



# ACCOMPLISHMENTS

# Q3 FY21



U.S. DEPARTMENT OF  
**ENERGY**

# NETL ACCOMPLISHMENTS

Quarter 3 – Fiscal Year 2021

## NETL'S BRIAN ANDERSON SELECTED TO LEAD FEDERAL EFFORT TO REVITALIZE COAL AND POWER PLANT ECONOMIES

NETL Director Brian Anderson, Ph.D., was named executive director of the Biden Administration's Interagency Working Group (IWG) on Coal and Power Plant Communities and Economic Revitalization. The IWG prepared an initial report that includes recommendations to catalyze robust economic activity and support workers in America's energy sector. NETL supported the drafting of the report through energy sector analysis and as Secretariat for the IWG. As director of NETL, Anderson has worked to unify government research institutes, private industry and academia behind the goal of delivering safe and affordable energy in an environmentally sustainable manner.



## NETL, US GEOLOGICAL SURVEY BOLSTERED RARE EARTH ELEMENT RESEARCH

NETL and the U.S. Geological Survey signed a memorandum of agreement to share geologic samples containing rare earth elements (REEs) and critical minerals (CM). The arrangement bolstered REE and CM research for both organizations and helped ensure vital components of clean energy technology will continue to be manufactured well into the future as the nation works to secure independence from offshore REE reliance. The acquisition of large amounts of new high-quality data will be particularly valuable for research involving NETL's REE Sedimentary Resource Assessment Method, which is developing a geo-data science-driven approach to assess REEs in coal and related systems.

## SRI'S MIXED-SALT PROCESS CARBON CAPTURE TECHNOLOGY LICENSED BY BAKER HUGHES

The DOE's Office of Fossil Energy and Carbon Management and NETL continued to support the engineering-scale development of SRI International's mixed-salt process (MSP), representing one of the Department's many commitments to carbon capture technology innovation. SRI's MSP is an advanced ammonia-based (carbon dioxide) CO<sub>2</sub> absorption technology that uses readily available, inexpensive ammonium and potassium salt solutions in a novel process flow configuration that results in improved efficiency, reduced use of heat and electrical energy, reduced ammonia emissions, and a high-pressure CO<sub>2</sub> product. SRI has entered into a global exclusive licensing agreement with Baker Hughes for MSP use for post-combustion CO<sub>2</sub> capture.

## NETL PROGRAM CREATES PIPELINE OF NEXT-GENERATION WELDERS

A technical education program, developed in partnership with NETL, hit the road in central Appalachia to deliver customized training and prepare workers for careers that require advanced welding and manufacturing skills. The Robert C. Byrd Institute (RCBI) at Marshall University in Huntington, West Virginia, is using \$336,796 in federal funds to work with institutions such as Mountwest Community and Technical College to offer hands-on training in classrooms and a mobile training laboratory. The mobile lab is a distinctive feature of the RCBI initiative because it is designed to deliver on-the-job, fast-track certifications and customized training at companies located in West Virginia and eastern Kentucky.



## UNIVERSITY OF PITTSBURGH COLLABORATION SUPPORTED ENERGY INNOVATION AT NETL FOR MORE THAN A DECADE

An NETL partnership with University of Pittsburgh (Pitt) researchers marked a 10-year milestone in developing and commercializing sensor technologies that have won multiple Carnegie Science Awards, produced more than a dozen patents and pending patents, advanced the understanding of energy production through high-impact research papers, and most recently applied a first-of-its-kind distributive sensing method to solid oxide fuel cells — a promising clean energy technology. The NETL-Pitt team continued developing the distributed sensing technology, applying their novel sensing methods to a range of measurement and monitoring applications across the energy infrastructure spectrum to enable new capabilities in operational efficiency, reliability and safety.

## NETL RESEARCH CHEMIST NAMED NACE FELLOW

National Association of Corrosion Engineers (NACE) International and the Association for Materials Protection and Performance selected NETL research chemist Margaret Ziomek-Moroz, Ph.D., to receive the 2021 NACE Fellows honor, becoming a member of the class of NACE Fellows for her sustained and widely recognized contributions to corrosion control. Ziomek-Moroz received her award during CORROSION 2021, NACE's virtual conference and expo, held April 19-30.

## NETL ENERGY ANALYSIS EXPERTS WORKED TO IMPROVE UNDERSTANDING OF CARBON CAPTURE COSTS

NETL and its partners co-authored a comprehensive white paper providing updated costing guidelines for carbon capture and storage (CCS) technologies, which are crucial to combatting climate change. Understanding the costs of these technologies is essential to guide research activities aiming to reduce cost and improve performance in different applications. The white paper, “Towards improved guidelines for cost evaluation of carbon capture and storage,” serves as a comprehensive effort to provide a complementary set of CCS costing guidelines, including improved cost guidelines for advanced low-carbon technologies, improved cost evaluation of carbon capture and storage from industry, and improved guidelines for uncertainty analysis of carbon capture and storage techno-economic studies.

## DECARBONIZATION CONCRETE WON PRESTIGIOUS GLOBAL COMPETITION

A technology developed in partnership with NETL and the University of California, Los Angeles (UCLA) won the grand prize in the prestigious NRG COSIA Carbon XPRIZE global competition for the development of an eco-friendly process that infuses a revolutionary concrete with carbon dioxide emissions directly captured from power plants and other industrial facilities. UCLA's CarbonBuilt team will receive \$7.5 million in the competition's track for technologies related to coal-fired power generation. UCLA's entry was one of 47 submissions from 38 teams in seven countries. The team was recognized for having the best demonstration project, as well as for the product's technology and market advantages.

## NETL AND CMU USED COMPUTER VISION TO DESIGN DURABLE ALLOYS

NETL collaborated with Carnegie Mellon University (CMU) to make faster and more accurate predictions of heat-resistant alloy properties and develop cost-effective, corrosion-resistant materials needed in flexible energy systems that will be highly efficient, produce fewer emissions and help meet the nation's decarbonization goals while producing reliable supplies of electricity. The NETL-managed project focused on collecting data about microstructures and properties and using computational tools to achieve desired properties.

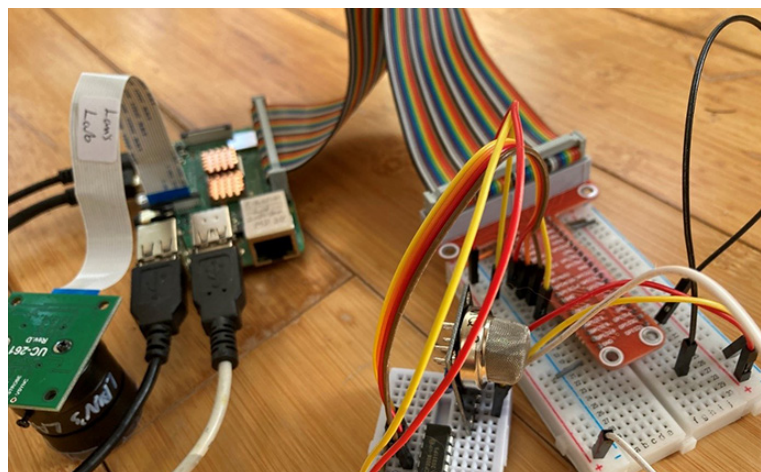


## NETL ADVANCED INTEGRATED ROBOTICS AND ULTRASOUND TESTING

In partnership with NETL, researchers from New Mexico State University and Arizona State University created a new generation of lizard-inspired autonomous robots to monitor and inspect vital energy and civil infrastructure. The team designed a versatile, tube inspector robot with embedded non-contact ultrasound sensing that allows for crack and corrosion detection of components. The robot can enter a power plant unit from a small area and move on a variety of surfaces and complex geometries. The lizard-inspired robot overcomes many obstacles that impede other robots and has great potential to reduce costs and risks to workers while greatly enhancing inspection capabilities.

## MORGAN STATE UNIVERSITY COLLABORATION ADVANCED ULTRA-HIGH TEMPERATURE THERMOCOUPLES

In support of NETL's Historically Black Colleges and Universities and Other Minority Institutions Program, the Lab consistently engages new organizations such as Morgan State University (MSU), which is developing robust high-temperature sensors that will unlock higher power plant efficiencies as part of their first-ever collaboration with NETL. The ceramic-based, super-high temperature thermocouples that are corrosion resistant and erosion resistant up to 1800 degrees Celsius and 1000 psi. The project also contributed to the training and academic advancement of students at MSU. As part of the project, students were trained to use Python computer programming language to collect and analyze experimental data.



## IDAHO NATIONAL LABORATORY DEVELOPED NEW RARE EARTH ELEMENT SENSING WITH NETL

In partnership with NETL, researchers at Idaho National Laboratory (INL), Rutgers, Arizona State University, OLI Systems and Lawrence Livermore National Laboratory advanced new sensing methods for detecting rare earth elements (REEs) using luminescent detection. The simple, sensitive and rapid approach detects REEs in any kind of carbon-based solid or liquid, is applicable to diverse chemical and mineral matrices, and will effectively detect REEs in aqueous solutions at less than one part per million. The method can also distinguish among multiple REEs co-occurring in the same sample. The INL team developed and applied their sensing technology based on the luminescence of lanthanides in fly ash resulting from combustion of Powder River Basin and Appalachian coals. The team determined that the approach also worked with pre-combustion resources from Pennsylvania, North Dakota, Virginia, Kentucky and Montana and expects that it will work with acid mine drainage.

## NETL ADVANCED CARBON STORAGE FOR COMMERCIAL DEVELOPMENT

With NETL leadership and support, researchers at Battelle successfully helped to pave the way for commercial deployment of carbon capture, storage and utilization (CCUS) technologies through vital research associated with the recently concluded Midwest Regional Carbon Sequestration Partnership (MRCSP). Part of the NETL-managed Regional Carbon Sequestration Partnership initiative, MRCSP was a collaboration of nearly 40 government, industry and university partners joined to assess the technical potential, economic viability and public acceptability of CCUS technologies. The partnership met all objectives and stored more than two million tons of carbon dioxide in three phases effectively and safely. Results and lessons learned are available through NETL's Energy Data eXchange.

## NETL, LANL BUILT PROTOTYPE RARE EARTH SENSOR

In partnership with NETL, researchers at Los Alamos National Laboratory built a new prototype sensor for rapid in-field detection and characterization of rare earth elements (REEs) in fossil fuel-based resources and waste materials. The backpack-size, field-portable unit provides simultaneous chemical and mineralogical analysis of REEs. This instrument, which integrates laser-induced breakdown spectroscopy and Raman spectrometry, enables the assessment of the REE chemistry and mineralogy in a single field instrument without the need for sample preparation. It will be used to rapidly determine both concentration and composition in 10 seconds, which will save time and money in view of prospecting for resources that contain high REE concentrations in forms that are easily extractable.

## NETL EMPLOYEES RECOGNIZED WITH PRESTIGIOUS FEDERAL AWARDS IN PITTSBURGH

The Pittsburgh Federal Executive Board honored two NETL employees with prestigious Excellence in Government Awards for significant accomplishments, leadership, outreach and impact on the region and beyond. Anthony Burgard received a Gold Award in the Outstanding Contribution to Science (Non-Medical) category for leading the development of an innovative suite of new science-based computational modeling tools by a diverse team of researchers from across DOE's laboratory complex. Patricia Rawls received a Bronze Award in the Outstanding Supervisor in a Professional Series category for expertly managing a large group of engineers and scientists with diverse backgrounds and areas of expertise to drive the next generation of energy advancements.



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