NATIONAL ENERGY TECHNOLOGY LABORATORY

MARCH 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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FECM Updates Mission Statement Including Seven Strategic Pathways

The U.S. Department of Energy's (DOE) Office of Fossil Energy and Carbon Management's (FECM) mission is to minimize the environmental impacts of fossil fuels while working toward net-zero emissions. FECM's programs use research, development, demonstration, and deployment approaches to advance technologies to reduce carbon emissions and other environmental impacts of fossil fuel production and use. Priority areas of technology work include point-source carbon capture, hydrogen with carbon management, carbon transport and storage, carbon conversion, critical mineral production, methane emissions reduction, and carbon dioxide (CO_2) removal to address the accumulated CO_2 emissions in the atmosphere. FECM recognizes that global decarbonization is essential to meeting climate goals and works to engage with international colleagues to leverage expertise in these areas. FECM is also committed to improving the conditions of communities impacted by the legacy of fossil fuel use and to supporting a healthy economic transition that accelerates the growth of good-paying jobs. More details on FECM's mission and seven strategic pathways can be found here.

Interagency News and Updates

DOE Kicks Off Recruitment to Support Implementation of Bipartisan Infrastructure Law

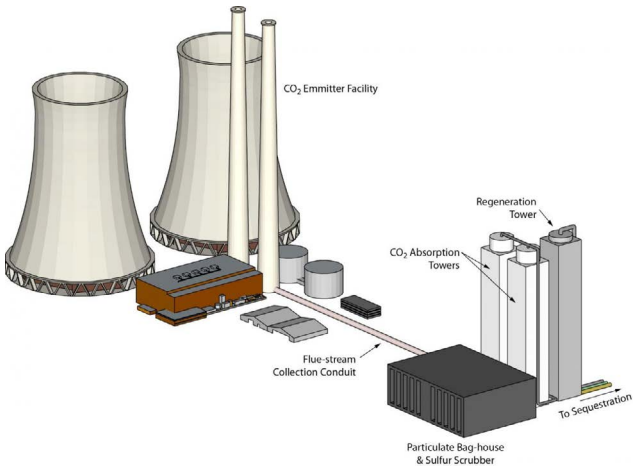
DOE announced the launch of its Clean Energy Corps, which is made up of staff from more than a dozen offices across DOE who will work together to research, develop, demonstrate, and deploy solutions to climate change. DOE announced that the Clean Energy Corps is ready to recruit an additional 1,000 employees using a special hiring authority included in the Bipartisan Infrastructure Law (BIL) to help implement BIL's historic infusion of funding and accelerate the nation's drive to a clean energy future. The Clean Energy Corps' new hiring portal will help streamline the application process for industry veterans, experienced technical experts, and the next generation of clean energy leaders it seeks to attract.

DOE Announces Funding to Advance Carbon Capture Technologies for Natural Gas Power and Industrial Sectors

FECM announced up to $96 million in federal funding for projects that will develop point-source carbon capture technologies for natural gas power plant and industrial applications capable of capturing at least 95 percent of CO_2 emissions generated. Evaluating the potential for commercial deployment of these technologies in the power and industrial sectors will help advance the Biden-Harris Administration's goal of a carbon pollution-free power sector by 2035, and a net-zero greenhouse gas (GHG) economy by 2050. This funding opportunity announcement (FOA), administered through the National Energy Technology Laboratory (NETL), will support projects to develop and test transformational carbon capture materials, equipment, processes, or a combination thereof for applications in natural gas combined cycle (NGCC) power generation and the industrial sector. Other projects will perform front-end engineering design (FEED) studies for industrial plants and NGCC power plants integrated with carbon capture systems. Read the full FOA (DE-FOA-0002515) and areas of interest here.

NETL Project Partner Develops Transformational Carbon Capture Technology Based on Mixed Salts

SRI International, with oversight from NETL, is developing a transformational carbon capture technology that leverages an advanced mixed-salt process to reduce capture costs and provide a pathway toward the nation's decarbonization goals. The SRI International project includes a unique carbon capture solvent under development, which contains potassium carbonate, ammonium salts, and methyl diethanolamine to aid low-temperature regeneration and high CO_2 loading.



Interagency News and Updates (continued)

DOE Announces Funding to Develop Clean Hydrogen

FECM announced $28 million in federal funding for research and development (R&D) and FEED projects that will advance clean hydrogen as a carbon-free fuel for transportation, industrial use, and electricity production. This FOA, administered through NETL, will leverage innovative approaches to produce clean hydrogen at lower costs from materials that include municipal solid waste, legacy coal waste, waste plastics, and biomass with carbon capture and storage (CCS). Projects selected under this FOA will improve the performance, reliability, and flexibility of methods to produce, transport, store, and use clean hydrogen. Read the full FOA (DE-FOA-0002400) with areas of interest here.

NETL Project Partners Seek to Capture GHG from Cement Kilns

NETL industry partner CEMEX is evaluating the use of a transformational membrane technology to capture GHGs produced during the manufacturing of cement, as well as to lower the environmental footprint of cement. The CEMEX Balcones operation produces about 2.2 million metric tons of cement annually, with flue gas from its kilns generating substantial carbon emissions. The CEMEX project also would capture and generate high-purity CO_2 for permanent storage in deep subsurface formations or for application in developing technologies, such as using the gas as a feedstock to produce high-value chemicals or as supercritical CO_2 to operate turbomachinery.

2021 HBCU-OMI FECM Webinar

On Dec. 1, 2021, NETL hosted a webinar as part of the Historically Black Colleges and Universities and Other Minority Institutions (HBCU-OMI) Program. The webinar offered an opportunity to become familiar with NETL, including its mission as the leading national laboratory for FECM, and to gain an in-depth understanding of how to plan, organize, and submit proposals responsive to a set criterion. In addition to providing information on FECM and NETL's principal lines of research, the webinar focused on providing participants information on how to prepare a responsive proposal. The basics of how to link experience and competencies to the topics were covered, as well as how to critically read a FOA to maximize an institution's available array of knowledge, expertise, and resources. The webinar also provided information on the formulation of the actual proposed research to be conducted, and how to maneuver the administrative requirements of doing business with the government.

DOE Announces Funding to Advance Clean Energy Breakthroughs at Energy Research Centers Across America

DOE announced a $420 million funding opportunity for DOE's Energy Frontier Research Centers (EFRC). This funding will advance climate solutions through early-stage research on clean energy technology, advanced and low-carbon manufacturing, and quantum information science. Breakthroughs in basic research will be key to creating the climate solutions that will help achieve President Biden's goal of a zero-emissions economy by 2050. The EFRC Program brings together diverse teams of scientists across disciplines and institutions solely focused on solving complex problems in early-stage research and accelerating advances in the most challenging areas of materials sciences, chemical sciences, geosciences, and biosciences. The registration link can be found here.

Interagency News and Updates (continued)

Interior Department, Federal Partners Announce Interagency Effort to Clean Up Legacy Pollution, Implement Infrastructure Law

The U.S. Department of the Interior (DOI) announced an interagency initiative to implement a new federal program for addressing orphaned wells, a key initiative of the BIL. The law includes $4.7 billion for orphaned well site plugging, remediation, and restoration activities. A Memorandum of Understanding (MOU), signed by DOI, the U.S. Department of Agriculture, DOE, the U.S. Environmental Protection Agency, and the Interstate Oil and Gas Compact Commission, establishes a framework to implement the orphaned well program and commits the signing parties to leverage their capabilities, resources, and expertise in support of the initiative.

DOE Launches Initiative from President Biden's Bipartisan Infrastructure Law to Modernize National Grid

DOE launched the "Building a Better Grid" Initiative to catalyze the nationwide development of new and upgraded high-capacity electric transmission lines, as enabled by President Biden's BIL. Building a Better Grid will work with community and industry stakeholders to identify national transmission needs and support the buildout of long-distance, high-voltage transmission facilities that are critical to reaching President Biden's goal of 100% clean electricity by 2035 and a zero-emissions economy by 2050. As outlined in a Notice of Intent, Building a Better Grid will support the development of nationally significant transmission projects and grid upgrades.

DOE's First Year Under the Biden-Harris Administration

DOE had a standout first year under the Biden-Harris administration, pioneering game-changing scientific research, safely advancing the nation's important nuclear security and cleanup missions, making huge strides to tackle the climate crisis, build a clean energy economy, and create good-paying jobs. Details on DOE's top accomplishments are available here.

FECM Year in Review

In 2021, FECM updated its mission to reflect a new focus: to minimize the environmental impacts of fossil fuels and help the nation achieve net-zero GHG emissions. FECM awarded nearly $265 million in funding to public and private research institutions toward 112 projects that support these goals. FECM's 2021 highlights include announcing a new name, structure, and mission; awarding $211.5 million to advance carbon management and R&D efforts; launching key carbon management initiatives; awarding more than $25 million toward clean hydrogen research; and creating research opportunities for under-represented students in science, technology, engineering, and math (STEM).

SMART Webinar Now Available

The Science-informed Machine Learning for Accelerating Real-Time Decisions in Subsurface Applications (SMART) webinar "Virtual Digital Twin for Real-Time Integrated Power Plant Control Room and Field Operations Research, Training, and Education" is now available. The webinar was given by Stephen E. Zitney from NETL's Strategic Systems Analysis and Engineering and Research and Innovation Center.

U.S. and International Events

AAPG's CCUS Conference

AAPG's Carbon Capture, Utilization, and Storage (CCUS) Conference, to be held Mar. 29–31, 2022, in Houston, Texas, will highlight current CCUS work and address related challenges, including subsurface geologic storage, CO_2 enhanced hydrocarbon recovery, reservoir monitoring and risk assessment, case studies, industry applications, economics, incentives, and policy, infrastructure, non-technical considerations.

Gordon Research Conference: Permanently Removing CO_2 from Our Emissions and Atmosphere

The fourth installation of the CCUS Gordon Research Conference series, to be held Apr. 3–8, 2022, in Ventura, California, will examine the following questions: (1) can the United States decarbonize safely, and with a variety of approaches appropriate for the variety of power and industrial challenges? and (2) can the United States develop methods to clean up the atmosphere in time to keep within reasonable temperature limits?

Appalachian Hydrogen & Carbon Capture Conference

The Appalachian Hydrogen & Carbon Capture Conference, to be held Apr. 21, 2022, in Pittsburgh, Pennsylvania, will explore challenges in hydrogen and carbon capture in the Appalachian region. Lynn Brickett, DOE Point Source Carbon Capture Director, and Bob Schrecengost, Senior Program Manager in FECM's Advanced Energy and Hydrogen Systems, are scheduled panelists.

ARPA-E Energy Innovation Summit

The 2022 Advanced Research Projects Agency-Energy (ARPA-E) Energy Innovation Summit has been rescheduled for May 23–25, 2022, at Gaylord Rockies Resort and Convention Center in Denver, Colorado. This annual conference and technology showcase that brings together experts from different technical disciplines and professional communities to discuss America's energy challenges. Now in its twelfth year, the summit offers a three-day program aimed at moving transformational energy technologies out of the lab and into the market.

ASME's Turbomachinery Technical Conference & Exposition

The American Society of Mechanical Engineers (ASME) Turbomachinery Technical Conference and Exposition, to be held June 13–17, 2022, in Rotterdam, Netherlands, attracts the industry's leading professionals and key decision-makers whose innovation and expertise help to shape the future of the turbomachinery industry. The five-day conference and three-day expo will include hundreds of live presenting authors, as well as recorded video presentations on demand.

XIX International Conference on Carbon Dioxide Utilization

The Summer 2022 XIX International Conference on Carbon Dioxide Utilization (ICCDU-22) will be held June 26–30, 2022, at Princeton University, New Jersey. ICCDU-22 is a global meeting place for chemists, engineers, and environmental policy planners to discuss the latest developments in the field of CO_2 capture and utilization.

U.S. and International Events (continued)

CEM13/MI7

The 13th Clean Energy Ministerial (CEM) and the ministerial for Mission Innovation (MI)—a collective effort by the public and private sector to rapidly create the net-zero economy that leaves no community behind—will be held Sept. 2022, in Pittsburgh, Pennsylvania. CEM is a platform for members to help shape the global clean energy agenda and advance the deployment of specific clean energy technologies and solutions.

Carbon Capture Technology Conference & Expo

The Carbon Capture Technology Conference & Expo is a two-day event to be held Oct. 19–20, 2022, in Messe Bremen, Germany. The event 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 non-governmental organizations, 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.

19-20 OCT 2022 / MESSE BREMEN / GERMANY

16th Greenhouse Gas Control Technologies Conference

The 16th Greenhouse Gas Control Technologies (GHGT) Conference, to be held Oct. 23–27, 2022, in Lyon, France, has established itself as the principal international conference on GHG mitigation technologies, especially CCS. The GHGT conferences are held every two years in member countries, rotating between North America, Europe, and Asia. Each conference is a forum for technical discussions related to the field of GHGT.

Business and Industry News

SoCalGas to Test New Carbon Capture Technology

Southern California Gas Company (SoCalGas) announced it will support research to test and further develop an innovative technology that captures CO_2 from the air while simultaneously collecting water that can then be reused for irrigation. Testing the new carbon capture technology, called Isothermal Water Vapor and CO_2 Capture (IWVC), will provide key insight into its efficiency and operating costs, ultimately determining the cost-effectiveness of its deployment at scale. SoCalGas contributed approximately $650,000 to the $3.2 million project, which has also received funding (~$2.5 million) from DOE/NETL award FE0031970. The IWVC technology was conceived at Pacific Northwest National Laboratory (PNNL) and is being commercialized by Los Angeles, California-based startup Avnos Inc.

Business and Industry News (continued)

Public-Private Research Consortium Established CAER as CO_2 Capture Pioneers

Researchers at the University of Kentucky Center for Applied Energy Research (CAER) created an industrial-governmental-academic consortium that has led to changes in global industrial processes, numerous patents and publications, and scientific breakthroughs that are changing Kentucky's and the world's economy. CAER launched its CO_2 capture research program in 2006 with a $1.5 million initial investment from Louisville Gas and Electric Company (LG&E) and Kentucky Utilities Company (KU). At that same time, utilities in Kentucky and state government officials were seeking a research collaboration to help learn more about capturing CO_2. Thanks to CAER's longtime relationship with Kentucky's energy companies and the Kentucky Energy & Environment Cabinet (EEC), a commonwealth conversation emerged. The result of that dialogue was a public-private research consortium that brought together resources to help solve the energy imperative.

ISTC to Use CO_2 to Cultivate Algae for Animal Feeds

A $2.5 million project by Illinois Sustainable Technology Center (ISTC) aims to use CO_2 from a coal-fired power plant, combined with nutrients from wastewater treatment plants, to cultivate algae for animal feeds. The three-year project aims to demonstrate that producing algae for commodity animal feeds can be cost-effective and has added environmental benefits. The algae cultivation system will be integrated with the City Water, Light, and Power plant in Springfield, Illinois.

CarbonBuilt Shoulders Habitat for Humanity Home, Builds Out C-Suite

CarbonBuilt, developer of a CO_2 utilization method proven in manufactured concrete, joined CEMEX, the National Concrete Masonry Association, the National Ready Mixed Concrete Association, and the Alabama Concrete Industries Association in the late-2021 dedication of a Habitat for Humanity Tuscaloosa (Alabama) home. Crews built the clay brick veneer-clad, single-story residence with concrete block from a CarbonBuilt technology demonstration at DOE's National Carbon Capture Center (NCCC). Utility Southern Co. manages the NCCC facility (located in Wilsonville, Alabama) under NETL sponsorship. The demonstration proved the efficacy of CarbonBuilt's Reversa technology, which spans concrete mix design innovations and a curing method whereby CO_2 is injected into kilns or chambers and mineralizes to calcium carbonate.

Tallgrass Awarded Grant by Wyoming for CCS Plant

Tallgrass Energy won a grant from the Wyoming Energy Authority (WEA) to fund the development of a commercial-scale CO_2 storage hub in the Denver-Julesburg (DJ) Basin in eastern Wyoming. Tallgrass expects to utilize the WEA grant in 2022 to fund development activities and the drilling of a characterization well in connection with its anticipated Class VI permit filing for the hub. Last fall, Tallgrass was also awarded federal funding by NETL as part of a national effort to advance next-generation clean hydrogen technologies and to support DOE's Hydrogen Energy Earthshot Initiative to reduce cost and accelerate breakthroughs in the clean hydrogen sector.

Publications

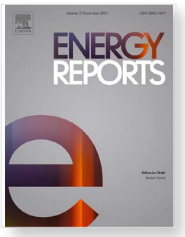
Current state of industrial heating and opportunities for decarbonization

MAXWELL PISCIOTTA, HÉLÈNE PILORGÉ, JOHN FELDMANN, RORY JACOBSON, JUSTINE DAVIDS, SHELVEY SWETT, ZACHARY SASSO, JENNIFER WILCOX, PROGRESS IN ENERGY AND COMBUSTION SCIENCE, AVAILABLE ONLINE 4 JANUARY 2022, 100982, IN PRESS, CORRECTED PROOF. (SUBSCRIPTION MAY BE REQUIRED.)

Overlooked glassy polymer attributes illustrated by asymmetric polyimide hollow fibers

MARYAM IRANI, NICHOLAS LEÓN, ZHONGYUN LIU, WILLIAM J. KOROS, JOURNAL OF MEMBRANE SCIENCE LETTERS, VOLUME 2, ISSUE 1, MAY 1, 2022. (SUBSCRIPTION MAY BE REQUIRED.)

Toward energy-efficient industrial thermal systems for regional manufacturing facilities



SEAN KAPPA, JUN-KI CHOI, KELLY KISSOCK, ENERGY REPORTS, VOLUME 8, ISSUE C, 1377-1387, NOVEMBER 2022. (SUBSCRIPTION MAY BE REQUIRED.)

High-pressure CO_2 permeation properties and stability of ceramic-carbonate dual-phase membranes

OSCAR OVALLE-ENCINIA, JERRY Y.S. LIN, JOURNAL OF MEMBRANE SCIENCE, VOLUME 646, MARCH 2022. (SUBSCRIPTION MAY BE REQUIRED.)

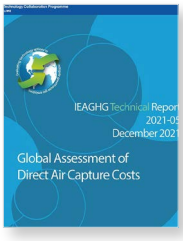
Mitigated carrier saturation of facilitated transport membranes for decarbonizing dilute CO_2 sources: An experimental and techno-economic study

YANG HAN, W. S. WINSTON HO, JOURNAL OF MEMBRANE SCIENCE LETTERS, VOLUME 2, ISSUE 1, MAY 1, 2022. (SUBSCRIPTION MAY BE REQUIRED.)

Mixed matrix membranes for post-combustion carbon capture: From materials design to membrane engineering

LEIQING HU, KRYSTA CLARK, TALIEHSADAT ALEBRAHIM, HAIQING LIN, JOURNAL OF MEMBRANE SCIENCE, VOLUME 644 ISSUE C, FEB. 1, 2022. (SUBSCRIPTION MAY BE REQUIRED.)

Global Assessment of DACCS Costs, Scale and Potential



INTERNATIONAL ENERGY AGENCY GREENHOUSE GAS R&D PROGRAMME, JAN. 18, 2022.

About DOE's Carbon Capture Program

NETL's Carbon Capture Program is developing the next generation of advanced carbon dioxide (CO_2) capture technologies. The U.S. Department of Energy's (DOE) Office of Fossil Energy and Carbon Management has adopted a comprehensive multi-pronged approach for the research and development of advanced CO_2 capture technologies that have the potential to provide step-change reductions in both cost and energy requirements as compared to currently available technologies.

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

Contact Us

DOE Carbon Capture contacts:

Andrew Jones, Carbon Dioxide Removal Technology Manager, 412.386.5531

Dan Hancu, DOE Senior Program Manager, Point Source Carbon Capture, 240.220.1186

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

1450 Queen Avenue SW
Albany, OR 97321-2198
541-967-5892

3610 Collins Ferry Road
P.O. Box 880
Morgantown, WV 26507-0880
304-285-4764

626 Cochrans Mill Road
P.O. Box 10940
Pittsburgh, PA 15236-0940
412-386-4687

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

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