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. 8

## 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

### 2024 FECM/NETL Carbon Management Research Project Review Meeting

Some of the nation's top scientists and engineers will gather in Pittsburgh, Pennsylvania, beginning August 5, 2024, for the 2024 Office of Fossil Energy and Carbon Management (FECM)/National Energy Technology Laboratory (NETL) Carbon Management Research Project Review Meeting to discuss climate change mitigation research and share updates on their efforts to advance innovative solutions for a sustainable energy future. Results from more than 150 research projects sponsored by the U.S. Department of Energy's (DOE) FECM will be discussed during the five-day meeting, with all sessions open to the public. Presenters from research universities, government laboratories and agencies, electric utilities, research organizations, and industry will share their findings from projects advancing a broad range of carbon management initiatives, including the safe storage of greenhouse gas (GHG) in the subsurface; conversion of carbon dioxide ($CO_2$) into value-added products; and the development of novel materials to capture $CO_2$ from power plants, difficult-to-decarbonize industries, and ambient air. The meeting provides attendees a chance to share in the knowledge and insights gained by more than 150 DOE-sponsored research and development (R&D) projects from the following programs: ***Point-Source Carbon Capture (PSCC)***, ***Carbon Dioxide Removal (CDR)***, ***Carbon Conversion***, and ***Carbon Transport and Storage***. Following the meeting, presentations will be made available on the ***NETL Conference Proceedings*** page.

From *NETL*. July 2024.

CONTINUE

# ANNOUNCEMENTS

## OCED Awards CCS Project


DOE's Office of Clean Energy Demonstrations (OCED) awarded the ***Baytown Carbon Capture and Storage Project***, led by Calpine Texas CCUS Holdings, with $12.5 million (of the total federal cost share of up to $270 million) to begin activities in Phase I. During Phase I, Calpine will complete an integrated front-end engineering design (FEED) study to determine the specifications for $CO_2$ capture, transport, and storage components.

From *OCED*. July 2024.

## NETL Review Article Among Most Read

NETL's work in developing carbon mineralization technologies, which presents an alternative pathway toward a decarbonized power sector and economy, is gaining widespread recognition from the greater research community. According to Wiley, publisher of ChemBioEng Reviews, NETL's review article "***Mineralization of Carbon Dioxide: Literature Review***" is among the most read articles (top 40 most read, recently and all-time) and the most cited articles (top 30 most cited, recently and all-time) from that journal.

From *NETL*. July 2024.

## MRCI Partners and Stakeholders Meeting

MRCI Midwest Regional Carbon Initiative

The DOE-funded Midwest Regional Carbon Initiative (MRCI) will be 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.

From *MRCI*. May 2024.

## U.S. Site Review Tool Released

The U.S. Interagency Working Group on Coal and Power Plant Communities and Economic Revitalization (***Energy Communities IWG***), of which DOE is a member agency, released a new Site Review Tool as a resource for manufacturers and investors interested in developing or expanding clean energy manufacturing projects in energy communities and nationwide, including those interested in developing commercial-scale storage facilities, PSCC projects, direct air capture (DAC) hubs, hydrogen production hubs with CCS, carbon utilization, and $CO_2$ transport. The interactive map provides access to publicly available information on facilities, nearby infrastructure, and community attributes.

From *Energy Communities IWG*. July 2024.

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


**NETL is chairing a session 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 session, titled "Engineering Geologic Carbon Dioxide Storage Systems," will focus on CCS 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.**

## TGS Grants Early Access to CCS Data

Energy data company TGS announced early access to a comprehensive carbon storage assessment dataset along the Texas and Louisiana Gulf Coast. This evaluation will help prospective bidders maximize their bid accuracy, optimize project costs, and drive sustainable growth in the CCS sector.

From *TGS Press Release*. July 2024.

## Report Forecasts CCUS Capture Capacity

According to a report, carbon capture, utilization, and storage (CCUS) capture capacity is projected to reach 2.5 gigatonnes per year by 2045. The IDTechEx report, "***Carbon Capture, Utilization, and Storage (CCUS) Markets 2025-2045: Technologies, Market Forecasts, and Players***," includes a CCUS market outlook; 20-year granular forecasts; company profiles; and benchmarking of PSCC, DAC, $CO_2$ transport and storage, $CO_2$ utilization cases, and carbon removals.

From *IDTechEx*. July 2024.

# ANNOUNCEMENTS *(cont.)*

## Survey to Explore Potential CCS at EemsEnergyTerminal

In partnership with the Netherlands' Ministry of Economic Affairs and Climate Policy, Gasunie — a Dutch natural gas infrastructure and transportation company — and Vopak — a Dutch independent infrastructure provider — are exploring options to keep operating the EemsEnergyTerminal for longer than initially planned at the port of Eemshaven (Groningen Netherlands). The survey will explore ways to bring about a future, rapid transition to a sustainable energy system — one where hydrogen and CCS play key roles.

From *EemsEnergyTerminal News*. June 2024.

## Report on CCUS 10-Year Market Forecast

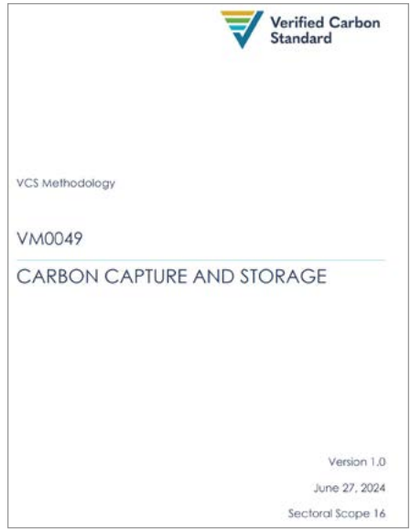
According to a report from Wood Mackenzie, by 2034, global carbon capture capacity is projected to reach 440 million metric tons per year and storage capacity is projected to reach 664 million metric tons per year, providing an almost $200 billion investment opportunity. The ***CCUS: 10-year market forecast*** also estimates that nearly half of the investment globally is associated with $CO_2$ capture, with the remaining $53 billion from transport and $43 billion from storage. Approximately 70% of the investment will be in North America and Europe across the value chain.

From *Carbon Capture Journal*. June 2024.


## CCS Methodology Released

Verra — a nonprofit that develops and manages standards for sustainable development, climate action, and responsible business practices — released a globally applicable framework for technology-based CCS activities that generate CDRs and emissions reductions. ***Verified Carbon Standard (VCS) Methodology VM0049 Carbon Capture and Storage*** outlines the overarching requirements for CCS projects; projects will select from a set of modules for different $CO_2$ capture, transport, and storage activities to quantify the CDRs and emissions reductions they generate. These modules can be combined to suit a project's specific design or its technological needs. This modular format is adaptive to project expansions, the development of shared infrastructure, and future innovations.

From *Verra News Release*. June 2024.




# PROJECT AND BUSINESS DEVELOPMENTS

## Alberta Cleantech Firm Announces Second CCS Project

A Calgary, Alberta-based cleantech firm ***announced*** a final investment decision (FID) to proceed with its second CCS project. The Entropy Inc. project will capture emissions from parent company Advantage Energy's Glacier Gas Plant in northwest Alberta. The facility is expected to be operational by the second quarter of 2026 and will be able to capture 160,000 metric tons of $CO_2$ per year.

From *Calgary Herald*. July 2024.

## Shell to Build CCS Projects in Canada

Shell Canada announced an FID to proceed with the Atlas Carbon Storage Hub. The first phase of Atlas will provide underground storage for $CO_2$ captured by the Polaris project — a carbon capture project in Alberta, Canada, designed to capture approximately 650,000 metric tons of $CO_2$ annually from the Shell-owned Scotford refinery and chemicals complex. The $CO_2$ emissions captured by Polaris will be sent to two storage wells at the Atlas Hub via pipeline, where it will be stored underground in the Basal Cambrian Sands.

From *Carbon Capture Journal*. June 2024.

## Indonesia to Implement CCS/CCUS Projects

Indonesia is transforming its energy sector with the potential implementation of 15 CCS and CCUS projects planned to be operational by 2030, according to the Indonesia Ministry of Energy and Mineral Resources. The country boasts a vast potential for carbon storage resources, and the government is focusing on two specific basins — the Sunda Asri basins and Bintuni basins — to be utilized as CCS hubs in East Asia and Australia. To assist in the advancement of these decarbonization technologies, the government has initiated a range of measures that include setting up a CCS/CCUS National Center of Excellence in collaboration with research organizations and academic institutions, enhancing global partnerships within the CCS/CCUS industry, and creating additional regulations and policies.

From *Carbon Herald*. July 2024.

## EnEarth Applies for $CO_2$ Storage License

EnEarth, part of the Energean Group, formally submitted an application to the Hellenic Hydrocarbons and Energy Resources Management Company for a $CO_2$ storage license at Prinos, Kavala, NE Greece. As detailed in the application submitted for approval, the storage capacity of the first phase of the project will be up to 1 million metric tons of $CO_2$ per year. Once fully developed, the project's storage capacity could reach 3 million metric tons of $CO_2$ per year.

From *Carbon Capture Journal*. July 2024.

# PROJECT AND BUSINESS DEVELOPMENTS *(cont.)*

## Companies to Collaborate on Offshore Power Generation Concept with CCS

SBM Offshore — an Oil industry company — and Ocean-Power — an energy solutions development company — signed a memorandum of understanding with the intent to collaborate on a floating power generation hub with CCS. The partnership aims to assess the technical feasibility and commercial readiness to collaborate on the concept, exclusive to the Norwegian Continental Shelf and United Kingdom Continental Shelf.

From *SBM Offshore News Release*. July 2024.

## Investments in Canadian CCS Projects

The Canadian Growth Fund has agreed to shoulder half of the capital for planned CCS projects by oil-sands producer Strathcona Resources Ltd. The CCS projects would be built on Strathcona's steam-assisted gravity drainage oil-sands facilities in the provinces of Alberta and Saskatchewan. Calgary, Alberta-based Strathcona expects the projects to capture up to two million metric tons of $CO_2$ a year. Strathcona expects the first project to be in Saskatchewan, where the provincial government awarded it subsurface $CO_2$ storage rights earlier this year.

From *Rigzone*. July 2024.

# LEGISLATION AND POLICY

## Bipartisan Legislation Could Lead to Carbon Import Tax

Bipartisan U.S. lawmakers introduced legislation calling for a federal study of carbon intensity for common domestic imports. The ***Providing Reliable, Objective, Verifiable Emissions Intensity and Transparency (PROVE IT) Act*** could help advance a carbon import tax. The Senate version of the legislation, which was introduced June 2023 and passed the Environmental and Public Works Committee in January 2024, would authorize DOE to publish a comparative study between the carbon emissions of products produced in the United States versus their foreign import counterparts.

Senator Chris Coons (D-DE) | Senator Kevin Cramer (R-ND)
PROVE IT Act
Providing Reliable, Objective, Verifiable Emissions Intensity & Transparency

From *The Hill*. July 2024.

## Pennsylvania Passes CCS Bill

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

A CCS bill was signed into law in Pennsylvania that aims to bolster the commonwealth's efforts to decarbonize power and industrial sectors while ensuring safe, permanent storage of $CO_2$. ***Senate Bill 831*** enhances landowner rights and empowers the Pennsylvania Department of Environmental Protection to require additional analysis for permitting decisions that may affect environmental justice communities. It also mandates seismic activity monitoring to ensure the safe and permanent geologic storage of $CO_2$ and addresses long-term liability concerns by setting a default 50-year period for monitoring and accountability.

From *Clean Air Task Force*. July 2024.

## Austria Unveils National Strategy for Managing Carbon Emissions

Austria unveiled its national strategy for managing carbon emissions, focusing on three key technologies: CCS, carbon capture and utilization (CCU), and CDR. The ***plan*** unfolds in two phases: the first, currently underway, assesses Austria's current carbon management situation and outlines steps to regulate the reduction of emissions through these technologies; the second phase will focus on putting these plans into action.

Federal Ministry
Republic of Austria
Climate Action, Environment, Energy, Mobility, Innovation and Technology

From *Carbon Herald*. July 2024.

## European Commission Approves Swedish Scheme to Support Reduction of Biogenic $CO_2$ Emissions via CCS

The European Commission ***approved*** a Swedish scheme to support the capture, transport, and storage of biogenic $CO_2$ and contribute to Sweden's efforts to reduce its emissions and achieve its climate objectives. Running until December 2028, the Swedish scheme will be rolled-out via 15-year contracts under a competitive bidding process. The first auction is expected to open in 2024. Aid will be awarded to companies emitting biogenic $CO_2$ in Sweden and implementing projects with a potential capacity to capture and store 50,0000 metric tons of biogenic $CO_2$ per year.

European Commission

From *Global CCS Institute*. July 2024.

## Danish Energy Agency Opens Public Consultation on CCS Fund

Danish Energy Agency

The Danish Energy Agency published public consultation material in connection with the launch of the CCS Fund, which is intended to cover costs for the capture, transport, and geologic storage of fossil, biogenic, or atmospheric $CO_2$. The ***consultation*** will run until August 20, 2024, and the Danish Energy Agency expects to publish the tender material in October 2024 and award contracts in April 2026 following a prequalification and negotiation round.

From *Carbon Capture Journal*. June 2024.

## German Government Adopts Draft Law to Amend Carbon Dioxide Storage Act

The German Federal Cabinet adopted a draft law to amend the Carbon Dioxide Storage Act and key points of a carbon management strategy. The draft law is based on a draft bill from February 2024, which has been partially refined. In future, the law will be known as the Act on the Permanent Storage and Transportation of Carbon Dioxide. The aim of the amendment is to promote the decarbonization of German industry and Germany's competitiveness, create a secure legal framework for the onshore and offshore storage of $CO_2$, and promote the construction and operation of privately owned $CO_2$ pipelines for the transport of $CO_2$.

From *Lexology*. June 2024.

# EMISSIONS TRADING

## Study: Emissions Trading Good for Health

The European Union Emissions Trading System (EU ETS) has considerable health benefits and saves billions in costs, according to a study by the Cluster of Excellence "Climate, Climatic Change and Society" at the University of Hamburg. The study also analyzed the indirect effects of the EU ETS on hazardous air pollutants such as sulfur oxide, particulate matter, and nitrogen oxides.

From *Hamburg News*. July 2024.

## RGGI Report Tracks Proceeds Investment

The states participating in the Regional Greenhouse Gas Initiative (RGGI) released a report tracking the investment of proceeds generated from RGGI's regional $CO_2$ allowance auctions. The ***report*** tracks investments of RGGI proceeds in 2022, providing state-specific success stories and program highlights. In 2022, $364 million in RGGI proceeds were invested in programs including energy efficiency, clean and renewable energy, beneficial electrification, GHG abatement, and direct bill assistance.

From *RGGI*. July 2024.

## RGGI Release Materials for Quarterly $CO_2$ Allowance Auction

The RGGI states released materials for their 65th quarterly $CO_2$ allowance auction, to be held September 4, 2024. As indicated in ***the Auction Notice for $CO_2$ Allowance Auction 65***, a total of 15,943,608 $CO_2$ allowances will be offered for sale at a minimum reserve price of $2.56. Auction 65 includes an emissions containment reserve (ECR) of 7,807,029 allowances, from which allowances can be withheld if the interim clearing price is less than the ECR trigger price of $7.35.

From *RGGI*. July 2024.

# SCIENCE

## Researchers Develop Fast Carbon Storage Technology


Researchers at the University of Texas at Austin developed a method for creating $CO_2$ hydrates — substances that trap $CO_2$ like ice — at an unprecedented speed, eliminating the need for harmful chemicals. The researchers achieved a sixfold increase in hydrate formation speed compared to existing methods. The research was published in ***ACS Sustainable Chemistry & Engineering***.

From *Carbon Herald*. July 2024.

## *Researchers Study Ocean's Role in Storing $CO_2$*

Massachusetts Institute of Technology researchers conducted a study of the ocean's ability to store $CO_2$ in the face of weakening ocean circulation. The results, published in ***Nature Communications***, found that the expected benefits of the ocean's carbon storage ability may not only be reduced but reversed, indicating an increase in atmospheric $CO_2$ concentrations with slowed ocean turnover.

From *Hoodline*. July 2024.

## Process Stores $CO_2$ in Concrete Without Strength Loss

By using a carbonated — rather than a still — water-based solution during the concrete manufacturing process, a Northwestern University-led team of engineers discovered a way to store $CO_2$ in the ubiquitous construction material without compromising its strength or durability. In laboratory experiments, the process achieved a $CO_2$ storage efficiency of up to 45%, meaning that nearly half of the $CO_2$ injected during concrete manufacturing was captured and stored. Their work was published in ***Communications Materials***.

From *Northwestern University*. June 2024.

## Simulators to Predict Fate of $CO_2$ Underground

Chemistry researchers are expanding the ***GEOS carbon storage simulator***, enabling it to predict what happens when $CO_2$ is injected and stored in subsurface formations. GEOS is an open-source tool originally developed by Lawrence Livermore National Laboratory, Stanford University, and TotalEnergies. A group of researchers from the Technical University of Denmark are expanding it to include, among other things, their expert knowledge on geochemical reactions. The researchers' work is part of the ***INNO-CCUS*** partnership.

From *Carbon Capture Journal*. July 2024.

## Research Unveils Carbon Storage Power of Planted Mangroves

Research published by ecologists from the U.S. Forest Service and their partners revealed that planted mangroves can store up to 70% of the carbon stock found in intact mangrove stands after just 20 years. The research, derived from logistic models built from 40 years of data and nearly 700 planted mangrove stands worldwide, could impact global mangrove restoration efforts, as over the past five decades, 35% of the global mangrove area has been lost due to historical factors, human-driven land use changes, extreme weather events, and erosion.

From *The Express Tribune*. July 2024.

## Enhanced Method for Seismic Monitoring of $CO_2$ Storage

Los Alamos National Laboratory research claims that a new rock physics model provides more comprehensive and actionable data about how $CO_2$ changes rock properties throughout geologic storage sites. The new rock physics model is expected to help improve the underground $CO_2$ storage system and reduce the amount of $CO_2$ that is able to escape into the atmosphere. The paper was published in ***Nature, Communications Earth & Environment***.

From *Carbon Capture Journal*. 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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