



U.S. DEPARTMENT OF  
**ENERGY**



NATIONAL  
ENERGY  
TECHNOLOGY  
LABORATORY

# CTSN CARBON TRANSPORT and STORAGE NEWSLETTER

**VOL. 24, NO. 2**

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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 Funding for Carbon Capture, Transport, and Storage

The U.S. Department of Energy's (DOE) Office of Fossil Energy and Carbon Management (FECM) announced federal funding for nine projects that will advance carbon dioxide (CO<sub>2</sub>) capture technologies and help establish the foundation for a successful carbon transport and storage industry in the United States. Some projects selected under this funding opportunity announcement (FOA) will focus on developing lower-cost, highly efficient technologies that will capture CO<sub>2</sub> from power and industrial facilities for geologic carbon storage or conversion into long-lasting products. This will include carbon capture in the cement, steel, and glass industries, as well as natural gas power plants. Others will focus on accelerating the deployment of multi-modal transport of CO<sub>2</sub> through the creation of transportation hubs. DOE's National Energy Technology Laboratory (NETL) will manage the ***selected projects***.

From *energy.gov*. December 2023.

## ANNOUNCEMENTS

## DOE Announces Funding for CDR Technology

DOE-FECM announced the semifinalists for the development phase of the Direct Air Capture (DAC) Pre-Commercial Prize. The seven semifinalists will receive cash awards and technical assistance for technology solutions that reduce CO<sub>2</sub> emissions by removing them directly from the atmosphere.

From [energy.gov](https://www.energy.gov). December 2023.



## DOE to Fund Projects that Transform Carbon Emissions into Valuable Products

DOE-FECM **issued a Notice of Intent (NOI)** to provide funding for the large-scale conversion of carbon emissions into environmentally responsible and economically valuable products. This effort supports the Biden administration's climate goal of achieving net-zero emissions by 2050, as well as the goals of DOE's Clean Fuels and Products Energy Earthshot, which aims to meet projected 2050 net-zero emissions demands for 100% of aviation fuel; 50% of maritime, rail, and off-road fuel; and 50% of carbon-based chemicals by using sustainable carbon resources.

From [energy.gov](https://www.energy.gov). December 2023.

## CBO Report on CCS in the U.S.



A report by the Congressional Budget Office (CBO) examined the status, federal support, and future potential of carbon capture and storage (CCS) in the United States. According to [the CBO report](#), there are 15 CCS facilities currently operating in the United States, with an additional 121 under construction or in development. The report also states that annual appropriations for CCS research and related programs totaled \$5.3 billion (in nominal dollars) over the 2011–2023 period.

From [CBO](https://www.cbo.gov). December 2023.

## Environmental Review of California CCS Project Released

The Kern County Planning and Natural Resources Department released a **draft environmental impact report** for a CCS project in California that plans to store CO<sub>2</sub> underground at the Elk Hills Oil Field. The release of the draft started the clock on a public review that included four joint workshops with the U.S. Environmental Protection Agency (EPA). (See [Project and Business Developments](#) for more information on this project.)

From [Bakersfied.com](https://www.bakersfied.com). December 2023.

DOE Re-Opens Funding Opportunity to Expand National CO<sub>2</sub> Storage Infrastructure

DOE-FECM announced the third opening of a five-year **funding opportunity** available through President Biden's **Investing in America agenda** to support the transport and storage of CO<sub>2</sub> captured from industrial and power generation facilities, as well as from legacy CO<sub>2</sub> emissions removed directly from the atmosphere. Projects selected under the Bipartisan Infrastructure Law's (BIL) Storage Validation and Testing Program will develop new and expanded carbon storage projects through FECM's **Carbon Storage Assurance Facility Enterprise (CarbonSAFE) Initiative**, each with the capacity to store 50 or more million metric tons of CO<sub>2</sub> over a 30-year period. Multiple openings of this FOA allow for the continuous development of commercial-scale carbon storage infrastructure, with projects focusing on feasibility determination, detailed site characterization, planning, permitting, and construction stages of project development.

From [energy.gov](https://www.energy.gov). December 2023.



## PROJECT AND BUSINESS DEVELOPMENTS

### Wyoming Grants Three Carbon Storage Permits

The Wyoming Department of Environmental Quality (DEQ) issued three Class VI permits to construct wells for underground CO<sub>2</sub> storage to Frontier Carbon Solutions. The Wyoming Legislature worked with DEQ to develop a program granting the state primacy to review and approve Class VI permits through EPA's Underground Injection Control Program. Frontier Carbon Solutions was awarded the **permits to construct three wells** west of Green River, Wyoming, which are part of the **Sweetwater Carbon Storage Hub**.

From *Wyoming DEQ*. December 2023.



### EPA Releases Draft Class VI Permits for CO<sub>2</sub> Injection and Storage in California



EPA released draft Class VI permits for underground CO<sub>2</sub> injection and storage in **Carbon TerraVault's (CTV)** 26-R reservoir located within the CTV I CCS

vault at the Elk Hills Oil Field in Kern County, California. These are California's first draft permits for underground CO<sub>2</sub> storage wells as well as the first draft permits utilizing a depleted oil and natural gas field in the United States. The 26-R reservoir has an expected CO<sub>2</sub> injection rate of 1.46 million metric tons per year and a total estimated capacity of up to 38 million metric tons. CTV I has a total estimated storage capacity of up to 46 million metric tons. The draft EPA permits **are available for public review**.

From *California Resources Corporation*. December 2023.

### Companies Sign MOU to Explore CCS

PTT Global Chemical Public Company Limited (GC) signed a memorandum of understanding (MOU) with Mitsubishi Heavy Industries Asia Pacific to jointly study the technologies required to develop a large-scale petrochemical complex. The collaboration will involve the study of solutions that use low-carbon fuels such as hydrogen and ammonia, as well as CCS technologies. The four-year MOU includes two main objectives: to (1) compare the feasibility of using hydrogen and ammonia as fuels for gas turbines as well as CCS technologies to reduce CO<sub>2</sub> emissions from power generators, and (2) assess how CCS technologies can best be applied and optimized for the steam-methane reforming process.

From *PR Newswire*. December 2023.



### CCS Value Chain Between Japan and Australia to be Explored

Australia-based Woodside Energy signed a non-binding MOU with four Japanese companies to explore the potential of a CCS value chain between Japan and Australia. Woodside, Sumitomo Corporation, JFE Steel Corporation, Sumitomo Osaka Cement Co. Ltd, and Kawasaki Kisen Kaisha Ltd aim to study the capture, storage, and transportation of CO<sub>2</sub> emissions from the Setouchi and Shikoku regions of Japan and the injection and storage of the CO<sub>2</sub> at Australian storage sites.

From *Gas World*. December 2023.

### Large-Scale CCS Project Reaches FEED Stage

A feasibility study for a large-scale Dutch CO<sub>2</sub> storage project was completed, and it has progressed to the front-end engineering design (FEED) phase. As part of the **Aramis** CO<sub>2</sub> transport and storage initiative in the Dutch part of the North Sea, the L10CCS project will store up to 5 million metric tons of CO<sub>2</sub> annually in depleted gas fields. The FEED phase is expected to be completed in the second half of 2024, with a project Final Investment Decision anticipated in 2025. The timeline of the L10CCS project is fully aligned with the Aramis project timeline and is planned to be connected and operational as of Day 1 of the opening of the CO<sub>2</sub> transport system, now planned for 2028.

From *Carbon Capture Journal*. December 2023.

### ExxonMobil, FuelCell Energy to Build CCS Pilot Plant

ExxonMobil Corp. announced plans to build a pilot plant to test a CCS technology developed by FuelCell Energy Inc. The technology, according to



FuelCell Energy, can decrease CO<sub>2</sub> output while also producing heat and electricity. ExxonMobil affiliate Esso Nederland BV (Breda, Netherlands) plans to build the pilot plant at its Rotterdam Manufacturing Complex—an integrated refining and petrochemical site. The pilot plant will receive funding from the Innovation Fund of the European Climate Infrastructure and Environment Executive Agency.

From *Waste Today Magazine*. December 2023.

### Companies Sign LOI to Build Carbon Storage Tanks

Value Carbon and Evos signed a Letter of Intent (LOI) to construct two storage tanks with an adjacent CO<sub>2</sub> facility for the purification, liquefaction, and storage of CO<sub>2</sub>, complete with the necessary infrastructure to facilitate the loading and discharging of trucks and barges to harness growth potential. The Evos terminal in Rotterdam is proximal to the Rotterdam Shortsea Terminal in the Eemhaven and deep-sea terminals at the Maasvlakte—strategically positioned next to CO<sub>2</sub> infrastructure, with ready access to essential steam and electricity supplies. The project is planned for completion in the first half of 2026.

From *Value Carbon Press Release*. December 2023.



## PROJECT AND BUSINESS DEVELOPMENTS (cont.)



## CCS Plant Planned in Sweden

A Swedish energy company signed an LOI with the city of Helsingborg to establish a CCS plant with a plan to go net zero. Öresundskraft plans to establish a CCS facility at the Filborna district heating plant, slated to be operational by 2027. The CCS technology at Filborna will enable the efficient capture and geologic storage of both fossil and biogenic CO<sub>2</sub>.

From *Carbon Capture Journal*. December 2023.

## Trial to Help Better Understand CCUS Launched

NSG Group's Pilkington U.K., a supplier of architectural glass, announced it has successfully launched a carbon capture trial at its St. Helens, U.K., site. The trial is part of C-Capture's national project, XLR8 CCS—Accelerating the Deployment of a Low-Cost Carbon Capture Solution for Hard-to-Abate Industries. According to officials, the project aims to prove the ability of C-Capture's carbon capture technology to remove CO<sub>2</sub> from the flue gas emissions of industrial sources in three industries that are difficult to decarbonize but committed to reducing carbon levels (cement, energy, and waste industries). The funding is part of the Carbon Capture, Utilization, and Storage (CCUS) Innovation 2.0 Program aimed at accelerating the deployment of next-generation CCUS technology in the U.K.

From *U.S. Glass Magazine*. December 2023.

## LEGISLATION AND POLICY

EPA Grants Louisiana Authority Over CO<sub>2</sub> Injection and Storage

State primacy was formally granted by the EPA to Louisiana in the permitting and regulation of wells and projects involving the underground storage of CO<sub>2</sub>. Permitting of such wells and operations (i.e., Class VI permits) is generally directly regulated by EPA; however, EPA can grant primary regulatory authority to individual states that develop a regulatory framework that matches or exceeds EPA's Class VI standards, as is now the case in Louisiana's Office of Conservation.

From *State of Louisiana Department of Energy and Natural Resources*. December 2023.

Ontario Government Opening Land for CO<sub>2</sub> Storage Demonstrations

The Ontario government is enabling industries to begin testing and demonstrating small-scale underground carbon storage projects on private land. The government said it is taking a measured and phased approach to enabling and regulating geologic carbon storage to provide clarity for businesses to plan and invest in Ontario while ensuring safe and responsible development. This will include looking at other Canadian jurisdictions where carbon storage projects already exist and exploring options to access underground space that is used for carbon storage. Work on a framework to enable the development of large commercial projects is underway.

From *Carbon Capture Journal*. December 2023.



## Alberta Program Designed to Encourage CCUS Projects

The Government of Alberta introduced the [\*Alberta Carbon Capture Incentive Program\*](#) (ACCI) to incentivize the development and implementation of carbon capture technologies. The ACCI is designed to encourage CCUS projects in the province and aligns with Alberta's commitment to achieving emissions reduction targets outlined in [\*Alberta's Climate Leadership Plan\*](#).

From *Mondaq*. December 2023.



## Thailand Draft's Amendment to Regulate Carbon Storage

The Department of Mineral Fuels in Thailand has been developing a legal framework to accommodate CCS-related activities that aims to introduce the concept of "carbon business" as a regulated activity. The Draft Petroleum Act defines "carbon business" as "an exploration for a carbon storage site or a storage of carbon in a carbon storage site."

From *Baker McKenzie*. December 2023.

## EMISSIONS TRADING



## RGGI Auction Results Announced

The Regional Greenhouse Gas Initiative (RGGI)-participating states announced the results of the 62nd RGGI auction of CO<sub>2</sub> allowances. A total of 27,656,000 CO<sub>2</sub> allowances were sold at a clearing price of \$14.88 (bids ranged from \$2.50 to \$20.00 per allowance). The auction generated \$411.5 million for states to reinvest in strategic programs, including energy efficiency, renewable energy, direct bill assistance, and greenhouse gas (GHG) abatement programs. Additional details are available in the [Market Monitor Report for Auction 62](#).

From *RGGI*. December 2023.

## Maritime a Part of EU ETS

The European Union Emissions Trading System (EU ETS) came into effect for the maritime transportation sector on January 1, 2024. The system will cover 50% of CO<sub>2</sub> emissions from voyages starting or ending in an EU port and 100% of emissions from voyages between two EU ports and when ships are within EU ports.

From *JD Supra*. December 2023.



## Government of India Introduces Amendments to Carbon Credit Trading Scheme

The Government of India introduced amendments to its Carbon Credit Trading Scheme. The key changes focus on an “offset mechanism,” allowing non-obligated entities to register projects for tracking and certifying reductions or avoidance of GHG emissions. The amendments also include adjustments to the Principal Scheme, specifying that non-obligated entities can either generate or validate projects. Moreover, the compliance mechanism now involves giving a target for emissions reduction. The offset mechanism aims to facilitate the accounting of GHG emissions reduction, removal, or avoidance.

From *Solar Quarter*. December 2023.

## Sylvera, Singapore Collaborate on Carbon Credits

Sylvera—a carbon data provider—is collaborating with the Singapore government to facilitate high-quality carbon credits for meeting Paris Agreement commitments. Based in London, Sylvera builds software that independently assesses carbon projects aimed at capturing, removing, or preventing emissions. The collaboration aims to swiftly allocate climate finance to areas making tangible climate impacts and use these credits in alignment with Singapore’s Paris Agreement objectives.

From *CarbonCredits.com*. January 2024.

## SCIENCE

Novel Catalyst for CO<sub>2</sub> Conversion

A team of researchers explored the conversion of CO<sub>2</sub> using electrocatalysis. In the process, a voltage source supplies electrical energy, which is fed to the reaction system via electrodes and drives the chemical conversions at the electrodes. The researchers showed that their system could efficiently convert CO<sub>2</sub>—it generated current densities of more than 300 milliamperes per square centimeter. The researchers—led by Ruhr University Bochum and the Fraunhofer Institute for Environmental, Safety, and Energy Technology UMSICHT in Oberhausen—outlined their findings in the journal [Cell Reports Physical Science](#).

From *Science Daily*. December 2023.

Ocean’s CO<sub>2</sub> Storing Capacity Studied

According to a study published in the journal [Nature](#) (subscription may be required), the ocean’s capacity to store atmospheric CO<sub>2</sub> is approximately 20% greater than current estimates. The scientists looked at the role played by plankton in the natural transport of carbon from surface waters down to the seabed. By analyzing a bank of data collected from around the world by oceanographic vessels since the 1970s, scientists were able to digitally map fluxes of organic matter throughout the world’s oceans. The resulting new estimate of carbon storage capacity is 15 gigatonnes per year, an increase of around 20% compared with previous studies (11 gigatonnes per year) published by the Intergovernmental Panel on Climate Change in its [2021 report](#).

From *Science Daily*. December 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<sub>2</sub>, 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<sub>2</sub> emissions. The program also serves to increase the understanding of the effectiveness of advanced technologies in different geologic reservoirs appropriate for CO<sub>2</sub> 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<sub>2</sub> behaves in the subsurface. These objectives are necessary to increasing public confidence in safe, effective, and permanent geologic CO<sub>2</sub> 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

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## 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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