NATIONAL ENERGY TECHNOLOGY LABORATORY

OCTOBER 2022

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 Invests Funding to Advance CCS for Natural Gas Power and Industrial Sectors

The U.S. Department of Energy's (DOE) Office of Fossil Energy and Carbon Management (FECM) announced more than $31 million in funding for 10 projects to develop carbon capture technologies capable of capturing at least 95% of carbon dioxide (CO_2) emissions generated from natural gas power plants, waste-to-energy power plants, and industrial applications, including cement and steel. DOE's National Energy Technology Laboratory (NETL) will manage the 10 selected projects, which will support development and testing of transformational carbon capture materials, equipment, and processes for applications in natural gas combined cycle (NGCC) power plants, waste-to-energy power generation facilities, and the industrial sector. Five of the projects will perform front-end engineering design (FEED) studies for industrial plants and NGCC power plants integrated with carbon capture systems.

Interagency News and Updates

Nation's Carbon Management Experts Convene in Pittsburgh

Researchers from NETL, DOE, other national laboratories, U.S. research universities, industry, and professional associations gathered for the NETL-hosted 2022 Carbon Management Project Review Meeting—a five-day meeting to present updates on more than 225 carbon management projects underway to ensure a sustainable clean energy future. During the meeting, NETL held a collaborative workshop to discuss the Direct Air Capture (DAC) Test Center's capabilities and ensure it will serve as an asset to mitigating CO_2 concentrations in the atmosphere when it goes live in spring 2024.

DOE Awards Funding to Advance Clean Hydrogen Production

DOE announced the award of $28.9 million to 15 industry- and university-led projects and a new $32 million funding opportunity for research that will advance innovative clean hydrogen technology solutions. The funding will support clean hydrogen uses for a more available and affordable fuel for electricity generation, industrial decarbonization, and transportation fuel. NETL will manage the selected projects.

DOE Invests Funding to Support University Training and Research for Decarbonization and Environmental Remediation Projects

DOE announced $6.4 million in funding for 18 projects to conduct early-stage research and development (R&D) of decarbonization technologies and environmental remediation and to develop strategies to enhance the engagement of minority-serving institutions on FECM-related research at eligible U.S. colleges and universities. The investment includes nine projects totaling almost $3.8 million through the University Coal Research (UCR) Program and nine projects totaling almost $2.6 million through the Historically Black Colleges and Universities and Other Minority Institutions (HBCU-OMI) Program. NETL will manage the selected projects.

DOE Announces Funding for Technologies to Transform Energy Production and Reduce Emissions

DOE announced more than $540 million in awards for university- and national laboratory-led research into clean energy technologies and low-carbon manufacturing. The awards were made from funding opportunities DE-FOA-0002653 (Research at Energy Frontier Research Centers) and DE-FOA-0002676 (Research on Chemical and Materials Sciences to Clean Energy Technologies and Low-Carbon Manufacturing). Several projects will involve basic research underpinning DOE's Energy Earthshots Initiatives, which set goals for significant improvements in clean energy technology. The awards from these two funding opportunities are supported by the Office of Basic Energy Sciences within DOE's Office of Science.

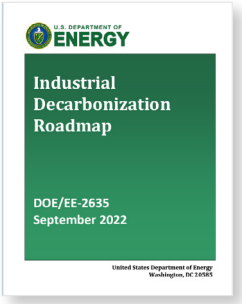
Interagency News and Updates (continued)

DOE Announces Funding to Explore New Technologies That Convert Carbon and Waste into Clean Energy

DOE announced $46 million for 22 projects that will create biofuel energy to help decarbonize the transportation and power generation sectors. These innovative projects, led by universities, private companies, municipal resource management entities, and local governments, will develop waste conversion and carbon capture technologies to produce fuels from biomass and waste streams, and enable algal systems to capture carbon and turn it into alternative clean energy sources.

Biden-Harris Administration Releases Agenda to Reduce Emissions Across U.S. Industrial Sector

DOE released its "Industrial Decarbonization Roadmap"—a comprehensive report identifying four key pathways to reduce industrial emissions in U.S. manatufacturing. The roadmap emphasizes the urgency of dramatically reducing carbon emissions and pollution from the industrial sector, and presents a staged research, development, and demonstration (RD&D) agenda for industry and government.



DOE Projects Monumental Emissions Reduction from Inflation Reduction Act

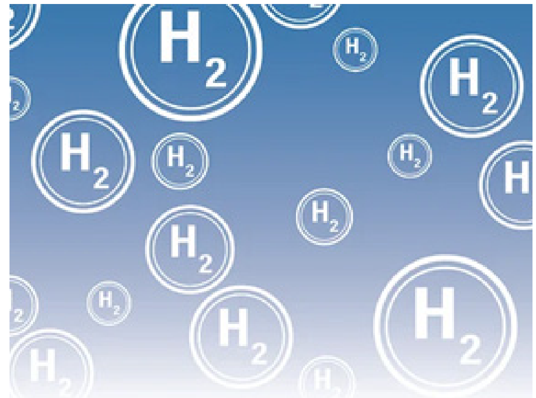
DOE released a fact sheet highlighting the Inflation Reduction Act's (IRA) monumental support for clean energy technologies that will lower energy costs for families and businesses while helping drive 2030 economy-wide greenhouse gas (GHG) emissions to 40% below 2005 levels. The legislation will also bolster domestic manufacturing and provide direct investments for overburdened and underserved communities across America. This is the first report by the U.S. government analyzing how the IRA can reduce GHG pollution.

NETL Researchers Advance Carbon Matchmaker to Make Connections for Lower Emissions

The Carbon Matchmaker, developed by FECM, is an online tool to build strong public-private partnerships and connect carbon management teams across the country. The Carbon Matchmaker aligns with goals and initiatives included in the Bipartisan Infrastructure Law (BIL), which directs more than $12 billion for carbon management RD&D over the next five years. The tool design promotes the formation of teams to support geographically diverse carbon capture, utilization, and storage (CCUS) and CO_2 removal (CDR) projects across the United States.

Interagency News and Updates (continued)

NETL Hydrogen Research—An Introduction



NETL, through its research on hydrogen production, transportation, storage, and use, is playing a critical role in DOE efforts to put hydrogen on the front lines of efforts to attain net-zero carbon emission goals in the power sector by 2035 and the broader economy by 2050, while meeting DOE's Hydrogen Shot goal of $1 per 1 kilogram in one decade. If the Hydrogen Shot goals are achieved, scenarios show the opportunity for at least a five-fold increase in clean hydrogen use. A U.S. industry estimate shows the potential for a 16% CO_2 emissions reduction by 2050, $140 billion in revenue, and 700,000 jobs created by 2030.

Exascale Application Project Targets CCS

Carbon capture and storage (CCS) technologies are promising approaches for reducing CO_2 emissions, but one of the biggest challenges in deploying them is the scale-up from laboratory design to industrial scale. The Multiphase Flow with Interphase eXchanges (MFiX)-Exa software subproject of DOE's Exascale Computing Project (ECP) is helping achieve that scaling. Utilizing the adaptive mesh refinement for exascale (AMReX) software framework developed at Lawrence Berkeley National Laboratory (LBNL), MFiX-Exa can track billions of individual particles simultaneously to simulate the gas-solid flows typical of a reactor—something standard computing cannot achieve.

Cold-flow demonstration of a circulating fluidized bed with gas and particle dynamics predicted by MFIX-Exa, rendering generated by Ascent in situ visualization. (Credit: Jordan Musser, National Energy Technology Laboratory)

DOE's Carbon Negative Shot Summit Highlights

The Carbon Negative Shot is an all-hands-on-deck call for innovation in CDR pathways that will capture CO_2 from the atmosphere and durably store it at gigaton scales for less than $100/net metric ton of CO_2-equivalent. CDR, in conjunction with aggressive decarbonization, is a climate-critical activity required to reach our nation's climate goal of achieving net-zero emissions by 2050.

ENERGY earthshots U.S. DEPARTMENT OF ENERGY | Carbon Negative™

Career Opportunities at NETL

At the core of NETL's success is its commitment to hiring the right people for the right positions. DOE's only government-owned and government-operated national laboratory offers exciting federal careers in research and engineering, technical project management, procurement, finance and budget, legal, and administrative support. Learn more at NETL Careers.

Interagency News and Updates (continued)

Bipartisan Infrastructure Law Hub

The BIL represents the most dramatic changes to DOE since its founding in 1977. For the next five years, the BIL will stand up 60 new DOE programs, including 16 demonstration and 32 deployment programs, and expand funding for 12 existing research, development, demonstration, and deployment (RDD&D) programs. NETL's BIL Hub provides information on the BIL, including links to the Guidebook, DOE's Clean Energy Corps, DOE's Applicant Portal, and DOE's Grid Resilience Program, as well as information on solicitations and funding opportunities.

U.S. and International Events

2022 University Coalition for Fossil Energy Research Virtual Annual Technical Review Meeting

The University Coalition for Fossil Energy Research Virtual Annual Technical Review Meeting will be held Oct. 5, 2022, at NETL's Morgantown, WV, campus. Topics will include integrated carbon management, point source carbon capture, hydrogen fuel production and delivery, emissions quantification, and the feasibility of recovering rare earth elements (REEs). Registration is free. The draft agenda is now available.

Carbon Capture Technology Conference and Expo

The Carbon Capture Technology Conference and Expo, to be held Oct. 19–20, 2022, in Messe Bremen, Germany, 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 non-governmental organizations, consultants, and government bodies. The event will explore how to rapidly accelerate the deployment and commercialization of CDR 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 Oct. 23–27, 2022, in Lyon, France, has established itself as the principal international conference on GHG 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. Bios for GHGT keynote speakers are now available.

U.S. and International Events (continued)

VERGE 22

VERGE 22, a climate tech event, will be held Oct. 25–27, 2022, in San Jose, CA. Thousands of leaders—from business, government, solution providers, and startups—will work together to address the climate crisis across six strategic areas: clean energy, sustainable transportation, CDR, regenerative food systems, net-zero buildings, and the startup ecosystem.

National Carbon Capture Conference & Expo

The National Carbon Capture Conference & Expo, to be held Nov. 8–9, 2022, in Des Moines, IA, is a two-day event designed specifically for companies and organizations advancing technologies and policy that support the CDR from all sources, including fossil fuel-based power plants, ethanol production plants, and industrial processes, as well as directly from the atmosphere. The program will focus on research, data, trends, and information on all aspects of CCUS, with the goal to help companies build knowledge, connect with others, and better understand the market and carbon utilization.

2022 Appalachian Hydrogen & Carbon Capture Conference

The Appalachian Hydrogen & Carbon Capture Conference, to be held Nov. 10, 2022, in Pittsburgh, PA, explores issues surrounding hydrogen use and CCS in the unique context of the Appalachian region.

The Energy Transition—The Role for Sustainable Carbon

The Energy Transition—The Role for Sustainable Carbon workshop will be held Nov. 16–18, 2022, in Sardinia, Italy. The workshop will cover options and opportunities for progressing a comprehensive energy transition that makes full use of the energy choices available, including sustainable carbon options. The workshop will include a mix of policy-relevant sessions and technology development considerations for limiting CO_2 and other emissions.

A&WMA Climate Change 2022

The virtual Air & Waste Management Association (A&WMA) conference, to be held Nov. 29–30, 2022, will address emerging policies and strategies for tackling climate change impacts, including mitigation, adaptation, and resiliency. The conference will emphasize the types of climate commitments made following the 2021 United Nations Climate Change Conference (COP26) meeting in Glasgow, Scotland, and the efforts and plans to meet these commitments at all levels, as well as advances in policies since the global 2015 Paris Accord.

Business and Industry News

Support for Carbon Capture and Sequestration Is Key to a Greener Grid

In a new paper published in Environmental Science and Technology, researchers at Carnegie Mellon University (CMU) and the University of Wyoming show that existing fossil fuel capacity can play a significant role in reaching net-zero with both current and modified "Section 45Q" tax incentives for CCS. The team arrived at this conclusion after an intensive policy analysis of energy generation strategies encompassing sources like nuclear, renewables with different energy storage options, and carbon-emitting generation with CCS with capture rates at a conventionally studied 90% capture rate and a newly targeted 99% rate.

Engineers, Industry Partners Needed for Progress on Clean Energy Goals

President Joe Biden set three energy goals for the United States: achieve a 50–52% reduction from 2005 levels in economy-wide net GHG pollution by 2030, 100% carbon pollution-free electricity by 2035, and net-zero GHG emissions by no later than 2050. Government collaboration with the private sector, across several industries and involving engineers across several disciplines, will be critical to achieving these goals. NETL is working to incentivize and partner with innovators to encourage development of clean energy solutions.

Researchers Use Melamine to Create Effective, Low-Cost Carbon Capture

A team of scientists from the University of California-Berkeley, Stanford, and the University of Texas have created a cost- and energy-efficient way to capture CO_2 from smokestacks by using an inexpensive polymer called melamine. The process for synthesizing the melamine material, published in the journal *Science Advances*, could potentially be scaled down to capture emissions from vehicle exhaust or other movable sources of CO_2. The melamine porous network captures CO_2 with an efficiency comparable to early results for another relatively recent material for carbon capture—metal organic frameworks (MOFs).

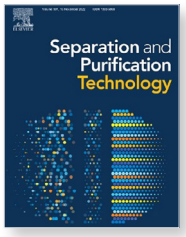
Can Pittsburgh Save The Planet?

The Global Clean Energy Action Forum, held Sept. 21–23, 2022, brought thousands of researchers, business leaders, and government officials from more than 30 countries to the David L. Lawrence Convention Center in Pittsburgh, PA. Hosted by DOE in partnership with CMU, the forum is a follow-up to the COP26 meeting held in Glasgow, Scotland, last year. Leaders gathered in Pittsburgh to provide updates on their Glasgow commitments, aiming to reduce emissions, expand the use of clean energy, and keep the planet from warming past its breaking point.

GLOBAL
CLEAN ENERGY
ACTION FORUM
CEM13/MI•7 USA 2022

Publications

Discrepancy quantification between experimental and simulated data of CO_2 adsorption isotherm using hierarchical Bayesian estimation



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Actions for reducing US emissions at least 50% by 2030

JOHN BISTLINE, NIKIT ABHYANKAR, GEOFFREY BLANFORD, LEON CLARKE, RACHEL FAKHRY, HAEWON MCJEON, JOHN REILLY, CHRISTOPHER RONEY, TOM WILSON MEI YUAN, ALICIA ZHAO, SCIENCE, VOLUME 376, ISSUE 6596, MAY 26, 2022. (SUBSCRIPTION MAY BE REQUIRED.)

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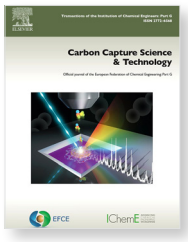

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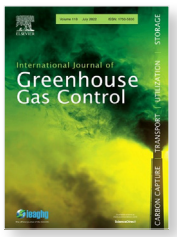

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About DOE Carbon Capture:

DOE/NETL is developing the next generation of advanced CO_2 capture technologies through NETL's Point Source Carbon Capture Program and the Carbon Dioxide Removal Program.

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 Dioxide Removal Program Fact Sheet
- 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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