NATIONAL ENERGY TECHNOLOGY LABORATORY

DECEMBER 2022

CARBON CAPTURE NEWSLETTER

U.S. DEPARTMENT OF ENERGY | OFFICE OF FOSSIL ENERGY AND CARBON MANAGEMENT | NATIONAL ENERGY TECHNOLOGY LABORATORY

HIGHLIGHTS

The newsletter is compiled by the National Energy Technology Laboratory to provide information on recent activities and publications related to carbon capture.

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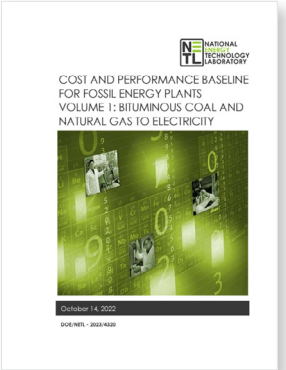
NETL Releases 2022 Compendium of Carbon Capture Technology

The U.S. Department of Energy (DOE) National Energy Technology Laboratory (NETL) 2022 Compendium of Carbon Capture Technology, which provides a technical summary of the NETL's Carbon Capture Program, is now available online. The compendium is compiled biannually to provide a technical summary of carbon dioxide (CO_2) capture technology research and development (R&D) sponsored by NETL's Point Source Capture (PSC) and Carbon Dioxide Removal (CDR) programs. The current compendium presents 124 projects in a single document, all of which were active between Oct. 1, 2019, and Oct. 1, 2021. Projects listed in the document are critical to the nation's efforts to achieve a greenhouse gas (GHG)-neutral economy by 2050, a carbon-pollution-free power sector by 2035, and a 50% reduction from 2005 levels in economy-wide net GHG pollution by 2030.

Interagency News and Updates

NETL Baseline Study Updated to Include the Performance and Cost of High Carbon Capture Rates for Power Generation Systems

NETL recently updated its widely used study on the performance and cost of fossil-fueled commercial power generation systems. The report, titled "Cost and Performance Baseline for Fossil Energy Plants, Volume 1: Bituminous Coal and Natural Gas to Electricity," is used by industry, researchers, and policy makers as a key reference for contemporary CO_2 capture systems applied to pulverized coal (PC) and natural gas combined cycle (NGCC) electricity generating units. Revision 4a includes new cases for H-class NGCCs and incorporates updated quotes for the Shell CANSOLV post-combustion capture system. The revision also extends carbon capture rates for PC and NGCC cases to greater than 90%, which will support the administration's goal for a decarbonized power sector by 2035.



Partnership to Accelerate Commercialization of NETL-Supported Carbon Capture Technology

Schlumberger and RTI International (RTI) will work together to accelerate the scale-up of a non-aqueous solvent (NAS) technology that enhances the efficiency of absorption-based CO_2 capture in industrial applications. For years, RTI has been developing the NAS technology with support from FECM and NETL. The NAS technology could substantially reduce energy consumption in carbon capture operations at coal-fired power plants compared to other solvent-based technologies and reduce the costs of operation.

Biden-Harris Administration Announces Funding from BIL to Finance CO_2 Transportation Infrastructure

DOE began accepting letters of interest from applicants for loans under a new $2.1 billion Carbon Dioxide Transportation Infrastructure Finance and Innovation (CIFIA) Program. Enacted under President Biden's BIL, CIFIA offers funding for large-capacity, shared CO_2 transportation projects located in the United States. Appropriated annually through 2026, CIFIA will support shared infrastructure projects—including pipelines, rail transport, ships and barges, and ground shipping—that connect anthropogenic sources of carbon with endpoints for its storage or utilization. Carbon management technologies, such as direct air capture (DAC), carbon capture from industry and power generation, carbon conversion, and CO_2 transportation and storage (T&S) technologies, must be deployed at a large scale in the coming decades to meet U.S. net-zero GHG goals by 2050.

Interagency News and Updates (continued)

DOE Issues Notice of Intention for CDR Measurement, Reporting, and Verification Lab Call

DOE's Office of Technology Transitions, in partnership with the Office of Fossil Energy and Carbon Management (FECM), intends to issue a Technology Commercialization Fund solicitation funded by the Bipartisan Infrastructure Law (BIL). The lab call will solicit proposals from across the DOE national laboratory complex to accelerate the commercialization of CO_2 removal technologies by advancing measurement, reporting, and verification best practices and capabilities. The solicitation could offer an opportunity for industry and other non-federal entities to partner with a national laboratory to support the emerging CDR sector.

NETL Researchers Among the Top 2% of Scientists Worldwide According to Stanford University List

A recent analysis published by Stanford University lists 25 current and former NETL researchers as being in the top 2% of global scientists. The analysis looks at the impact researchers have within their scientific communities. NETL's work reaches far beyond the walls of the laboratories; in 2021, NETL research was cited thousands of times in scientific publications. The analysis comprised lists according to career-long impact and single-year impact. Current and former NETL researchers listed in the top 2% for career-long impact were David E. Alman, Sofiane Benyahia, Ray Boswell, Ronald W. Breault, Ömer N. Doğan, Yuhua Duan, Michael C. Gao, Randall S. Gemmen, Angela L. Goodman, Evan J. Granite, Jeffrey Hawk, Gordon R. Holcomb, Mehrdad Massoudi, Phuoc Tran, Henry W. Pennline, James Rawers, Harpreet Singh, Ranjani Siriwardane, D.H. Smith, and C.M. White.

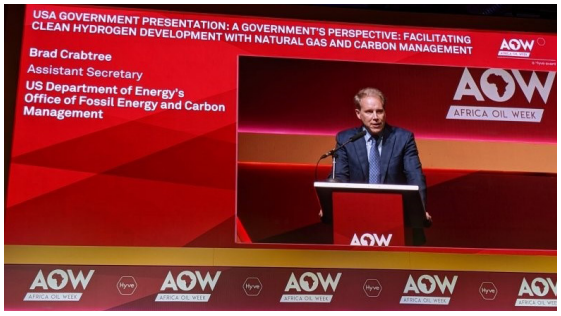
NETL Contributions to Sustainability Detailed at Hydrogen Americas Summit

NETL Director Brian Anderson, Ph.D., detailed NETL's contributions to building a sustainable energy future with hydrogen power derived from fossil energy resources at the second Hydrogen Americas Summit, held Oct. 10–11, 2022, in Washington, D.C. Organized by DOE and the Sustainable Energy Council, the summit convened government representatives, hydrogen and energy stakeholders, and service providers and end-users to identify opportunities and gather insights into the latest projects and policy developments crucial to propelling the hydrogen power industry forward.

Interagency News and Updates (continued)

Africa Oil Week 2022 Wrap-Up—Advancing U.S.-Africa Energy Collaboration

DOE's Assistant Secretary for FECM, Brad Crabtree, attended Africa Oil Week, which has long been a focal point of DOE's engagement with African countries. For this year's Africa Oil Week, Assistant Secretary Crabtree participated in two keynote sessions and led a workshop, where he outlined the importance of clean hydrogen and responsible oil and natural gas development in Africa's clean energy future. Assistant Secretary Crabtree's thoughts on the value of Africa Oil Week are available here.



DOE's Assistant Secretary for FECM, Brad Crabtree, speaking at Africa Oil Week

16th Greenhouse Gas Control Technologies Conference Wrap-Up

DOE's Principal Deputy Assistant Secretary for FECM, Dr. Jennifer Wilcox, attended the 16th Greenhouse Gas Control Technologies (GHGT-16) Conference on October 24–25, 2022. This year's event, which was held in Lyon, France, brought more than 1,000 participants together to discuss technologies that will contribute to achieving the objectives of the Paris Climate Agreement. At the GHGT-16 Conference, Dr. Wilcox participated in a panel and provided keynote remarks to discuss why advancing a suite of carbon management solutions is critical to achieving a future net-zero GHG economy.

NETL Releases Updated Map Highlighting Pittsburgh's Energy Districts

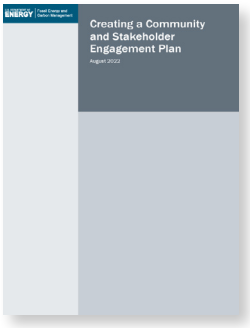
A unique partnership between NETL and the City of Pittsburgh supports the development of energy districts designed to meet the energy needs of individual neighborhoods using highly efficient and cost-effective technologies. In 2015, NETL and Pittsburgh leaders signed a memorandum of understanding (MOU) to transform the city's energy system and aging infrastructure by implementing a "grid of microgrids" concept that spanned nine energy districts. Many of the advancements made under the MOU are highlighted in an updated City of Pittsburgh Energy Districts Map. It includes information about the 10 districts across Pittsburgh that are operating, planned, or under development to supply local residents, businesses, and institutions with clean, reliable, and affordable power.

2022 Carbon Management Project Review Meeting Posters Now Available

Posters from the 2022 Carbon Management Project Review Meeting are now available. Presentations are categorized under three general topics: CDR, carbon T&S, and PSC.

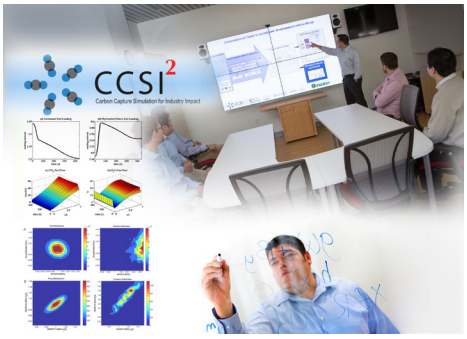
Interagency News and Updates (continued)

Justice & Engagement: Planning for Societal Considerations and Impacts in FECM Projects



Projects funded by FECM will develop the following plans to address societal considerations and impacts (SCI), ensuring projects center on justice and engagement: Community, Tribal, and Stakeholder Engagement; Diversity, Equity, Inclusion, and Accessibility; Environmental Justice; and Quality Jobs. Get brief synopses of the components in the four types of SCI plans required of FECM's funding opportunity applicants.

CCSI^2 Program Fact Sheet Updated



Graphical collage from CCSI^2 Factsheet

The Carbon Capture Simulation for Industry Impact (CCSI^2) Program develops, validates, and applies advanced computational techniques for technology simulation, optimization, uncertainty quantification (UQ), and process control. Computational products are consolidated in the CCSI Toolset software for developing rigorous understanding of CO_2 capture technologies that enable efficient R&D. CCSI^2 develops a detailed multi-scale understanding of the most effective pathways to minimize the cost to capture CO_2. The CCSI^2 fact sheet was updated in September 2022.

Career Opportunities at NETL

At the core of NETL's success is its commitment to hiring the right people for the right positions. DOE's only government-owned and government-operated national laboratory offers exciting federal careers in research and engineering, technical project management, procurement, finance and budget, legal, and administrative support. Learn more at NETL Careers.

Bipartisan Infrastructure Law Hub

BIL HUB

The BIL represents the most dramatic changes to DOE since its founding in 1977. For the next five years, the BIL will stand up 60 new DOE programs, including 16 demonstration and 32 deployment programs, and expand funding for 12 existing research, development, demonstration, and deployment (RDD&D) programs. NETL's BIL Hub provides information on the BIL, including links to the Guidebook, DOE's Clean Energy Corps, DOE's Applicant Portal, and DOE's Grid Resilience Program, as well as information on solicitations and funding opportunities.

U.S. and International Events

FECM Carbon Management Day Webinar

The FECM Carbon Management Day Webinar on Dec. 1, 2022, will gather carbon management stakeholders across industry, academia, and communities to celebrate the progress that has been made to date and recognize the work that still needs to be done to meet U.S. climate goals. Topics will include updates on FECM's key initiatives and a closer look into FECM-funded carbon management projects.

CCS4G Symposium 2022—Super Critical Connections

The one-day Carbon Capture and Storage for Geoscientists (CCS4G) Symposium, to be held Dec. 15, 2022, in London, England, will focus on the geoscience aspects of geologic CO_2 storage. The conveners are soliciting oral presentations from industry experts to meet the goal of offering deep technical insights into topics pertinent to CCS.

CCUS 2023

Carbon, Capture, Utilization, and Storage (CCUS) 2023, to be held Apr. 2023 at the University of Houston in Houston, Texas, will highlight current CCUS work and address related challenges, including subsurface geologic storage and site selection; CO_2 enhanced hydrocarbon recovery and utilization; reservoir modeling monitoring and risk assessment; case studies; industry applications; economics, incentives, and policy; infrastructure; and non-technical considerations.

GRC on Carbon Capture, Utilization, and Storage

The fifth edition of the Gordon Research Conference (GRC) on Carbon Capture, Utilization, and Storage will be held May 28–June 2, 2023, in Les Diablerets, Switzerland. The conference will examine scientific advances covering all dimensions of the anthropogenic carbon cycle: from capturing hard-to-abate CO_2 emissions to using CO_2 as feedstock and generating negative emissions by removing CO_2 from the atmosphere and oceans.

Carbon Capture Summit 2023

The key focus for the Carbon Capture Summit 2023, to be held June 2023 in Amsterdam, Netherlands, will be "working in collaboration with industry" by sharing expertise, building capacity, and providing advice and support so CCUS can play an integral role in reducing carbon emissions. Government agencies, global corporations, research bodies, and non-government organizations (NGOs) committed to learning and adopting CCUS technologies will participate in the event.

U.S. and International Events (continued)

Carbon Capture Technology Expo

The Carbon Capture Technology Expo, to be held June 28–29, 2023, in Houston, Texas, will bring together leading engineering firms, technology manufacturers and suppliers, energy firms, the oil and gas sector, heavy industry, chemical companies, various manufacturing organizations, research groups and NGOs, consultants, and government bodies to explore how to rapidly accelerate the deployment and commercialization of carbon-removal technologies as a key solution on the pathway to net-zero carbon emissions.

Hydrogen Technology Conference & Expo

The Hydrogen Technology Conference & Expo, to be held June 28–29, 2023, in Houston, Texas, is dedicated to discussing advanced technologies for the hydrogen and fuel cell industry. The event brings together the entire hydrogen value chain to focus on developing solutions and innovations for low-carbon hydrogen production, efficient storage, and distribution, as well as applications, in a variety of stationary and mobile applications.

Clearwater Clean Energy Conference

The 47th Clearwater Clean Energy Conference, to be held July 23–28, 2023, in Clearwater, Florida, provides essential information to power generators who must meet the pressures of energy utilization in the 21st century. The conference will include more than 200 technical presentations in four days, all offered both in person and virtually.

Business and Industry News

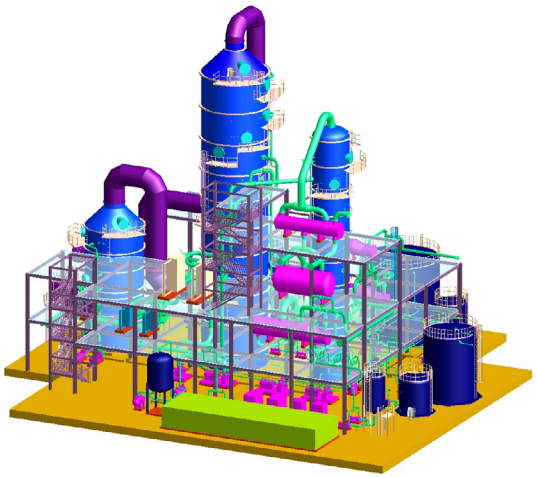
Catalyzing the Clean Energy Pivot

NETL has played a lead role in developing and driving many of the technology innovations that have helped power the modern, fossil fuel-based economy over the last century. Now, its mission is focused squarely on helping deliver a sustainable and equitable energy future. In this conversation, NETL Director Brian Anderson discusses NETL's and the broader government's role spearheading the advancement of critical climate technologies and the challenges of helping deliver a sustainable and equitable low-carbon energy future.

Bench-Scale Carbon Capture experiments at NETL

B&W to Study Application of SolveBright™ CO_2-Capture Technology for CONSOL Energy Decarbonization Project

The Babcock & Wilcox (B&W) Environmental segment has been awarded a contract to study the application of its SolveBright™ solvent-based CO_2 capture solution for CONSOL Energy's advanced coal and biomass-based 21st Century Power Plant project, which is currently in development. B&W selected Honeywell UOP's Advanced Solvent Carbon Capture (ASCC) process technology for the CO_2 capture aspect of the project.



CONSOL Energy's advanced coal and biomass-based 21st Century Power Plant project

NETL Researchers Publish Paper on MOF Designed to Capture CO_2

Researchers from University of Pittsburgh Swanson School of Engineering and NETL published a journal paper for the Royal Society of Chemistry about creating new metal-organic frameworks (MOFs) designed to capture just CO_2. The MOFs would have a core-shell design, meaning CO_2 would be trapped in the core, while the shell is able to block other gases, specifically water. The shell and the core would be made from different MOF materials, with the shell MOF designed to slow down water and the core MOF designed to bind CO_2.

Publications

NETL CO_2U LCA Guidance Toolkit

NETL'S LIFE CYCLE ANALYSIS TEAM, NETL, JUNE 17, 2022.

NETL 45Q Addendum to the CO_2U LCA Guidance Toolkit

MATTHEW JAMIESON, MICHELLE KRYNOCK, SHEIKH MONI, MICHELE MUTCHEK, TIMOTHY J. SKONE, P.E., NETL, SEPT. 6, 2022.

Cost and Performance Baseline for Fossil Energy Plants, Volume 3 – Low Rank Coal and Natural Gas to Electricity

ROBERT E. JAMES, III, TRAVIS SHULTZ, MARK WOODS, MARC TURNER, TOMMY SCHMITT, MATTHEW OAKS, JACOB KONRADE, MARK BLECKINGER, MIKE STURDIVAN, NETL, PRESENTED AT THE 39TH ANNUAL INTERNATIONAL PITTSBURGH COAL CONFERENCE, VIRTUAL, SEPT. 19–22, 2022.

High CO_2 Capture Rate Cost and Performance for F- and H-Class Natural Gas Combined Cycles (NGCC)

TIMOTHY FOUT, TRAVIS SHULTZ, ROBERT JAMES, THOMAS SCHMITT, SARAH LEPTINSKY, MARC TURNER, SYDNEY HUGHES, ALEX ZOELLE, CHARLES WHITE, MARK WOODS, PRESENTATION AT THE 39TH ANNUAL INTERNATIONAL PITTSBURGH COAL CONFERENCE, VIRTUAL, SEPT. 19–22, 2022.

Direct Air Capture Case Studies: Sorbent System

JESSICA VALENTINE, ALEXANDER ZOELLE, NETL, JULY 8, 2022.

Direct Air Capture Case Studies: Solvent System

JESSICA VALENTINE, ALEXANDER ZOELLE, NETL, AUG. 31, 2022.

Pilot Plant Performance and Process Simulation of a Hydrophobic Physical Solvent for Pre-combustion CO_2 Capture

NICHOLAS SIEFERT, KATHRYN SMITH, ROBERT THOMPSON, JEFFREY CULP, WEI SHI, KEVIN RESNIK, DAVID HOPKINSON, MICHAEL SWANSON, JOSHUA STANISLOWSKI, HUSAIN ASHKANANI, BADIE MORSI, 2022 INTERNATIONAL PITTSBURGH COAL CONFERENCE VIRTUAL, SEPT. 19–22, 2022.

Review of Techno-Economic Analysis Studies Using Physical Solvents for Pre-Combustion CO_2 Capture

NICHOLAS SIEFERT, HUSAIN ASHKANANI, BADIE MORSI, 2022 INTERNATIONAL PITTSBURGH COAL CONFERENCE VIRTUAL, SEPT. 19–22, 2022.

Hydrogen-powered Electrochemically-driven CO_2 Removal from Air Containing 400 to 5000 ppm CO_2

STEPHANIE MATZ, LIN SHI, YUN ZHAO, SHIMSHON GOTTESFELD, BRIAN P. SETZLER, YUSHAN YAN, JOURNAL OF THE ELECTROCHEMICAL SOCIETY, VOLUME 169, NUMBER 7, JULY 7, 2022.

About DOE Carbon Capture:

DOE/NETL is developing the next generation of advanced CO_2 capture technologies through NETL's Point Source Carbon Capture Program and the Carbon Dioxide Removal Program.

The Compendium of Carbon Capture Technology provides a technical summary of the DOE/NETL's Carbon Capture Program, assembling carbon dioxide capture technology research and development (R&D) descriptions in a single document.

Carbon Capture Reference Materials

- Carbon Capture Program Factsheet
- Carbon Dioxide Removal Program Fact Sheet
- Carbon Capture Infographics
- Compendium of Carbon Capture Technology
- Carbon Dioxide Capture Handbook
- CCSI^2
- Systems Analysis
- Conference Proceedings
- Accomplishments Posters
- Fossil Energy Techlines

Contact Us

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Lynn Brickett, Director, Point Source Carbon Capture Division, 412.386.6574

Amishi Claros, Acting Director, CO_2 Removal and Conversion, 202.586.1888

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Program staff are also located in **Houston, Texas** and **Anchorage, Alaska**

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