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

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

CSN CARBON STORAGE NEWSLETTER

VOL. 22, NO. 1

CARBON STORAGE PROGRAM DOCUMENTS and REFERENCE MATERIALS

- Carbon Storage Educational Resources
- Program Reports, Plans, and Roadmaps
- Conference Proceedings
- Carbon Storage Portfolio
- Systems Analysis
- Peer Review
- Best Practices Manuals
- Fossil Energy and Carbon Management Techlines

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

DOE/FECM/NETL HIGHLIGHTS

DOE, USGS to Explore CCS.

The U.S. Department of Energy's (DOE) Office of Fossil Energy and Carbon Management (FECM) and the U.S. Department of Interior's (DOI) U.S. Geological Survey (USGS) announced a partnership to explore global, regional, and national resources for the geologic storage of carbon dioxide (CO_2). Under the ***Memorandum of Understanding (MOU)***, the agencies will collaborate with international governments, geologic surveys, and other organizations to provide technical assistance through a series of discussions, meetings, workshops, and research activities. The information will be used by government, academia, industry, research organizations, and other stakeholders to help identify potential investment opportunities for research, development, demonstration, and deployment to advance carbon capture and storage (CCS) technologies for application in power and industrial sectors. From *energy.gov*. December 2021.

CONTINUE

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

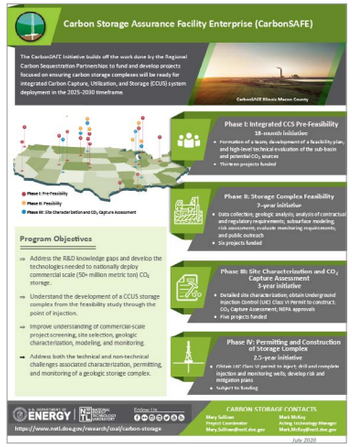
DOE Releases RFI on Deployment-Ready CO_2 Reduction, Removal Tech.

DOE ***released a Request for Information (RFI)*** on demonstration-ready technologies that can reduce emissions and remove CO_2 from the atmosphere. The RFI seeks feedback from industry, investors, developers, academia, research laboratories, government agencies, non-governmental organizations, and potentially affected communities (including environmental justice, tribal, energy transition, and other communities). Information provided through the RFI is expected to inform the design of successful projects, as well as the effective, just, and sustainable deployment of technologies that enable a safe climate future. From *energy.gov*. December 2021.

ANNOUNCEMENTS

DOE Announces Intent to Fund Carbon Storage Projects.

DOE's FECM released a ***Notice of Intent (NOI)*** to fund cost-shared research and development (R&D) projects to accelerate wide-scale deployment of CCS and CO_2 removal. The potential projects will be selected under DOE's ***Carbon Storage Assurance Facility Enterprise (CarbonSAFE) Initiative***, which focuses on developing geologic storage sites with capacities to store at least 50 million metric tons of CO_2.



DOE to Fund Decarbonization Projects.

In December 2021, DOE's FECM announced intent to fund projects through its University Training and Research Program, which is comprised of the University Coal Research (UCR) and the Historically Black Colleges and Universities and Other Minority Institutions (HBCU-OMI) Programs. The projects would be funded to conduct early-stage R&D of decarbonization approaches, such as exploring biomass feedstocks blended with waste coal and coupled with CCS to advance net-zero energy production.

RGGI Releases Report on Secondary Market.

RGGI Inc.

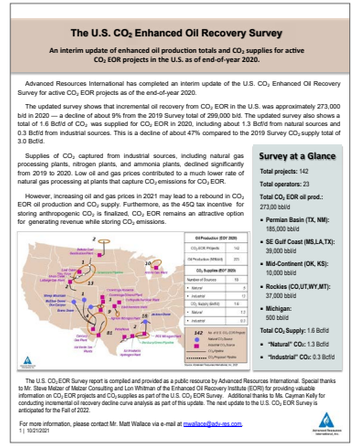
The states participating in the Regional Greenhouse Gas Initiative (RGGI) released the "***Report on the Secondary Market for RGGI CO_2 Allowances: Third Quarter 2021***." Prepared by independent market monitor Potomac Economics, the report found no evidence of anticompetitive conduct in the RGGI CO_2 allowance secondary market.

Companies to Develop Roadmap to Decarbonize.

Emirates Global Aluminum (EGA) and ***GE*** signed an MOU to develop a roadmap to reduce greenhouse gas (GHG) emissions by exploring hydrogen as a fuel and carbon capture, utilization, and storage (CCUS). The decarbonization roadmap will explore the potential to integrate CCUS into EGA's power plants and implement changes to the auxiliary and balance of plant systems.

ARI Releases Report on CO_2-EOR.

Advanced Resources International (ARI) ***released a report*** updating enhanced oil recovery (EOR) and CO_2 supplies for CO_2-EOR projects for the end of the year 2020. The report found a decrease in oil production from CO_2-EOR in 2020, which was comparable to the overall decline in U.S. crude production.



Australian Govt Releases GHG Storage Acreage.

Australian Government
Department of Industry, Science, Energy and Resources

The Australian Minister for Resources and Water announced the availability of five new areas in Australian Commonwealth waters for the exploration of GHG storage opportunities. Maps for the 2021 Offshore Greenhouse Gas Acreage Release, public consultation comments, and information on the bidding process are available on ***the Australian Government's Department of Industry, Science, Energy, and Resources website***.

Canadian Company Signs LOI, MOU for CCS.

SPECTRUM H_2

SpectrumH_2 signed a Letter of Intent (LOI) to assess the feasibility of a large-scale carbon capture facility and associated CO_2 storage project in Alberta, Canada. The company also announced an MOU with an intermediate natural gas producer to help establish the production, marketing, and distribution of zero-emission blue hydrogen with associated CCS at a hydrogen production plant in Alberta.

Cooperative Agreement to Explore CCS.

The United Arab Emirates' (UAE) Abu Dhabi National Oil Corporation (ADNOC) signed an agreement with French company TotalEnergies to explore collaboration in CCS. ADNOC currently has the capacity to capture 800,000 tons of CO_2 annually and plans to expand the capacity sixfold, with the aim of reaching 5 million tons of CO_2 captured each year by 2030.

ANNOUNCEMENTS *(cont.)*

Midwest Regional Carbon Initiative Newsletter.

The MRCInfo Newsletter is available via ***mailing list*** to share updates on events and progress on various projects and their impact to the region and overall environment. The ***Midwest Regional Carbon Initiative (MRCI)*** is led by the Battelle Memorial Institute and Illinois Geologic Survey and aims to advance CCUS research by addressing key technical challenges, obtaining and sharing data to support CCUS, facilitating regional infrastructure planning, and performing regional technology transfer. Additional information on FECM's Regional Initiatives is available via the ***NETL website***.

MHI CO_2 Capture System Ordered for Use in Commercial Plant.

Mitsubishi Heavy Industries Engineering—a subsidiary of Mitsubishi Heavy Industries (MHI)—will incorporate its CO_2 capture system into a biomass power plant within Hiroshima City, Japan, for Taihei Dengyo Kaisha, Ltd, a provider of plant construction, maintenance, and auxiliary services.

PROJECT AND BUSINESS DEVELOPMENTS

Partnership to Explore CCS Opportunities.

Malaysia state energy firm Petronas and ExxonMobil announced a partnership to explore opportunities in CCS technologies. According to the MOU, both companies plan to assess the viability of potential CCS projects in select locations offshore Peninsular Malaysia and identify suitable technology for potential application. In addition, the companies will share subsurface technical data to enable CO_2 storage assessment and characterization. From *Reuters*. November 2021.

Companies Plan CCS Project on US Gulf Coast.

U.S.-based companies Talos Energy and Freeport LNG Development signed an LOI to develop a CCS project on the U.S. Gulf Coast. The Freeport LNG CCS project will be built next to Freeport LNG's natural gas pre-treatment facilities near Freeport, Texas, which is within 25 miles of an industrial cluster that could provide up to 15 million metric tons per year of additional CO_2. Talos will manage and operate the project with partner Storegga Geotechnologies, which ***signed an MOU with Talos*** earlier in 2021 to explore CCS opportunities in the Gulf region. From *Upstream*. November 2021.

MOU to Explore CO_2 Liquefaction, Storage Facility.

Singapore LNG Corporation Pte Ltd and Linde Gas Singapore Pte Ltd signed an MOU to explore the feasibility and development of a CO_2 liquefaction and storage facility in Singapore. The project will initially target the liquefaction, storage, and transport of CO_2 for the project partners, but could potentially be scaled-up to handle CO_2 from more sources, with an open-access, multi-user concept. From *Singapore LNG Press Release*. November 2021.

Project to Test Subsea Pipelines for CO_2 Transport.

DNV, Wintershall Noordzee, and the OTH Regensburg University of Applied Sciences are exploring how existing natural gas pipelines in the southern North Sea can be used for the future transport of CO_2. The large-scale CO_2 pipeline testing includes a comparison of the pipe in a submerged (water) condition versus the pipe in open air. The aim of the tests is to better define the model parameters used for different backfill types. The large-scale testing of the CO_2 pipelines will take place at DNV's Testing and Research Facility at Spadeadam in the United Kingdom (UK). From *DNV News*. November 2021.

Summit Carbon Solutions Begins Test Well Drilling.

Summit Carbon Solutions has begun testing the potential for CO_2 storage at a carbon storage hub in North Dakota, USA. In addition to drilling stratigraphic test wells, Summit received state and local permits to collect 3D seismic data on approximately 200 square miles of land in western North Dakota. The company will use the resulting data to create a 3D model that will provide the basis for simulation, design, and permitting of CO_2 storage facilities. From *Carbon Capture Journal*. December 2021.

Companies Agree to Provide CO_2 Transport, Storage Services.

Navigator CO_2 Ventures will provide CO_2 transportation and storage services to OCI's Iowa Fertilizer Company facility under an agreement for up to 1,130,000 metric tons of CO_2 per year. The project will have two phases; start of operations for the first phase is projected for 2024. From *Business Wire*. December 2021.

Danish Energy Agency Funds CCS Project.

The Danish Energy Agency will fund a CCS project in the North Sea. Project Greensand will transport CO_2 by ship to the Nini West reservoir off Denmark and inject it via the offshore wellhead platform. The CO_2 will be stored in depleted oil and gas sandstone reservoirs beneath the seabed, and existing infrastructure will be repurposed from oil and gas production to CO_2 injection. From *Offshore Engineer*. December 2021.

LEGISLATION AND POLICY

US Government Establishes Goal to Achieve Net-Zero Carbon Emissions by 2050.

The President of the United States ***signed an Executive Order (EO)*** directing the U.S. federal government to achieve a goal of net-zero carbon emissions by 2050. In addition, the EO calls for the federal government to use 100% carbon-free electricity and to reduce its CO_2 emissions by 65%, both by 2030. From *The Hill*. December 2021.

EMISSIONS TRADING

Results of 54th RGGI Auction Released.

The RGGI-participating states announced the results of their 54th auction of CO_2 allowances. A total of 27,041,000 CO_2 allowances were sold at a clearing price of $13.00, with bids ranging from $2.38 to $17.00 per allowance. The emissions sold included the initial offering of 23,121,518 allowances, as well as 3,919,482 of the 11.98 million cost containment reserve (CCR) allowances available for sale. (The CCR is a fixed additional supply of allowances that is made available for sale if an auction's interim clearing price exceeds a certain price level [$13.00 in 2021].) None of the 11.31 million emissions containment reserve (ECR) allowances made available were sold. (The ECR is a designated quantity of allowances to be withheld if an auction's interim clearing price is below an established price level [$6.00 in 2021].) Auction 54 generated $351 million for states to reinvest in strategic programs, including energy efficiency, renewable energy, and GHG abatement programs. Additional details are available in the ***Market Monitor Report for Auction 54***. From *RGGI News Release*. December 2021.

SCIENCE

Researchers Use Physics to Assess CO_2 Storage Sites.

A team of researchers used physics-informed deep learning to study hypothetical CO_2 storage sites. The work was completed as part of DOE's ***Science-informed Machine learning to Accelerate Real-Time (SMART)*** Decisions for Carbon Storage Initiative. Led by Penn State University (PSU), the research team combined artificial intelligence and physics to develop a predictive modeling approach that avoided the cost and time commitment required with normal numerical simulations. In the study, published in the ***Journal of Contaminant Hydrology***, the team trained deep-learning algorithms to make accurate predictions across a variety of scenarios. By simulating CO_2 in a 7,500-foot-deep reservoir, the algorithms were able to predict how CO_2 saturation and pressure would behave in new simulated systems. From *PSU News*. November 2021.

Study Examines Behavior of Salty Water Under Different Conditions.

Researchers from the University of Bath (UK) studied the way salty water acts in deep geologic formations, paving the way for future research into the CO_2 storage potential beneath the seabed. In the study, published in the ***Journal of Chemical Physics***, the researchers observed saline solutions under conditions of pressure and temperatures that mimic the conditions found in the deep geologic formations. Using a technique that allowed them to examine saline solutions in extreme conditions, they studied different versions of sodium chloride, providing new insight into the way salty water behaves under different sets of pressure and temperature conditions. From *Carbon Capture Journal*. December 2021.

Report Assess Ocean-Based Carbon Storage.

A ***report*** from the National Academies of Sciences, Engineering, and Medicine assessed the potential risks and benefits of using ocean-based approaches to store CO_2. Six specific approaches were studied, each evaluated for their efficacy, durability, scalability, potential environmental risks, and social considerations, among other factors. The results led the report committee to recommend the United States undertake a research program to learn more about how these methods could be utilized. From *National Academy of Sciences, Engineering, and Medicine News Release*. December 2021.

PUBLICATIONS

Digital Monitoring of CO_2 Storage Projects (Digimon).

The following is from the abstract of this article: "With an overall objective to 'accelerate the implementation of CCS by developing and demonstrating an affordable, flexible, societally embedded and smart Digital Monitoring early-warning system', the DigiMon project aims to combine different technologies for monitoring CO_2 storage into a uniform system. The project includes qualification of critical system components, integration of the components and embedding the system in a societal context." **Arvid Nøttvedt, Kirsti Midttømme, Martha Lien, Hanneke Puts, and Anna Stork,** *Proceedings of the 15th Greenhouse Gas Control Technologies Conference 15-18 March 2021*. (Subscription may be required.)

Application of Active Reservoir Management to Enable Geologic CO_2 Storage.

The following is from the abstract of this article: "Active reservoir management (ARM) can enhance geologic CO_2 storage activities via strategic extraction of formation water and can provide site operators with a means of managing risks and costs associated with carbon capture, utilization, and storage (CCUS) projects. Implementation of ARM strategies for CCUS can provide several advantages to a project, including 1) reducing stress on sealing formations and separating pressure from the CO_2 footprint; 2) geosteering of injected fluids away from hazards or permitted storage facility boundaries; 3) reducing area of review (AOR) and/or amalgamated lease area; and 4) improving injectivity, capacity, and storage efficiency to reduce infrastructure and operating requirements. The Energy & Environmental Research Center (EERC) is conducting field tests of ARM strategies for CCUS at a commercial saltwater disposal facility in western North Dakota, USA. Ongoing commercial injection of oilfield produced brine serves as a proxy for CO_2 injection at the site. Initial interference testing has substantiated connectivity between project wells and that extraction response should be observable in the injection wells. A water treatment development and test facility has also been established at the North Dakota Brine Extraction and Storage Test (BEST) site to enable the development and demonstration of new and emerging water treatment technologies on produced or extracted waters. The test bed facility enables pilot testing, demonstration, and performance monitoring of novel water treatment technologies capable of treating high-salinity (average of 180,000 mg/L total dissolved solids [TDS]) fluids associated with CO_2 storage in deep saline formations (DSFs)." **John Hamling, Ryan J. Klapperich, Marc D. Kurz, Tao Jiang, Agustinus Zandy, and Lonny Jacobson,** *Proceedings of the 15th Greenhouse Gas Control Technologies Conference 15-18 March 2021*. (Subscription may be required.)

What Does It Take to Go Net-zero-CO_2? A Life Cycle Assessment on Long-term Storage of Intermittent Renewables With Chemical Energy Carriers.

The following is from the abstract of this article: "The concept of net-zero-CO_2 power systems has gained increased attention by the EU goal to be a climate neutral continent by 2050. As potential pathways towards a net-zero-power system, this work analyzes future power systems based on intermittent renewable electricity with long-term storage through chemical energy carriers, so called Power-to-Fuel-to-Power systems, and a system based on the combustion of natural gas with 100% carbon capture and storage. The chemical energy carriers selected for electricity storage are hydrogen, methane and ammonia. Using life cycle assessment, [the authors] determine and compare the environmental impacts of 1 kWh of dispatchable electricity produced by the two pathways on seven impact categories. There was not one single pathway that had the most environmental benefits on all seven impact categories. Of the Power-to-Fuel-to-Power systems assessed the use of hydrogen for storage has the lowest environmental impact in all categories. Additionally, all the Power-to-Fuel-to-Power systems have a lower environmental impact on climate change, photochemical ozone formation and fossil resource depletion compared with the natural gas with carbon capture and storage system. The natural gas with carbon capture and storage system has a lower environmental impact on particulate matter formation, marine eutrophication and mineral resource scarcity. [The authors'] work is complemented by an analysis of pathways from a net-zero-direct-CO_2 to a life-cycle net-zero-CO_2-equivalent power system which is actually climate neutral, achieved by direct air capture of the residual CO_2 from the atmosphere. However, this leads to an increase in all other impact categories of 11% for the Power-to-Fuel-to-Power systems and 21% in the natural gas combustion with carbon capture and storage system. A system sizing study also highlights the very low capacity factors of the capital employed for electricity storage, raising the point of economic feasibility." **Jan Bernard Wevers, Li Shen, and Mijndert Van der Spek,** *Proceedings of the 15th Greenhouse Gas Control Technologies Conference 15-18 March 2021*. (Subscription may be required.)

The spatial spillover effect of fossil fuel energy trade on CO_2 emissions.

The following is from the abstract of this article: "[The authors] diagnose CO_2 emission changes and determine the driving mechanisms and spatial spillover effect worldwide using spatial econometric techniques embedded within energy trade in the period 2000–2014. [The authors] focus on fossil fuel import, taking it as the medium through which to examine the spatial spillover effect on CO_2 emissions, and compare the spatial influence between developed and developing countries. [The authors] propose different hypotheses considering the magnitude of spatial influence through fossil fuel trade between developed countries, between developing countries, and between developed and developing countries. These hypotheses are manifested in the multiple spatial econometric model. Results revealed general heterogeneity of CO_2 emissions among different countries alongside fluctuations and wavy increments in the analyzed groups of countries. However, the convergence of emissions was predictable because the growth rate of CO_2 emissions was low in countries with high levels of CO_2 emission and converged rapidly with that of developed countries. The spatial autocorrelation phenomenon and spatial spillover effects generated from energy trade have previously only been verified worldwide rather than solely in developed countries or developing countries. Urbanization, industrial development, deforestation and GDP growth all drive the increase in CO_2 emissions whereas renewable energy options can help to mitigate emission increases." **Chen Zeng, Lindsay C. Stringer, and Tianyu Lv,** *Energy*. (Subscription may be required.)

Zero-energy penalty carbon capture and utilization for liquid fuel and power cogeneration with chemical looping combustion.

The following is from the abstract of this article: "The utilization of captured CO_2 for fuel, chemicals and materials is currently a focus of significant research effort as a method that can simultaneously mitigate greenhouse gas effect while reduce fossil fuel depletion. In this work, CO_2 source is provided by a desirable three-stage Fe-based chemical looping combustion power system that can achieve zero-energy-penalty CO_2 capture while simultaneously obtain pure H_2 source. The aim of this study is to present this designed process for the first time with demonstrating it as an energy-efficient and environmental-friendly CO_2-to-liquid fuel pathway. Within this context, the liquid fuels energy output and carbon emissions are compared with different CO_2 utilization ratios to the thermodynamic assessment, intending to disclose the insufficiency location within system. With conceivable improvements in an optimum condition, the fuel energy saving ratio and CO_2 emission ratio of this process are projected to be 12.19% and 98.46%, respectively in relative to separate production system. The maximal exergy destruction, though projected to be located in chemical looping hydrogen generation unit (as represented by 37.56% of total exergy destruction), still has opportunities to reduce in some extent by elevating oxygen carries high-temperature resistance along with future research needs. Finally the sensitivity analysis is also projected to assess the strong influencing parameters that affect the system performance." **Yangdong He, Lin Zhu, Luling Li, and Ling Sun,** *Journal of Cleaner Production*. (Subscription may be required.)

PUBLICATIONS *(cont.)*

Energy, exergy, economic and environmental (4E) analysis of an integrated process combining CO_2 capture and storage, an organic Rankine cycle and an absorption refrigeration cycle.

The following is from the abstract of this article: "In order to reduce the cost of CO_2 capture and storage, and promote the application of this technology in the coal chemical industry, [the authors] propose an integrated process combining an organic Rankine cycle, an absorption refrigeration cycle, and the purification of syngas from coal. Its purpose is to make efficient use of the waste heat produced in the manufacture of natural gas from coal, converting it into available energy, such as electric energy and cold energy, so as to save energy and reduce emissions. At the same time, the integration process can effectively improve the efficiency of energy use. Based on an accurate model, a simulation of the entire process is established, and the process is then analyzed from the aspects of energy, exergy, economy, and the environment. The thermal efficiency of the organic Rankine cycle, and the coefficient of performance of the absorption refrigeration cycle, are 0.148 and 0.1058, respectively. The result of an exergy analysis shows that the exergy efficiency of the waste heat utilization system is 42.88%. The integration process can greatly reduce the operational cost of CO_2 capture and storage, making it 81% lower than that of the basic process. The results of a life-cycle assessment show that the integration process has good environmental benefits, with a total equivalent CO_2 emission of 2.03 kg CO_2-eq/t. The integration process is of great significance for CO_2 capture and storage in the coal chemical industry, and for the optimization and improvement of other processes by making use of low grade waste heat." **Xiaobin Liu, Xiao Yang, Mengxiao Yu, Wanxiang Zhang, Yinglong Wang, Peizhe Cui, Zhaoyou Zhu, Yixin Ma, and Jun Gao,** *Energy Conversion and Management*. (Subscription may be required.)

A Hybrid Optimization Methodology Identifying Optimal Operating Conditions for Carbon Dioxide Injection in Geologic Carbon Sequestration.

The following is from the abstract of this article: "Prior to determining the optimal operating parameters for CO_2 injection, conditions for both injection wellbore and storage formation should be evaluated; the build-up pressure induced by the CO_2 injection could promote fractures in the storage formation, even collapsing the wellbore. In this study, a hybrid optimization methodology, which combined the proxy modeling and multi-objective optimization, was engaged in searching appropriate operating conditions for CO_2 injection. The study utilized a fully coupled wellbore-reservoir (WR) model to simulate the CO_2 injection scenarios. Three responses, such as pressure, temperature, and CO_2 mass flow rate at the bottom-hole of injection wellbore, were investigated. To reduce the computational cost, the statistical proxy models were developed for approximating three responses. The developed fine-tuned proxy models revealed four influential factors; wellhead pressure, injected CO_2 temperature, wellbore diameter, and permeability of a storage formation were significant in predicting three responses. Among these four influential factors, permeability was treated to be an uncertainty factor, while the other three factors were treated as tuning factors. According to acquired optimal solution sets, the optimum values for wellhead pressure and injected CO_2 temperature were distributed around 10.0 MPa and 35°C, respectively. For the wellbore diameter, its mean of optimal solutions was 0.1 m, and more solutions were concentrated at this mean value with a decrease in permeability." **Jize Piao, Weon Shik Han, Peter K. Kang, Baehyun Min, Kue-Young Kim, Gidon Han, and Jong Gil Park,** *International Journal of Greenhouse Gas Control*. (Subscription may be required.)

The determinants of CO_2 prices in the EU emission trading system.

The following is from the abstract of this article: "In 2005, the European Union launched its Emissions Trading System (ETS), the first and one of the largest international carbon markets aimed at reducing member states' CO_2 emissions. Policymakers tend to use the carbon price as an indicator of the 'health' and effectiveness of the ETS mechanism, although this measure is influenced by many other energy and climate policies, energy market fundamentals, and speculative shocks. This paper develops a model that links the energy sector (oil, natural gas, coal, electricity prices, and the share of fossil fuels in electricity generation), economic activity, and the carbon price. The model can be used as a monitoring tool for carbon price dynamics. [The authors] represent the model empirically through a Structural Vector Autoregression and use frequency-domain analysis to distinguish the effects of changes in fundamental factors from shocks to market microstructure. [The authors'] empirical results show that up to 90% (65% on average) of the fluctuations in the carbon price, adjusted for supply effects, are explained by fluctuations in fundamental market variables; however, the individual contributions are not stable. Overall, [the authors'] results suggest that the ETS has started to work well." **Yuliya Lovcha, Alejandro Perez-Laborda, and Iryna Sikora,** *Applied Energy*. (Subscription may be required.)

ABOUT DOE'S CARBON STORAGE PROGRAM

The **Carbon 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 depositional environments. 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, basalt formations, and organic-rich shale basins—and to improve the understanding of how CO_2 behaves in the subsurface. These objectives are key to increasing confidence in safe, effective, and permanent geologic CO_2 storage.

The ***Carbon 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 Storage Program Resources

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

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ABOUT NETL'S CARBON STORAGE NEWSLETTER

Compiled by the National Energy Technology Laboratory, this newsletter is a monthly summary of public and private sector carbon 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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