NATIONAL ENERGY TECHNOLOGY LABORATORY

FEBRUARY 2024

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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OCED Selects Three Projects to Reduce Harmful Carbon Pollution, Create New Economic Opportunities, and Advance Carbon Reducing Technologies

The U.S. Department of Energy (DOE) Office of Clean Energy Demonstrations (OCED) announced up to $890 million in funding for three projects to demonstrate technologies designed to capture, transport, and store carbon emissions that would otherwise accelerate climate change and jeopardize public health. Funded by the President's Bipartisan Infrastructure Law (BIL), the three projects—located in California, North Dakota, and Texas—have the potential to curb carbon dioxide (CO_2) emissions from three power plants by preventing roughly 7.75 million metric tons of CO_2 emissions from being released into the atmosphere each year—an amount equivalent to the annual CO_2 emissions of 1.7 million gasoline-powered cars. Funding applicants were required to submit Community Benefits Plans, which will help ensure meaningful community and labor engagement in carbon management technologies while addressing environmental burdens in partnership with communities to ensure an equitable and just energy transition.

Interagency News and Updates

DOE Releases First in Series of Reports Highlighting Pathways Toward Clean Hydrogen EarthShot

DOE announced the findings of a report highlighting ways to achieve its goal of making hydrogen an affordable, abundant source of clean energy and examining different pathways to get there through thermal conversion. The report is the first of three assessments of clean-hydrogen production pathways for DOE's Hydrogen Shot™, unveiled in June 2021 as the first goal of the Energy Earthshots Initiative™—a set of eight separate moonshots to accelerate breakthroughs of more abundant, affordable, and reliable clean energy solutions within the decade. The Hydrogen Shot seeks to reduce the cost of clean hydrogen by 80% to $1 per kilogram by 2031.

NETL Research Suggests Tailored, Regional Approach for CCS in Central and Eastern U.S.

A recent National Energy Technology Laboratory (NETL) analysis of the Central United States, which divided the region into three impact areas to explore variables associated with transporting and storing captured CO_2, found that geographic differences had significant impacts on costs and provided a framework to evaluate these impacts. In the research, each regional area provided the means to design a carbon capture and storage (CCS) network that could connect different source types at hypothetical locations with geologic storage reservoirs through either (1) a dedicated pipeline connecting a single source to a single storage reservoir site, or (2) a trunkline network consisting of pipeline segments and hubs connecting multiple sources to multiple storage reservoir sites. The results highlight the significance, on overall costs, of the location and type of the CO_2 source, capture rate of the CO_2 source, quality of the saline storage reservoir, and distance between source and sink.

Early Interest in Off-Roading Drove NETL Engineer's Career Choice

Michael Fasouletos, NETL Point Source Carbon Capture Team Supervisor

Growing up near Moundsville, West Virginia, NETL's Mike Fasouletos loved riding all-terrain vehicles (ATVs), dirt bikes, and anything with a motor and wheels on the family's farm, driving him to a career in engineering. His dream job was to design the next great bike or ATV. This desire to help find solutions and to perfect designs and processes or find new ones—the crux of an engineer's work—has never waned, especially as Fasouletos advances priority projects to address climate change. As a supervisor for Point Source Carbon Capture at NETL, Fasouletos leads a team of eight project managers who are collaborating with researchers at the nation's top universities, in industry, and at research organizations to develop cutting-edge decarbonization technologies. Projects advanced by the team are designed to capture CO_2 from point sources, such as fossil fuel-based power generation and industrial facilities, so the greenhouse gas (GHG) can be stored in the subsurface or used as a feedstock to produce value-added products rather than emitted into the atmosphere.

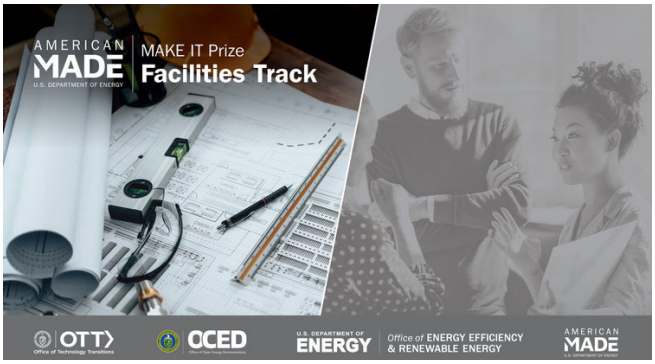
Interagency News and Updates (continued)

Notice of Intent: FOA Carbon Management (Round 5)

In support of Executive Order 14008: Tackling the Climate Crisis at Home and Abroad, and to further past DOE-supported carbon management research, development, and demonstration done in cooperation with industry and academia to solve climate change challenges, DOE's Office of Fossil Energy and Carbon Management (FECM) anticipates issuing a Funding Opportunity Announcement (FOA) (DE-FOA-0002614 Round 5) seeking applications for financial assistance awards that support research and development for a variety of carbon management technologies.

DOE Awards 13 Organizations to Build Roadmaps to Clean Energy Manufacturing

DOE announced 13 Phase One winners of the inaugural Manufacture of Advanced Key Energy Infrastructure Technologies (MAKE IT) Prize Strategies Track, which supports communities developing roadmaps for bringing vibrant manufacturing activities to their regions. The awarded teams include Illinois Clean Tech Economy Coalition (Chicago, Illinois), Project Hermes (Tulsa, Oklahoma), WE-MADE (Edinburg, Texas), Beatrice Nebraska Clean Energy Manufacturing (Beatrice, Nebraska), Greening the Great Plain (Lawton, Oklahoma), Northeast Ohio Clean Manufacturing Partnership (Cleveland, Ohio), NextCorps (Rochester, New York), Evansville Energy Nucleus (Evansville, Indiana), MESA NM (New Mexico), Berkshire Innovation Center (Pittsfield, Massachusetts), Accelerating Climate Tech Solutions and Job Growth in Long Island, NY (New York City, New York), White Mountain Economic Development (St. Johns, Arizona), and Pennsylvania Sustainable Business Network (Pittsburgh, Pennsylvania).



2023 Sees NETL Begin Testing at DAC Center and Launching Other CO_2 Removal Projects

NETL's Direct Air Capture (DAC) Center at its Pittsburgh campus is a one-of-a-kind facility dedicated to supporting private sector technology maturation by using national laboratory competencies and knowledge through collaborative research efforts. In October, NETL experts took part in the Global DAC Conference at Columbia University in New York City. The gathering brought together global leaders and innovators who are working to develop DAC as a robust, cost-effective, and environmentally just atmospheric carbon dioxide removal (CDR) technology. This year, the lab launched a four-year plan to develop a process that integrates expertise from NETL's extensive materials design, computational materials design, computation fluid dynamics, and process system design research portfolios to advance a cutting-edge technology that will remove CO_2 from the atmosphere via DAC contactors.

Interagency News and Updates (continued)

NETL's Hannah Sieger Supporting Upcoming DAC Center to Address Climate Change

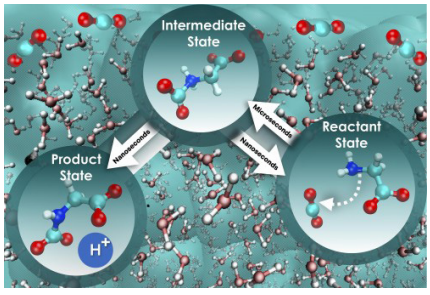
Hannah Siegler, NETL General Engineer

Hannah Sieger, NETL's contracting officer representative (COR) for the upcoming DAC Center, grew up watching as evidence and effects of climate change mounted, and today she stands ready to support NETL as it works to address this challenge. The testing and development of DAC technologies is an essential component of achieving a low-carbon economy and a tool to help mitigate some of the environmental issues the nation is facing. As COR, Sieger works to support the intended timeframe of the DAC Center's implementation by managing the contractors to concurrently work through the design and construction of the utilities with NETL's onsite personnel who would separately work through the design of the testing- and experiment-specific facilities equipment.

DOE Announces Clean Energy Achievements at COP28

U.S. Deputy Secretary of Energy David M. Turk traveled to Dubai, United Arab Emirates, for the 28th Conference of the Parties to the U.N. Framework Convention on Climate Change (COP28), where he led the U.S. energy delegation. The United States and Net Zero World partner countries announced progress on building clean, secure energy systems in leading emerging economies. Net Zero World is DOE's flagship initiative that works in partnership with major energy-producing countries to develop and implement holistic approaches to decarbonizing their entire energy systems. It does so through a whole-of-government approach and by leveraging the world-class expertise of 10 national laboratories to provide demand-driven assistance to energy ministers and their departments.

Light-Activated Acid Drives Energy-Efficient, On-Demand Release of Captured CO_2



Using light instead of heat, researchers at DOE's Oak Ridge National Laboratory have found a new way to release CO_2 from a solvent used in DAC to trap the GHG. The novel approach paves the way for economically viable separation of CO_2 from the atmosphere. The on-demand release of CO_2 is possible because the long-lived excited state of a novel acid controls the solution's proton concentration using ultraviolet light, creating conditions that lead to CO_2's energy-efficient release. By contrast, current DAC technologies filter air through an aqueous solution containing a sorbent material, such as an amino acid, that takes up atmospheric CO_2 and holds it. Heating the solvent releases the CO_2 and regenerates the amino acid for recycling. The study was published in *Angewandte Chemie International Edition*. (Subscription may be required.)

NETL Marks Carbon Transport and Storage Milestones in 2023

NETL's Carbon Transport and Storage Program features onsite world-class leaders, scientists, and engineers, as well as the engineering and scientific expertise, to manage external research projects that further FECM's goals. The program's accomplishments promote the growth of good-paying jobs, especially to those in disadvantaged or burdened communities. An extensive roster of research successes for 2023 included several key milestones.

Interagency News and Updates (continued)

Website: DOE Explains DAC

DOE supports DAC research, development, and demonstration through FECM, OCED, and the Advanced Research Projects Agency–Energy. DOE also supports research on DAC through the Office of Science Basic Energy Sciences (BES) and Biological and Environmental Research (BER) Programs. BES supports the foundational science behind materials, chemicals, and biochemical and geological processes associated with the capture, conversion, and storage of CO_2. BER supports research to understand atmospheric CO_2 and other GHGs.

New Analysis Outlines National Opportunities to Remove CO_2 at Gigaton Scale

Lawrence Livermore National Laboratory researchers, along with scientists from more than a dozen institutions, have completed a first-of-its-kind high-resolution assessment of CDR in the United States. The report, "*Roads to Removal: Options for Carbon Dioxide Removal in the United States*," charts a path for the United States to achieve a net-zero GHG economy by 2050, helping to ensure the nation's climate security and resilience by cleaning up Earth's atmosphere and addressing the root cause of climate change. It also includes an integrated analysis of CDR techniques and resources that are currently available, along with the costs that will be incurred on the path to net-zero.

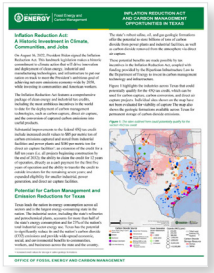
Fact Sheet: University Training and Research Program

The University Training and Research (UTR) Program supports novel, early-stage research at U.S. colleges and universities that advances the FECM mission of delivering integrated solutions related to minimizing the environmental impacts of fossil fuels while working toward net-zero emissions. By investing in the education and training of America's future scientists and engineers, this program highlights the key role technology plays in addressing America's energy challenges, promotes the development of innovative and disruptive technologies, and reinforces workforce development as a part of our nation's continued economic prosperity.

Fact Sheet: Industry Guide to Carbon Capture and Storage at Cement Plants

FECM's "Industry Guide to Carbon Capture and Storage at Cement Plants" fact sheet provides an overview of cement production, CO_2 emissions reductions at cement plants, and current FECM-funded projects using carbon capture technology at cement plants.

Fact Sheet: The Inflation Reduction Act and Carbon Management Opportunities in Texas



FECM's "Inflation Reduction Act and Carbon Management Opportunities in Texas" fact sheet includes a short history of the Inflation Reduction Act and briefly discusses the potential for carbon management and emissions reductions in Texas.

Interagency News and Updates (continued)

DOE Invests Funding for Socially Equitable and Environmentally Responsible Carbon Storage Partnerships

Through the "Regional Initiative for Technical Assistance Partnerships" funding opportunity, DOE intends to establish multidisciplinary partnerships that include stakeholders with extensive technical, managerial, regulatory, business, and social science expertise specific to carbon transport and storage. Each partnership will focus on a particular region where multiple carbon storage projects are expected to be deployed and provide project developers, regulators, community advocacy groups, labor organizations, and other affected stakeholders with objective, unbiased technical assistance within that region. The projects will provide a valuable public information resource for developers of carbon storage sites, affected communities, and other interested parties.

DOE STEM Portal

DOE is building pathways for a diverse workforce to pursue science, technology, engineering, and math (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

Carbon Capture, Utilization, and Storage Conference

Carbon, Capture, Utilization, and Storage (CCUS), 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; CO_2 enhanced hydrocarbon recovery and utilization; reservoir modeling monitoring and risk assessment; case studies; industry applications; economics, incentives, and policy; and infrastructure.

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.

2024 Europe Forum on Carbon Capture and Storage

The Global CCS Institute's (GCCSI) 2024 Europe Forum on Carbon Capture and Storage, to be held Apr. 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.

CO_2 Capture, Storage & Reuse 2024 Conference

CO_2 Capture, Storage & Reuse 2024 Conference, 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.

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 CCS, the infrastructure required to make it possible, and the financial and marketplace impacts to participating producers.

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 CO_2 byproducts into profitable applications for concrete, carbon fiber, polymers, food, fertilizers, liquid fuels, chemicals, graphene, and more.

U.S. and International Events (continued)

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 CO_2 emissions.

GHGT-17 Conference

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 Provides Funding for Three Carbon Capture Projects at U.S. Power Plants

DOE announced up to $890 million for three large-scale carbon capture demonstration projects in the power sector. Each project aims to demonstrate integrated carbon capture, transport, and storage technologies and infrastructure that can be deployed at power plants. According to a recent Congressional Budget Office report, 15 CCS facilities are currently operating in the United States. Together, they have the capacity to capture 0.4% of the nation's total annual CO_2 emissions. The report notes an additional 121 CCS facilities are under construction or in development. If all were completed, they would increase the nation's CCS capacity to 3% of current annual CO_2 emissions.

Ebb Carbon Pilot Project Neutralizes Acid in Seawater for Carbon Storage

At the Pacific Northwest National Laboratory's seaside facility in Sequim, Washington, a pilot project of Ebb Carbon—one of several companies building a business on ocean CDR technology—scrubs acid from the waters of the Salish Sea. Carbon dioxide in the atmosphere naturally seeps in and out of the ocean's surface waters, but marine organisms take up some of it to build things like shells and coral skeletons. When they die, some of that carbon sinks and is stored for eons in the ocean's depths. But CO_2 also makes seawater more acidic. Ebb Carbon's device neutralizes the acid in seawater and resets the natural system so it can store even more carbon deep in the ocean. The system in Sequim Bay removes about 100 tons of CO_2 per year.

Publications

TEA of the CO_2 capture process in pre-combustion applications using thirty-five physical solvents: Predictions with ANN

Husain E. Ashkanani, Rui Wang, Wei Shi, Nicholas S. Siefert, Robert L. Thompson, Kathryn H. Smith, Janice A. Steckel, Isaac K. Gamwo, David Hopkinson, Kevin Resnik, Badie I. Morsi, INTERNATIONAL JOURNAL OF GREENHOUSE GAS CONTROL, VOLUME 130, DECEMBER 2023. (SUBSCRIPTION MAY BE REQUIRED.)

Evaluating CCS Cost Options for CO_2 Sources in the Central United States

Allison Guinan, Alana Sheriff, Elizabeth Basista, Chung Yan Shih, Hannah Hoffman, Timothy Grant, NETL, AUGUST 25, 2023.

Final Technical Report for A Novel Molten Salt System for CO_2 Based Oxidative Dehydrogenation with Integrated Carbon Capture

Fanxing Li, Kyle Vogt-Lowell, Dennis Chacko, Vasudev Haribal, John Hu, FECM, OCT. 15, 2023.

Techno-economic analysis of a combined power plant CO_2 capture and direct air capture concept for flexible power plant operation

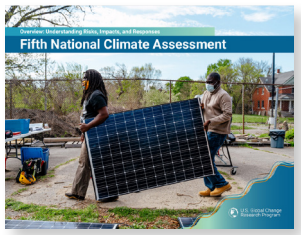
Moataz Sheha, Edward J. Graham, Emre Gençer, Dharik Mallapragada, Howard Herzog, Phillip Cross, James Custer, Adam Goff, Ian Cormier, COMPUTERS & CHEMICAL ENGINEERING, VOLUME 180, JANUARY 2024.

Optimization of a Natural Gas Power Plant with Membrane and Solid Sorbent Carbon Capture Systems

Frits Byron Soepyan, Mahpara Habib, Zhien Zhang, Leo R. Nemetz, Md Emdadul Haque, Aaron M. Esquino, Joanna R. Rivero, Debangsu Bhattacharyya, G. Glenn Lipscomb, Michael S. Matuszewski, Katherine M. Hornbostel, CARBON CAPTURE SCIENCE & TECHNOLOGY, VOLUME 10, MARCH 2024.

Fifth National Climate Assessment (NCA5)

Crimmins, A.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, B.C. Stewart, and T.K. Maycock, Eds. U.S. GLOBAL CHANGE RESEARCH PROGRAM, 2023.



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 (PSCC) and advancing a diverse set of CDR approaches to directly remove CO_2 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
- CCSI^2
- Systems Analysis
- Conference Proceedings
- Accomplishments Posters: PSCC and CDR

Contact Us

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