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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 Funding to Support CO₂ Storage

The U.S. Department of Energy (DOE) announced funding to support 16 selected projects across 12 states that will reduce carbon dioxide (CO₂) emissions and bolster the nation's carbon management industry. The projects, funded by the Bipartisan Infrastructure Law (BIL), will expand the CO₂ storage infrastructure needed to reduce CO₂ emissions from industrial operations and power plants, as well as from legacy emissions in the atmosphere. The projects were selected for negotiation to support the development of new and expanded large-scale, commercial carbon storage projects, each with the capacity to securely store 50 or more million metric tons of CO₂ over a 30-year period. All projects will support the **Carbon Storage Assurance Facility Enterprise (CarbonSAFE) Initiative**, managed by DOE's Office of Fossil Energy and Carbon Management (FECM).

From *NETL*. November 2023.



DOE/FECM/NETL HIGHLIGHTS (cont.)

DOE Releases Toolkit to Assess Induced Seismicity at CO₂ Storage Sites

A forecasting toolkit developed jointly by a pair of DOE initiatives and funded, in part, through the BIL will help operators of underground CO₂ storage sites assess the likelihood and magnitude of seismic activity that could arise from commercial-scale injection. The **Operational FoRecasting Of Induced Seismicity toolkit (ORION)** is an open-source, observation-based toolkit designed to forecast how potential induced seismic hazards may evolve in response to CO₂ injection. The toolkit incorporates details on proposed injection operations and information on the seismic history at the site to forecast magnitude and frequency of potential induced seismic activity over time. This information can then be used to inform operational decisions and foster communication between stakeholders. ORION can also be used to explore the effectiveness of proposed mitigation strategies that aim to reduce the frequency and/or magnitude of potential induced seismic activity.

From *NETL*. September 2023.



DOE Announces Funding to Accelerate mCDR Capture and Storage

DOE announced funding for 11 projects across eight states to accelerate the development of marine carbon dioxide removal (mCDR) via capture and storage technologies. Funded through DOE's **Sensing Exports of Anthropogenic Carbon Through Ocean Observation (SEA-CO₂) Program**, the projects will support novel efforts to measure, report, and validate mCDR and identify cost-effective and energy-efficient carbon removal solutions. Advancing innovative approaches like mCDR to reduce greenhouse gas (GHG) emissions is critical to the Biden administration's efforts to achieve a net-zero emissions economy by 2050. The projects will be managed by DOE's **Advanced Research Projects Agency-Energy (ARPA-E)**.

From *energy.gov*. October 2023.



ANNOUNCEMENTS



DOE Announces Launch of Regional Clean Hydrogen Hubs

DOE announced the launch of seven **Regional Clean Hydrogen Hubs (H₂Hubs)**, several of which will have a CO₂ transport and storage component. The National Energy Technology Laboratory (NETL) **is partnering with three of the seven**, including the **Appalachian Regional Clean Hydrogen Hub (ARCH₂)**, which will leverage the region's (West Virginia, Ohio, Pennsylvania) ample access to low-cost natural gas to produce low-cost clean hydrogen and permanently store the associated carbon emissions.

From *energy.gov*. October 2023.



FECM Fact Sheets Available

Fact sheets are available for download on DOE's website covering topics such as **hydrogen with carbon management**; the **Inflation Reduction Act (IRA) and carbon management**; **carbon capture, use, transport, and storage**; and **carbon dioxide removal (CDR) technologies**. In addition, DOE/FECM also prepared a **sampling of resources** on safety and risk assessment to assist stakeholder understanding of carbon capture, transport, and storage.

From *energy.gov*. November 2023

2023 MRCI Partners and Stakeholders Meeting Recap

The 2023 Midwest Regional Carbon Initiative's (MRCI) Partners and Stakeholders Meeting discussed the growth in carbon capture, utilization, and storage (CCUS) across the **20-state MRCI region**. Held in Morgantown, West Virginia, the meeting comprised **presentations** (including from DOE/NETL) on topics such as capturing and transporting CO₂, demonstrating CCUS, geologic storage resources and CarbonSAFE. Two pre-meeting workshops on Community Benefits Plans and Storage Resources Management Systems were held, as was a post-meeting workshop on hydrogen energy and related CO₂ management. MRCI is part of the **DOE/NETL Regional Initiative to Accelerate CCUS Deployment**.

From *MRCI*. October 2023.

ANNOUNCEMENTS *(cont.)*



FERC Order Permits Conversion to CO₂ Transportation

The Federal Energy Regulatory Commission (FERC) issued an [order](#) that will permit Trailblazer Pipeline Company LLC to convert its natural gas pipeline system to CO₂ transportation. The company intends to use the pipeline to transport CO₂ from ethanol plants and other emissions sources in Nebraska and Colorado to Wyoming for geologic storage.

From *Akin Gump Strauss Hauer & Feld LLP*. October 2023.

Partnership to Deliver CCS Solutions

[Getech](#)—a locator of subsurface resources—and [Cozairo](#)—a carbon capture and storage (CCS) solutions and blue hydrogen project development company—signed a strategic collaboration agreement to collaboratively identify CCS opportunities. Together, the companies will deliver end-to-end CCS solutions to non-oil and gas CO₂ emitters seeking to reduce their carbon footprint. The focus will be on storing carbon in the vicinity of the emission point source, reducing infrastructure and capital requirements.

From *Energy-Pedia*. October 2023.

Background Seismicity Monitoring at Northern Lights CO₂ Storage Project



CGG joined Phase III of the HNET Horda Platform Region project to monitor background seismicity at the [Northern Lights CO₂ storage project](#) in the Norwegian North Sea. Phase III will run until April 2024 and is focused on determining natural seismicity in the planned CO₂ offshore injection site. The operator aims to assess the nature of tectonic seismic activity prior to CO₂ injection underground and more accurately analyze any induced seismicity during the injection period.

From *Offshore Magazine*. October 2023.

Report Focuses on CCUS Impact

A report from the United Nations Climate Change [Katowice Committee on Impacts](#) explores the impacts and potential of emerging industries that can help reduce GHG emissions and reach net-zero by 2050. The [report](#) focuses on three industries: hydrogen, CCUS, and artificial intelligence.

From *United Nations Framework Convention on Climate Change*. October 2023.



ABB, Imperial College Extend Carbon Capture Collaboration

A carbon capture pilot plant will continue to be used to train the net-zero workforce after ABB and Imperial College London signed a 10-year contract to extend their partnership. More than 4,500 students have had hands-on experience of ABB's technology solutions at the plant since it opened in 2012 at Imperial College. To enable the commercial CCS market to scale, ABB is deploying technology solutions to lower the capital and operational investment costs and de-risk integration into existing and new operations. In March 2023, ABB joined forces with London-based Pace CCS to make the capture, transportation, and storage of industrial CO₂ emissions more accessible.

From *World Pipelines*. October 2023.

MOU Focuses on Development of CCS Value Chain

Mitsui O.S.K. Lines Ltd. (MOL) and Cosmo Oil Co. Ltd. announced the signing of a Memorandum of Understanding (MOU) on the study of ocean transport, with the goal of establishing a CCS value chain. Under the MOU, MOL and Cosmo Oil will collaborate on the establishment of a "CCS value chain consisting of separation, capture, transport, injection, and storage" for CO₂ released from Cosmo Oil's refineries.

From *MOL Press Release*. October 2023.

CO₂ Pipeline Project Canceled

Navigator CO₂ Ventures canceled its Heartland Greenway pipeline project aimed at capturing 15 million metric tons of CO₂ annually from Midwest ethanol plants and storing it underground, the company announced.

From *Reuters*. October 2023.

Joint Venture Formed to Develop DAC Plant

Occidental and BlackRock announced a joint venture to invest in the development of the STRATOS direct air capture (DAC) plant. Construction of the facility is underway and is expected to be commercially operational in mid-2025. The amount of carbon captured (the plant has the potential to capture up to 500,000 metric tons of CO₂ per year) will generate carbon removal credits.

From *Occidental Press Release*. November 2023.



BlackRock®

PROJECT AND BUSINESS DEVELOPMENTS



Application Filed for Proposed CO₂ Pipeline Project in Illinois

One Earth Sequestration LLC filed an application with the Illinois Commerce Commission (ICC) seeking a Certificate of Authority to Construct and Operate a pipeline to transport and store CO₂ produced by its ethanol plant in Gibson City, Illinois. The pipeline would be part of a proposed CCS project that consists of a CO₂ capture, dehydration, and compression facility, along with three CO₂ injection wells and three monitoring wells, according to application materials filed with the ICC.

From *Ethanol Produce Magazine*. October 2023.



FPSO Piloting Post-Combustion CCS Plant

Malaysian floater specialist Yinson Production and operator Azure Energy are piloting an offshore CCS plant onboard the Agogo floating production, storage, and offloading (FPSO) vessel, offshore Angola. Carbon Circle Holding—a carbon removal and energy engineering, procurement, and construction company—has been selected to design and construct the CCS plant.

From *Upstream Online*. October 2023.

Large-Scale CCS Project Announced in California

California energy production company Aera Energy announced the launch of its large-scale CCS project, CarbonFrontier. Once operational in the late 2020s, CarbonFrontier is expected to capture up to 1.6 million metric tons of CO₂ per year from Aera's operations for storage at its Belridge oil field. The project will be continuously monitored with oversight by local, state, and federal regulatory entities, including the California Air Resources Board (CARB) and the U.S. Environmental Protection Agency (EPA).

From *Yahoo*. October 2023.



Installed Apparatus Enables Advanced CCUS Studies and Experiments

The Oil and Natural Gas Corporation's (ONGC) Institute of Reservoir Studies (IRS) in Ahmedabad installed and commissioned a CO₂ Core Flood Apparatus addition to its Injection and CCUS Laboratory. The apparatus is designed to replicate underground reservoir conditions, allowing for physical simulation and assessment of CO₂ behavior in reservoir rocks, quantifying incremental oil recovery, and evaluating storage potential.

From *Tech Observer*. October 2023.

Bellona Europa Launches Project Focusing on CCS

Bellona Europa, part of the Oslo-based Bellona Foundation, launched its Ports2Decarb project, which is a collaboration with ports to leverage their potential as hubs for industrial decarbonization in Europe, with a focus on CCS solutions. Selected ports in the Baltic and North Sea regions are envisioned as hubs for deploying CCS technologies, primarily aimed at sectors such as chemicals, steel, and cement.

From *Carbon Herald*. October 2023.

Aker Carbon Capture Awarded Pre-FEED Contract

Aker Carbon Capture signed a pre-front-end engineering design (pre-FEED) contract to implement carbon capture at several power plants throughout Europe. The contract will assess the optimal CO₂ capture and compression, as well as the heat recovery potential and heat integration solutions for the applicable plants, reducing the total heating and cooling demands related to capturing and conditioning the CO₂. Combined, the planned capture capacity for all the applicable sites could reach up to 14 million metric tons of CO₂ per year.

From *Aker Carbon Capture*. October 2023.

Porthos Announces FID Large-Scale CCS Project

Porthos, a joint venture between the Port of Rotterdam Authority, Gasunie, and EBN, announced its final investment decision (FID) for the development of a large-scale CO₂ transport and storage system in the Netherlands. With construction set to commence in 2024, Porthos is expected to be operational by 2026. Porthos will support the decarbonisation of the Rotterdam port area and, once complete, aims to store 2.5 million metric tons of CO₂ per year for 15 years, contributing to the Netherlands' ambition to reach climate neutrality by 2050.

From *Global CCS Institute*. October 2023.

Italy's Eni, Britain Agree on Terms for CCS Project

Italy's Eni reached an agreement with Britain's government on the terms and conditions for providing services in one of the CCS projects under development in the country. Eni is the CO₂ transport and storage operator of the British **HyNet North West** consortium, which aims to transform one of Britain's most energy-intensive industrial districts into a low-carbon industrial cluster thanks to CCS. HyNet North West is expected to be operational by the middle of the decade, with a storage capacity of approximately 4.5 million metric tons of CO₂ per year in the first phase.

From *Reuters*. October 2023.

LEGISLATION AND POLICY



Taiwan Unveils Regulations to Reach Net-Zero

The Ministry of Environment (MOE) announced regulations governing how entities can produce carbon credits or offset their emissions as part of Taiwan's bid to reach its net-zero target. The Climate Change Response Act, a framework law, was promulgated in February 2023, with the MOE stating then that detailed subsidiary regulations would be announced before the end of the year. Three regulations on emission registration and verification were announced earlier in 2023, while those related to the carbon fee—the rate and who will have to pay it—are slated to be announced in December.

From *Focus Taiwan*. October 2023.



Bulletin Provides Clarity on Small-Scale and Remote Carbon Storage in Alberta

The Government of Alberta released the *Mineral Rights Information Bulletin 2023-01* to provide clarity on the business requirements and best practices for applying for Small-Scale and Remote (SSR) Carbon Sequestration Tenure. The bulletin covers the applications, rent and issuance fees, pore space agreements, pore space unit agreements, and other regulatory guidance. The government stated that SSR Carbon Sequestration Tenures are applicable in the following situations: for storing carbon emissions that are released too far from a hub, when hub infrastructure may be delayed, or when a hub is not ready to accept the volume of CO₂ from an emitter; where carbon storage would be less than 200,000 metric tons of CO₂ annually; in application for waste gas disposal, such as sour gas or acid gas, which emit from oil and gas facilities and needs to be disposed of; or to store carbon emissions from facilities testing carbon capture approaches.

From *Dentons*. October 2023.

Indonesia Regulation to Allow Cross Border Carbon Storage

Potential regulations in Indonesia will allow CCS for more industries and allow GHGs from abroad to be stored in the country, according to government officials. Indonesia's existing regulatory framework for implementing CCS and CCUS currently only applies to the oil and gas sector. Under the new regulation, businesses such as cement and metal industries will also be permitted to store CO₂ they captured to CCS and CCUS facilities.

From *Reuters*. October 2023.

EMISSIONS TRADING



EU Launches Initial Phase of Carbon Border Adjustment Mechanism

The European Union (EU) launched the first phase of its system to impose CO₂ emissions tariffs on imported steel, cement, and other goods. Under the Carbon Border Adjustment Mechanism (CBAM), EU importers will be required to report the GHG emissions embedded during the production of volumes of iron and steel, aluminum, cement, electricity, fertilizers, and hydrogen. The bloc will not begin collecting any CO₂ emissions chargers at the border until 2026; starting in 2026, importers will be required to purchase certificates to cover the emissions, similar to what EU industries must do, when they buy permits from the EU carbon market.

From *Reuters*. September 2023.

Carbon Trading Commences in Abu Dhabi

AirCarbon Exchange (ACX) announced the *ACX Abu Dhabi*—an exchange and clearing house in Abu Dhabi Global Market—is live, with key transactions already being carried out and settled on the platform. With secured investments and approved regulatory licenses in place, ACX established the necessary foundation for the participation of Voluntary Carbon Market (VCM) entities in trading carbon credits and other environmental instruments.

From *Carbon Herald*. October 2023.

SCIENCE



Project Investigating Ocean's Carbon Storage Role

The Natural Environment Research Council (NERC) Biological Influence on Future Ocean Storage of Carbon (BIO-Carbon) Program earmarked funding for three projects investigating the role of marine life in carbon storage. The Particle Transformation and Respiration Influence on Ocean Carbon Storage (PARTITRICS) project employs shipboard observations and autonomous underwater vehicles (AUVs) to investigate the transformation of organic matter through interactions with particles and organisms. The Coccolithophore Controls on Ocean Alkalinity (CHALKY) project focuses on quantifying how diversity and ecology influence carbon absorption in the oceans. Finally, the Integrating Drivers of Atlantic Productivity (IDAPro) project employs a combination of ship-based, robotic, and satellite platforms to enhance understanding of phytoplankton productivity, the foundational single-cell organisms in the ocean responsible for substantial carbon storage.

From *Hydro International*. October 2023.

Scientists Identify Gene that Triggers Root Growth, Boosts Carbon Storage

Oak Ridge National Laboratory (ORNL) scientists identified a gene “hotspot” in the poplar tree that triggers increased root growth, supporting an increase in carbon storage. Published in the journal *New Phytologist*, the research finds that more roots allow the poplar tree to draw more carbon for long-term storage underground. (Tao Yao et al, Expression quantitative trait loci mapping identified PtrXB38 as a key hub gene in adventitious root development in Populus, *New Phytologist* (2023). DOI: [10.1111/nph.19126](https://doi.org/10.1111/nph.19126))

From *Phys.org*. October 2023.

Carbfix Turning Stored CO₂ Into Stone

In a geodesic dome at the Hellisheidi geothermal power plant in Iceland, CO₂ transported via pipeline from the nearby power plant is mixed with water drawn up from the ground and injected into the basalt rock below. In the nine years that Carbfix has been using this practice, approximately 95% of the CO₂ was turned into rock in the subsurface in less than two years, according to the company.

From *Reuters*. October 2023.

Scientists Study New Approach to Valuing Carbon Storage Potential of Natural Habitats

A team led by University of Cambridge scientists developed a new approach to valuing the carbon storage potential of natural habitats, enabling investors to directly compare carbon credit pricing across a wide range of projects. The method was published in the journal *Nature Climate Change*, where the researchers argue that saving tropical forests is a less-expensive way of balancing emissions than some current CCS technologies. (Realising the social value of impermanent carbon credits, *Nature Climate Change* (2023). DOI: [10.1038/s41558-023-01815-0](https://doi.org/10.1038/s41558-023-01815-0), www.nature.com/articles/s41558-023-01815-0)

From *Phys.org*. October 2023.

Researchers Study Tree Leaves and Carbon Storage

Researchers worldwide collected data on tree species to improve their understanding of the different types of tree leaves and to draw conclusions about the CO₂ cycle. By quantifying the distribution of tree leaf types and their corresponding biomass, and identifying regions where climate change will exert greater pressure on current leaf types, these findings are expected to enable better predictions about the future functioning of terrestrial ecosystems and the carbon cycle. (Haozhi Ma et al, The global biogeography of tree leaf form and habit, *Nature Plants* (2023). DOI: [10.1038/s41477-023-01543-5](https://doi.org/10.1038/s41477-023-01543-5))

From *Phys.org*. October 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 CO₂, 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 CO₂ emissions. The program also serves to increase the understanding of the effectiveness of advanced technologies in different geologic reservoirs appropriate for CO₂ 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 CO₂ behaves in the subsurface. These objectives are necessary to increasing public confidence in safe, effective, and permanent geologic CO₂ 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:



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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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