



ACCOMPLISHMENTS

Q4 FY25



U.S. DEPARTMENT
of **ENERGY**

NETL ACCOMPLISHMENTS

Quarter 4 – Fiscal Year 2025

NETL-Performed

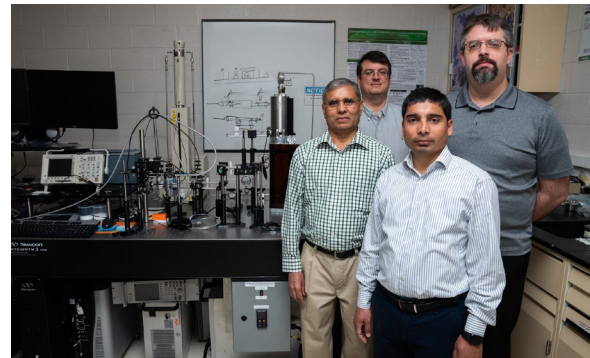
NETL's Scott Crawford Was Recognized for Providing Valuable Feedback to Researchers Around the World

The journal Nanomaterials recognized NETL research physical scientist Scott Crawford as a 2025 exceptional reviewer for his contributions to the publication's peer review process during 2025. Nanomaterials is an international, peer-reviewed, interdisciplinary and open-access scholarly journal, which the Multidisciplinary Digital Publishing Institute (MDPI) publishes semimonthly online. The journal publishes reviews, regular research papers, communications and short notes relevant to any field of study that involves the science and application of nanomaterials.



NETL Advanced Laser Technology To Detect Critical Materials in U.S. Coal and Shale in the Field

NETL researchers advanced a pioneering laser technology to provide laboratory-quality detection and analysis of rare earth elements (REEs) directly in the field, bringing the nation one step closer to securing a reliable domestic supply of these vital materials used in nearly all modern technology. The NETL team uses laser-induced breakdown spectroscopy (LIBS) technology as a rapid and efficient solution for analyzing the elemental composition of materials in the field and even deep underground. LIBS achieves this on-site analysis by using a high-energy laser pulse to create a tiny, luminous plasma on the sample surface. By analyzing the light emitted from this plasma, scientists can identify and quantify elements present within seconds.



NETL Researchers Took Top GEODE Datathon Engineering Award with Geothermal Innovation

An NETL-led team secured first place in the engineering track of the Geothermal Energy from Oil and Gas Demonstrated Engineering (GEODE) Datathon for their development of the FlowDash Geothermal Energy Enhancer, a new machine learning tool that can reduce risks and costs for geothermal energy operations and enhance safety for neighboring communities. The innovation offers a custom two-level machine learning workflow to indicate the potential presence of geothermal energy. The tool not only maps the geometry of underground fracture networks but also identifies potential high fluid flow paths along subsurface fractures based on the expertise and technologies adapted from oil and gas for geothermal applications. The DOE-funded GEODE Consortium brings together subject matter experts from the oil and gas and geothermal industries to research, develop and deploy next-generation geothermal technologies. The Datathon included 43 teams divided into an engineering group and a geoscience group. The more than 140 participants represented 27 universities, 25 private companies and 16 U.S. states.

NETL Researchers Earned Three 2025 R&D 100 Awards for Innovative Projects

NETL researchers who discovered transformational technologies to produce high-quality synthetic graphite from plastics, convert wastes and biomass into fuels and chemicals, and find critical minerals using a new revolutionary sensor were named winners in the prestigious R&D 100 Awards competition.

- Plastic Upcycled Synthetic Graphite (PLUS-Graphite). A winner in the Mechanical/Materials category, PLUS-Graphite was developed by Christopher Matranga, Ki-Joong Kim, Ngoc Tien Huynh, Yuan Gao, Viet Pham and Congjun Wang.
- Microwave-Assisted Solids-to-Fuels & Chemical Conversion (MAST-FCC). A winner in the Process/Prototyping category, MAST-FCC was developed by Dushyant Shekhawat, Christina Wildfire, Ashraf Abedin, Xinwei Bai and Pranjali Muley.
- eMission Critical Sensor. A winner in the IT/Electrical category, eMission Critical Sensor was developed by a team led by Paul Ohodnicki of the University of Pittsburgh and NETL's Scott Crawford. Other team members were NETL's John Ahern, John Baltrus, Ki-Joong Kim and Ward Burgess.



NETL Database Upgrade May Help Pennsylvania Communities in Marcellus Formation Generate Revenue

NETL upgraded its [National Energy Water Treatment & Speciation \(NEWTS\) database](#), a free online resource, by incorporating data from the Pennsylvania Department of Environmental Protection on over 1,000 produced water streams generated by Marcellus Shale hydraulic fracturing operations in the Keystone State. This enhancement allows municipalities, water authorities and other entities to analyze the geochemical data from energy-process water, identify potential contaminants, and develop remediation models using popular geochemical modeling software. A significant accomplishment is the upgraded tool's ability to help identify the presence of critical minerals, such as lithium, in produced water, which could be extracted and used as a revenue source to offset the cost of community improvements. Notably, NETL research suggests that Marcellus Shale wastewater from Pennsylvania could meet 38-40% of current domestic lithium consumption, addressing a national priority for securing critical mineral supplies. NEWTS contains geochemical and geospatial data from wastewater sample records spanning 48 states.



NEWTS
DATABASE

NETL Researchers Gasified Plastic Waste With Coal and Biomass for Improved Hydrogen-Rich Gas Production

NETL researchers developed a more effective and less expensive method for combining plastic waste (specifically low-density and high-density polyethylene) with coal and biomass in a steam gasification process. This innovation produces hydrogen-rich syngas, a versatile gas that can be used as fuel or as a building block for a range of chemicals that can help tackle critical energy challenges. The research addresses problems in traditional plastic gasification, such as agglomeration, energy-intensive size reduction and tar formation, by using coal waste, which contains alkali and alkali earth metals that act as a catalyst, aiding in char gasification and tar cracking. This co-gasification approach offers a promising pathway for converting plastic waste into valuable products, recovering its energy content, and provides flexibility in adjusting feedstock proportions to optimize syngas characteristics and yield. The findings were explained in a recent [article](#) in Fuel, a publication dedicated to the science and technology of fuel and energy.



NETL Alloy Development Process Supported U.S. Exports of Liquefied Natural Gas

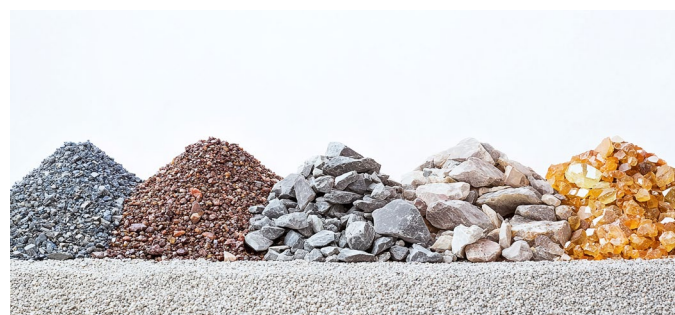
NETL researchers developed a process to manufacture a class of high-performance alloys for use in a variety of applications, including the export of liquefied natural gas from the United States to international markets. In their [study](#), published in the journal Acta Materialia, NETL researchers outlined their development of a novel multilength-scale approach that provides a pathway to produce high-strength model and commercially available nickel-, cobalt- and chromium-containing alloys. In the new process, researchers determined that techniques such as pre-straining and heat treatment improved resistance to deformation.

NETL's AquaTrade: The Produced Water Matchmaker for Oil and Gas Operators

NETL developed a new tool to assist in the reuse and recycle of produced water generated by oil and gas operations, providing the industry with an easy-to-use online portal that encourages responsible water use during the production of U.S. hydrocarbon energy resources. Developed in collaboration with multiple partners, AquaTrade is a custom-built, matchmaking portal to reduce freshwater consumption in oil and gas operations. Produced water management is an integral part of operations in basins throughout the nation. Due to its elevated salinity, produced water usually cannot be discharged to the surface environment without treatment. However, it can be recycled for hydraulic fracturing when completing new oil and gas wells, reducing the need to source fresh or brackish water. NETL is seeking industrial and other partners to further pilot AquaTrade and to solicit feedback on opportunities for improvement. Interested parties may email AquaTrade@netl.doe.gov for more information.

NETL and Partners Revolutionized Critical Mineral Discovery with AI-Powered Technology

A collaborative effort between NETL, Ramaco Resources and Weir International has successfully advanced an NETL-developed machine-learning technology for rapidly identifying and quantifying critical minerals, including REEs in unconventional sources, such as coal refuse piles. By deploying NETL's AI-informed model, this partnership, which is supported by the DOE Technology Commercialization Fund, identified significant REE deposits at Ramaco's Brook Coal Mine in Wyoming -- projected to host the largest unconventional REE deposit in the U.S. This breakthrough is crucial for establishing a domestic supply chain for critical minerals, enhancing national security and fostering economic growth by reducing reliance on foreign sources.



NETL Determined Naturally Occurring Signals Can Help Improve Oil and Gas Production and Safety

NETL researchers demonstrated that naturally occurring signals in underground fluids can serve as effective indicators of flow patterns between existing oil and gas wellbores — a discovery that can help decision-makers understand the interactions between wells to optimize the efficiency and safety of oil and gas production. Fluid flow between drilled wells is known as well-to-well communication. NETL experts estimate that currently, 70% of new wells are “child wells” — wells drilled in proximity to producing wells known as “parent wells.” Keeping track of well-to-well communication between the wells is important for optimized fracturing operations and to prevent potential problems. Unexpected fluid migration between wells results in inefficient production, increased leakage risks and increased levels of extracted waste fluid, known as produced water, that requires treatment or disposal.

NETL Researcher Was Selected as Emerging Leader Honoree for 2025 Service to America Medals

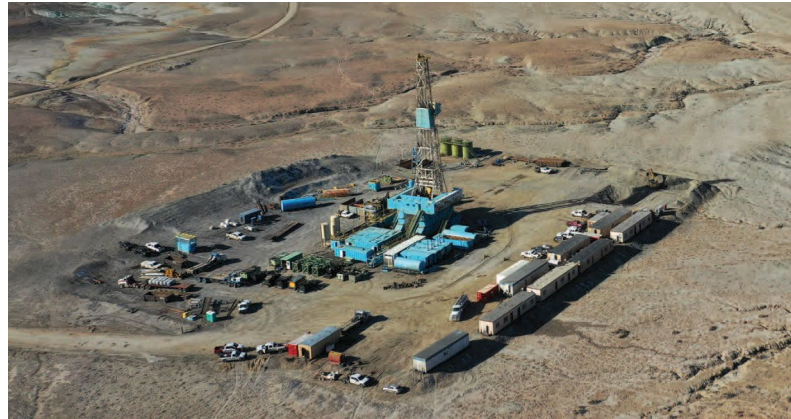
NETL’s Ruishu Wright was selected as an honoree for the prestigious 2025 Samuel J. Heyman Service to America Medals in the Emerging Leader category for her groundbreaking work developing novel sensor technologies aimed at monitoring critical infrastructure and preventing catastrophic failures. The “Sammies,” known as the Oscars of public service, recognize dedicated federal employees who have made significant contributions to the country. Wright leads a multidisciplinary team at NETL and manages multiple research projects with a total annual budget of \$5 million to \$10 million. She has dedicated her federal service to developing and deploying sensor technologies that could save billions of dollars lost during power outages and avert serious injuries from pipeline explosions and grid fires.



NETL-Managed/Awarded

NETL-Managed Project Unlocked Potential of Utah’s Paradox Basin To Reshape the Energy Landscape

A research and development project managed by NETL with the University of Utah and industry partner Zephyr Energy plc unlocked the potential to produce significant volumes of natural gas and oil in eastern Utah’s Paradox Basin. Through extensive characterization, including a dedicated well and advanced 3D geophysical analysis, the project not only informed optimized horizontal drilling strategies but also identified previously overlooked hydrocarbon resources. The project’s success is exemplified by the State 36-2R well, which is projected to yield substantial natural gas and condensate, demonstrating performance comparable to top-tier wells in other major U.S. basins and establishing a model for developing other complex, unconventional resource plays.



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