. Using synchrotron X-ray fluorescence microprobe and X-ray absorption near edge structure techniques,
- Determined the binding environment for critical minerals such as cobalt, nickel, zinc, manganese and REEs in complex geological matrices.
- Developed a patent-pending step leaching protocol — Targeted Rare Earth Extraction (TREE) — to effectively recover multiple critical minerals and functional residuals from legacy wastes, including Appalachian acid mine drainage solids, coal ash, drill cuttings and mine tailings.
- Created an opportunity to transform abundant waste streams into environmental and economic assets — 1,102 tons REE/year in Appalachia alone.



Critical Minerals and Materials (CMM) Characterization and Extraction Process Development Facility

NETL is a 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.