NATIONAL ENERGY TECHNOLOGY LABORATORY

JANUARY 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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FECM Celebrates the 3rd Annual Carbon Management Day

The U.S. Department of Energy (DOE) Office of Fossil Energy and Carbon Management (FECM) celebrated its third annual Carbon Management Day on Dec. 1, 2023. The atomic mass of carbon is 12.01, which is why FECM celebrates Carbon Management Day on December 1st. Carbon management is an integral part of meeting the Biden administration's goal of net-zero greenhouse gas (GHG) emissions by 2050. Carbon Management Day celebrates the progress that has been made to date and recognizes the work that still needs to be done. The Carbon Management Day webinar (agenda available here) provided the latest news and announcements on DOE carbon management initiatives, featured a fireside chat with DOE carbon management leaders, and informed stakeholders on how they can get involved.

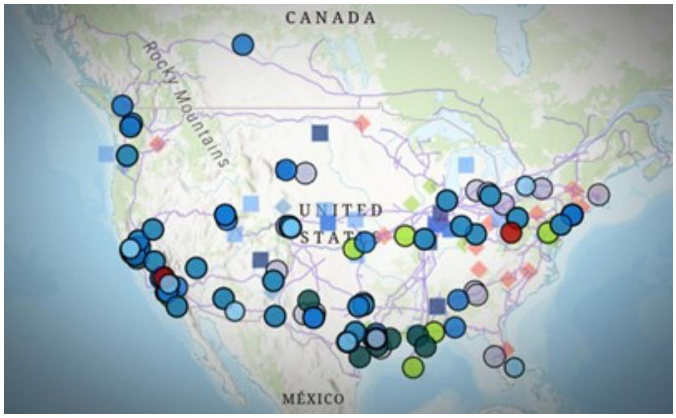
Interagency News and Updates

NETL Talks DAC with Tech Developers, Policymakers from Around the World

National Energy Technology Laboratory (NETL) experts took part in the recent Global Direct Air Capture (DAC) Conference—a two-day event that brought together global leaders and innovators who are working to develop DAC as a robust, cost-effective, and environmentally just technology to remove GHGs from the atmosphere. Held Oct. 16–17, 2023, at Columbia University in New York City, the conference aims to be an annual gathering for knowledge-sharing and cross-sectoral discussions in DAC. David Luebke, technical director of NETL's DAC Center, served on a panel that discussed DAC research, development, and demonstration priorities. Other speakers included FECM Principal Deputy Assistant Secretary Dr. Jennifer Wilcox and FECM Senior Advisor for Deployment Rory Jacobson.

Carbon Matchmaker Builds Bridges Across Carbon Management Community

Developed by NETL researchers in coordination with FECM, Carbon Matchmaker, an online information hub, connects users across the carbon capture, utilization, and storage (CCUS) community and carbon dioxide removal (CDR) supply chains, helping to achieve net-zero GHG emissions through strong public-private partnerships in a just and sustainable way. The research team leveraged NETL's expertise in geo-data science, computational data management, and virtualization to support the development and deployment of the web-based platform. Carbon Matchmaker has since continued to connect entities that generate carbon dioxide (CO_2) with the technology and commercial sectors that offer capabilities to reduce GHG emissions.



Since its launch last year, Carbon Matchmaker has reviewed and approved significant amounts of data and integrated this data into an interactive web map so those using the tool can locate resources and form teams to address carbon management issues in their regions.

NETL Presents Hydrogen, Carbon Management Advancements at 2023 AIChE Annual Meeting

Representatives from NETL showcased the laboratory's research to decarbonize the U.S. economy and power sector through advances in carbon management and hydrogen energy, among other initiatives, during the 2023 American Institute of Chemical Engineers (AIChE) Annual Meeting. Held Nov. 5–9, 2023, in Orlando, Florida, the 2023 AIChE Annual Meeting provided an educational forum for chemical engineers interested in innovation and professional growth. Academic and industry experts covered a wide range of topics relevant to innovative research, new technologies, and emerging growth areas in chemical engineering. Among the presenters during the AIChE meeting was NETL's Dushyant Shekhawat, Ph.D., team supervisor for the Reaction Engineering team, who led sessions on the topics of value-added chemicals from natural gas and informed the conference on the latest developments in fuel processing for hydrogen production.

Interagency News and Updates (continued)

DOE Seeks Information on Carbon Management Curricula Under the UTR Program

FECM is requesting information on various questions regarding potential funding for workforce development efforts through new curricula on carbon management informed by community knowledge and values through FECM's University Training and Research (UTR) Program. This is solely a Request for Information (RFI) and is not a Funding Opportunity Announcement (FOA). DOE is not accepting applications to this RFI response. The due date is Jan. 5, 2024. Additional details can be found at FedConnect.

EnergyTech University Prize Announced

The American-Made EnergyTech University Prize (EnergyTech UP) is sponsored by the Office of Technology Transitions at DOE, as well as several other program offices. EnergyTech UP, in partnership with American-Made Challenges, is designed to be approachable, equitable, and scalable nationwide. Winners will be chosen based on the strength of their business proposals. Students interested in participating in this prize will be provided with a curated list of national laboratory technologies that are ready for commercialization and that can be used for their business plan.

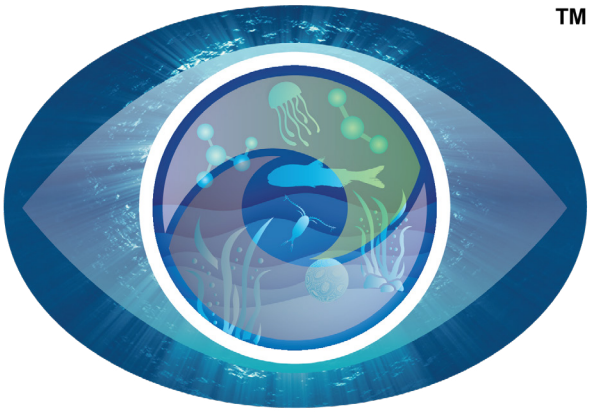
DOE Invests Funding for CarbonSAFE Projects

DOE announced more than $444 million to support 16 selected projects across 12 states that will fight climate change by bolstering the nation's carbon management industry. Funded by the Bipartisan Infrastructure Law (BIL), the projects will expand CO_2 storage infrastructure needed to significantly and responsibly reduce CO_2 emissions from industrial operations and power plants, as well as from legacy emissions in the atmosphere. The 16 projects were selected for negotiation to support the development of new and expanded large-scale, commercial carbon storage projects, each with the capacity to securely store 50 or more million metric tons of CO_2 over a 30-year period. The projects will support the FECM-managed Carbon Storage Assurance Facility Enterprise (CarbonSAFE) Initiative.

Interagency News and Updates (continued)

DOE Announces Funding to Advance Marine CDR Techniques and Slash Harmful GHG Pollution

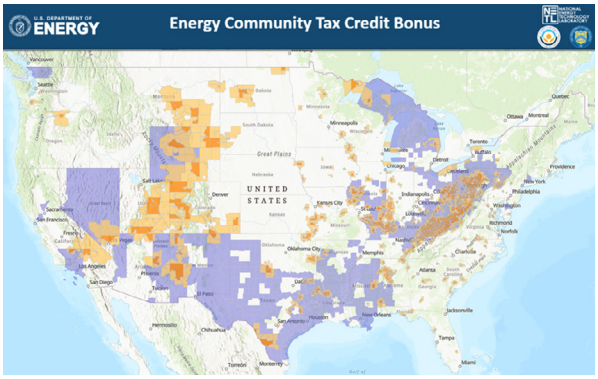
DOE announced $36 million for 11 projects across eight states to accelerate the development of marine CDR (mCDR) and storage technologies. Funded through DOE's Sensing Exports of Anthropogenic Carbon Through Ocean Observation (SEA-CO_2) Program, these projects will support novel efforts to measure, report, and validate mCDR and identify cost-effective and energy-efficient CDR solutions. mCDR techniques take advantage of the ocean's natural carbon capture and storage (CCS) processes and have the potential to mitigate and remove hundreds of millions of tons of CO_2 emissions per year.



DOE's Sensing Exports of Anthropogenic Carbon through Ocean Observation (SEA-CO_2) program logo.

NETL Geo-Data Helps Prioritize Energy Communities in America

With insights from custom mapping and data science analyses, NETL is helping prioritize energy communities and spotlight opportunities for economic improvement and environmental justice in a changing energy landscape. Since 2021, increasing demand for energy, environmental, community, and justice data lead to a growth in energy mapping and visualization projects with NETL's geo-data science experts. NETL has performed rapid analytics on hundreds of energy, environmental, and community-level datasets to meet these demands, resulting in publicly accessible data and interactive maps that can help drive investments in energy communities, inform community and stakeholder engagement, support economic revitalization, strengthen American supply chains, and create jobs from the new clean energy economy.



Since November 2021, demand for NETL's geo-data science expertise has grown from multiple DOE stakeholders to help map and visualize energy data and affiliated environmental, community and justice data.

Report Available: Net Zero Roadmap: A Global Pathway to Keep the 1.5 °C Goal in Reach

In May 2021, the International Energy Agency published "Net Zero Emissions by 2050: A Roadmap for the Global Energy Sector," which set out a narrow but feasible pathway for the global energy sector to contribute to the Paris Agreement's goal of limiting the rise in global temperatures to 1.5°C above pre-industrial levels. Since the report was released, many changes have taken place, notably amid the global energy crisis triggered by Russia's invasion of Ukraine in February 2022. In addition, energy sector CO_2 emissions have continued to rise, reaching a new record in 2022. This 2023 update to the report surveys this complex and dynamic landscape and sets out an updated pathway to net zero by 2050, taking account of the key developments that have occurred since 2021.

Interagency News and Updates (continued)

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

The FECM fact sheet "Inflation Reduction Act and Carbon Management Opportunities in Texas" includes a short history of the Inflation Reduction Act (IRA) and briefly discusses the potential for carbon management and emission reductions for Texas.

Funding Notice: BIL—Carbon Utilization Procurement Grants

DOE announced $100 million to support states, local governments, and public utilities in purchasing products derived from converted carbon emissions. 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 CO_2 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 (LCA). The LCAs are checked for conformance and approved by NETL. Read the full FOA here.

Modeling a Net-Zero Future: Energy Experts Harness Simulation for Global Decarbonization

Energy experts from across the globe tried their hands at different computer modeling tools during the latest workshop held jointly by DOE's Net-Zero World Initiative and the International Atomic Energy Agency. DOE's Argonne National Laboratory, a partner in the initiative, hosted the hands-on workshop held in August 2023. Launched at the 2021 United Nations Climate Change Conference, Net-Zero World comprises several DOE national laboratories, U.S. government agencies, philanthropic organizations, think tanks, businesses, and universities. The initiative promotes just and resilient net-zero emission energy systems around the world. Argentina, Chile, Egypt, Indonesia, Nigeria, Singapore, Thailand, and Ukraine have joined the initiative to date.

USE IT Act CCUS Permitting Task Forces

On Oct. 31, 2023, DOE and the White House Council on Environmental Quality (CEQ) finalized a Memorandum of Understanding to promote cooperative efforts between CEQ and DOE to establish, maintain, and manage two CO_2 CCUS Permitting Task Forces and clarify the agencies' respective roles in administering the Task Forces. The two Task Forces are being established pursuant to the Utilizing Significant Emissions with Innovative Technologies (USE IT) Act. The purpose of each Task Force is the same, but the scope is to differ by geographical area—one Task Force will focus on federal lands and the outer continental shelf, and the other will focus on non-federal lands.

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.

Interagency News and Updates (continued)

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 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. In the next few 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 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

PowerGen International

PowerGen International, to be held Jan. 23–25, 2024, in New Orleans, Louisiana, is a networking and business hub for power generation professionals and solution providers. Bringing together power producers, utilities, consultants, manufacturers, and large-scale energy users, it serves as a platform to explore innovative solutions amid the shift toward cleaner and more sustainable energy sources.

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; CO_2 enhanced hydrocarbon recovery and utilization; reservoir modeling monitoring and risk assessment; case studies; industry applications; economics, incentives, and policy; and infrastructure.

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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.

U.S. and International Events (continued)

2024 Europe Forum on Carbon Capture & 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, non-governmental 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

CO_2 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.

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.

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

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 Members Listed on TIME100 Climate List

TIME magazine released the inaugural TIME100 Climate, a list of the world's most influential leaders driving business to real climate action. To assemble this list, TIME reporters and editors sought out measurable, scalable achievements and prioritized recent action, selecting individuals making significant progress in fighting climate change by creating business value. Each has been evaluated on a variety of factors, including recency of action, measurable results, and influence. Congratulations to Jigar Shah, Director of DOE's Loan Programs Office, and Dr. Jennifer Wilcox, FECM Principal Deputy Assistant Secretary, who are featured on the list.

Jigar Shah
Director of the Loan Programs Office, U.S. Department of Energy

Jennifer Wilcox
Principal Deputy Assistant Secretary of Fossil Energy and Carbon, U.S. Department of Energy

Photos Source: Time Magazine

Heirloom Unveils America's First Commercial DAC Facility

Secretary of Energy Jennifer M. Granholm and California Lieutenant Governor Eleni Kounalakis were invited to unveil the first commercial DAC facility in the United States. The facility can capture up to 1,000 tons of CO_2 per year, which will be sent for storage to fulfill commercial CDR purchases. Fully powered by renewable energy, the Tracy facility has been operational for nearly 1,000 hours and is actively capturing atmospheric CO_2, which will be stored in concrete through a partnership with CarbonCure Technologies.

GCCSI Releases New 2023 Carbon Capture Report

GCCSI published its annual report on carbon capture for 2023. The report details some of the key milestones for the CCS industry over the past 12 months and demonstrates the sector is developing more rapidly than before. One of the main takeaways of the report is a 48% increase in carbon capture capacity of all CCS facilities—an increase to 361 million metric tons of CO_2 per year. The report also highlights the growing interest in the shipping of CO_2 as the single most prominent means of transport for certain regions.

A United Effort to Advance Marine Carbon Capture Tech

Researchers at the University of Pittsburgh (Pitt) Swanson School of Engineering, in collaboration with NETL, are among 11 projects in eight states selected to receive a combined $36 million (part of the SEA-CO_2 program) to accelerate the development of mCDR and storage technologies. The Pitt team will receive $2,274,859 to develop buoy-based optical fiber sensors for measuring pH and CO_2 in seawater from the ocean's surface to the seafloor.

Publications

CO_2 capture from wet flue gas using a water-stable and cost-effective metal-organic framework

RYAN P. LOUGHRAN, TARA HURLEY, ANDRZEJ GŁADYSIAK, ARUNRAJ CHIDAMBARAM, KONSTANTIN KHIVANTSEV, ERIC D. WALTER, TRENT R. GRAHAM, PATRICK REARDON, JANOS SZANYI, DYLAN B. FAST, QUIN R.S. MILLER, AH-HYUNG ALISSA PARK, KYRIAKOS C. STYLIANOU, CELL REPORTS PHYSICAL SCIENCE, VOLUME 4, ISSUE 7, 2023.

Unique biological amino acids turn CO_2 emission into novel nanomaterials with three switchable product pathways

XIANFENG WANG, ZHENGHONG BAO, NOVRUZ G. AKHMEDOV, DAVID HOPKINSON, JAMES HOFFMAN, YUHUA DUAN, ADEFEMI EGBEBI, KEVIN RESNIK, BINGYUN LI, ENVIRONMENTAL TECHNOLOGY & INNOVATION, VOLUME 32, NOVEMBER 2023.

A thin-film modeling approach for analysis of carbon capture sorbent-based devices

FLAVIO D.F. CHUAHY, KELLIS KINCAID, KASHIF NAWAZ, CARBON CAPTURE SCIENCE & TECHNOLOGY, VOLUME 9, DECEMBER 2023.

Effects of pressure and temperature on CO_2 facilitation of amino acid salt-containing membranes for post-combustion carbon capture

TING-YU CHEN, W.S. WINSTON HO, JOURNAL OF MEMBRANE SCIENCE, VOLUME 689, JAN. 5, 2024. (SUBSCRIPTION MAY BE REQUIRED.)

Cost and Life Cycle Analysis for Deep CO_2 Emissions Reduction of Steelmaking: Blast Furnace-Basic Oxygen Furnace and Electric Arc Furnace Technologies

GUIYAN ZANG, PINGPING SUN, AMGAD ELGOWAINY, PALLAVI BOBBA, COLIN MCMILLAN, OOKIE MA, KARA PODKAMINER, NEHA RUSTAGI, MARC MELAINA, MARIYA KOLEVA, INTERNATIONAL JOURNAL OF GREENHOUSE GAS CONTROL, VOLUME 128, SEPTEMBER 2023.

Nanoengineering membrane surfaces: A new paradigm for efficient CO_2 capture

LEIQING HU, VINH T. BUI, NARJES ESMAEILI, HAIQING LIN, CARBON CAPTURE SCIENCE & TECHNOLOGY, VOLUME 10, MARCH 2024.

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

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www.netl.doe.gov

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