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

VOL. 24, NO. 9

## CARBON TRANSPORT and STORAGE PROGRAM DOCUMENTS and REFERENCE MATERIALS

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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 Expands Portfolio of Carbon Management Technologies to Reduce $CO_2$ Emissions

The U.S. Department of Energy's (DOE) Office of Fossil Energy and Carbon Management (FECM) announced the availability of additional funding to advance diverse carbon management approaches that reduce carbon dioxide ($CO_2$) emissions. The funding will support the development of technologies that capture $CO_2$ from industrial and power generation sources or directly from the atmosphere and transport it either for geologic storage or conversion into valuable products such as fuels and chemicals. The sixth opening of FECM's Carbon Management funding opportunity announcement will support the following areas of interest: Reactive Carbon Capture Approaches for Point-Source Capture or Atmospheric Capture with Integrated Conversion to Useful Products; Engineering-Scale Testing of Transformational Carbon Capture Technologies for Natural Gas Combined Cycle (NGCC) Power Plants; Engineering-Scale Testing of Transformational Carbon Capture Technologies in Portable Systems at Industrial Plants; Preliminary Front-End Engineering Design (Pre-FEED) Studies for Carbon Capture Systems at Existing (Retrofit) Domestic NGCC Power Plant; Pre-FEED Studies for Carbon Capture Systems at Hydrogen Production Facilities Using Coal, Mixed Coal/Biomass, or Natural Gas Feedstock; and Enhancing $CO_2$ Transport Infrastructure ($ECO_2$ Transport): Pre-FEED Studies for Multimodal $CO_2$ Transfer Facilities. ***The application deadline is October 14, 2024***.

From *energy.gov*. August 2024.

CONTINUE

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

### DOE Announces Funding to Advance $CO_2$ Capture, Transport and Storage across US

DOE/FECM announced the selection of nine university and industry-led projects to receive federal funding to advance commercial-scale carbon capture, transport, and storage throughout the United States. These regional partnership projects will accelerate the understanding of specific geologic basins to enable the permanent storage of $CO_2$ emissions from industrial operations and power plants, as well as from legacy emissions in the atmosphere. The partnerships will provide technical, informational, and educational assistance to interested parties involved in DOE and private sector-based carbon transport and storage projects located throughout the country, as well as to communities where those projects are located.

From *energy.gov.* August 2024.

### DOE Announces Principles to Guide Excellence and Accountability in Carbon Management

DOE/FECM announced the release of the final Responsible Carbon Management Initiative Principles under its Responsible Carbon Management Initiative (RCMI). With this announcement, DOE embarks on the pilot phase of the RCMI, which aims to encourage and recognize project developers and others in industry pursuing the highest levels of safety, environmental stewardship, accountability, community engagement, and societal benefits in carbon management projects. "Carbon management" encompasses the suite of technologies used to reduce emissions by capturing, transporting, converting, and storing $CO_2$, as well as removing it directly from the atmosphere.

From *energy.gov.* August 2024.

## ANNOUNCEMENTS

### NETL Online Tool Supports Development of Permits for Geologic Carbon Storage

NETL introduced a free online tool to accelerate the discovery of publicly available data when developing permit applications for the underground storage of $CO_2$. The ***Carbon Storage Site Mapping Inquiry Tool (MapIT)*** provides operators, project leads and researchers with user-friendly, web-based assistance to find, query and download relevant data to use in the development of Class VI permit applications. The MapIT database has been aggregated from publicly available data gathered by various state and federal agencies, such as the U.S. Geological Survey, the U.S. Environmental Protection Agency (EPA), DOE and state geological surveys.


From *energy.gov.* August 2024.

### DOE Awards Funding to CCS Hydrogen Hub

DOE's Office of Clean Energy Demonstrations (OCED) awarded the Appalachian Hydrogen Hub — also known as the ***Appalachian Regional Clean Hydrogen Hub*** ($ARCH_2$), led by Battelle — with federal funding to begin Phase 1 of the project plan. $ARCH_2$ is proposing locations across West Virginia, Ohio, and Pennsylvania and plans to leverage the region's ample access to low-cost natural gas to produce low-cost clean hydrogen and permanently store the associated carbon emissions.

From *OCED.* August 2024.

### How the U.S. Federal Government Invests in Carbon Management

Over the past two decades, the federal government has invested billions of dollars into more than a 1,000 carbon management projects across the country. These projects advance the research, development, and commercial-scale deployment of carbon management technologies and infrastructure and expand U.S. carbon management capabilities to reduce carbon emissions from industrial and power sectors.

From *energy.gov.* July 2024.

### NETL Chairing Carbon Transport and Storage Sessions at the 2024 AIChE Annual Meeting

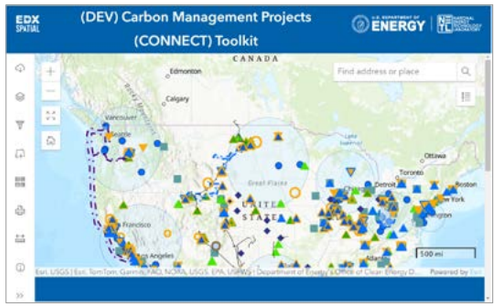
**NETL is chairing three sessions on carbon transport and storage at the 2024 American Institute of Chemical Engineers (AIChE) Annual Meeting (October 27–31, 2024, in San Diego, California). The sessions, titled "Engineering Geologic Carbon Dioxide Storage Systems I, II and III," will focus on CCS research and development (R&D) for permanent, efficient, and cost-effective storage of $CO_2$.**


### Save the Date: DOE's Demonstrate Deploy Decarbonize 2024

**DOE's Demonstrate Deploy Decarbonize 2024 (Deploy24) will take place in Washington, D.C., December 4–5, 2024. Hosted by DOE, Deploy24 is the second annual gathering of decision-makers from across the private and public sectors — including senior industry executives, capital allocators, community leaders, and others across the clean energy supply chain — all focused on accelerating the deployment of critical energy and decarbonization technologies and supply chains in the United States.**

# ANNOUNCEMENTS *(cont.)*

## FECM Launches Carbon Management Projects (CONNECT) Toolkit




The Carbon Management Projects (CONNECT) Toolkit is an online mapping tool and database that provides details about key federally funded carbon management projects, such as the funding status and amount, location, sources of $CO_2$ emissions, and many other project details. It also offers relevant information on other federal initiatives, regulatory permits, natural resource potential, existing infrastructure, point-source emissions, socio-demographic indicators, and protected lands.

From *energy.gov*. July 2024.

## MRCI Partners and Stakeholders Meeting

MRCI Midwest Regional Carbon Initiative

The DOE-funded Midwest Regional Carbon Initiative (MRCI) is hosting their 2024 Stakeholders and Partnership Meeting September 23–24, 2024, in Columbus, Ohio. MRCI will share the work they have been doing to accelerate carbon capture and storage (CCS) acceptance and deployment in its 20-state region of the United States.

## IRS Issues Guidance for Claiming Carbon Oxide Utilization Credit

The Internal Revenue Service (IRS) issued initial guidance on the credit for the storage of carbon oxide, which was amended by the Inflation Reduction Act of 2022 (IRA). The ***notice*** describes information that must be included in a written life cycle analysis report and provides the procedures that taxpayers must follow to submit the report, along with required supporting information, to the IRS and DOE for review.

From *IRS*. July 2024.

## NSF-Funded Center Established to Lead Geologic $CO_2$ Storage Innovation

SMART $CO_2$ Storage Modeling, Analytics & Risk Reduction Technologies ($CO_2$-SMART)

A team of researchers from the University of Southern California (USC) Viterbi School of Engineering and the Penn State College of Earth and Mineral Sciences received funding from the National Science Foundation (NSF) to establish a center for $CO_2$ Storage Modeling, Analytics, and Risk Reduction Technologies ($CO_2$-SMART). ***$CO_2$-SMART***, which will be dedicated to innovation in the geologic storage of $CO_2$ as a technology to enable industrial decarbonization at scale, will hold its formal kickoff meeting in fall 2024.

From *USC Viterbi*. July 2024.

## Global CCS Institute Releases Two Reports on CCS/CCUS



The Global CCS Institute released two reports on both CCS and carbon capture, utilization and storage (CCUS). "***The Status of CCUS in France: Present and Future Opportunities***" posits that France's plan to decarbonize its economy makes it a key player in the European CCUS space. "***State of the Art: CCS Technologies 2024***" showcases the latest carbon capture and storage technologies that are available on the market. Featured in the 2024 edition are over 120 state-of-the-art CCS offerings.

From *Global CCS Institute*. July 2024.

## Report Outlines Trends, Opportunities in CCUS Supply Chain


The Carbon Capture and Storage Association published a report that sets out key trends and opportunities in the CCUS supply chain across six areas: transparency, skills, jobs, United Kingdom (UK) content, technology, and wider economic benefits. The findings in the report were developed by engaging with nine CCS project developers over a six-month period to analyze the commitments and aspirations across 11 individual CCS projects that are deploying over the next few years.

From *Carbon Capture Journal*. August 2024.

## Report Reviews Major CCS Projects

A report from the Clean Air Task Force evaluated the performance of 13 CCS projects to better understand the technology's future impact on climate action. The findings from "***Carbon capture and storage: What can we learn from the project track record***" show that several large-scale projects have consistently met high levels of technical performance, providing a foundation for increased climate benefits at future projects.

From *Clean Air Task Force*. July 2024.

# PROJECT AND BUSINESS DEVELOPMENTS

## ExxonMobil, CF Industries Sign CCS Deal

Energy company ExxonMobil entered into a CCS agreement with ammonia producer CF Industries. Exxon will transport and store up to 500,000 metric tons per year of the $CO_2$ captured from CF Industries' complex in Yazoo City, Mississippi, which makes nitrogen products for agricultural fertilizer. The project will enable CF Industries to reduce the site's $CO_2$ emissions by up to approximately 50% and is expected to start in 2028, Exxon said in a statement.

From *Reuters*. July 2024.

## Companies to Evaluate Integration of CCUS

Methanol producer Methanex Corporation and CCS specialist Entropy will evaluate the integration of CCUS technology at Methanex's Medicine Hat site in Alberta, Canada. A pre-FEED study will look at the feasibility of leveraging Entropy's modular post-combustion carbon capture technology at the site. The aim is for the project to support both the storage and utilization of $CO_2$. The pre-FEED study will also evaluate the economic viability of the project, including access to pore space, carbon offtake agreements, municipal alignment, and funding from both provincial and federal carbon reduction programs.

From *Gasworld*. July 2024.

## French $CO_2$ Capture, Transport Project Moves to Pre-FEED Stage

France's main gas transmission operator, GRTgaz, and Elengy, the country's liquefied natural gas terminal operator, launched feasibility studies for their proposed Grand Ouest $CO_2$ ($GOCO_2$) project aiming to capture and transport industrial $CO_2$ emissions from French Pays de la Loire and Grand Ouest regions. The goal of $GOCO_2$, which was launched in July 2023 as part of the French government's CCUS strategy, is to develop an investment program to capture the $CO_2$ released by industrial sites for pipeline transport to the Saint-Nazaire maritime export terminal, where it will be stored in permanent geologic structures. The estimated capacity will be 2.6 million metric tons of $CO_2$ annually by 2030, which can be expanded up to 4 million metric tons per year by 2050.

From *Offshore-Energy*. July 2024.

## Partnership to Explore Feasibility of Liquid $CO_2$ Storage Facility

Energy company Uniper is turning to a partnership between Navigator Gas and Bumi Armada — known as Bluestreak $CO_2$ — as the next phase of a project to capture, recycle and store $CO_2$ released from one of the company's UK-based power plants. Under an agreement signed with Uniper for its natural gas-powered Isle of Grain power plant, Bluestreak $CO_2$ will explore the feasibility of implementing a jetty-moored floating liquid $CO_2$ storage facility that would support a fleet of liquid $CO_2$ shuttle tankers. The vessels would be capable of loading from the facility and delivering the stored $CO_2$ to either a floating carbon and storage unit or a unit that also has the capability to inject the $CO_2$ into offshore storage aquifers and or depleted oil and gas reservoirs.

From *Maritime-Executive*. July 2024.

## FEED Contract Awarded for US Gulf Coast Plant

The SLB and Aker Carbon Capture joint venture announced a contract award by its partner CO280 Solutions for the FEED of a large-scale carbon capture plant at a pulp and paper mill on the U.S. Gulf Coast. The project, which aims to remove 800,000 metric tons of carbon emissions annually, will also deliver permanent, verifiable and affordable carbon dioxide removal (CDR) credits.

From *Aker Carbon Capture*. August 2024.

## FEED Contract Awarded for CCS Project

TotalEnergies EP Nederland awarded Petrofac a FEED contract for a $CO_2$ injection platform as part of the Aramis CCS project in the Netherlands. The project involves the decommissioning of topsides and the installation of a new repurposed platform connecting to the Aramis $CO_2$ distribution network. The $CO_2$ will be stored in depleted offshore gas fields under the North Sea and will be based on an "open access" philosophy so that other industrial customers and storage fields can be added incrementally to the system.

From *Offshore Engineer*. August 2024.

## BP to Advance CCUS in Indonesia

BP signed a cooperation agreement with the Bandung Institute of Technology (ITB) to advance the R&D of CCUS in Indonesia. The agreement covers feasibility studies that aim to support the Tangguh CCUS project and the development of the Tangguh CCS hub and marks the implementation of the memorandum of understanding that the parties signed last October. In addition to the feasibility studies, the six-year agreement also details support for infrastructure for the ITB Centre of Excellence for CCS and CCUS.

From *Upstream Online*. August 2024.

# LEGISLATION AND POLICY

## SAFE CCS Act Signed Into Law in Illinois

The Safety and Aid for the Environment in Carbon Capture and Sequestration (SAFE CCS) Act was signed into law, establishing strict safety requirements and a temporary ban on $CO_2$ pipeline construction in Illinois. The law sets rigorous standards for CCS projects, mandating state permits that include comprehensive safety monitoring and require projects to achieve a net reduction in greenhouse gases (GHGs).

From *Mahomet Daily*. July 2024.

## CCUS Bill Signed Into Law in Alaska

Three energy bills were signed into law in Alaska, including a bill that creates a regulatory framework for the state to utilize its geologic resources for CCUS. By creating the regulatory framework necessary for operation, HB 50 will enable the state to attract investment in CCUS and authorizes the state to charge operators for the use of public lands for the geologic storage of $CO_2$.

From *Office of Governor Mike Dunleavy*. July 2024.

## Law Targets Impact of Carbon Credits on Forests

A bill signed into law in New Hampshire will address two concerns raised about forest carbon credit programs. House Bill 1697 requires the New Hampshire Department of Revenue Administration to undertake an immediate study on the impact of such carbon credits on timber tax revenues. The bill also calls on the New Hampshire Division of Forest and Lands to establish and maintain a public registry of all forest lands in the state that are enrolled in a carbon credit program.

From *The Berlin Daily Sun*. July 2024.

## European Commission Publishes Revised Guidance Documents to CCS Directive


The European Commission published ***revised guidance documents*** supporting the implementation of a directive on the geologic storage of $CO_2$. The updates aim to streamline permitting procedures and support sustainable $CO_2$ storage solutions in the European Economic Area. Key updates focus on novel $CO_2$ storage technologies in mafic/basalt rocks and depleted hydrocarbon reservoirs, CCS value chain aspects, corrosion and safety issues, and the regulatory transition from hydrocarbon production to $CO_2$ storage. The documents also provide additional guidance for member states in determining geologic areas suitable for $CO_2$ storage or exploration.

From *European Commission*. July 2024.

## Scottish Government to Fund CCS Project

The Scottish government announced funding to explore how a pipeline could transport $CO_2$ from Scotland's central belt to the northeast. The Acorn Carbon Transport and Storage Project — a joint venture with the Scottish Cluster — is working with industrial, power, hydrogen, bioenergy, and waste-to-energy businesses that wish to capture $CO_2$ emissions and transport them for geologic storage under the North Sea.

From *Aberdeen & Grampian Chamber of Commerce*. July 2024.

## Indonesian Government to Issue Ministerial Regulation on CCS Projects

The Indonesian Ministry of Energy and Mineral Resources announced it will issue a ministerial regulation on CCS and CCUS projects. The regulation will include operating permits, CCS/CCUS in the oil and gas sector, carbon definitions, storage capacity, measurement reporting and verification, cross-border $CO_2$ transport requirement, carbon value, guarantee fund, and operational safety. Indonesia currently has 15 CCS/CCUS projects under study or preparation.

From *Enerdata*. August 2024.

# EMISSIONS TRADING

## Carbon Trading in Indonesia Reaches $2.26 Million

According to government officials, Indonesia's carbon trading market reached a transaction value of $2.26 million from its launch in September 2023 to June 2024, amounting to 608,000 tons of $CO_2$ equivalent. For comparison, the global market for $CO_2$ permits reached almost $950 billion in 2023, marking a 2% increase from the previous year, according to analysts. The European Union's emissions trading system alone was worth approximately $830 billion, representing 87% of the global total; North American markets combined were valued at approximately $77 billion; and the Chinese market was worth approximately $2.5 billion. The Indonesian government has committed to reducing carbon emissions by nearly 32% independently and over 43% with international support.

From *Jakarta Globe*. July 2024.

# SCIENCE

## Study Demonstrates Verification and Quantification of Small-scale Carbon Mineralization

Researchers from Pacific Northwest National Laboratory (PNNL) developed a process that transforms $CO_2$ into solid rock, mimicking Earth's natural processes, but at a faster pace — from thousands of years to mere months. But since storing $CO_2$ in solid minerals (i.e., carbon mineralization) at a scale large enough to make an impact takes more than just the discovery alone, researchers are also attempting to measure, verify, and communicate that the $CO_2$ stored underground is mineralized and won't escape. Recent research ***published in the journal Analytical Chemistry*** counts carbon mineral molecules at a scale of less than 100 parts per million, allowing researchers to see how much carbon is actually being stored.

From *PNNL News*. July 2024.

## Research Aims to Quantify Carbon Storage in Grasslands

A research project in North Dakota is studying carbon storage in pastures with results that could help ranchers benefit from carbon storage credits. The project is being conducted on a ranch in central North Dakota to try to quantify just how much carbon can be stored in the root systems of grasses on a cattle ranch. The project, in the second year of a two-year study, has found that in pastures that have been grazed by cattle, the grasses store more carbon than if they had been left ungrazed.

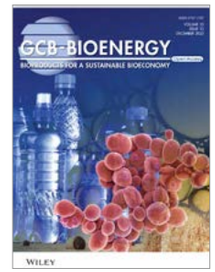
From *Carbon Herald*. July 2024.

## Catalyst Converts Captured $CO_2$ into Valuable Products

Researchers at the University of Toronto's Faculty of Applied Science & Engineering designed a catalyst that can efficiently convert captured carbon into valuable products, even in the presence of contaminants that degrade the performance of current versions. The discovery, described in a paper ***published in Nature Energy***, is believed to be a step toward more economically viable techniques for CCS that could be added to existing industrial processes.

From *University of Toronto*. July 2024.

## Researchers Study Biochar's $CO_2$ Storage Potential in Bhutan




A recent study revealed Bhutan has the potential to store 68% of its GHG emissions by converting crop residues into biochar — a carbon-rich, lightweight, black material that looks like charcoal and is used in soil to help crops grow. It has potential for mitigating climate change because the carbon in biochar can remain in the soil for a long time, rather than being released into the atmosphere as $CO_2$. The research was published in ***GCB Bioenergy***.

From *Mongabay*. July 2024.

## Study Finds Southern Ocean Absorbing More $CO_2$ Than Previously Thought


Research led by the University of East Anglia and Plymouth Marine Laboratory found that the Southern Ocean absorbs more $CO_2$ than previously thought. Using direct measurements of $CO_2$ exchange, or fluxes, between the air and sea, the scientists found that the ocean around Antarctica absorbs 25% more $CO_2$ than previous indirect estimates based on shipboard data have suggested. The results — ***published in Science Advances*** — show the summer Southern Ocean is likely to be a strong $CO_2$ sink, challenging the much weaker estimates based on float data and model simulations.

From *ScienceDaily*. July 2024.

## Study Finds Forests Consistently Absorb $CO_2$


Despite facing regional threats like deforestation and wildfires, a study found that the world's forests have consistently absorbed $CO_2$ for the past three decades, even as disruptions chip away at their capacity. The study, based on long-term ground measurements combined with remote sensing data, found that forests take up an average of 3.5 ± 0.4 billion metric tons of carbon per year. The study was ***published in the journal Nature***.

From *Science Daily*. July 2024.

## 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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