



ACCOMPLISHMENTS

Q2 FY21



U.S. DEPARTMENT OF
ENERGY

NETL ACCOMPLISHMENTS

Quarter 2 – Fiscal Year 2021

NETL DATA MINING PRODUCED INSIGHTS TO PROTECT WELL INTEGRITY

In a groundbreaking study, NETL researchers and their collaborators compiled and analyzed an unprecedented amount of regulatory data that describes the integrity of oil and gas wells in multiple states. The study results will be valuable for industry operators and regulatory agencies as they seek to prevent well leakage and ensure the success of carbon storage, oil and gas production, natural gas storage, and hydrogen storage operations. Findings are presented in the research article “Public Data From Three U.S. States Provide New Insights Into Well Integrity,” published in the Proceedings of the National Academy of Sciences of the United States of America. <https://doi.org/10.1073/pnas.2013894118>



SOCIETY TO HONOR NETL TURBINE EXPERT WITH TWO AWARDS

NETL's Richard Dennis, a leader in the field of advanced turbine development, will receive two prestigious awards at this year's American Society of Mechanical Engineers (ASME) Turbomachinery Technical Conference & Exposition, also known as Turbo Expo 2021. The ASME International Gas Turbine Institute will present Dennis with its 2021 Industrial Gas Turbine Technology Award. He also will receive the ASME Dedicated Service Award during the virtual conference and exhibition, which is set for June 7-11.

PILOT-SCALE TESTING CONDUCTED FOR RARE EARTH ELEMENT (REE) EXTRACTION AND RECOVERY IN KENTUCKY

A NETL-supported project at the University of Kentucky successfully conducted pilot-scale testing in their facility that was designed to extract mixed rare earth elements (REEs) from coal and coal byproducts using advanced extraction technologies, achieving production of mixed rare earth oxide concentrates of up to 98% purity and exceeding original project goals. Successful testing of pilot-scale technology is anticipated to serve as a stepping stone to future scale-up to commercial rare earth production facilities based in the United States.



NETL RELEASED NEW MODELING LIBRARY TO IMPROVE POWER PLANT FLEXIBILITY AND EFFICIENCY

As part of an update to NETL's Institute for the Design of Advanced Energy Systems' (IDAES) integrated platform, the Lab released a robust new dynamic power plant modeling library that could lead to more efficient, reliable and flexible power plants while providing a foundation for the development of innovative, new integrated energy systems to support widespread decarbonization. The IDAES Dynamic Power Plant Modeling Library can be leveraged to improve power plant efficiency during flexible operation and explore tradeoffs between the short-term benefits of quickly ramping capacity with long-term impacts on equipment health.

NETL-SPONSORED CENTER ACHIEVED FIRST FIRING OF NATURAL GAS TESTING SYSTEM

By completing its “first fire” of a new natural gas infrastructure system, the National Carbon Capture Center (NCCC) is paving the way for testing of carbon capture technologies using actual natural-gas-derived flue gas. This achievement marks a significant milestone for the NETL-sponsored facility as it expands the variability of carbon capture technologies for natural gas power generation, in addition to coal-fired power plants.

NETL DIRECTOR ANDERSON NAMED LABORATORY DIRECTOR OF THE YEAR

The Federal Laboratory Consortium for Technology Transfer selected NETL Director Brian Anderson, Ph.D., for its prestigious Laboratory Director of the Year award in recognition of his outstanding contributions to support technology transfer activities in the NETL organization and the communities it serves. Since Anderson was named NETL director in 2018, his leadership has significantly advanced the Laboratory's partnerships and technology transfer. His leadership and advocacy led to increased production of NETL intellectual property and related requests for licenses and other development agreements. Anderson has also successfully led strategic engagements with industry partnerships to advance a range of technologies, including carbon capture and storage, toward commercialization.



\$1 MILLION PARTNERSHIP TO TRAIN APPALACHIA'S NEXT GENERATION OF WELDERS LAUNCHES

NETL and the Appalachian Regional Commission awarded five grants totaling \$1 million to support training programs that will teach workers new welding techniques and other advanced manufacturing skills. The majority of the funding will be allocated by DOE's High-Performance Materials program to support the Advanced Welding Workforce Initiative and prepare a new generation of welders to manufacture and service high-temperature alloy components in electric generating stations.

NETL-SUPPORTED REE EXTRACTION PROJECT EXCEEDED GOALS IN NORTH DAKOTA

An NETL-supported project at the University of North Dakota (UND) to economically extract strategically important REEs has shown that lignite is a potential domestic source of these vital minerals through a process that also produces valuable byproducts and takes advantage of existing mining infrastructure. Researchers simplified an acid-leaching REE extraction process to a single step for economic benefit. The upgraded process extracts REEs and produces a significantly improved lignite material byproduct, which may be easily integrated into additional added-value opportunities, including activated carbon production, combined heat and power, humic acid production, and use as an upgraded fuel for utilities/industry.

NETL RESEARCHERS RECEIVED SECRETARY'S HONOR AWARDS

NETL researchers received Secretary's Honor Awards for their service and contributions to both the DOE's mission and to the nation. Christopher Matranga was honored for advancing technologies to find applications for domestic coal that will strengthen the U.S. economy, improve the environment and promote American energy independence. Randy Gentry was honored for his contributions on the Science and Technology Risk Matrix Team, which reduced the risk of foreign influence and foreign actors to the DOE national laboratory complex. Gregory Hackett and Daniel Maloney were honored for their contributions to the Integrated Energy Systems Team's efforts to address the feasibility of hydrogen generation technology and demonstrate its potential at two operating nuclear reactors.

NETL ADVANCED PROJECT TO EVALUATE OIL PRODUCTION POTENTIAL IN UTAH

An NETL-supported project with Zephyr Energy and the Energy & Geoscience Institute at the University of Utah successfully drilled a 9,745-foot-deep stratigraphic test well in the Paradox Basin of Utah and extracted a greater-than-expected amount of whole core rock samples from the subsurface. The material is being analyzed to better understand the region's geology, especially the role of natural fractures, and identify optimum strategies to recover oil from the sizable Cane Creek resource play. A primary project objective is to exploit natural fractures as much as possible to minimize environmental impacts of production from this and other similar unconventional plays.



FIRST-OF-ITS-KIND DISTRIBUTED SENSING METHOD APPLIED TO SOLID OXIDE FUEL CELL

Solid oxide fuel cells (SOFCs) hold great promise for providing highly efficient, clean energy for a low-carbon economy. However, adoption of these next-generation technologies hinges on reducing component degradation and improving longevity. The ability to make numerous, real-time, highly accurate temperature measurements across an SOFC could better inform SOFC modeling efforts aimed at designing more resilient fuel cells. To this end, NETL researchers, in collaboration with the University of Pittsburgh, successfully embedded multiple distributed fiber optic sensors into an SOFC multi-cell test to achieve a previously unattainable degree of spatial resolution in temperature measurement.



NETL STUDY POINTED TO MARKET STRUCTURE AS FACTOR IN POWER OUTAGES

In February 2021, the near-collapse of the Texas electrical grid, operated by the Electric Reliability Council of Texas (ERCOT), validated the importance of the NETL Energy Markets Analysis Team's (EMAT) work to help utility companies prepare for changing conditions and recover rapidly from disruptions. Last spring, EMAT released its report "2020 Summer Resource Adequacy in the ERCOT Region," which included analysis of simulation studies of the ERCOT system. Findings noted the power system's anticipated reserve margins were below levels set by ERCOT leadership. Although the NETL study reviewed ERCOT's ability to meet demand during a summer heat wave, the issues identified played significant roles in the events that reduced ERCOT's ability to deliver electricity to the more than 25 million people it serves when demand spiked.

NETL DRILLING, SUBSURFACE RESEARCH FEATURED IN NEW BOOK

Editors from NASA's Jet Propulsion Laboratory and Honeybee Robotics invited NETL scientists to contribute a chapter on environmental drilling as part of the recently published "Advances in Terrestrial Drilling: Ground, Ice, and Underwater." The book details the latest drilling and excavation principles and processes for terrestrial environments. The chapter features NETL's Offshore Risk Modeling suite, which is a product of six years of research to harness big data capabilities that comprises eight innovative science- and data-driven computational tools and models designed to predict, prepare for and prevent future oil spills.

NETL-SUPPORTED PROJECT ADVANCED REE EXTRACTION PROCESSES IN WEST VIRGINIA

An NETL-supported project with West Virginia University (WVU) to extract economically and strategically important rare earth elements (REEs) from Appalachian coal resources reached new milestones, such as partial automation of the recovery process, and exceeded its original REE purity and recovery goals. WVU researchers used the on-campus Rare Earth Extraction Facility, which was designed, constructed and commissioned in 2018 as a part of this cooperative agreement, to demonstrate that acid mine drainage precipitates from mining sites could be transformed into valuable revenue streams for local communities and businesses using acid leaching solvent extraction.

NETL RESEARCHERS PUBLISHED NOVEL GEOSPATIAL DATA SCIENCE METHOD

A novel geospatial data method developed by NETL researchers for modeling and predicting geologic structural complexity within the subsurface was published in the Journal of Structural Geology. The novel method leverages the spatially integrated multivariate probabilistic assessment (SIMPA) tool to improve predictions through development of a knowledge-data framework. By helping to develop better tools and techniques to predict the storage and behavior of carbon dioxide, natural gas and other resources within the subsurface, NETL's innovative research is enabling hydrocarbon extraction efforts to operate cheaper and more efficiently while leaving a lighter environmental footprint.



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