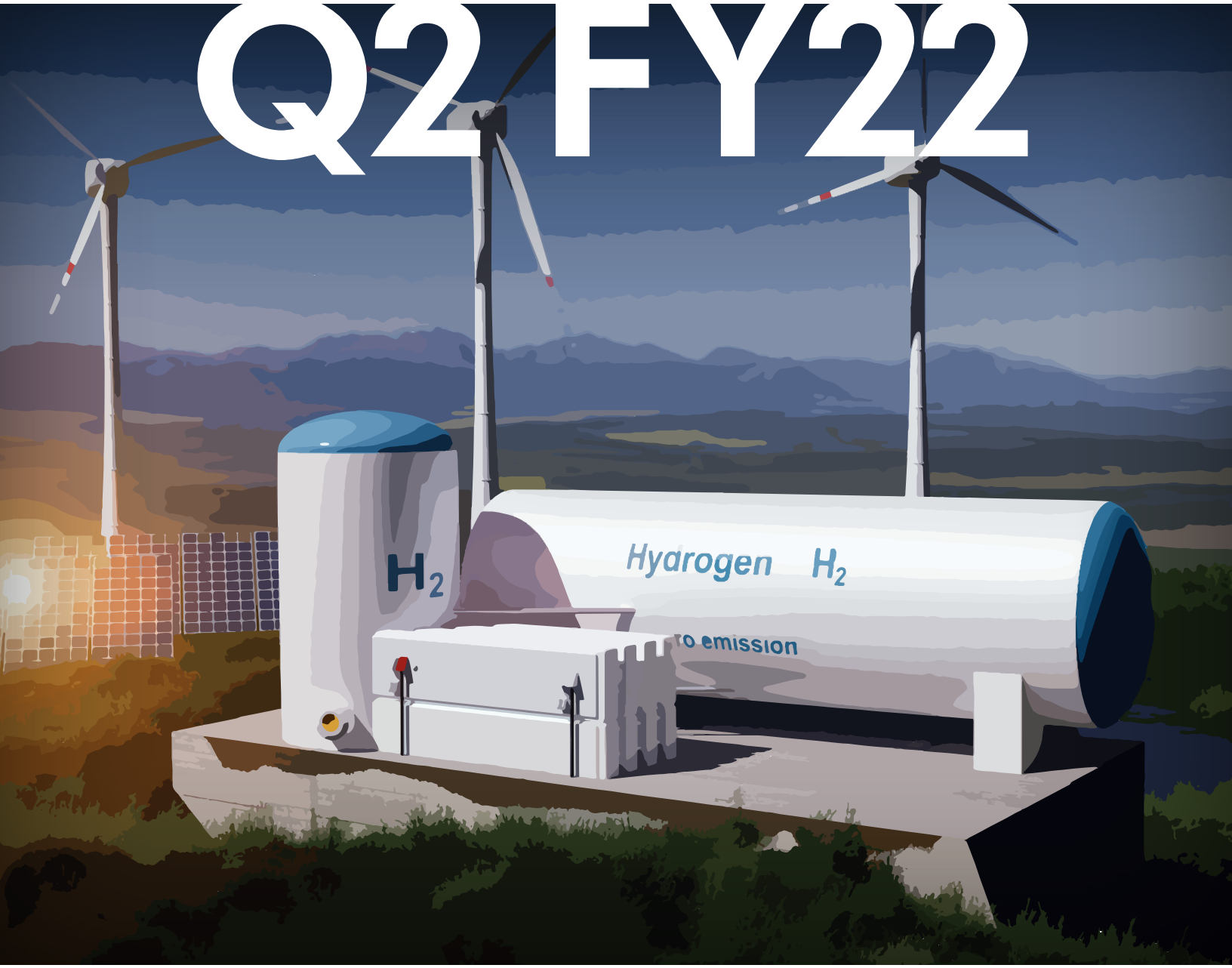
NATIONAL ENERGY TECHNOLOGY LABORATORY

ACCOMPLISHMENTS

Q2 FY22



U.S. DEPARTMENT OF ENERGY

NETL ACCOMPLISHMENTS

Quarter 2 – Fiscal Year 2022

NETL Connected Researchers with Data Through the Power of Artificial Intelligence

NETL researchers, working closely with experts at the DOE Office of the Chief Information Officer, designed a multi-cloud-based computational solution to complement on-site resources that will accelerate clean energy research across the agency. The team then tested the cloud environment using the powerful NETL-developed deep-learning tool SmartSearch©, which helps to mitigate one of the biggest draws on a researcher's time — searching for, acquiring, and transforming relevant data. SmartSearch represents a paradigm shift in the way researchers search for data by allowing researchers to feed the tool a collection of data similar to what they hope to find.

NETL Released New Carbon Ore Resources Database to Support Sustainable Extraction Research

NETL's new Carbon Ore Resources Database (CORD) is a valuable online tool to enable the recovery of high-value carbon and critical minerals from U.S. mining and industrial waste streams needed to support innovative manufacturing while lowering the environmental footprint of using domestic resources. As the world seeks to reduce greenhouse gas emissions from conventional sources, there is a growing opportunity to address environmental and social needs through the beneficiation and alternative, carbon-neutral impact of U.S. carbon resources. To tap into these resources for maximum benefit requires large quantities of data to drive analyses and support regulatory, commercial and research decisions and breakthroughs — and CORD can serve as a game changer.

NETL Senior Researcher Honored by Illinois Institute of Technology

NETL's Sofiane Benyahia, Ph.D., received the Charles W. Pierce Distinguished Alumni Award from the Illinois Institute of Technology (IIT) Department of Chemical and Biological Engineering. The award is presented annually and recognizes alumni who have brought recognition to IIT through their outstanding contributions to the advancement of the chemical and biological engineering profession and exceptional dedication and support to the university. The award honors the legacy of Charles W. Pierce, who is not only the first graduate of the department but is also recognized as the first African American who earned a degree in chemical engineering. Benyahia has more than 20 years of experience conducting computational fluid dynamics simulations of multiphase flows resulting in more than 40 peer-reviewed publications. His research focuses on developing computationally efficient and physically accurate models to better understand, predict and troubleshoot systems in the chemical and energy industries.

GE Global Research with Cooperative Energy Conducted Commissioning Test of First-of-Its-Kind Transformer

Under an NETL-managed program, GE Global Research in partnership with Cooperative Energy completed commissioning tests for a first-of-its-kind full-scale prototype large power transformer (LPT), a technology that can lead to greater grid resilience during power outages. Now fully operational as part of the power distribution system in Columbia, Mississippi, the LPT represents the world's first variable impedance flexible design transformer in its class, rated at 60 megavolt amperes. This transformer's variable impedance design advances a more flexible and adaptable LPT promoting greater standardization to increase grid resilience, such as faster recovery through greater interchangeability of components.

NETL Released Analysis Tool to Advance Commercialization of Solid Oxide Cell Technology

NETL released an analysis tool that will assist commercial developers and researchers to evaluate the costs of manufacturing large volumes of solid oxide cells (SOC) and stacks, aiding the development and commercialization of SOC technology. Highly efficient, ultralow emission SOC technologies are uniquely suited to address environmental concerns associated with electric power generation and hydrogen production, helping to meet clean energy goals that call for a net-zero carbon emission electricity sector by 2035 and economy-wide net-zero emissions by 2050.

NETL Confirmed Technical Feasibility of Pittsburgh International Airport Gas-to-Fuel Plant for Jet Fuel Production

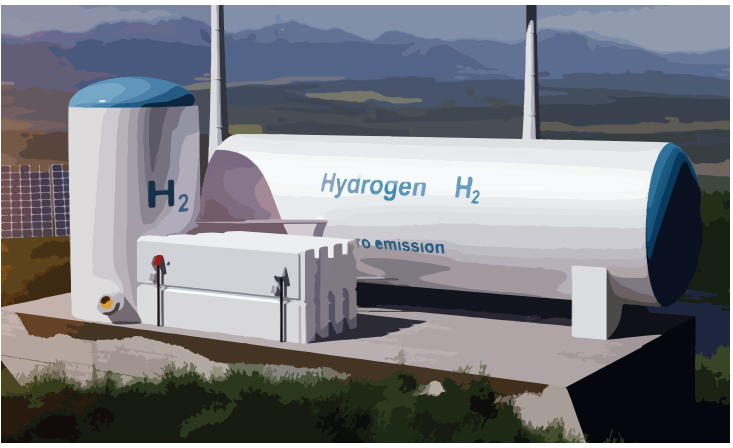
A new NETL report confirmed that it would be technically feasible to produce jet fuel at the Pittsburgh International Airport by converting natural gas from wells on the property into liquid fuel using a commercially available technology — a step that could build upon the airport's already successful grid independence initiatives, insulate the airport from fuel disruptions in the marketplace, and provide a path to reduced greenhouse gas emissions. Excess production capacity could also be made available for the United States Air Force (USAF) Pittsburgh Air Reserve Station and the USAF 171st Air Refueling Wing co-located at the airport.

NETL's Ocean Current Forecasting Tool Used in Great Pacific Garbage Patch Cleanup Effort

A digital tool developed by NETL that helps examine ocean currents and wind patterns to predict where oil and other particles in the ocean are likely to travel in the event of an oil spill is being used for a range of non-energy related uses, such as keeping track of the Great Pacific Garbage Patch for cleanup activities. NETL's Climatological and Instantaneous Isolation and Attraction Model (CIIAM) was developed within the Lab's Advanced Offshore Research portfolio as one of several projects initiated because of lessons learned following the 2010 Deepwater Horizon oil spill in the Gulf of Mexico. CIIAM leverages scientific expertise along with big data science, machine learning, and computing to forecast hazards and identify risks that contribute to offshore spills. It also provides rapid predictions of the transport of surface spills to aid response planning and containment.

Membrane-Based Carbon Capture Technology Milestone Demonstrated NETL's Tech Development Expertise

When NETL recently gave the green light for a private sector partner to build a large-pilot-scale field test of a technology that can effectively capture more greenhouse gases without using hazardous chemicals at a reduced cost, it represented the latest chapter in a technology development story that has been a dozen years in the making. Membrane Technology and Research Inc. (MTR) is a world leader in the development and production of membrane-based separation systems for the petrochemical, natural gas, and refining industries. MTR researchers have had a long working relationship with NETL experts on ideas and support to develop a cost-effective CO_2 capture process that uses a new class of membrane material known as Polaris™. The latest technology scale-up milestone in the process was the selection of the Polaris technology for a 10 MWe large pilot scale field test at the Wyoming Integrated Test Center in Gillette, Wyoming. That technology development milestone, the result of 11,500 hours of field testing, had its origins more than a decade ago.



Fossil Energy's Role in Accelerating a Clean Affordable Hydrogen Future Outlined in New Report

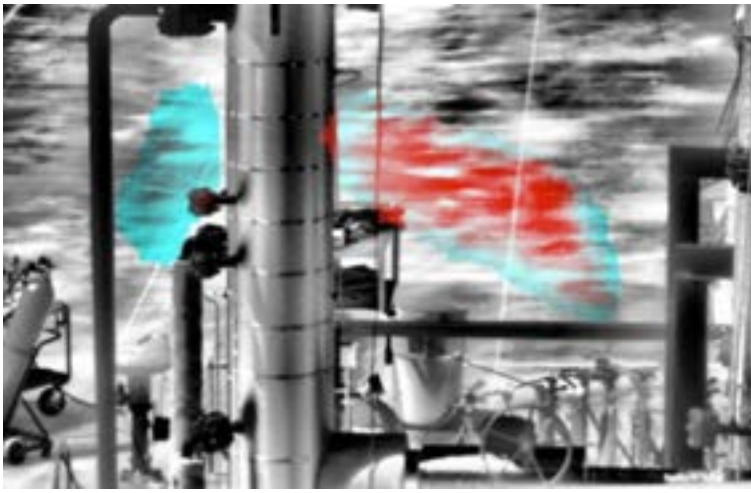
NETL released a detailed final report Feb. 14, 2022, that encapsulated public and private sector input and key themes associated with fossil energy's role in enabling an accelerated and affordable clean hydrogen future. The report, "Enabling an Accelerated and Affordable Clean Hydrogen Future – Fossil Energy Sector's Role Workshop Final Report," was based on a two-day workshop hosted by NETL and Gas Technology Institute in September 2021.

NETL CCS Report Saw Major Job Growth Potential and No Significant Supply Chain Risks

A buildout of America's evolving carbon capture and storage (CCS) technologies offers noteworthy job growth potential with no significant supply chain risks, according to an NETL-authored report released in February by Secretary of Energy Jennifer M. Granholm. NETL conducted the report, titled "Carbon Capture, Transport and Storage, Supply Chain Review," to assess potential supply chain bottlenecks to CCS implementation. NETL researchers conducted a supply chain risk analysis by comparing raw material estimates against domestic and global production to search for opportunities and vulnerabilities.

Smart Methane Detection Technology Developed to Significantly Reduce Greenhouse Gas Emissions

Southwest Research Institute (SwRI), with support from NETL, concluded a five-year project resulting in the development of a novel methane leak detection technology that has the potential to significantly reduce greenhouse gas emissions in the energy sector. Compressor stations are essential for moving natural gas in midstream applications, but these stations have been shown to significantly contribute to fugitive methane emissions. SwRI's Smart Methane Emission Detection System can reliably, accurately, and autonomously detect and estimate methane leaks in natural gas infrastructure in real time using midrange infrared optical gas imaging cameras. The technology represents a significant improvement over existing methane detection systems, which have significantly lower estimation capabilities.



NETL-Supported REE from Coal Ash Technology Development Attracted New Support from DOD

U.S. Department of Defense (DOD) progress on a $4 million plan to pursue a technology for recovering rare earth elements (REEs) and other critical minerals from coal ash, has its roots in a ground-breaking project spearheaded by NETL and private partner Physical Sciences Inc. (PSI). The DOD's action is an example of how NETL leverages cooperative partnerships for technology development in the public and private sectors. PSI, with support from NETL, demonstrated a concept of how REE concentrates can be produced using coal ash resources from Appalachia. The project's goal was to provide a potential domestic source of REEs along with a viable environmental remediation process for coal fly ash. REEs are crucial for a variety of economic, energy and defense applications.

ComTest Produced Superalloys for Efficient, Cleaner Power Plants and More

A six-year project managed with NETL oversight has culminated in the manufacture of commercial-scale nickel superalloy components that are needed for higher-efficiency thermal power plants. Launched in November 2015, the Advanced Ultra-Supercritical Component Testing Project, which was completed in late February 2022, has enabled domestic manufacturers to fabricate full commercial-scale components that will enable plants to operate with greater efficiency and at conditions of up to 1,400 degrees Fahrenheit and steam or supercritical carbon dioxide pressures of at least 3,500 pounds per square inch. At higher levels of efficiency, fossil-fueled power plants generate electricity using less fuel and produce fewer emissions. Through this project, Energy Industries of Ohio Inc. and other partners, with NETL support and guidance, have developed cost-effective, reliable components and brought them to the commercial-scale demonstration level of technology readiness.