

MARCH 2024

CARBON CAPTURE NEWSLETTER



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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DOE Invests Funding for Carbon Capture, Transport, and Storage to Reduce Carbon Pollution

The U.S. Department of Energy's (DOE) Office of Fossil Energy and Carbon Management (FECM) announced \$45.6 million in federal funding for [nine projects](#) that will advance carbon dioxide (CO₂) capture technologies and help establish the foundation for a successful carbon transport and storage industry in the United States. Some projects selected under this funding opportunity announcement (FOA) will focus on developing lower-cost, highly efficient technologies that will capture CO₂ from power and industrial facilities for geologic carbon storage or for conversion into long-lasting products. This will include carbon capture in the cement, steel, and glass industries, as well as natural gas power plants. Others will focus on accelerating the deployment of multi-modal transport of CO₂ through the creation of transportation hubs. Preliminary engineering design studies will consider how these hubs will connect multiple transport modes.

Interagency News and Updates

DOE Seeks Information on Industrial Demonstration and Deployment of Carbon Capture Technologies

DOE released a [Request for Information \(RFI\)](#) that seeks to obtain public input related to a DOE plan to support the demonstration and deployment of carbon capture technologies applied to industrial sources of greenhouse gas (GHG) emissions. This plan will supplement the material included in the DOE report “[Pathways to Commercial Liftoff: Industrial Decarbonization](#).” The information being sought is intended to assist DOE in the planning of priorities and initiatives to catalyze the development, demonstration, and deployment of carbon capture, utilization, and storage (CCUS) for industrial decarbonization. Responses to this RFI must be submitted electronically to DE-FOA-0003263@netl.doe.gov with the subject line “DE-FOA-0003263 - RFI” no later than 5:00 p.m. ET on March 14, 2024.



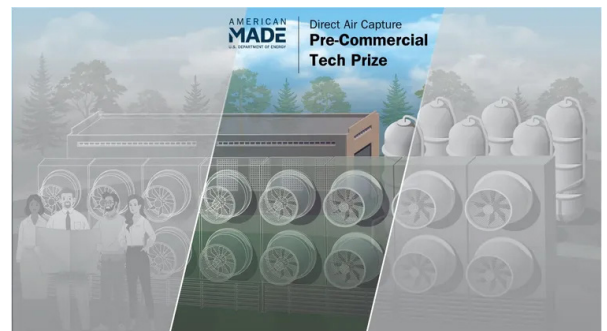
DOE Invests Funding for University-Led Projects to Advance Decarbonization and Net-Zero Greenhouse Gas Emissions

FECM announced the selection of 19 projects to receive \$17.4 million to support novel, early-stage research at 17 U.S. colleges and universities. The funding will support projects that establish visiting scholars' programs, create new academic curricula related to geosciences, and provide interdisciplinary training in humanities-driven science, technology, engineering, and mathematics (STEM) fields. Projects were selected under FECM's University Training and Research (UTR) Program, which includes the University Carbon Research and the Historically Black Colleges and Universities and Minority Serving Institutions sub-programs. The UTR Program seeks to create research and development (R&D) opportunities for traditionally underrepresented communities and tap into the innovative and diverse thinking of student researchers. The 19 projects selected for funding will help ensure that students are being equipped with cutting-edge, translatable skills that will allow them to contribute to the U.S. workforce and greater economy over the course of a longstanding and enduring career.



DOE Announces Funding Toward CDR Technology Innovation

FECM announced seven semifinalists for the development phase of the Direct Air Capture (DAC) Pre-Commercial Prize to receive a total of \$1.05 million in cash awards and technical assistance for technology solutions that reduce CO₂ emissions by removing them directly from the atmosphere. Advancing developments in carbon dioxide removal (CDR), including DAC technology, is imperative to attaining the Biden administration's historic climate and clean energy agenda. The [DAC Pre-Commercial Technology Prize](#) is one of several prize competitions hosted by DOE and funded by the Bipartisan Infrastructure Law (BIL) to support breakthrough DAC technologies that demonstrate strong potential to rapidly commercialize and scale CDR.



Interagency News and Updates (continued)

NETL Achieves Multiple Successes in 2023 To Advance Carbon Capture Technologies

DOE and the National Energy Technology Laboratory (NETL) are developing the next generation of advanced CO₂ capture concepts to support the United States in achieving ambitious goals for a GHG-neutral economy by 2050, a carbon-free power sector by 2035, and a 50% reduction from 2005 levels in economy-wide net GHG emissions by 2030.

R&D efforts have led to reductions in both capital and operating costs through the implementation of energy and process efficiencies and the development of advanced CO₂ capture media (solvents, sorbents, and membranes). NETL intramural research and projects undertaken with partners span a broad portfolio, including post- and pre-combustion capture, to reduce carbon emissions across a wide spectrum of industries and from the atmosphere. Work undertaken by NETL to support these efforts resulted in multiple successes over the past year.



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

A recent analysis published by Stanford University included 26 current and former NETL researchers in the top 2% of global scientists, underscoring the deep pool of talent at NETL focused on creating a clean energy future. 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 Dominic Alfonso, David E. Alman, Sofiane Benyahia, Ray Boswell, Ronald W. Breault, Yuhua Duan, Michael C. Gao, Randall S. Gemmen, Angela L. Goodman, Evan J. Granite, Jeffrey Hawk, Gordon R. Holcomb, Mehrdad Massoudi, James Rawers, Wissam Saidi, Harpreet Singh, Ranjani Siriwardane, Dan C. Sorescu, D.H. Smith, Phuoc Tran, and C.M. White.



DOE Seeks Information on High-Efficiency Gasification for Hydrogen Production

FECD released an RFI that seeks input on strategies and technologies for developing innovative gasification designs for converting biomass and mixed-waste feedstocks into syngas to enable the low-cost production of clean hydrogen. [This RFI](#) supports the overall efforts of the FECD Hydrogen with Carbon Management (HCM) Program and the DOE Hydrogen Shot. The purpose of the RFI is to solicit feedback from industry members, investors, project developers, nongovernmental organizations, academia, research laboratories, government agencies, and other stakeholders on technologies and strategies that companies are deploying, or could deploy, to increase clean hydrogen production from alternative, low-value feedstocks, excluding traditional coal and petcoke, at competitive costs and with market factors in play.



Interagency News and Updates (continued)

NETL Hydrogen Research Continued Down Successful Path in 2023

As part of FECM's HCM Program, NETL research focuses on the development and use of carbon-neutral or net-negative carbon emissions energy systems and associated technologies. The HCM Program's efforts are an integral part of the DOE Hydrogen Shot, with a goal of reducing clean hydrogen costs by 80% to \$1 per 1 kilogram within 1 decade (1-1-1), while expanding employment of the U.S. energy workforce. Seeking a cost-competitive decarbonized alternative to traditional fossil fuels, the HCM Program has an R&D portfolio consisting of a new generation of carbon-neutral or net-negative carbon emissions technologies.

NETL's EDX Helping Solve Data Curation Problem

NETL's [Energy Data eXchange \(EDX®\)](#) gives researchers more time to perform research by solving four major data curation problems: enterprise-level curation, data governance, scalability, and discoverability. Solving these problems meets the needs of DOE stakeholders, scientists, and professionals working toward DOE's mission. Enterprise-level curation places EDX in a different space than any other system, enabling researchers to focus on research. Data storage and curation management is costly and can be challenging for individual researchers and projects. EDX has a unique and replicable enterprise-level curation model that supports NETL's long-term data curation strategy.



Global Leaders in Renewables and Net-Zero Electricity Sign Join Carbon Management Challenge

The Carbon Management Challenge is a joint effort and call to action by countries worldwide to accelerate the deployment of carbon capture, removal, use, and storage technologies. Nineteen countries plus the European Commission have joined the Carbon Management Challenge to date. Many of these countries, such as Iceland, Sweden, Denmark, Romania, and the United Kingdom, already derive more than 50% of their electricity from net-zero sources (renewables, biomass, waste, nuclear) and are better known for leading in renewables and net-zero electricity than carbon capture and storage (CCS). Denmark plans to have 90% of its electricity from wind and solar by 2030. Outside of China, the United Kingdom has the largest offshore wind capacity installed in the world. None of these countries are net-exporters of fossil energy.

Time-Tested Magnesium Oxide: Unveiling CO₂ Absorption Dynamics

Scientists at DOE's Oak Ridge National Laboratory (ORNL) analyzed a set of magnesium oxide crystal samples exposed to the atmosphere for decades, and another for days to months, to gauge the reaction rates. They found that CO₂ is taken up more slowly over longer periods because of a reacted layer that forms on the surface of the magnesium oxide crystals. Most of the previous research, aimed at understanding how fast the magnesium oxide and CO₂ chemical reactions occur, relied on rough calculations rather than materials testing. The ORNL study marks the first time a multidecade test has been conducted to determine the reaction rate over long time scales.

2024 Priorities for Decarbonizing America's Industrial Sector

On Nov. 17, 2023, DOE's Industrial Efficiency and Decarbonization Office (IEDO) hosted a stakeholder webinar to highlight its 2023 accomplishments and to lay out its priorities for 2024. During the webinar, IEDO Director Avi Shultz discussed how the office is working to advance research, development, pilot-scale demonstrations, and technical assistance and workforce development programs that will help decarbonize America's industrial sector. The [webinar](#) also included a question-and-answer session.



Interagency News and Updates (continued)

2023 Sees NETL Make Strides in CO₂ Conversion R&D

In 2023, NETL researchers grew versatile biocatalysts using microbes from a coalbed methane (CBM) well to convert industrial CO₂ wastes and other single-carbon compounds into useful chemicals to manufacture biofuel, food additives, and other high-value products while reducing GHG emissions. In testing completed at NETL, researchers found the microbes from the CBM well, which was drilled in an Appalachian coal seam as part of a mining operation, generated a biocatalyst that outperformed other biocatalysts from microbes collected at oil and natural gas well sites and other locations. NETL researchers also invented a [new self-healing cold spray coating](#) for use inside pipelines that protects against corrosion, a common problem that can cause catastrophic failure events, such as explosions, and the release of emissions from environmentally damaging substances, like methane.

Funding Notice—BIL: Carbon Utilization Procurement Grants

DOE announced \$100 million in funding to support states, local governments, and public utilities in purchasing products derived from converted carbon emissions. The goal is to speed up adoption of advanced carbon management technologies, creating a market for environmentally sustainable alternatives in fuels, chemicals, and building products sourced from captured emissions from industrial and power generation facilities. The Carbon Utilization Procurement Grants Program will help offset 50% of the costs to states, local governments, and public utilities or agencies to procure and use products developed through the conversion of captured CO₂ and carbon monoxide emissions. The commercial or industrial products to be procured and used under these grants must demonstrate a significant net reduction in GHG emissions compared to incumbent products via a life cycle analysis.

DOE Invests Funding for Workforce Development Opportunities in U.S. Energy Communities

FECM announced \$800,000 in federal funding for eight local government and nonprofit organizations representing communities across the country, from Alaska to Pennsylvania, that will each create a roadmap toward repurposing their existing energy assets. The Capacity Building for Repurposing Energy Assets initiative will assist these communities, where a significant portion of their local economy has historically been supported by energy assets, such as coal, oil, and/or natural gas power facilities and accompanying equipment and infrastructure. This funding will help the communities build technical capacity and develop a workforce necessary to help revitalize energy systems, address environmental impacts, and tackle challenges associated with energy assets that have been retired or are slated for retirement.

DOE ‘Roads to Removal’ Report Maps Path to Gigatonne-Scale CO₂ Removal

In a new report, “[Roads to Removal: Options for Carbon Dioxide Removal in the United States](#),” leading scientists found that the United States has sufficient capacity to remove CO₂ at the scale needed to achieve net-zero emissions, while also providing economic opportunity, ecological benefits, and public health benefits. The study, led by Lawrence Livermore National Laboratory in collaboration with experts across the United States and with support from DOE, shows that CDR can deliver benefits to the environment, communities, and the economy. Watch a [video overview](#) of the report via YouTube.



Interagency News and Updates (continued)

PNNL Leads an Effort to Advance Marine Carbon Dioxide Removal

A Pacific Northwest National Laboratory (PNNL) project team will develop new models and experiments to assess a variety of Ocean Alkalinity Enhancement (OAE) techniques being developed by industry partners. OAE involves adding alkaline substances to seawater, which enhances the ocean's ability to absorb CO₂ from the atmosphere. Once in the ocean, the CO₂ that is taken up remains stable over long time scales in the form of dissolved inorganic carbon. This process naturally occurs when weathered rocks dissolve in the ocean, producing alkalinity and spurring chemical reactions to convert CO₂ into stable forms of carbon. The goal of OAE is to substantially speed up this natural process. The numerical models and lab experiments will be used to evaluate how OAE changes the chemistry of the water and to provide data to support OAE siting and scenario design to accelerate CDR.



Chief Scientist Zhaoqing Yang is serving as the principal investigator of the PNNL led mCDR ARPA-E project. (Photo by Andrea Starr | Pacific Northwest National Laboratory)

DOE STEM Portal

DOE is building pathways for a diverse workforce to pursue STEM careers. DOE seeks to engage learners at all levels to promote STEM and energy literacy and to attract, inspire, and develop a STEM identity and a sense of belonging in STEM. DOE is committed to promoting and supporting people from all backgrounds and perspectives, including individuals and communities that have been historically underrepresented in STEM fields and activities at DOE.

Explore Career Opportunities with FECM

FECM is looking for enthusiastic, driven professionals to join the team and help define the future of energy. Sign up for FECM career alerts now to receive the newest vacancies. Text FECM CAREERS to 468311 to receive text message alerts or subscribe [here](#).

Explore 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

The BIL represents the most dramatic changes to DOE since its founding in 1977. The BIL is standing up 60 new DOE programs, including 16 demonstration and 32 deployment programs, and expand funding for 12 existing research, development, demonstration, and deployment 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

Conference: Carbon, Capture, Utilization, and Storage

Carbon, Capture, Utilization, and Storage, to be held March 11–13, 2024, in Houston, Texas, will highlight current CCUS work and address related challenges, including subsurface geologic storage and site selection; CO₂ enhanced hydrocarbon recovery and utilization; reservoir modeling monitoring and risk assessment; case studies; industry applications; economics, incentives, and policy; and infrastructure.



Conference: Decarbonisation Summit 2024

Gasworld's Decarbonisation Summit 2024: Industrial Gases & Clean Energies 3.0., to be held Apr. 10–12, 2024, in New Jersey, will discuss the role of the global industrial gas and equipment business in the future of clean fuels and decarbonization.

Conference: 2024 Europe Forum on Carbon Capture & Storage

The Global CCS Institute's 2024 Europe Forum on Carbon Capture and Storage, to be held April 17, 2024, in Rotterdam, Netherlands, is an opportunity for policy leaders, nongovernmental organizations, industry experts, academics, those in the financial sector, and the general public to meet and discuss the state of CCUS technology in Europe.

Conference: CO₂ Capture, Storage & Reuse 2024

CO₂ Capture, Storage & Reuse 2024, to be held May 15–16, 2024, in Copenhagen, Denmark, will focus on presentations, industry panel discussion, technical insights, and networking. The day before the main event (on May 14, 2024), a limited number of conference participants will have a unique opportunity to visit the state-of-the-art Amager Bakke facility managed by ARC.

Conference: Carbon Capture & Storage Summit

The Carbon Capture & Storage Summit, to be held June 10–12, 2024, in Minneapolis, Minnesota, will offer attendees a comprehensive look at the economics of carbon capture and storage, the infrastructure required to make it possible, and the financial and marketplace impacts to participating producers.



Conference: Carbon Capture Technology Expo

The Carbon Capture Technology Expo, to be held June 26–27, 2024, in Houston, Texas, will unveil the latest current and emerging technologies from some of the sector's leading experts and energy leaders while providing a showcase for innovative models that can capture carbon's potential by turning CO₂ byproducts into profitable applications for concrete, carbon fiber, polymers, food, fertilizers, liquid fuels, chemicals, graphene, and more.

U.S. and International Events (continued)

Conference: Carbon Capture World Expo & Conference

The Carbon Capture World Expo & Conference, to be held June 26–27, 2024, in Essen, Germany, brings together carbon capture experts from the global marketplace to provide an opportunity to meet with all parties—technology providers, equipment builders, engineering companies, and end users—determined to resolve anthropogenic CO₂ emissions.

Conference: GHGT-17

The 17th Greenhouse Gas Control Technologies (GHGT) Conference, to be held Oct. 20–24, 2024, in Calgary, Alberta, Canada, is the principal international conference on GHG mitigation technologies. 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

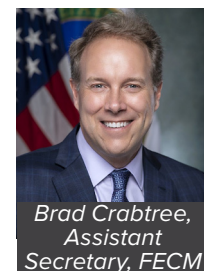
DOE's Investment in the Transformative Work of NCCC

The National Carbon Capture Center (NCCC), managed/operated by Southern Company and funded by FECM and multiple sponsors, serves as NETL's leading carbon capture research and test facility. The NCCC's highly specialized team advances emerging technologies to deployment, assists in moving carbon capture technologies to scale-up, and then helps usher them to successful commercial deployment. Six recent DOE-funded projects—with direct testing connection with the NCCC—will concentrate on developing lower-cost, highly efficient technologies that will capture CO₂ from power and industrial facilities, facilitate permanent geologic carbon storage, or convert carbon into long-lasting products.



POLITICO Tech Episode Features FECM Assistant Secretary Crabtree

On the podcast POLITICO Tech, FECM Assistant Secretary Brad Crabtree explains the Biden administration's case for capturing more carbon, despite criticisms from climate activists that it favors the fossil fuel industry.



Argos USA and Holcim US Secure DOE Funding for Carbon Capture

DOE has awarded \$45.6 million of federal funding to carbon capture projects across U.S. industries, including Argos USA's engineering-scale carbon capture project at its Harleyville, South Carolina, cement plant and Holcim US' engineering-scale carbon capture project at its Holly Hill, South Carolina, cement plant. The projects will focus on technologies for CO₂ capture and multi-modal transport via hubs.

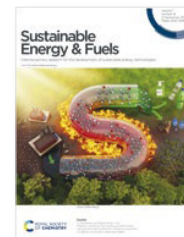
Publications

A comprehensive review on regeneration strategies for direct air capture

KEJU AN, KAI LI, CHENG-MIN YANG, JAMIESON BRECHTL, KASHIF NAWAZ, JOURNAL OF CO₂ UTILIZATION, VOLUME 76, OCTOBER 2023.

Evaluating degradation of CO₂ adsorbents in flue gas from bioenergy with carbon capture and storage

HANNAH E. HOLMES, ROBERT D. SCHRECK, PAVITHRA NARAYANAN, SHREYA GHOSH, WENTING SUN, MATTHEW J. REALFF, RYAN P. LIVELY, SUSTAINABLE ENERGY & FUELS, VOLUME 18, 2023 (SUBSCRIPTION MAY BE REQUIRED.)

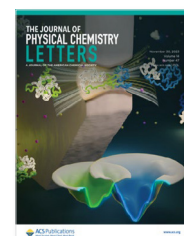


Molecular redox-active organic materials for electrochemical carbon capture

HYOWON SEO, MRS COMMUNICATIONS, VOLUME 13, SEPTEMBER 2023.

Carbon Capture: Theoretical Guidelines for Activated Carbon-Based CO₂ Adsorption Material Evaluation

DREW M. GLENNA, ASMITA JANA, QIANG XU, YIXIAO WANG, YUQING MENG, YINGCHAO YANG, MANISH NEUPANE, LUCUN WANG, HAIYAN ZHAO, JIN QIAN, SETH W. SNYDER, JOURNAL OF PHYSICAL CHEMICAL LETTERS, VOLUME 14, ISSUE 47, NOVEMBER 2023.



The future of biofuels in the United States transportation sector

CALEB H. GEISSLER, JOONJAE RYU, CHRISTOS T. MARAVELIAS, RENEWABLE AND SUSTAINABLE ENERGY REVIEWS, VOLUME 192, MARCH 2024.

Modified Cu–Zn–Al mixed oxide dual function materials enable reactive carbon capture to methanol

CHAE JEONG-POTTER, MARTHA A. ARELLANO-TREVIÑO, W. WILSON MCNEARY, ALEXANDER J. HILL, DANIEL A. RUDDY, ANH T. TO, EES CATALYSIS, VOLUME 2, 2024.

About DOE Carbon Capture:

DOE/NETL is developing the next generation of advanced CO₂ capture technologies through NETL's Point Source Carbon Capture Program (PSCC) and advancing a diverse set of CDR approaches to directly remove CO₂ emissions from the atmosphere through NETL's Carbon Dioxide Removal Program.



The Digital 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 searchable database.



Carbon Capture Reference Materials

- Point Source Carbon Capture Program Fact Sheet
- Carbon Dioxide Removal Program Fact Sheet
- Carbon Capture Infographics
- Interactive Project Maps: PSCC and CDR
- Compendium of Carbon Capture Technology
- Carbon Dioxide Capture Handbook
- CCSI²
- Systems Analysis
- Conference Proceedings
- Accomplishments Posters: PSCC and CDR

Contact Us

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There are several ways to join the conversation and connect with NETL's Carbon Capture activities:

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