

## CSN

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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:

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CARBON STORAGE  
NEWSLETTER

## DOE/NETL HIGHLIGHTS

*NRAP Commences Phase II Research Program.*

The U.S. Department of Energy's (DOE) *National Risk Assessment Partnership (NRAP)* has entered Phase II of its research, in which researchers will consider how potential geologic carbon storage risks can be mitigated and how uncertainties in site performance can be reduced using strategic monitoring. Initiated in 2011, the National Energy Technology Laboratory (NETL)-led NRAP quantifies environmental risks at geologic carbon storage sites. *Phase I resulted in accomplishments* such as the first quantitative risk profiles for a full geologic carbon storage system, identification of key geologic storage reservoir risk relationships, and development of the NRAP Toolset. Phase II objectives include the development of advanced predictive models of geologic carbon storage system containment effectiveness/leakage response; development of a second-generation, open-source integrated assessment framework to quantify containment effectiveness/leakage response; development of improved tools and protocols to support advanced seismic hazard analysis and forecasting; development of tools to model monitoring and optimize design of monitoring networks for leak detection; and testing and validation of NRAP tools and methods using field data sets. From *energy.gov* on September 25, 2017.

*NETL-Developed Software Toolset Recognized.*

NETL's NRAP Toolset has been selected as a finalist for *R&D Magazine's annual R&D 100 Awards*, which recognize the top 100 technologies and services of the year. The Toolset software package includes 10 science-based computational tools that predict environmental risk performance of geologic carbon dioxide (CO<sub>2</sub>) storage sites. The Toolset supports industry and regulatory stakeholders in the design and implementation of safe and effective large-volume geologic CO<sub>2</sub> storage sites, providing users with credible, science-based resources for evaluating, developing, and managing the geologic storage of CO<sub>2</sub>. In addition, the Toolset expedites selection and characterization of candidate storage sites, builds public and industry stakeholder confidence in predictive data regarding storage site performance, aids in the preparation and evaluation of permits, and helps decision makers address large-scale implementation of geologic carbon storage projects. From *energy.gov* on October 6, 2017.



*Members of the NRAP Team meet to discuss the Toolset.*

## ANNOUNCEMENTS

*DOE Announces Funding for Carbon Capture, Storage, and Utilization Efforts.*

DOE's Office of Fossil Energy (FE) announced the availability of financial assistance to advance carbon capture technologies. The Funding Opportunity Announcement (FOA), titled "*Design and Testing of Advanced Carbon Capture Technologies*," will support cost-shared research and development (R&D) projects that continue the development of carbon capture technologies to either the engineering scale or a commercial design.

## ANNOUNCEMENTS (cont.)

### NETL Research Studies CO<sub>2</sub> Interaction with Shale.



NETL researchers are using complex experiments to determine if shale formations can serve as a storage reservoir for CO<sub>2</sub> captured from fossil fuel-burning power plants and other industries. Initial NETL research has shown that injected CO<sub>2</sub> may change the rock's porosity and permeability; understanding

these and other effects is key to developing successful carbon storage techniques and achieving more accurate predictions of the formation's storage potential. The research supports DOE's goal to increase the ability to predict CO<sub>2</sub> storage capacity in geologic formations to within  $\pm 30$  percent.

### NETL Releases Updated BPMs for Geologic Carbon Storage.

DOE/NETL announced the release of the final two of five 2017 revised edition Best Practice Manuals (BPMs) for geologic carbon storage projects. The final two BPMs ("*Operations for Geologic Storage Projects*" and "*Monitoring, Verification, and Accounting (MVA) for Geologic Storage Projects*") join the three BPMs released in July 2017 to provide a holistic approach to carrying out a geologic storage project from inception to completion. Developed in conjunction with the *Regional Carbon Sequestration Partnerships (RCSPs)*, the revised BPMs include new information learned as the RCSPs progressed to large-scale Development Phase field projects, as well as a variety of carbon storage scenarios at different geologic and geographic settings across the United States.



### DOE/NETL Conference Proceedings Available Online.

Proceedings of the DOE/NETL-sponsored "2017 Mastering the Subsurface Through Technology Innovation, Partnerships, and Collaboration: Carbon Storage and Oil and Natural Gas Technologies Review Meeting," held in Pittsburgh, Pennsylvania, USA, on August 1-3, 2017, are available online. Included are posters and presentations from the three-day meeting.

## PROJECT and BUSINESS DEVELOPMENTS

### CO<sub>2</sub> Storage Partnership Signed.

A CO<sub>2</sub> storage partnership has been signed to mature the development of carbon storage on the Norwegian continental shelf (NCS). Part of Norwegian efforts to develop full-scale carbon capture and storage (CCS) in Norway, the Statoil-led partnership involves partners Norske Shell and Total E&P Norge. The project will store CO<sub>2</sub> captured from industrial facilities in Eastern Norway, transporting it by ship from the capture facilities to a receiving terminal located onshore on the west coast of Norway, where it will be transferred to storage tanks prior to being sent through pipeline for injection east of the Troll field on the NCS. The project's objective is to stimulate development of CCS so the long-term targets in Norway and the European Union (EU) can be reached. From *Statoil News* on October 2, 2017.

### Ultra-High-Resolution 3D Seismic Technology Deployed in DOE/NETL Offshore CO<sub>2</sub> Storage Monitoring Project.

Researchers from the Gulf Coast Carbon Center at the Texas Bureau of Economic Geology conducted an ultra-high-resolution 3D seismic data collection survey off Japan's north island of Hokkaido. At the time of the survey, approximately 65,000 tons of CO<sub>2</sub> had been injected into a geologic formation 1,100 meters below the seafloor. Funded through DOE/NETL's Carbon Storage Program, the seismic data were collected using technology designed to provide high-resolution 3D data that can be used to characterize the geology above potential CO<sub>2</sub> storage sites.



Acoustic energy sources (compressed air) being deployed for ultra-high-resolution 3D seismic data acquisition at the Tomakomai CO<sub>2</sub> storage demonstration project offshore Tomakomai, Hokkaido, Japan.

### New International Standards for CO<sub>2</sub> Capture and Storage.

New international standards for the storage and transport of CO<sub>2</sub> will be presented at a seminar at the Norwegian Petroleum Directorate (NPD) in Stavanger, Norway, in fall 2017. The standards relate to the storage of CO<sub>2</sub> and its transportation by pipeline.

### UKCCSRC Autumn 2017 Biannual Proceedings Available Online.

Posters and presentations from the United Kingdom Carbon Capture and Storage Research Center's (UKCCSRC) Autumn 2017 Biannual meeting are available online. Held in September 2017, the Autumn Biannual Meeting focused on the UKCCSRC's core research program.

### University of Maryland Releases Updated Action Plan.

The University of Maryland (UMD) released an updated action plan outlining strategies to help the university become carbon neutral by 2050. In addition to reducing the university's CO<sub>2</sub> emissions, *Climate Action Plan 2.0* will also fully integrate sustainability into its educational and research efforts. Since the original plan in 2009, UMD has reduced greenhouse gas (GHG) emissions by 28 percent.

### Safe CO<sub>2</sub> Storage Test Aids Top Research Project.

A new method that monitors the safe storage of industrial GHGs will be used at a Carbon Management Canada-operated CCS test site in Alberta, Canada. Developed by researchers from the University of Edinburgh, the method shows that the chemical fingerprint of CO<sub>2</sub> captured from power plants remains recognizable after underground injection, enabling stored industrial CO<sub>2</sub> to be distinguished from other sources of CO<sub>2</sub> (e.g., groundwater, natural emissions from plants, bacteria). The method was verified by studying experimental storage sites in Australia and Canada in which the gas was sampled before and after injection, leading to researchers finding that the fingerprints remained identifiable. From *The University of Edinburgh* on September 20, 2017.

## PROJECT and BUSINESS DEVELOPMENTS *(cont.)*

### *EOR Research Partnership Formed.*

The Abu Dhabi National Oil Company (Adnoc) and the Center of Integrated Petroleum Research (CIPR) at Bergen University, Norway, have agreed to a partnership to conduct applied research into enhanced oil recovery (EOR) techniques. Under the agreement, Adnoc and CIPR will collaborate on research into a range of EOR applications while looking to reduce the risk of the different technologies and prepare for future full field expansion of the solutions that demonstrate the best deployment value. From *Trade Arabia* on October 2, 2017.

### *Canadian Investment in Carbon Capture and Conversion.*

The Government of Canada and the Government of British Columbia have invested in a carbon capture and conversion testing facility. The new BC Research (BCRI) Technology Commercialization and Innovation Centre is home to the Carbon Capture and Conversion Institute (CCCI); together, BCRI and CCCI offer experts, pilot plant, and laboratory space for the development of technologies to reduce industrial GHGs. The funding is expected to help CCCI develop and scale-up CO<sub>2</sub> capture and conversion technologies. From *Carbon Capture and Conversion Institute (CCCI)* on September 14, 2017.

## LEGISLATION and POLICY

### *EU Roadmap to Be Updated.*

The European Commission is preparing an update of its low-carbon economy roadmap for 2050. According to officials, the European Commission will launch a public consultation with a view to updating its low-carbon economy roadmap in 2018. The [2050 low-carbon economy roadmap](#) was originally published in 2011 and laid the foundation for the EU's energy policy, with the goal of at least 80 percent reduction in the bloc's emissions by mid-century. From *EURACTIV.com* on September 21, 2017.

### *Research on Benefits of CCS in UK.*

According to new research conducted by the Global CCS Institute, the deployment of CCS technology could have potential benefits to the East Coast of the United Kingdom. In addition to creating sustainable jobs, the study, titled "Clean Air – Clean Industry – Clean Growth: How carbon capture will boost the UK economy," also finds that CCS technology deployed in the region could lead to the capture and storage of 1,500 million metric tons of CO<sub>2</sub>. From *Global CCS Institute* on October 5, 2017.

## EMISSIONS TRADING

### *California and Québec Joint Cap-and-Trade Auction Notice.*

The California and Québec governments released the Auction Notice for their 13th joint auction of GHG allowances, to be held in November 2017. The November 2017 Joint Auction #13 will make 79,548,286 CO<sub>2</sub> allowances available for sale in the Current Auction, which is the auction of allowances from the current and previous budget years. In addition, 9,723,500 CO<sub>2</sub> allowances will be made available for sale in the Advance Auction, which is the auction of future vintage allowances. From *The Ministry of Sustainable Development, the Environment, and the Fight Against Climate Change Auction Notice* on September 15, 2017.

### *RGGI Report: Investments Generating Consumer Benefits.*

The states participating in the Regional Greenhouse Gas Initiative (RGGI) released a report that tracks the investment of proceeds generated in 2015 by RGGI's regional CO<sub>2</sub> allowance auctions. According to the report, which provides state-specific highlights, in 2015 more than \$410 million in RGGI proceeds were invested in programs such as energy efficiency, clean and renewable energy, GHG abatement, and direct bill assistance. For more information on both 2015 and cumulative investments and benefits, refer to the report, titled "[The Investment of RGGI Proceeds in 2015](#)." From *RGGI News Release* on October 3, 2017.

### *France and Germany Seek Agreement on EU Carbon Market Reform.*

The French and German governments will work together to reinforce carbon pricing in the European electricity sector, France's ecology ministry announced. In addition, the governments will seek an agreement on the EU's Emissions Trading System (ETS) carbon market by November 2017. From *Reuters* on September 4, 2017.

## CLIMATE and SCIENCE NEWS

### *Collaboration Studies Carbon Storage in Organic Soils.*

A collaboration between the National Soil Project at Northeastern University and The Organic Center led to a study that found soils from organic farms store more CO<sub>2</sub>, and for longer periods of time, than soil from conventional farms. Conducted by Northeastern University researchers, the study compared more than 1,000 soils from organic and conventional farms across the United States to understand how different agriculture management practices influence components of soil organic carbon (SOC). The findings showed that soils from organic farms have 13 percent more SOC and store 25 percent more CO<sub>2</sub>. From *The Organic Center* on September 11, 2017.

### *U.S. Naval Research Laboratory Patent Contributes to CO<sub>2</sub> Removal.*

A [recently awarded patent](#) to the U.S. Naval Research Laboratory (NRL) has the potential to aid in the removal of approximately five tons of CO<sub>2</sub> per year. NRL's electrolytic-cation exchange module (E-CEM) design provides the capability to produce the raw materials necessary to develop synthetic fuel stock. E-CEM is capable of producing hydrogen (H<sub>2</sub>) while simultaneously removing CO<sub>2</sub> from seawater. From *U.S. Naval Research Laboratory News Release* on October 3, 2017.

## JOURNAL ARTICLES

*Advantages from Combining CCS with Geothermal Energy.*

The following is the Abstract of this article: "CCS technology is one important option to reduce CO<sub>2</sub> emissions, however social, political and mainly economic barriers limit its implementation. A combination of CCS-geothermal technologies can contribute to achieve faster this reduction and to decrease costs by sharing injection wells, using CO<sub>2</sub> instead of water as heat transfer fluid, thereby lowering water consumption and saving pump costs. It can also change public perception towards CCS. This technology is currently in mature level, allowing to store CO<sub>2</sub> in a safe way. Moreover all knowledge acquired on CO<sub>2</sub> storage and monitoring can be also used for geothermal energy." **Edesio Miranda-Barbosa, Bergur Sigfússon, Johan Carlsson, and Evangelos Tzimas, *Energy Procedia*.** (Subscription may be required.)

*Developing a Consistent Database for Regional Geologic CO<sub>2</sub> Storage Capacity Worldwide.*

The following is the Abstract of this article: "Assessments of the geologic storage capacity of CO<sub>2</sub> in the current literature are incomplete and inconsistent, complicating efforts to assess the worldwide potential for CCS. [The authors] developed a method for generating first-order estimates of storage capacity requiring minimal data to characterize a geologic formation. [The authors] show this simplified method accounts for the majority of the variance in storage capacity found in more detailed studies conducted in the United States. [The authors] apply [their] method to create a worldwide database of storage capacity, disaggregated into 18 regions, and compare this storage capacity to CCS deployment in the MIT Economic Prediction and Policy Analysis (EPPA) model. Globally, [the authors] estimate there are between 8,000 and 55,000 gigatonnes (Gt) of practically accessible geologic storage capacity for CO<sub>2</sub>. For most of the regions, [the authors'] results indicate storage capacity is not a limiting factor for CCS deployment through the rest of this century even if stringent emissions reductions are required." **Jordan Kearns, Gary Teletzke, Jeffrey Palmer, Hans Thomann, Haroon Kheshgi, Yen-Heng, Henry Chen, Sergey Paltsev, and Howard Herzog, *Energy Procedia*.** (Subscription may be required.)

*Tracking the interaction between injected CO<sub>2</sub> and reservoir fluids using noble gas isotopes in an analogue of large-scale carbon capture and storage.*

The following is the Abstract of this article: "Industrial scale [CCS] technology relies on the secure long term storage of CO<sub>2</sub> in the subsurface. The engineering and safety of a geological storage site is critically dependent on how and where CO<sub>2</sub> will be stored over the lifetime of the site. Hence, there is a need to determine how injected CO<sub>2</sub> is stored and identify how injected CO<sub>2</sub> interacts with sub-surface fluids. Since July 2008 ~1 Mt of CO<sub>2</sub> has been injected into the Cranfield EOR field (MS, USA), sourced from a portion of the natural CO<sub>2</sub> produced from the nearby Jackson Dome CO<sub>2</sub> reservoir. Monitoring and tracking of the amount of recycled CO<sub>2</sub> shows that a portion of the injected CO<sub>2</sub> has been retained in the reservoir. Here, [the authors] show that the noble gases (<sup>20</sup>Ne, <sup>36</sup>Ar, <sup>84</sup>Kr, <sup>132</sup>Xe) that are intrinsic to the injected CO<sub>2</sub> can be combined with CO<sub>2</sub>/He and  $\delta^{13}\text{C}_{\text{CO}_2}$  measurements to trace both the dissolution of the CO<sub>2</sub> into the formation water, and the interaction of CO<sub>2</sub> with the residual oil. Samples collected 18 months after CO<sub>2</sub> injection commenced show that the CO<sub>2</sub> has stripped the noble gases from the formation water. The isotopic composition of He suggests that ~0.2%, some 7 kt, of the injected CO<sub>2</sub> has dissolved into formation water. The CO<sub>2</sub>/He and  $\delta^{13}\text{C}_{\text{CO}_2}$  values imply that dissolution is occurring at pH = 5.8, consistent with the previous determinations.  $\delta^{13}\text{C}_{\text{CO}_2}$  measurements and geochemical modelling rule out significant carbonate precipitation and [the authors] determine that the undissolved CO<sub>2</sub> after 18 months of injection (1.5 Mt) is stored by stratigraphic or residual trapping. After 45 months of CO<sub>2</sub> injection, the noble gas concentrations appear to be affected by CO<sub>2</sub>-oil interaction, overprinting the signature of the formation water." **Domokos Györe, Stuart M.V. Giffillan, and Finlay M. Stuart, *Applied Geochemistry*.** (Subscription may be required.)

*Readily implementable techniques can cut annual CO<sub>2</sub> emissions from the production of concrete by over 20%.*

The following is the Abstract of this article: "Due to its prevalence in modern infrastructure, concrete is experiencing the most rapid increase in consumption among globally common structural materials; however, the production of concrete results in approximately 8.6% of all anthropogenic CO<sub>2</sub> emissions. Many methods have been developed to reduce the [GHG] emissions associated with the production of concrete. These methods range from the replacement of inefficient manufacturing equipment to alternative binders and the use of breakthrough technologies; nevertheless, many of these methods have barriers to implementation. In this research, [the authors] examine the extent to which the increased use of several currently implemented methods can reduce the [GHG] emissions in concrete material production without requiring new technologies, changes in production, or novel material use. This research shows that, through increased use of common supplementary cementitious materials, appropriate selection of proportions for cement replacement, and increased concrete design age, 24% of [GHG] emissions from global concrete production or 650 million [metric tons] CO<sub>2</sub>-eq can be eliminated annually." **Sabbie A Miller, Arpad Horvath, and Paulo J M Monteiro, *Environmental Research Letters*.** (Subscription may be required.)

*The impacts of emissions accounting methods on an imperfect competitive carbon trading market.*

The following is the Abstract of this article: "To achieve a reduction in carbon intensity, the Chinese government has committed to establishing a nationwide carbon market. In this study, an interregional input-output model is proposed to derive cost curves for regional marginal abatement and to estimate inter-regional embodied emissions. An emissions trading model is presented for exploring the impacts of emissions accounting methods on imperfect competitive trading markets in the context of China achieving its 12th FYP intensity reduction target. The results indicated that emissions permits could be reallocated according to the CBA method. This could reduce both carbon emissions and total cost. Compared to the PBA method, the CBA method could lead to a greater change in permit prices and the amount of carbon trading in an imperfect competitive carbon market. Moreover, more regions with market power could cause declines in permit prices, resulting in changes in abatement costs. In addition, seven pilot markets (excluding Hubei province) are net embodied emissions importers. Pilot trading schemes in China could lead to carbon leakage among the other non-trading regions and sectors." **Yan Xia and Zhipeng Tang, *Energy*.** (Subscription may be required.)

*Carbon allowance auction design of China's emissions trading scheme: A multi-agent-based approach.*

The following is the Abstract of this article: "In this paper, a multi-agent-based ETS simulation model is proposed for carbon allowance auction design in China. In the proposed model, two main agents, i.e., the government (the ETS implementer) and the firms in different sectors (the ETS targets), are considered. Under the ETS policy, all agents make various decisions individually according to their own goals, and interact with each other through three main markets: the commodity market, the primary carbon auction market and the secondary carbon trading market. Different popular auction designs are introduced into the ETS formulation to offer helpful insights into China's ETS design. (1) Generally, the ETS would lead to positive effects on China's carbon mitigation and energy structure improvement, but a negative impact on economy. (2) As for auction forms, the uniform-price design is relatively moderate, while the discriminative-price design is quite aggressive in both economic damage and emissions reduction. (3) As for carbon price, the uniform-price auction might generate a slightly higher market clearing price than the discriminative-price auction, and the prices under two auction rules fluctuate about RMB 40 per metric ton. (4) As for carbon cap, the total allowances in the carbon auction market should be carefully set to well balance economic growth and mitigation effect." **Ling Tang, Jiaqian Wu, Lean Yu, and Qin Bao, *Energy Policy*.** (Subscription may be required.)

## REPORTS and OTHER PUBLICATIONS

***Second-Generation Toolset for Calculation of Induced Seismicity Risk Profiles.***

The following is the Abstract of this NRAP document: “This report describes development and demonstration of the second-generation toolset for NRAP. The toolset provides a probabilistic analysis of hazards and risks from earthquakes that could potentially be induced by increased subsurface pore pressures on faults resulting from CO<sub>2</sub> injection for geological carbon sequestration (GCS). Hazard and risk calculations utilize earthquake catalogs produced by physics-based simulations that incorporate injection-induced pressure changes generated by subsurface fluid flow modeling. The second-generation toolset has the capability of calculating the seismic hazard at an arbitrary number of ground surface sites from events occurring on multiple source faults. Hazard uncertainty bounds are determined using multiple realizations of simulated earthquake catalogs that sample the epistemic and aleatory uncertainty distributions on the input parameters. ‘Nuisance fragility functions’ for seismic ground motion developed as part of the second-generation work are combined with the hazard curves to estimate the risk of nuisance from ground shaking. Hazard and risk estimates for different time periods before, during, and after CO<sub>2</sub> injection can be compared to assess the impact of the GCS operation and to inform operational decision making. The results described in this report demonstrate the functionality of the toolset based on its application to a hypothetical scenario involving two faults. Further development, including modifications to the current computer code implementation and code parallelization, will be needed to bring the toolset up to full functionality in dealing with large numbers of faults.”

***Kimberlina, California Site Characterization for Applications to Potential Induced Seismicity.***

The following is the Executive Summary of this NRAP document: “This study considered a hypothetical location of a CO<sub>2</sub> injection facility at the Kimberlina site, described [in this document]. The report is divided into four parts: 1) ground motion prediction; 2) ambient (in-situ) stress field; 3) topographic site characterization, and 4) fault characterization. The focus is twofold: [(1) site characterization parameters and methodologies that have been applied to the Kimberlina site, and (2) a more general discussion of site characterization approaches and methodologies that are applicable to general sites of interest.] This study resulted in a number of summary conclusions and recommendations, some of which are specific to the hypothetical Kimberlina site, and many of which are more broadly applicable to the consideration of seismicity in selecting and characterizing future carbon storage sites, including the impact of surface facilities. The methods described herein can be applied to a site with a relatively small amount of measured seismic activity. The benefits of establishing seismic monitoring networks, collecting rock cores, and characterizing peak ground acceleration and velocity have been identified. Further detail regarding these conclusions and recommendations can be found in the final two sections of this report.”

***Algae Cultivation for Carbon Capture and Utilization Workshop Summary Report.***

The following is from the Introduction of this DOE Office of Energy Efficiency and Renewable Energy (EERE) Bioenergy Technologies Office (BETO) document: “BETO works to accelerate the development of a bioeconomy that can strengthen U.S. energy security, environmental quality, and economic vitality. BETO’s Advanced Algal Systems Program (also called the Algae Program) is implementing a long-term applied R&D strategy to support the bioeconomy by lowering the costs of production for algal biofuels and bioproducts. The Algae Program works with partners to develop innovative technologies, integrate these technologies in pre-pilot test environments, and conduct crosscutting analyses to better understand the potential and challenges of an algal biofuels and bioproducts industry. BETO’s Algae Program regularly hosts algal biofuels strategy workshops to engage stakeholders in discussions of R&D priorities and to facilitate partnerships. On May 23–24, 2017, BETO hosted the Algae Cultivation for Carbon Capture and Utilization (CCU) Workshop in Orlando, Florida. Over 80 attendees participated in the event, providing valuable input through facilitated discussions focused on innovative technologies and business strategies for growing algae on waste CO<sub>2</sub> emissions. Representatives from BETO, DOE’s FE’s Office of Coal and Power Research and Development, and experts in the fields of waste CCU and algae cultivation considered challenges and opportunities related to the following: [(1) sourcing CO<sub>2</sub>, including quality, quantity, siting, and transport; (2) cultivating algae, including biomass productivity, efficiency in CO<sub>2</sub> utilization, and carbon balances of end products; and (3) identifying sustainable ‘win-win’ solutions to reducing CO<sub>2</sub> emissions while achieving cost savings].”

## ABOUT DOE'S CARBON STORAGE PROGRAM

The **Carbon Storage Program** advances the development and validation of technologies that enable safe, cost-effective, permanent geologic storage of CO<sub>2</sub>. The Carbon Storage Program also supports the development of best practices for CCS that will benefit projects implementing CCS at a commercial scale, such as those being performed under NETL's Clean Coal Power Initiative and Industrial Carbon Capture and Storage Programs. The technologies being developed and the small- and large-scale injection projects conducted through this program will be used to benefit the existing and future fleet of fossil fuel power-generating facilities by developing tools to increase our understanding of the behavior of CO<sub>2</sub> in the subsurface and identifying the geologic reservoirs appropriate for 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



The [National Energy Technology Laboratory's CCS Database](#) includes active, proposed, and terminated CCS projects worldwide. The information is taken from publically available sources to provide convenient access to information regarding efforts by various industries, public groups, and governments towards development and eventual deployment of CCS technology. NETL's CCS Database is available as a Microsoft Excel spreadsheet and also as a customizable layer in Google Earth.

Newsletters, program fact sheets, best practices manuals, roadmaps, educational resources, presentations, and more are available via the [Carbon Storage Program Publications webpage](#).

Get answers to your carbon capture and storage questions at NETL's [Frequently Asked Questions webpage](#).

## 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.



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