

## CSN

MAY 2019

CARBON STORAGE  
NEWSLETTER

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/NETL HIGHLIGHTS
- ▷ ANNOUNCEMENTS
- ▷ PROJECT and BUSINESS DEVELOPMENTS
- ▷ LEGISLATION and POLICY
- ▷ EMISSIONS TRADING
- ▷ SCIENCE NEWS
- ▷ JOURNAL ARTICLES
- ▷ REPORTS and OTHER PUBLICATIONS

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 Techlines



## DOE/NETL HIGHLIGHTS

*DOE Announces Funding for Coal R&D Projects.*

The U.S. Department of Energy (DOE) announced federal funding for cost-shared research and development (R&D) projects for advanced coal technologies and research. The projects for coal-fueled power plants and technologies will fall under five separate Funding Opportunity Announcements (FOAs). One of the FOAs, *Transformational Sensing Systems for Monitoring the Deep Subsurface*, supported by the Office of Fossil Energy (FE) Carbon Storage Program, seeks to reduce uncertainty and enable real-time decision making associated with subsurface carbon dioxide (CO<sub>2</sub>) storage. All of the selected projects will be managed by DOE's National Energy Technology Laboratory (NETL). From *energy.gov* on April 10, 2019.

## ANNOUNCEMENTS

*DOE/NETL's Carbon Capture, Utilization, Storage, and Oil and Natural Gas Programs Annual Meeting.*

Registration is currently open for DOE/NETL's "Addressing the Nation's Energy Needs Through Technology Innovation – 2019 Carbon Capture, Utilization, Storage, and Oil and Gas Technologies Integrated Review Meeting," to be held August 26–30, 2019, at the David L. Lawrence Convention Center in Pittsburgh, Pennsylvania, USA.

*DOE Announces Funding to Accelerate CCUS.*

DOE announced federal funding for cooperative agreements that will help accelerate the deployment of carbon capture, utilization, and storage (CCUS). Through *this FOA*, DOE will seek to award cooperative agreements to R&D projects that will help identify and address regional storage and transport challenges. Specifically, this FOA will seek to preserve, share, and advance existing R&D by addressing key technical challenges; facilitating data collection, sharing, and analysis; evaluating regional infrastructure; and promoting regional technology transfer. The selected projects will support FE's *Carbon Storage Program*.

*DOE Selects Carbon Storage Project for Funding.*

The associated geologic storage project was selected under the FOA "Developing Technologies for Advancement of Associated Geologic Storage for Basinal Geo-Laboratories." Supported by the FE Carbon Storage Program and managed by NETL, the University of Wyoming project aims to establish the technical and economic viability of associated CO<sub>2</sub> storage and oil recovery in the greenfield residual oil zones of the Powder River Basin of Wyoming and Montana (USA).

*DOE Announces Investments in Coal FIRST.*

DOE announced investments to help develop coal plants of the future that will provide secure, stable, and reliable power with near-zero emissions. DOE FE issued a Notice of Intent for an FOA, titled "Critical Components for Coal FIRST Power Plants of the Future," that will make federal funding available for cost-shared R&D projects that focus on developing components required by Coal FIRST (Flexible, Innovative, Resilient, Small, and Transformative) systems.

COAL-FIRED PLANTS  
OF THE FUTURE

Coal, now and for the foreseeable future, is one of the most stable and prevalent sources of electricity in the United States. In fact, in 2017, about 30% of the total power generated in the United States came from coal. In the same year, coal was the primary electricity source in 18 states.



## ANNOUNCEMENTS (cont.)

### DOE/NETL Studies Focus on Geologic Storage of CO<sub>2</sub>.

DOE/NETL developed three studies that evaluated industrial analogs to CO<sub>2</sub> geologic storage. The three analogs studied (“*Underground Natural Gas Storage – Analog Studies to Geologic Storage of CO<sub>2</sub>*”; “*UIC Class I Injection Wells – Analog Studies to Geologic Storage of CO<sub>2</sub>*”; and “*CO<sub>2</sub> Leakage During EOR Operations – Analog Studies to Geologic Storage of CO<sub>2</sub>*”) were selected because of their commonalities with CO<sub>2</sub> geologic storage. The studies aim to draw insights and lessons learned from the history of other commercially prominent analogous industries and help address technical and policy-related questions concerning CO<sub>2</sub> geologic storage moving forward.



### RGGI Releases Notice and Materials for Auction 44.

The states participating in the Regional Greenhouse Gas Initiative (RGGI) released the Auction Notice and application materials for the 44<sup>th</sup> quarterly CO<sub>2</sub> allowance auction scheduled for June 5, 2019. The *Auction Notice for CO<sub>2</sub> Allowance Auction 44* provides the information needed to submit a Qualification Application for Auction 44 in which the RGGI states will offer 13,221,453 CO<sub>2</sub> allowances for sale at a minimum reserve price of \$2.26. A 10 million CO<sub>2</sub> allowance cost containment reserve (CCR) will also be made available. (The CCR will be accessed if the interim clearing price exceeds the CCR trigger price of \$10.51.)

### 2018 RGGI Market Monitoring Report Available.

Potomac Economics, the independent market monitor for the RGGI CO<sub>2</sub> allowance market, released the *Annual Report on the Market for RGGI CO<sub>2</sub> Allowances: 2018*. The report evaluates market activity for RGGI CO<sub>2</sub> allowances, focusing on allowance prices, trading and acquisition of allowances in the auctions and secondary market, participation in the market by individual firms, and market monitoring.



## PROJECT and BUSINESS DEVELOPMENTS

### Drilling Begins on Carbon Storage Test.

As part of a DOE-funded project, drilling on a test well in Gillette, Wyoming (USA) was initiated as part of a storage complex feasibility study. The project is from *DOE's Carbon Storage Assurance Facility Enterprise (CarbonSAFE) Initiative*, and the drilling will take place near Basin Electric Power Cooperative's Dry Fork Station. The Dry Fork Station was selected to develop integrated carbon capture and storage (CCS) complexes that will be constructed and permitted for operation around 2025. From University of Wyoming News on April 12, 2019.

### Ethanol Plant Moving Forward with CCS Project.

Red Trail Energy completed a geophysical survey on a North Dakota (USA) ethanol plant in which they propose to capture CO<sub>2</sub> and store it underground. The data from the survey is expected to help scientists from the University of North Dakota Energy and Environmental Research Center gain a better understanding of the subsurface geology of the Brook Creek formation. The project would involve the injection of approximately 160,000 metric tons of CO<sub>2</sub> per year into the Brook Creek formation. From *Williston Herald* on April 15, 2019.



Photograph from Southern States Energy Board's ECO2S Project as part of the CarbonSAFE Initiative.

### Status Report on Role of CCS Technologies.

The International Energy Agency released the 2018 “*Global Energy & CO<sub>2</sub> Status Report*.” The second annual online report provides an overview of recent global trends and developments in energy and CO<sub>2</sub> emissions in 2018.



### New Zealand Releases GHG Inventory Report.

*New Zealand's GHG Inventory report* represents an annual estimate of greenhouse gas (GHG) emissions and removals that occurred in New Zealand from 1990 through 2017. The inventory also contains emissions trends and methodologies used for estimating emissions and removals.

### Europe Relaunches CCUS Knowledge Exchange Network.

The European Commission announced funding for a knowledge-sharing network to develop CCUS projects throughout Europe. The European CCUS Projects Network will connect industry partners involved in current CCUS projects and provide them with opportunities for knowledge sharing, best practices, and guidance on increasing public awareness and acceptance of CCUS technologies.

## LEGISLATION and POLICY

### *Bill with Carbon Storage Focus Introduced.*

A group of U.S. Senators introduced a bill to increase federal funding for developing carbon capture technology. The *Enhancing Fossil Fuel Energy Carbon Technology (EFFECT) Act* would also establish four new research programs within DOE FE: Carbon Storage, Carbon Utilization, Carbon Removal, and Coal and Natural Gas Technology. From *The Hill* on April 11, 2019.

### *U.S. Senate Environment Panel Approves Bill.*

The U.S. Senate Environment Panel approved a bill that would support collaboration to construct and develop CCUS facilities and CO<sub>2</sub> pipelines. *The Utilizing Significant Emissions with Innovative Technologies (USE IT) Act* would, among other actions, clarify that CCUS projects and CO<sub>2</sub> pipelines are eligible for permitting review processes as well as direct the Council on Environmental Quality to establish guidance to assist project developers and operators of CCUS facilities and CO<sub>2</sub> pipelines. From *Carbon Capture Journal* on April 10, 2019.

### *Norwegian Government Proposes Funding of CCS Exploration Well.*

The Norwegian government, as part of the Norwegian full-scale CCS project, will propose funding for an exploration well for CO<sub>2</sub> storage on the Norwegian Continental Shelf. The exploration well is expected to provide Parliament with information on the quality and capacity of the reservoir, which will influence the decision on whether to proceed with the CCS project. The Norwegian government will present their proposal to Parliament in connection with the revised national budget for 2019. From *Royal Norwegian Ministry of Petroleum and Energy Press Release* on April 11, 2019.

## EMISSIONS TRADING

### *RGGI 2019 Interim Compliance Materials Available.*

The states participating in RGGI made materials regarding the 2019 interim control period compliance available. RGGI's fourth three-year control period is from January 1, 2018, through December 31, 2020; the 2019 interim control period began on January 1, 2019, and ends December 31, 2019. Each CO<sub>2</sub> budget source must hold allowances available for compliance deduction equal to 50% of their emissions by March 2, 2020. Market participants can acquire allowances through CO<sub>2</sub> allowance auctions or secondary markets. The next CO<sub>2</sub> allowance auction (*Auction 44*) will be held on June 5, 2019. From *RGGI News Release* on April 8, 2019.

### *Virginia Approves Regulation to Reduce GHGs.*

Virginia (USA) officials approved a regulation to establish a market-based program to reduce GHGs by 30% by 2030. The regulations align with the RGGI Model Rule and *guidelines set forth by RGGI*. Virginia's GHG reductions are set to begin in 2020. From *Daily Press* on April 22, 2019.

# RGGI Inc.



## SCIENCE NEWS

### *Researchers Develop Mechanical Trees to Capture, Store CO<sub>2</sub>.*

Researchers from Arizona State University (USA) have developed a cluster of "mechanical trees" capable of capturing CO<sub>2</sub> and storing it for industrial or agricultural use. A cluster of 12 trees has the potential to remove one metric ton of CO<sub>2</sub> from the atmosphere per day. The technology will be deployed in a pilot CO<sub>2</sub> farm targeting 100 metric tons of CO<sub>2</sub> capture per day; according to researchers, full-scale CO<sub>2</sub> farms using the mechanical trees should be capable of removing 3.8 million metric tons of CO<sub>2</sub> per year. From *The Engineer* on April 29, 2019.

### *Study Explains How Oceans Store CO<sub>2</sub>.*

Research led by the University of California, Santa Barbara (USA) was performed to study mechanisms of ocean carbon storage to improve understanding of how CO<sub>2</sub> moves in the ocean. *The study, which appears in the journal Nature*, discusses "particle injection pumps," which represent a multidimensional approach to account for carbon movement in the deep ocean. From *UC Santa Barbara News* on April 10, 2019.



### *Plastic Eaten by Plankton May Impair Ocean's Ability to Store CO<sub>2</sub>.*

According to a study conducted by Irish researchers, the consumption of microplastics by plankton has the potential to reduce the efficiency of the ocean's ability to store CO<sub>2</sub> on the seafloor. Marine scientists from the Ryan Institute at the National University of Ireland in Galway found that microscopic fragments of waste plastic might be interfering with the marine food chain, altering the density of faecal pellets and reducing the speed at which they sink to the seafloor. According to the research, published in the journal *Environmental Science and Technology*, the longer the faecal pellets remain at the sea surface, the greater their potential to be broken down as CO<sub>2</sub> and released into the ocean and atmosphere. From *The Irish Times* on April 30, 2019.



## JOURNAL ARTICLES

### *Feasibility of CO<sub>2</sub> migration detection using pressure and CO<sub>2</sub> saturation monitoring above an imperfect primary seal of a geologic CO<sub>2</sub> storage formation: a numerical investigation.*

The following is the abstract of this article: "A numerical model was developed to investigate the potential to detect fluid migration in a (homogeneous, isotropic, with constant pressure lateral boundaries) porous and permeable interval overlying an imperfect primary seal of a geologic CO<sub>2</sub> storage formation. The seal imperfection was modeled as a single higher-permeability zone in an otherwise low-permeability seal, with the center of that zone offset from the CO<sub>2</sub> injection well by 1400 m. Pressure response resulting from fluid migration through the high-permeability zone was detectable up to 1650 m from the centroid of that zone at the base of the monitored interval after 30 years of CO<sub>2</sub> injection (detection limit = 0.1 MPa pressure increase); no pressure response was detectable at the top of the monitored interval at the same point in time. CO<sub>2</sub> saturation response could be up to 774 m from the center of the high-permeability zone at the bottom of the monitored interval, and 1103 m at the top (saturation detection limit = 0.01). More than 6% of the injected CO<sub>2</sub>, by mass, migrated out of primary containment after 130 years of site performance (including 30 years of active injection) in the case where the zone of seal imperfection had a moderately high permeability (10<sup>-17</sup> m<sup>2</sup> or 0.01 mD). Free-phase CO<sub>2</sub> saturation monitoring at the top of the overlying interval provides favorable spatial coverage for detecting fluid migration across the primary seal. Improved sensitivity of detection for pressure perturbation will benefit time of detection above an imperfect seal." **Robert Dilmore, Argha Namhata, and Grant Bromhal**, *Computational Geosciences*. (Subscription may be required.)

### *Application of Blockchain in Carbon Trading.*

The following is the abstract of this article: "This paper introduces the similarity between the mechanism of carbon trading and blockchain, then it elaborates on the application of blockchain in carbon trading. In corporate carbon trading, blockchain technology can record and transfer information flow reliably, realize point-to-point transactions between suppliers and demanders to achieve 'decentralization,' help to reduce the entry threshold for the carbon trading market. At the same time, an analysis of social environment for blockchain-based carbon trading on person is made. Finally, the paper confirms the value of 'blockchain + carbon trading' and looks forward to the future." **Yuting Pan, Xiaosong Zhang, Yi Wang, Junhui Yan, Shuonv Zhou, Guanghua Li, and Jiexiong Bao**, *Energy Procedia*. (Subscription may be required.)

### *Analysis of the Impact of China's Emissions Trading Scheme on Reducing Carbon Emissions.*

The following is the abstract of this article: "By referring to the methods provided by Inter-governmental Panel on Climate Change (IPCC) and National Development and Reform Committee (NDRC), [the authors] first calculate the carbon emissions and carbon intensity (measured by emissions per output) of 39 sectors in 24 provinces from 2005 to 2015. Then using the panel data calculated, [the authors] apply difference-in-difference (DID) two-way fixed effects models to evaluate the causal impact of China's Emissions Trading Scheme (ETS) on the reduction of carbon emissions. Empirical results indicate that ETS sectors significantly decreased their emissions relative to non-ETS sectors after the start of ETS, while no obvious impact on carbon intensity was identified after ETS started. The results suggest that there is still room for policy makers to improve the ETS design to achieve declines not only in carbon emissions but also in carbon intensity in national ETS." **Zhang Haijun, Duan Maosheng, and Zhang Peng**, *Energy Procedia*. (Subscription may be required.)

### *The CCS hub in Norway: some insights from 22 years of saline aquifer storage.*

The following is the abstract of this article: "The development of industrial-scale CCS in Norway, starting with the Sleipner project in 1996, gives a uniquely long track record of experience with CCS and provides valuable insights for the projected global growth in CCS. By the end of 2017, the Sleipner and Snøhvit CCS projects had captured and stored 22 Mt of CO<sub>2</sub> in saline aquifers offshore Norway. CO<sub>2</sub> plume monitoring observations at Sleipner can be used to indicate an overall storage efficiency of around 5% of the pore volume, with approximately one tenth of this volume dissolved in the brine phase. These estimates are consistent with the fluid dynamics of CO<sub>2</sub> injection in which a gravity dominated processes are expected to give efficiencies in the range of 1-6%. Future projects may be able to find ways of improving these efficiencies." **Philip S. Ringrose**, *Energy Procedia*. (Subscription may be required.)

### *Offshore power generation with carbon capture and storage to decarbonise mainland electricity and offshore oil and gas installations: A techno-economic analysis.*

The following is the abstract of this article: "This study investigates the techno-economic potential of offshore power generation from natural gas with carbon capture and storage to reduce the climate impact of mainland electricity and the offshore oil and gas industry. This potential is assessed through techno-economic assessments over two relevant cases ('floating' and 'shallow water' cases) including comparison with relevant reference concepts. In the base case evaluation, the offshore power plant concept toward decarbonising mainland electricity results in high costs (178 and 258 \$/MWh respectively for the floating and shallow water cases) compared to a reference onshore power plant with carbon capture and storage (around 95 \$/MWh). However, a stronger potential is identified for the concept toward decarbonising offshore oil and gas platforms as the concept results in costs more comparable with the reference electrification concept (137 compared to 133 \$/MWh in the floating case and 207 compared to 166 \$/MWh in the shallow water case). Although the base cases show a limited potential for the offshore concept, the results show that with technological improvements (advanced capture technology, reuse of infrastructure...) and more suited case characteristics (development based on associated gas...), the offshore concept offers a significant potential for cost-efficiently decarbonising the offshore oil and gas industry, while a more moderate potential is foreseen for the decarbonisation of mainland electricity." **S. Roussanaly, A. Aasen, R. Anantharaman, B. Danielsen, J. Jakobsen, L. Heme-De-Lacotte, G. Neji, A. Sødal, P.E. Wahl, T.K. Vrana and R. Dreuxd**, *Applied Energy*. (Subscription may be required.)

## JOURNAL ARTICLES *(cont.)*

### *Salt marsh ecosystem restructuring enhances elevation resilience and carbon storage during accelerating relative sea-level rise.*

The following is the abstract of this article: "Salt marshes respond to sea-level rise through a series of complex and dynamic bio-physical feedbacks. In this study, [the authors] found that sea-level rise triggered salt marsh habitat restructuring, with the associated vegetation changes enhancing salt marsh elevation resilience. A continuous record of marsh elevation relative to sea level that includes reconstruction of high-resolution, sub-decadal, marsh elevation over the past century, coupled with a lower-resolution 1500-year record, revealed that relative sea-level rose  $1.5 \pm 0.4$  m, following local glacial isostatic adjustment ( $1.2$  mm/yr). As sea-level rise has rapidly accelerated, the high marsh zone dropped  $11$  cm within the tidal frame since 1932, leading to greater inundation and a shift to flood- and salt-tolerant low marsh species. Once the marsh platform fell to the elevation favored by low-marsh *Spartina alterniflora*, the elevation stabilized relative to sea level. Currently low marsh accretion keeps pace with sea-level rise, while present day high marsh zones that have not transitioned to low marsh have a vertical accretion deficit. Greater biomass productivity, and an expanding subsurface accommodation space favorable for salt marsh organic matter preservation, provide a positive feedback between sea-level rise and marsh platform elevation. Carbon storage was  $46 \pm 28$  g C/m<sup>2</sup>/yr from 550 to 1800 CE, increasing to  $129 \pm 50$  g C/m<sup>2</sup>/yr in the last decade..." **Meagan Eagle Gonneea, Christopher V. Maio, Kevin D. Kroeger, Andrea D. Hawkes, Jordan Mora, Richard Sullivan, Stephanie Madsen, Richard M. Buzard, Niamh Cahill, and Jeffrey P. Donnelly**, *Estuarine, Coastal and Shelf Science*. (Subscription may be required.)

### *Uncovering attitudes towards carbon capture storage and utilization technologies in Germany: Insights into affective-cognitive evaluations of benefits and risks.*

The following is the abstract of this article: "Carbon capture and storage (CCS) and carbon capture and utilization (CCU) are technologies which aim at mitigating climate change and saving fossil resources: CO<sub>2</sub> emissions from industrial plants are captured and stored underground (CCS) or used for the manufacturing of products (CCU). In contrast to CCS, CCU is less about the reduction of CO<sub>2</sub> emissions, since the global demand for feedstock CO<sub>2</sub> to be used for CCU products is considerably lower than the CO<sub>2</sub> emissions produced worldwide. Moreover, the CO<sub>2</sub> is only temporarily stored until the disposal of the CCU products. Instead, a reduction of fossil resources in product manufacturing is the primary goal for CCU. The successful roll-out of CCS and CCU is not solely determined by technical feasibility but also depends on public acceptance. Research has shown that acceptance of energy technologies is impacted by laypersons' attitudes. So far, little is known about differences in affective and cognitive evaluations of CCU in comparison to CCS. To address this research gap, an online survey was conducted in Germany (n = 449), in which affective and cognitive evaluation profiles for CCS and CCU were compared. Also, it was explored whether attitudes towards CCS are predictive of CCU acceptance. Results revealed basically similar evaluation profiles for CCS and CCU but CCU was rated significantly more positively. Comparing results for CCS supporters and opponents, it was found that CCS supporters rated CCU similarly positive whereas CCS opponents evaluated CCU significantly better than CCS. The findings can be used for communication concepts tailored to laypeople's requirements and concerns and yield implications for industrial policy-making." **Anika Linzenich, Katrin Arning, Julia Offerman-van Heek, and Martina Ziefle**, *Energy Research & Social Science*. (Subscription may be required.)

## REPORTS and OTHER PUBLICATIONS

### *Carbon Capture & Storage in The United States Power Sector: The Impact of 45Q Federal Tax Credits.*

The following is from the summary of this Clean Air Task Force (CATF) document: "In February 2018, the United States (U.S.) Congress passed the Bipartisan Budget Act of 2018, expanding the corporate income tax credit for carbon capture and storage (CCS). This tax credit, known as 45Q, was adopted to enable additional deployment of CCS projects in the U.S. – both to achieve economic goals such as meeting energy needs and supporting jobs as well as carbon emission reductions. CCS is an essential technology in the climate solution toolbox but has not yet been deployed widely enough to meet its full potential. CATF advocated for the expansion of 45Q for several years as a way to provide a performance-based financial incentive to increase deployment of the technology. In June 2018, after the adoption of the expanded 45Q tax credits, CATF retained Charles River Associates (CRA) to perform a modeling analysis, based on assumptions developed in conjunction with CATF, that estimates the impact of this new incentive on CCS deployment in the U.S. power sector by 2030. The modeling results show that 45Q leads to significant deployment of CCS, capturing and storing approximately 49 million [metric tons] of CO<sub>2</sub> annually in 2030. The estimated CO<sub>2</sub> that will be captured and stored is equivalent to removing roughly 7 million cars from U.S. roads. For perspective, this is greater than the number of new cars sold in the U.S. in all of 2017. Importantly, the modeling results show that the power sector carbon reductions due to 45Q-induced deployment of CCS are additive to those achieved through renewable sources of electricity generation. That is, the modeling shows that carbon capture-controlled electricity generation replaces uncontrolled fossil-fired power, not new or existing renewable energy. Electricity generation and corresponding emission reductions from renewables remain unaffected by the availability of 45Q."



CLEAN AIR  
TASK FORCE

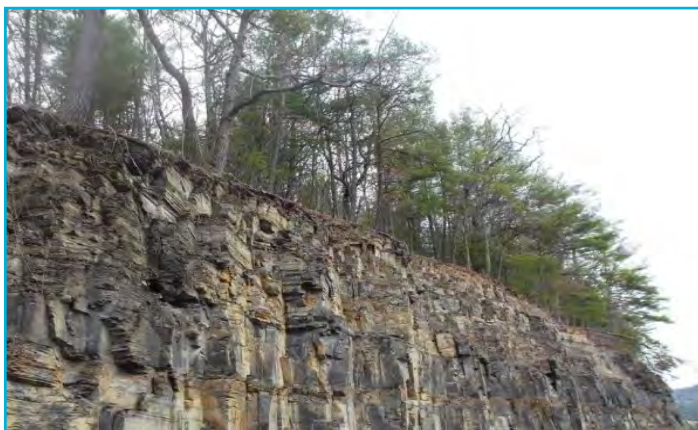
## ABOUT DOE'S CARBON STORAGE PROGRAM

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<sub>2</sub>, 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<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, basalt formations, and organic-rich shale basins—and to improve the understanding of how CO<sub>2</sub> behaves in the subsurface. These objectives are key to increasing confidence in safe, effective, and permanent geologic CO<sub>2</sub> 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](#).



Parallel, vertical, orthogonal natural fracture faces (joint sets) in an outcrop of organic-rich Millboro Shale (Marcellus equivalent), Clover Creek, VA. Photo by Dan Soeder, 2014.

## 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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