NATIONAL ENERGY TECHNOLOGY LABORATORY

# ACCOMPLISHMENTS

# Q3 FY24

U.S. DEPARTMENT OF ENERGY

# NETL ACCOMPLISHMENTS

## Quarter 3 – Fiscal Year 2024

### NETL Economist Named to Prestigious List of Young Leaders in West Virginia

Amanda Harker Steele, a research economist at NETL, was named to a prestigious list of individuals under the age of 40 who excel in their fields and are using their talents to build a brighter future for West Virginia. A federal employee at NETL since 2022, Harker Steele received the honor at The State Journal and WV News Generation Next: 40 Under 40 awards program. Being chosen for this recognition positions the recipient as a leader to watch.

### NETL-Led Project for Reducing Methane Emissions from Marginally Producing Wells Released Measurement Guidance

NETL released a detailed report that presents key guidelines for measuring methane emissions from marginally producing oil and natural gas wells. The guidelines were developed to assist the 14 states awarded funding under Funding Opportunity DE-FOA-0003109. This report was made possible through a partnership between NETL and U.S. Environmental Protection Agency.

### Carbon Storage Assessment Tool Upgraded, Released by NETL

NETL released version five of a user-friendly, sophisticated database that can be used to estimate the carbon dioxide ($CO_2$) storage potential of underground geological environments, helping stakeholders make more informed decisions that could improve the efficiency, safety and long-term stability of $CO_2$ storage operations. NETL's updated $CO_2$-SCREEN tool, which stands for Carbon Dioxide Storage prospeCtive Resource Estimation Excel aNalysis, now features additional storage efficiency factors. These factors are based on experimental measurements and reservoir simulations conducted on rock cores from storage reservoirs that were targeted for $CO_2$ storage across the United States.

### NETL Researchers Achieved Unprecedented Experimental Scale-Up of Catalyst for Hydrogen Production

NETL researchers scaled up hydrogen production tests by increasing the catalyst load from 500 grams to 4.5 kilograms, a significant step toward advancing the hydrogen production technology needed for a clean energy future. The patented NETL catalyst helps to enable a process called catalytic methane pyrolysis, which breaks down methane into hydrogen and solid carbon without creating $CO_2$ emissions. This and other clean methods of hydrogen production will be critical for the growth of the future hydrogen economy supported by DOE.

### NETL Researcher Recognized for Expertise in Journal Review

The Royal Society of Chemistry (RSC) recognized NETL's Scott Crawford as an outstanding peer reviewer for the open access journal RSC Advances. Peer review is an essential component for improving the quality and impact of published research while also ensuring that the research is conducted with integrity. Crawford's research at NETL focuses on materials science — work that has resulted in the development of a device to detect trace concentrations of rare earth elements (REEs), which are essential for the manufacturing of many green energy technologies.

### NETL Technology Improved Cement Strength and Durability With Nanostructured Additives Made From Charred Coal Waste

An NETL-developed technology improved the strength of cement by up to 30% and enhanced durability by 60% using nanostructured carbon additives made from charred coal fine waste. The technology was described in a peer-reviewed paper published in Nature's Scientific Reports, the fifth most cited journal in the world. Cement composites, including cement paste, mortar and concrete, are some of the most widely used construction materials in the world; their quasi-brittle nature, susceptibility to cracking, low toughness and low tensile strength have been identified as the main characteristics that result in poor durability and high maintenance costs.

### NETL Tool Provides Energy Research Data While Protecting Sensitive Information

NETL launched a Geospatial and Information Substitution and Anonymization (GISA) Tool that provides users with access to detailed data while protecting sensitive information, balancing data accessibility with privacy concerns. Anonymization is important to energy researchers across the United States because many datasets shared between partners and DOE contain sensitive information that may prevent or delay data from becoming public or shared with other entities. The GISA Tool offers multiple solutions for spatial, text-based, and tabular data and enables the anonymization of a subset of information within a dataset while preserving important variables.

### NETL-Supported Interagency Working Group Honored by the National Association of Government Communicators

The Interagency Working Group on Coal and Power Plant Communities and Economic Revitalization, which is supported by NETL, was awarded a second-place 2024 Blue Pencil & Gold Screen Award from the National Association of Government Communicators for the "Catalyzing Economic Development in Pennsylvania's Energy Communities" event held Oct. 20, 2023, at Westmoreland County Community College in Youngwood, Pennsylvania.

### NETL Released Latest Version of Multiphase Flow Software To Develop Efficient, Cleaner Energy Systems

NETL released Multiphase Flow with Interphase eXchanges (MFiX) Version 24.1, the latest upgrade to multiphase computational fluid dynamics software used to shorten the time and cost associated with developing new power generation technologies. MFiX is the cornerstone of NETL's multiphase flow reactor modeling efforts to understand how different phases of matter interact physically and chemically in power generation systems.

### NETL Report Examined Technologies for Reducing Emissions from Gas Flaring

Flaring, often used in the oil and gas industry to dispose of gases not processed and sold as part of normal operations, has been a common practice for nearly 160 years but is a source of greenhouse gas emissions — most notably methane. A comprehensive evaluation of gas flare technologies, conducted by NETL, suggests that significant emissions reduction will depend largely upon low-cost improvements to existing technologies backed by strategic federal investment.

### NETL Researcher Honored by the Oregon Federal Executive Board

The brightest minds in the Oregon federal workforce gathered Tuesday, May 7, at the Historic Hangar, located adjacent to Pearson Air Museum, in Vancouver, Washington, for the Oregon Federal Executive Board (FEB) Excellence in Government Awards, where an NETL researcher took home a prestigious honor. NETL's Jennifer Bauer received the award for Outstanding Innovator from the Oregon FEB for her work leading NETL's Geoscience, Artificial Intelligence, and Analysis (GAIA) team, which integrated thousands of disparate public data resources to support clean energy and energy community activities within the Lab, DOE and other federal agencies.

### NETL-Morgantown and NETL-Pittsburgh Staff Received Pittsburgh FEB Awards

Staff and researchers at NETL-Morgantown and NETL-Pittsburgh received two team awards and 10 individual awards from the Pittsburgh FEB during its 2024 Excellence in Government Awards program at the Heinz History Center during Public Service Recognition Week (PSRW), which was held May 5-11. Also as part of PSRW, NETL's Sean Plasynski, acting principal deputy director, was named a national FEB Leadership winner. Only 21 federal employees in the United States received this award, which recognizes leaders in federal service for exhibiting high levels of integrity, inspiring trust and exemplifying dedication to public service.

### NETL Advanced Luminescent Sensors To Detect REEs in Waste Byproducts

NETL researchers developed a low-cost compact fiber-optic sensor that exploits a process called "photoluminescence sensitization" to detect REEs — critical materials needed by U.S. manufacturers to make high-tech systems and devices — in waste byproducts generated from mining and fossil energy production. This new NETL technology, which significantly lowers the cost of REE characterization as compared to state-of-the-art methods by a factor of 5 to 10, can help generate a strong domestic supply chain of REEs to manufacture essential products and reduce U.S. reliance on offshore producers.

### NETL's Joule 2.0 Supercomputer Helped Study Extreme Wave Threat in the Gulf of Mexico

NETL researchers successfully used the Laboratory's Joule 2.0 supercomputer to create synthetic physics-based tropical cyclone wave simulations that help provide insights into the behavior of extreme waves in the Gulf of Mexico. Extreme waves are one of the most destructive forces in the Gulf of Mexico, known to have destroyed and damaged thousands of offshore structures. Since extreme events are rare, historical observations of events over the past few decades are insufficient to develop insights into extreme wave events, hindering the ability to anticipate future events and ensure that design and maintenance criteria are in place to provide offshore safety.

### NETL Report: Produced Water from Appalachian Hydraulic Fracturing Can Be Source for Lithium Used in Battery Production

Produced water that returns to the surface as wastewater after oil and gas hydraulic fracturing processes in parts of Appalachia can be a source of lithium, a valuable chemical element used in consumer products, according to an important report from NETL. The drilling boom in Appalachia created large volumes of produced water that is considered a waste. NETL researchers found that this fluid is significantly enriched with lithium compared to produced water from other shale formations.

### NETL's Award-Winning Tool for Evaluating Energy Infrastructure Available on Energy Data eXchange

NETL publicly released an award-winning analytical tool that uses advanced big data computing, artificial intelligence, machine learning and advanced analytical models to evaluate energy infrastructure integrity — a capability that can lead to effective cost savings and improved operational measures for environmental safety. The Advanced Infrastructure Integrity Model (AIIM) web mapping application is available on DOE's Energy Data eXchange® (EDX). Recognized with a 2022 Tech Connect National Innovation Award, AIIM has been acknowledged as a standout technology in its field.

### NETL's Supercomputer Helped Researchers Assess Integrity of Subsurface $CO_2$ Storage

NETL researchers used the Laboratory's Joule 2.0 supercomputer to provide a clearer picture of subsurface geological formations that could be used to effectively store captured $CO_2$ and to address any potential issues with integrity. Coupled with advanced machine learning models, researchers were able to provide detailed three-dimensional reservoir field images of $CO_2$ pressure and saturation fronts at potential subsurface $CO_2$ storage sites — work that is essential to monitoring and evaluating activities related to optimal reservoir management and risk reduction.

### NETL Director Marianne Walck Elected 2023 American Association for the Advancement of Science Fellow

The American Association for the Advancement of Science (AAAS) elected NETL Director Marianne Walck as a 2023 AAAS Fellow for distinguished contributions and technical excellence in geophysics, earth sciences and energy and climate science; strategic leadership at two national laboratories; and unwavering diversity, equity and inclusion.

### NETL's Energy Data eXchange Released Catalog of U.S. Prospective Subsurface Storage Reservoir Sealing Formations

The continual growth of geologic carbon storage projects calls for the growth of comprehensive data resources to support project planning, geologic characterization and risk analysis. Researchers at NETL published a new dataset, the Catalog of U.S. Prospective Subsurface Storage Reservoir Sealing Formations, that aggregates prospective seal units for potential storage resources within the U.S. for geologic carbon storage in both onshore and offshore basins. The catalog lists prospective seals by unit name along with associated data and resources that are available for prospective domestic geologic storage resources.

### NETL Environmental Engineer Received Prestigious Carnegie Mellon University Service Award

NETL's Natalie Pekney was awarded the Carnegie Mellon University Civil and Environmental Engineering (CEE) Department's Lieutenant Colonel Christopher K. Raible Distinguished Public Service Award during an alumni event held April 13 in Pittsburgh. The award recognizes alumni of CEE who have made significant contributions in military service or through noteworthy accomplishments achieved while employed by a government or non-profit agency in service to the public.

### NETL Engineer Appeared on List of Prestigious Researchers Who Advance Environmental Science

An NETL research engineer who has dedicated his career to assessing the environmental and human health risks associated with U.S. oil and gas well infrastructure, has been named to a prestigious list of individuals who have advanced the fields of environmental science or environmental engineering. Greg Lackey appears on the "40 under 40" list of "rising stars of environmental engineering and science" released by the American Academy of Environmental Engineers and Scientists.