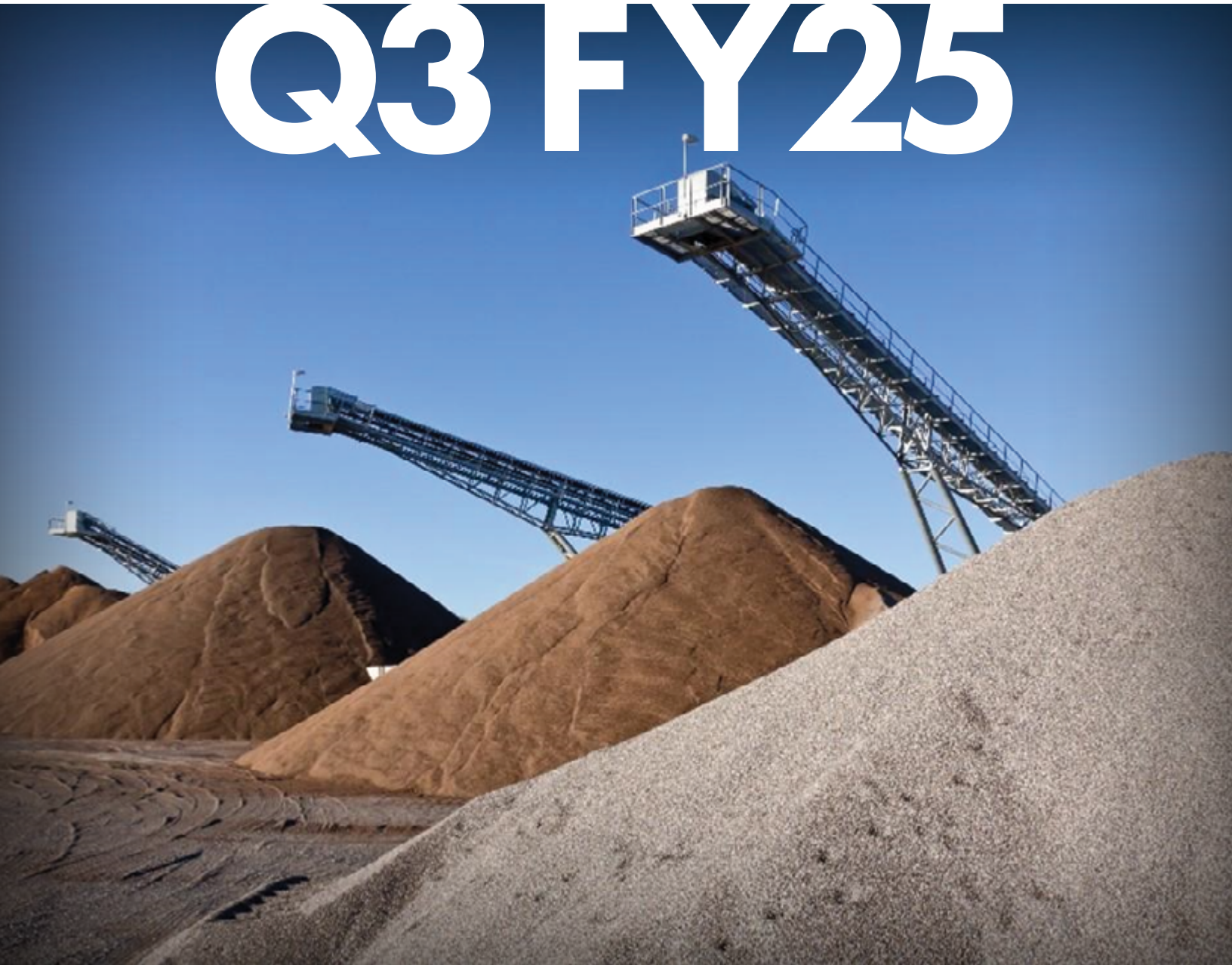
NATIONAL ENERGY TECHNOLOGY LABORATORY

ACCOMPLISHMENTS

Q3 FY25



U.S. DEPARTMENT of ENERGY

NETL ACCOMPLISHMENTS

Quarter 3 – Fiscal Year 2025

NETL-Performed

NETL Patented New Process for Extracting Critical Resources from Coal Fly Ash at High Quantities

NETL researchers developed a new process for extracting economically and strategically vital rare earth elements (REE) and critical minerals (CM) from America's coal fly ash that offers several advantages over other available technologies. NETL's patent, "Step-Leaching Process of Rare Earth Elements from Ash Materials Using Mild Inorganic Acids at Ambient Conditions," details methods to extract REE from select coal combustion fly ashes using mild acids at ambient temperatures via a three-step extraction process that results in high levels of extraction, ranging from 80-100%. By operating at ambient temperatures and pressures, the invention reduces operator costs and the environmental footprint, especially when compared to alternative methods of acquiring REE and CM.

The invention can enable the U.S. to meet a critical need for its economy while also incentivizing the use of coal ash, thereby transforming today's waste product into tomorrow's commodity. The process can also lead to new employment opportunities in America's mining communities by supplying America's REE needs.

NETL's Kelly Rose Among CDO Magazine's 2025 Top 50 Data Changemakers for the Energy Sector

Chief Data Officer (CDO) Magazine named NETL's Kelly Rose, senior fellow, Computational Sciences & Engineering, among its Top 50 Data Changemakers for the Energy Sector in 2025 for her impactful work in bringing big data and artificial intelligence techniques to subsurface energy applications. As the energy sector generates more data and opportunities for data-driven research, effective data management, access and security solutions become essential. At NETL, Rose's research focuses on the development of novel, science-based, data-driven methods and advanced computing solutions to address energy resource and security challenges. Notably, she led the development of the Energy Data eXchange, an award-winning platform for research data curation and collaboration. She previously served as the inaugural technical director of NETL's Science-based AI/ML Institute (SAMI), and established and leads NETL's GAIA (Geoscience Artificial Intelligence and Analysis) group, advancing geo-data science research to innovation solutions to applied energy challenges. Her work spans a variety of scientific domains, including geology, energy resource discovery, risk mitigation, geoinformatics, research data management, metocean studies, unconventional critical materials, hydrocarbon systems, mineral and groundwater resources, geohazards forecasting, materials innovation and infrastructure resiliency.

NETL's Tyner and Chaddock Named as 2025 Oppenheimer Fellows

NETL's Deputy Chief Operating Officer Scott Tyner and Associate Director for Energy Efficiency and Manufacturing Joel Chaddock have been named as 2025 Oppenheimer Science & Energy Leadership Program (OSELP) fellows — a year-long program of the National Laboratory Directors' Council (NLDC) designed to develop and empower exceptional leaders within the U.S. Department of Energy (DOE) national laboratories. Tyner and Chaddock join 18 other key leaders from DOE national laboratories in the program that is intended to introduce the next generation of DOE leaders to the breadth and depth of the national laboratory system, expose them to the challenges and complexities of managing this system, and equip them with the knowledge, experiences and professional networks needed to succeed as DOE leaders.

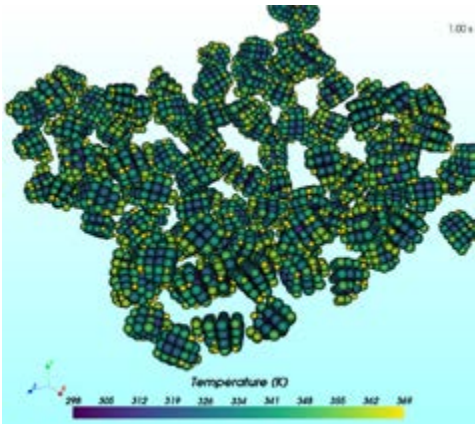
Tyner helps manage NETL's Laboratory Operations Center programs including facility operations, security, information technology, cybersecurity, business integration and career management and education. He has more than 20 years' experience in electrical and mechanical design, including project management in a research and development environment. With over 25 years supporting financial assistance activities within NETL, Chaddock oversees approximately 30 engineers, scientists and support personnel responsible for oversight of federal financial assistance awards. His current responsibilities include a portfolio valued at nearly $1.2 billion in federal and cost-shared projects related to transportation and building technologies.

New Interactive NETL Dashboard Streamlined Access to Global Offshore Carbon Storage Data

NETL released a new Offshore Geologic Carbon Storage (GCS) Inventory Dashboard on the Energy Data eXchange® (EDX) that allows users to more quickly locate relevant data about permanent carbon dioxide (CO_2) storage sites around the world. The dashboard's interactive web mapping interface and new capabilities unlock the full potential of NETL's offshore-focused digital resources for CO_2 transport and storage research and site comparison.

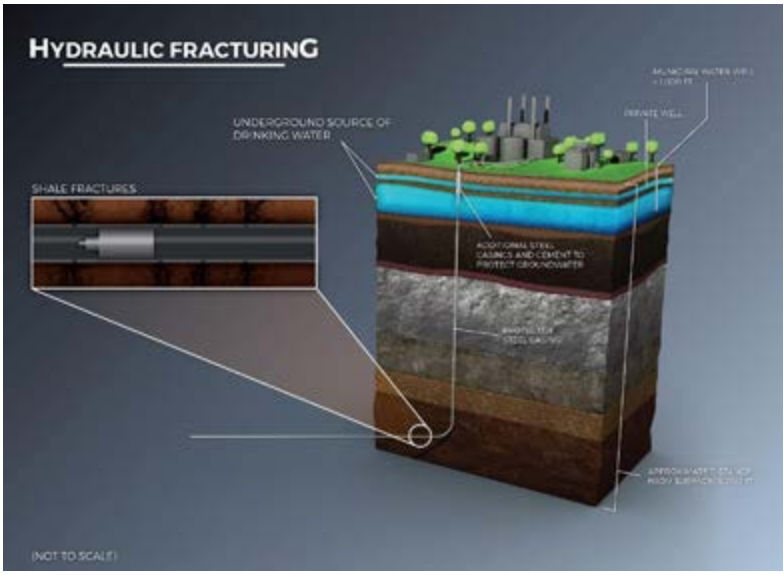
Released in 2024, the Offshore GCS Inventory is a dataset of more than 250 publicly available domestic and international offshore GCS sites and characterization studies for prospective sites. The dashboard and related offshore data products are hosted on the EDX disCO_2ver platform. The collection of offshore GCS products can assist stakeholders in examining available data for CO_2 storage project siting, including data focused on infrastructure and geology, and enable comparisons to active international projects. By studying the distribution of existing offshore GCS projects and identifying common trends, operators can better understand what enables successful projects and avoid potential pitfalls.

NETL Unveiled Latest Multiphase Flow Software Upgrade To Help Expand American Energy



NETL released the latest version of its award-winning code package Multiphase Flow with Interphase eXchanges (MFiX) — a computational fluid dynamics software suite designed to shorten the time and reduce the cost associated with developing new power generation technologies. MFiX serves as the cornerstone of NETL's efforts in multiphase flow science and reactor modeling, aiming to provide a deep understanding of how different phases of matter interact physically and chemically within energy systems. It is a crucial tool that helps drive engineering breakthroughs supporting U.S. economic competitiveness, national security and scientific discovery. The software currently boasts more than 9,700 registered users globally.

NETL Advanced Fiber-Optic Sensing as a New Tool To Unlock Energy From U.S. Shale Formations



NETL and Colorado School of Mines advanced the use of fiber-optic sensing to monitor fracture growth in the subsurface and optimize the production of natural gas from unconventional reservoirs, an important resource to meet the nation's growing energy needs. One of the most significant challenges encountered in hydraulic fracturing operations are "fracture hits," which occur when the hydraulic fracturing process creates fractures in the rock formation that interfere with nearby wells. Fracture hits can result in the invasion of fluids and sand into an existing producer (parent well) while a neighboring well (child well) is being hydraulically stimulated, possibly damaging the parent well and its ability to produce hydrocarbons.

To address this challenge, researchers placed strain-sensitive fiber-optic cable in monitoring wells in the Delaware Basin in west Texas. The fiber-optic cables collect data at a very high resolution. The data is then processed and interpreted using state-of-the-art geophysical inversion and machine learning techniques to determine a fracture's dimensions, spatial orientation, growth rate and deformation properties. This novel approach estimates the hydraulic fracture tip distance before the hydraulic fracture intersects the monitor well, providing an early warning regarding the fracture's growth and propagation velocity and direction. Determining the growth, speed and orientation of developing fractures is crucial to planning safe and cost-effective drilling operations.

NETL Developed an AI-Powered Data Anonymization Tool to Strengthen Research Partnerships Through Responsible Applied Energy Data Use

Access to data is essential for research and development, and higher quality data result in higher quality research. However, data producers may not want to share their proprietary data in public resources. Datasets shared between partners and the U.S. Department of Energy (DOE) can contain sensitive information that may prevent or delay data from becoming public or shared with other entities.

To address this challenge, NETL innovation produced the Geospatial and Information Substitution and Anonymization (GISA) tool, a new solution that leverages artificial intelligence (AI) to analyze and remove sensitive information from products prior to publishing. GISA helps data producers prepare anonymized versions for public use while preserving important variables, thereby enabling meaningful analysis and research without exposing sensitive information.