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

U.S. DEPARTMENT OF ENERGY | NATIONAL ENERGY TECHNOLOGY LABORATORY

CTSN CARBON TRANSPORT and STORAGE NEWSLETTER

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This newsletter was compiled by the National Energy Technology Laboratory to provide information on recent activities and publications related to carbon transport and storage. It covers domestic, international, and public and private sector news in the following areas:

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DOE/FECM/NETL HIGHLIGHTS

DOE Announces Selections for CCS Systems FEED Studies.

The U.S. Department of Energy's (DOE) Office of Clean Energy Demonstrations (OCED) selected eight integrated front-end engineering design (FEED) studies for award negotiations to support the development of community-informed integrated carbon capture, transport, and storage (CCS) systems. The ***eight FEED studies***, which represent five different U.S. states and one tribal nation, will address the design of integrated CCS projects and support the buildout of CCS capacity toward achieving a clean and equitable energy economy. The FEED studies are funded through OCED's ***Carbon Capture Demonstration Projects Program***, which seeks to address the urgent need to deploy carbon management technologies. The goal of the Carbon Capture Demonstration Projects Program is to accelerate the implementation of integrated CCS technologies and catalyze significant follow-on investments from the private sector to mitigate carbon emissions sources in industries across America.

From *energy.gov*. May 2023.

CONTINUE

DOE/FECM/NETL HIGHLIGHTS *(cont.)*

DOE Makes Funding Available to Aid Carbon, Transport, and Storage Industry.

DOE's Office of Fossil Energy and Carbon Management (FECM) announced up to $45.5 million in funding available to advance carbon dioxide (CO_2) capture technologies and help establish the foundation for a successful carbon transport and storage industry in the United States. Projects selected under the ***Funding Opportunity Announcement (FOA)*** will focus on two areas: (1) developing lower-cost, highly efficient technologies for carbon capture from power and industrial facilities that will capture CO_2 for geologic carbon storage or for conversion into long-lasting products like concrete, and (2) accelerating the deployment of multi-modal transport of CO_2 through the creation of transportation hubs. The application deadline is July 18, 2023.

From *energy.gov*. June 2023.

ANNOUNCEMENTS

2023 FECM/NETL Carbon Management Research Project Review Meeting.

The 2023 FECM/National Energy Technology Laboratory (NETL) Carbon Management Research Project Review Meeting will take place August 28–September 1, 2023, in Pittsburgh, PA. The meeting will provide attendees the opportunity to share the knowledge and insights gained by more than 150 DOE-sponsored research and development (R&D) projects from the following FECM R&D programs: ***Point Source Carbon Capture***, ***Carbon Dioxide Removal (CDR)***, ***Carbon Conversion***, and ***Carbon Transport and Storage***. A mixture of plenary, multi-topic breakout, and interactive poster sessions will be delivered to share research results and provide opportunities for discussion and collaboration on the subject research efforts, both domestic and international. The meeting will be co-located with the United States Energy Association's inaugural ***Carbon Management Technology Showcase (CMTS)***. (Note: registration for the CMTS is separate from the registration for the 2023 FECM/NETL Carbon Management Research Project Review Meeting.)


The 2023 FECM/NETL Carbon Management Research Project Review Meeting will be held at the David L. Lawrence Convention Center in Pittsburgh, PA.

NETL Scientists, Researchers Chairing Topical Session on Carbon and Hydrogen Storage in Geologic Systems.

THE GEOLOGICAL SOCIETY OF AMERICA® CONNECTS 2023 15–18 October Pittsburgh, Pennsylvania, USA

Scientists and Researchers from NETL are chairing a Topical Session at The Geological Society of America Connects 2023 Meeting, to be held October 15–18, 2023, in Pittsburgh, PA. The session, ***Carbon and Hydrogen Storage in Geologic Systems (T5)***, will bring together researchers and stakeholders to discuss the underlying research challenges associated with management of geologic storage formations. Interested speakers are invited to submit an abstract by visiting ***the meeting website***. (Abstract submissions are due by July 25, 2023.)

From *The Geological Society of America*. July 2023.

FACT SHEET: President Biden to Catalyze Global Climate Action Through MEF.

President Biden convened leaders of the Major Economies Forum on Energy and Climate (MEF), highlighting new steps the United States is taking to meet its 1.5°C-aligned goal of reducing emissions by 50–52% in 2030. Among the key areas discussed were the advancement of carbon management and partnering with other countries to accelerate carbon capture, removal, use, and storage technologies through a COP 28 Carbon Management Challenge. (COP 28 is the 28th session of the Conference of Parties, to be held in the United Arab Emirates from November 30 to December 12, 2023.)

From *The White House*. April 2023.

FACT SHEET: Biden-Harris Administration Outlines Priorities for Building America's Energy Infrastructure Faster, Safer, and Cleaner.

The Biden-Harris administration announced a suggested set of priorities for Congress to pass as part of bipartisan permitting reform legislation, including addressing the siting of hydrogen and CO_2 pipelines and storage infrastructure and providing federal siting authority for such infrastructure.

From *The White House*. May 2023.

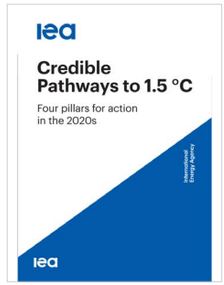
DOE Announces Winners of First Annual Carbon Management Collegiate Competition.

DOE's FECM announced the winners of the American-Made ***Carbon Management Collegiate Competition***, with the winning teams having the opportunity to present their winning proposals at DOE's annual ***Carbon Management Research Project Review Meeting*** in August 2023. The competition challenged students to help shape the future of carbon management by proposing regional carbon networks capable of transporting at least 1 million metric tons of CO_2 per year from industrial sources (e.g., power plants or ethanol production facilities) to locations that either use the CO_2 to manufacture products or for permanent storage.

From *energy.gov*. June 2023.

ANNOUNCEMENTS *(cont.)*

IEA Report Highlights Importance of CCS, CDR.



The International Energy Agency (IEA) released a report on the key actions needed to keep the Paris Agreement's target of limiting the global temperature rise to 1.5°C within reach. Among the pillars mentioned, the report, "***Credible Pathways to 1.5°C: Four pillars for action in the 2020s***," highlights the importance of CCS and CDR.

From *Carbon Capture Journal*. April 2023.

A Guide to CCS and EPA's Power Plant Rule.

In light of the proposed ***U.S. Environmental Protection Agency (EPA) power plant rule***, E&E News provided answers to common questions about CCS and power plants.

From *E&E News*. May 2023.

Podcast Discusses CCUS Regulatory Frameworks in Canada.

The Canadian government introduced two fiscal and regulatory levers—carbon pricing and an investment tax credit—to support the broad adoption of carbon capture, utilization, and storage (CCUS) in Canada. The Oxford Institute for Energy Studies (OIES) released a podcast discussing this and other topics related to the development of CCUS in Canada.

From *OIES*. May 2023.

Australian Industry Releases Carbon Roadmap for Net-Zero Future.

The Australian Petroleum Production and Exploration Association released a roadmap for a net-zero emissions future. ***The report*** proposes establishing nine "Net-Zero Zones" across Australia, with shared infrastructure for gas, renewables, CCUS, and hydrogen production.

From *Energy World*. May 2023.

MRCI Participates in Science Festival.

MRCI
Midwest Regional Carbon Initiative

The DOE-funded Midwest Regional Carbon Initiative (MRCI) hosted an interactive display at the Center of Science and Industry (COSI) Big Science Celebration 2023 in Columbus, Ohio. The display included three interactive stations focused on the geology of CCS, and it was complimented with signage explaining CCS and the goal of the program. CCS Rock Kits were distributed, which directed attendees to NETL's webpage.

From *MRCI*. June 2023.

PROJECT AND BUSINESS DEVELOPMENTS

Collaboration to Accelerate CCUS in the United States.

Svante | Carbon America

Carbon America and Svante Technologies Inc. announced a collaboration on the commercial deployment of CCUS projects in the United States. The companies will work together to identify and deploy projects that can rapidly reduce U.S. greenhouse gas (GHG) emissions. The collaboration leverages Svante's novel solid sorbent carbon capture technology and Carbon America's experience in CCUS project development.

From *Svante Press Release*. May 2023.

Drax, C-Zero Sign MOU for Sale of CDR Credits From BECCS Facility.

Drax and C-Zero Markets agreed to a Memorandum of Understanding (MOU) concerning the sale of CDR credits from Drax's U.S. bioenergy with carbon capture and storage (BECCS) facility. Under the terms of the MOU, C-Zero will buy 2,000 metric tonnes of CO_2 from Drax's BECCS facility for $300 per metric tonne. Drax aims to deliver 12 million metric tonnes of CO_2 per year using BECCS by 2030.

From *Drax Press Release*. May 2023.

Aker Carbon Capture, Carbfix Extend CCS MOU.

Aker Carbon Capture and Carbfix extended their partnership aimed at exploring full CCS value chains. Under the two-year MOU, the two Nordic companies will work together on point source capture and storage volumes between 100,000 to 1 million metric tons of CO_2 per year from industries such as cement, gas-to-power, and waste-to-energy.

From *Aker Carbon Capture News*. May 2023.

Companies to Collaborate on Cement CCS.

Air Liquide and Holcim agreed to collaborate on Holcim's cement CCS project under development in Belgium. Using Air Liquide's Cryocap™ technology, Holcim expects to reduce CO_2 emissions by up to 1.1 million tons per year. Air Liquide intends to build and operate a unit of its proprietary Cryocap Oxy technology to capture and purify up to 95% of the CO_2 generated from Holcim's production unit in Obourg. The captured CO_2 will then be managed through ***Antwerp@C CO_2 Export Hub***, where it will be transported, liquefied, and loaded onto CO_2 ships for offshore storage.

From *Carbon Capture Journal*. May 2023.

PROJECT AND BUSINESS DEVELOPMENTS *(cont.)*

MOU to Advance CCS Solutions.

Wood, an engineering and consulting company, and Computer Modelling Group Ltd. (CMG), a software company that produces reservoir simulation software for the oil and gas industry, signed an MOU specializing in CCS projects. Under the MOU, Wood will combine its surface, fluids transport, and pipeline engineering experience with CMG's subsurface software and services to provide an integrated and connected approach to CCS project development.

From *Wood Press Release*. April 2023.

Santos Signs Four Agreements for CO_2 Storage.

Australian energy company Santos ***executed deals*** with potential customers for CO_2 storage at the Bayu-Undan CCS project offshore Timor-Leste. The deals are with potential upstream gas and liquefied natural gas projects offshore the Northern Territory and in Darwin, and a South Korean energy and industrial conglomerate. The Bayu-Undan CCS project is situated within Santos' Darwin and Bayu-Undan Hub, which is part of the company's three-hub CCS strategy (also includes the under-construction Moomba CCS project).

From *Offshore Technology*. May 2023.

Ørsted Selected for Denmark's Full-Scale CCS Project.

The Danish Energy Agency awarded Ørsted Bioeneergy & Thermal Power with a 20-year contract for Denmark's first CCS project. The Ørsted Kalundborg Hub project, expected to capture and store 430,000 metric tons of CO_2 per year from 2026, will see Ørsted establish carbon capture at its wood chip-fired Asnæs Power Station in Kalundborg in western Zealand and the Avedøre Power Station's straw-fired boiler in the Greater Copenhagen area. Approximately 150,000 metric tons of biogenic CO_2 per year will be captured from the straw-fired unit at Avedøre Power Station; the CO_2 will initially be transported by lorry to Asnæs Power Station until a shared pipeline infrastructure across Zealand is established. Ørsted will capture 280,000 metric tons of biogenic CO_2 per year from the wood chip-fired unit at Asnæs Power Station, which will also function as a CO_2 hub, handling and shipping biogenic carbon from both the Avedøre and Asnæs combined heat and power stations to the Northern Lights storage reservoir in the Norwegian portion of the North Sea.

From *Offshore Energy*. May 2023.

Collaboration on CO_2 Storage in Denmark.

Gas Storage Denmark and Fidelis New Energy will collaborate on Fidelis' development, delivery, and operations of an onshore CO_2 system in Denmark. The Norne Carbon Storage Hub will provide CO_2-emitting companies the opportunity to access cost-effective and safe decarbonization options and will help Denmark and other countries achieve 2030 and 2050 climate goals. The CO_2 storage network will be capable of receiving CO_2 from local CO_2 sources via pipeline and international CO_2 sources via shipborne transport at multiple receiving facilities.

From *Victorian Advocate*. May 2023.

LEGISLATION AND POLICY

Legislation Introduced to Boost Carbon Removal Solutions.

The Carbon Removal and Emission Storage Technologies (CREST) Act, which directs DOE and the U.S. Department of the Interior to establish new research programs and evaluate the feasibility of carbon removal and storage pathways, quantify the net impact of carbon removal solutions, and establish a pilot reverse auction purchasing program to accelerate carbon removal market commercialization, was introduced in the U.S. Senate. Title I of ***the CREST Act*** builds upon previously authorized carbon removal R&D programs to include carbon removal pathways that can store CO_2 or use CO_2 to produce valuable products such as biofuels and other products. Title II creates a pilot carbon removal purchasing program that utilizes an innovative reverse auction mechanism to find the cheapest pathways for carbon removal solutions that meet specified performance metrics.

From *U.S. Senator Susan Collins Press Release*. May 2023.

Carbon Credit Bill Passes State Senate in Alaska.

The Alaska State Senate passed a carbon credit bill allowing the state to seek extra revenue via the carbon credits market and essentially leave vast amounts of carbon-absorbing areas, such as forests, undisturbed. The Alaska Department of Natural Resources also ***issued a report*** projecting that carbon credit pilot projects in three areas (the Haines, Tanana Valley, and Matanuska-Susitna Valley areas) could earn approximately $5 million concurrently, beginning as soon as 2024.

From *Juneau Empire*. May 2023.

UK Government to Develop North Sea Carbon Storage Map.

Britain's government intends to develop a map of the UK North Sea's subsurface geology showing the potential for CCS. Companies already working on CCS technology and licensed to drill in the region will be obliged to report their findings to the regulator, with the government using the information to quantify the potential for CCS in certain areas.

From *Offshore Magazine*. May 2023.

Dutch Government Allocates Funds to CCS Projects.

The Dutch government announced the allocation of funds—the bulk of which are for CCS projects through the SDE+++ scheme—that provide subsidies for the use of techniques to generate renewable energy and reduce carbon emissions. Of the €12 billion ($13.04 billion) budget, €6.7 billion ($7.28 billion) will be allocated for CCS projects. The budget for the SDE+++ scheme has increased due to the pricing of the European Union Emissions Trading Scheme being higher than previously expected.

From *ICIS*. April 2023.

EMISSIONS TRADING

RGGI Annual 2022 Market Monitoring Report Available.

The states participating in the Regional Greenhouse Gas Initiative (RGGI) released the ***Annual Report on the Market for RGGI CO_2 Allowances: 2022***. Prepared by independent market monitor Potomac Economics, the report evaluates activity in the market for RGGI CO_2 allowance auctions in 2022, focusing on allowance prices, trading and acquisition of allowances in the auctions and the secondary market, participation in the market by individual firms, and market monitoring. The report found no evidence of anti-competitive conduct.

From *RGGI*. May 2023.

India Set to Develop Carbon Trading Scheme.

According to the Union Ministries of Power and Environment, Forests, and Climate Change, India is set to develop a carbon trading scheme for decarbonization that is designed to enhance the country's energy transition by pricing GHG emissions. The Indian Carbon Market will create a national framework aimed at decarbonizing the Indian economy through GHG trading. A voluntary mechanism would also be developed concurrently to encourage GHG reduction from non-obligated sectors. The scheme will establish guidelines for verification and institutional and governance structures.

From *The Economic Times*. May 2023.

Vietnam Announces Plans to Launch Exchange for Carbon Emissions Trading.

Vietnam is expected to establish a market for trading CO_2 emissions in 2028 to enhance the exchange of carbon credits between local and international markets. Under the plan, proposed by the Ministry of Natural Resources and Environment, Vietnam is preparing to develop regulations on carbon credit management and the exchange of GHG emissions quotas and carbon credits. The process is due to be completed in 2027.

From *Xinhua*. May 2023.

SCIENCE

Technology Pulls Seawater from Ocean for Carbon Storage.

Scientists from the University of California at Los Angeles Institute for Carbon Management invented a technology that pulls seawater from the ocean and precipitates out the calcium carbonate in it via an electrochemical process—essentially "zapping" the seawater to remove and store carbon. Researchers project that the technology, called SeaChange, could pull approximately 10 pounds of CO_2 from the atmosphere per metric ton of seawater processed, with the pilot project designed to process more than 50 metric tons a day during the trial. (Storing 1 metric ton of CO_2 requires processing 220 metric tons of seawater. For comparison, from ***NETL's Direct Air Capture (DAC) Sorbent Study***, storing 1 metric ton of CO_2 from the air requires processing 2,700 tonnes of air.)

From *The Economic Times*. May 2023.

Tools Help Cities Assess Carbon Storage.

Researchers from Aalto University in Espoo, Finland, have developed a tool to help keep urban development plans in line with climate goals, providing a metric that planners can use to improve carbon-neutral planning of urban growth. The new metric, called the carbon storage factor, indicates how much carbon can be captured in planned urban developments. According to the researchers, urban growth commonly encroaches on forested areas and agricultural land, meaning that cities consume carbon sinks as they grow, making it harder for municipalities and countries to reach net-zero emissions targets. The research was ***published in Environmental Research Letters*** (Ilmari Talvitie, et al. 2023 Environ. Res. Lett. 18 044029).

From *Science Daily*. May 2023.

About DOE'S CARBON TRANSPORT and STORAGE PROGRAM

The **Carbon Transport and Storage Program** at the National Energy Technology Laboratory (NETL) is focused on developing and advancing technologies to enable safe, cost-effective, permanent geologic storage of CO_2, both onshore and offshore, in different geologic settings. The technologies being developed will benefit both industrial and power sector facilities that will need to mitigate future CO_2 emissions. The program also serves to increase the understanding of the effectiveness of advanced technologies in different geologic reservoirs appropriate for CO_2 storage—including saline formations, oil reservoirs, natural gas reservoirs, unmineable coal seams, basalt formations, and organic-rich shale formations—and to improve the understanding of how CO_2 behaves in the subsurface. These objectives are necessary to increasing public confidence in safe, effective, and permanent geologic CO_2 storage.

The ***Carbon Transport and Storage Program Overview*** webpage provides detailed information of the program's structure, as well as links to the webpages that summarize the program's key elements.

Carbon Transport and Storage Program Resources

Newsletters, program fact sheets, best practices manuals, roadmaps, educational resources, presentations, and more information related to the Carbon Transport and Storage Program is available on ***DOE's Energy Data eXchange (EDX) website***.

Get Social with Us

There are several ways to join the conversation and connect with NETL's Carbon Transport and Storage Program:

Disclaimer

About NETL'S CARBON TRANSPORT and STORAGE NEWSLETTER

Compiled by the National Energy Technology Laboratory, this newsletter is a monthly summary of public and private sector carbon transport and storage news from around the world. The article titles are links to the full text for those who would like to read more (note that all links were active at the time of publication).

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