NATIONAL ENERGY TECHNOLOGY LABORATORY

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CARBON CAPTURE NEWSLETTER

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

HIGHLIGHTS

The newsletter is compiled by the National Energy Technology Laboratory to provide information on recent activities and publications related to carbon capture.

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DOE Seeks Information on Deployment-Ready Carbon Reduction and Removal Technologies

The U.S. Department of Energy (DOE) released a Request for Information (RFI) in support of a plan for the deployment and demonstration of carbon management technologies such as carbon capture and storage (CCS) and removal of carbon dioxide from the atmosphere. The RFI seeks feedback from industry, investors, developers, academia, research laboratories, government agencies, non-governmental organizations (NGOs), and potentially affected communities. Technologies to decarbonize most of the nation's economy are both available and affordable in part due to decades of technology development led by DOE, but further innovation, demonstration, and large-scale deployment of carbon management solutions are needed to reach the Biden Administration's goals of 100% carbon-free electricity by 2035 and a net-zero-carbon economy by 2050. The RFI seeks information on direct air capture (DAC), point source carbon capture, geologic storage, CO_2 infrastructure, and more. The RFI is available here.

Interagency News and Updates

FECM Makes Historic Shift to Center Work on Climate Change

DOE's Office of Fossil Energy officially added "Carbon Management" to its name on July 4, 2021. This shift in focus recognizes that to meet its climate goals and energy needs, the United States must decarbonize the energy and industrial sectors and manage the carbon that comes with the legacy of burning fossil fuels. Through recent organizational changes, the Office of Fossil Energy and Carbon Management (FECM) centers its work on the climate—concentrating on research, development, demonstration, and deployment priorities that will pave the way for achieving net-zero carbon emissions by mid-century. These priorities include expanding the reach of carbon capture and storage (CCS) technologies; investing in carbon dioxide removal (CDR) technologies; reducing methane emissions from coal, oil, and gas production and transport; helping to advance a clean hydrogen economy; and developing domestic sources of the critical minerals that will be required in a clean energy economy.

FECM Launches Key Carbon Management Initiatives at COP26

At the United Nations Climate Change Conference (COP 26), Acting Assistant Secretary for FECM Dr. Jennifer Wilcox underscored DOE's support for the Biden-Harris Administration's whole-of-government approach to addressing the climate crisis and advancing energy and climate justice in the United States. Throughout the event, Dr. Wilcox spoke in a number of keynote speeches and panels on DOE's plans to support the United States in achieving net-zero carbon emissions by mid-century. In response to President Biden's charge to speed the development of critical technologies to combat climate change, Secretary of Energy Jennifer M. Granholm launched two DOE efforts: (1) the Carbon Negative Shot, which calls for progress in CDR that will remove and durably store CO_2 for less than $100/net metric ton of CO_2-equivalent across the full suite of approaches; and (2) the CDR Mission, which will become the world's first public-private partnership to accelerate innovation in CDR.

DOE's Secretary of Energy Jennifer M. Granholm pictured announcing Carbon Negative Shot at COP26

FECM Announces Intent to Fund Decarbonization and Environmental Remediation Projects Through University Training and Research

FECM announced its intent to fund projects through its University Training and Research Program, which comprises the University Coal Research (UCR) Program and the Historically Black Colleges and Universities and Other Minority Institutions (HBCU-OMI) Program. The programs serve to prepare the next generation of engineers and scientists working to advance the Biden-Harris Administration's goals of net-zero carbon emissions by 2050. Projects will be managed by FECM's National Energy Technology Laboratory (NETL). Both opportunities would fund projects to conduct early-stage research and development of decarbonization approaches and address the mitigation and remediation of legacy environmental impacts of coal-based power generation. Read the full Notice of Intent (NOI) for the UCR Program here. Read the full NOI for the HBCU-OMI Program here.

Interagency News and Updates (continued)

Research Opportunity for Undergraduate and Graduate Students

DOE's Mickey Leland Energy Fellowship (MLEF) Program is a 10-week summer research fellowship for undergraduate and graduate students in science, technology, engineering, and math (STEM) majors. Participants complete a cutting-edge research project at one of DOE's national laboratories or DOE Headquarters in support of DOE's mission to minimize the environmental impacts of energy resource recovery and use while working toward net-zero emissions. All eligible candidates are encouraged to apply.

DOE Awards Funding in Support of Carbon Management and Energy Storage Technologies

FECM announced funding for four national public power associations to help increase regional and state-level engagement in DOE's emerging carbon management work and advanced energy storage technologies at U.S. power generation facilities. The cooperative agreements issued with these awards will support the development of tools, educational resources, and training in long-term planning and policy analysis to improve the conditions of frontline communities impacted by the legacy of fossil fuel use and support a healthy transition to a clean energy economy. NETL will serve as the contracting authority for the cooperative agreements and will manage the following awards: (1) DOE-National Association of Regulatory Utility Commissioners (NARUC) Coal Modernization and Carbon Management Partnership, (2) State and Local Innovation and Analysis in Support of Long-Term Energy Planning and Policy, (3) Outreach for Advanced Storage Integration and Support (OASIS), and (4) Energy Storage Accessibility for Public Power Utilities.

NETL, DOE Laboratories Developing New Air Separation Technologies for Hydrogen Production

NETL researchers and project partners at Los Alamos National Laboratory, Pacific Northwest National Laboratory (PNNL), and Idaho National Laboratory are developing advanced air separation technologies that produce oxygen. The projects that NETL and its collaborators are advancing actively address climate change by reducing CO_2 emissions via clean hydrogen generation in oxygen-blown, gasification-based plants equipped with CCS. As part of this effort, NETL researchers are developing novel materials called oxygen carriers to which oxygen can absorb and desorb inside an air separation reactor, effectively separating the oxygen from other components of air, primarily nitrogen. The goal of the work is to design low-cost, high-performance carrier materials and then design a reactor that functions optimally with these materials. The technology, once deployed, could provide a cost-competitive option for modular systems, which can be optimized for an individual operator's specific needs.

U.S. and International Events

ARPA-E Energy Innovation Summit

The Advanced Research Projects Agency-Energy (ARPA-E) Energy Innovation Summit, to be held March 14–16, 2022, in Denver, Colorado, is an annual conference and technology showcase that brings together experts from different technical disciplines and professional communities to discuss America's energy challenges. In its twelfth year, the Summit offers a unique, three-day program aimed at moving transformational energy technologies out of the lab and into the market.

U.S. and International Events (continued)

Gordon Research Conference: Permanently Removing CO_2 from Our Emissions and Atmosphere

The fourth installation of the CCUS Gordon Research Conference series, to be held April 3–8, 2022, in Ventura, California, will examine the following questions: (1) can the United States decarbonize safely, and with a variety of approaches appropriate for a wide range of power and industrial challenges? and (2) can the United States develop methods to clean up the atmosphere in time to keep within reasonable temperature limits?

ASME's Turbomachinery Technical Conference & Exposition

The American Society of Mechanical Engineers (ASME) turbomachinery technical conference and exposition, to be held June 13–17, 2022, in Rotterdam, The Netherlands, attracts the industry's leading professionals and key decision-makers, whose innovation and expertise help to shape the future of the turbomachinery industry. The three-day expo will include hundreds of live presenting authors during the event, as well as recorded video presentations on demand.

CEM13/MI7

The 13th Clean Energy Ministerial (CEM) and the 7th ministerial for Mission Innovation (MI)—a collective effort by the public and private sector to rapidly create the net-zero economy that leaves no community behind—will be held September 2022, in Pittsburgh, Pennsylvania. CEM is a platform for members to help shape the global clean energy agenda and advance the deployment of specific clean energy technologies and solutions.

Carbon Capture Technology Conference & Expo

The Carbon Capture Technology Conference & Expo is a two-day event to be held 19–20 October 2022, in Messe Bremen, Germany. The event will bring together leading engineering firms, technology manufacturers and suppliers, energy firms, the oil and gas sector, heavy industry, chemical companies, various manufacturing organizations, research groups and NGOs, consultants, and government bodies to explore how to rapidly accelerate the deployment and commercialization of carbon-removal technologies as a key solution on the pathway to net-zero carbon emissions.

16th Greenhouse Gas Control Technologies Conference

The 16th Greenhouse Gas Control Technologies (GHGT) Conference, to be held October 23–27, 2022, in Lyon, France, has established itself as the principal international conference on greenhouse gas mitigation technologies, especially CCS. The GHGT conferences are held every two years in member countries, rotating between North America, Europe, and Asia. Each conference is a forum for technical discussions related to the field of GHGT.

Business and Industry News

SoCalGas Focuses on DAC Technology to Reduce Emissions

Southern California Gas (SoCalGas) is developing a new technology to capture CO_2 from the air, while simultaneously collecting water that can then be reused for irrigation. The technology—Isothermal Water Vapor and CO_2 Capture (IWVC)—is believed to drastically help reduce carbon emissions; SoCalGas's vital tests will provide key insight into efficiency, operating costs, and ultimately determining the cost-effectiveness of its deployment at scale. The IWVC technology was conceived at PNNL and is being commercialized by Los Angeles-based start-up Avnos.

Oregon State University to Lead DOE DAC Project

Oregon State University chemistry professor May Nyman was selected as one of the leaders of a DOE-funded effort to develop technologies for combating climate change by extracting CO_2 from the air. Nyman will receive funding over three years to lead a collaboration that includes scientists from Argonne National Laboratory, as well as Oregon State University. The team will explore how some transition metal complexes can react with air to remove CO_2. These complexes extract CO_2 and convert it to a stable solid, a metal carbonate similar to what is found in many naturally occurring minerals.

Chart Receives DOE Funding for Carbon Capture Tech

U.S.-based industrial gas equipment manufacturer Chart Industries was awarded DOE funding for its Sustainable Energy Solutions Cryogenic Carbon Capture (CCC) technology. The funding will be used to scale up the CCC system by allowing the design, building, commissioning, and operating of an engineering-scale CCC process at Central Plains Cement Company LLC's cement plant located in Sugar Creek, Missouri. Scaling-up will also involve the increase in capacity of CO_2 captured to 30 metric tons per day. In addition, the award will assist Chart in its aim to demonstrate greater than 95% capture rate of CO_2 from the flue gas slip stream, resulting in a greater than 95% pure CO_2 stream.

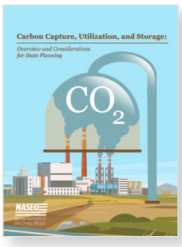
CAER Project Seeks to Capture Carbon Directly from Atmosphere

An NETL-funded University of Kentucky (UK) Center for Applied Energy Research (CAER) DAC project will leverage technology and innovation previously developed by CAER's Power Generation Research Group. In 2014, CAER constructed a pilot-scale carbon capture unit at Louisville Gas and Electric Company and Kentucky Utilities Company's E.W. Brown Generating Station. CAER will be developing an intensified, cost-effective, and scalable process using aqueous potassium hydroxide (KOH) as a capture solvent for DAC. The process employs a hybrid membrane absorber coupled with an electrochemical solvent regenerator that extracts CO_2 from air, enriching carbon content in the solution after capture. The system will then release the CO_2 back into the electrochemical regenerator and produce a stream of hydrogen. The hydrogen could then be sold to offset the DAC cost.

Researchers to Design Large-Scale System for DAC and Storage of CO_2 in the U.S.

NETL has partnered with the Illinois Sustainable Technology Center (ISTC) to develop preliminary designs and determine feasibility for the first commercial-scale DAC and storage system (DAC+S) for CO_2 removal in the United States. The 18-month project will explore the possibility of pulling 100,000 metric tons of CO_2 from the air annually (this amount is expected to help offset upfront costs and make the service profitable at commercial scale). The project will use DAC technology provided by the Swiss company Climeworks. Climeworks has built and operated several DAC plants in various climates across Europe, among them the industrial-scale DAC plant in Hinwil, Switzerland, and the DAC+S plant Orca in Hellisheidi, Iceland.

Publications



Carbon Capture, Utilization, and Storage: Overview and Considerations for State Planning

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About DOE's Carbon Capture Program

NETL's Carbon Capture Program is developing the next generation of advanced carbon dioxide (CO_2) capture technologies. The U.S. Department of Energy's (DOE) Office of Fossil Energy and Carbon Management has adopted a comprehensive multi-pronged approach for the research and development of advanced CO_2 capture technologies that have the potential to provide step-change reductions in both cost and energy requirements as compared to currently available technologies.

The Compendium of Carbon Capture Technology provides a technical summary of the DOE/NETL's Carbon Capture Program, assembling carbon dioxide capture technology research and development (R&D) descriptions in a single document.

Carbon Capture Reference Materials

- Carbon Capture Program Factsheet
- Carbon Capture Infographics
- Compendium of Carbon Capture Technology
- Carbon Dioxide Capture Handbook
- $CCSI^2$
- Systems Analysis
- Conference Proceedings
- Accomplishments Posters
- Fossil Energy Techlines

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Program staff are also located in **Houston, Texas** and **Anchorage, Alaska**

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