

JULY 2022

# CARBON CAPTURE NEWSLETTER

**BIL**★**HUB**

Resources for the **Bipartisan Infrastructure Law**



## 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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## Biden Administration Launches Program to Capture Carbon Pollution from Air

The U.S. Department of Energy (DOE) announced a Bipartisan Infrastructure Law (BIL) effort to establish four regional direct air capture (DAC) hubs to capture and store carbon dioxide (CO<sub>2</sub>) emissions directly from the air. The DAC hubs will each comprise a number of projects to help address the impacts of climate change, create good-paying jobs, and prioritize community engagement and environmental justice. Each of the projects selected for the Regional DAC Hubs Program will demonstrate the delivery and storage or end use of removed atmospheric carbon. The hubs will have the capacity to capture and store at least 1 million metric tons of CO<sub>2</sub> from the atmosphere annually, either from a single unit or from multiple interconnected units. For more information, read the [Notice of Intent \(NOI\)](#).

# Interagency News and Updates

## DOE Announces Funding to Study Advanced Clean Hydrogen Technologies for Electricity Generation

DOE announced funding for six research and development (R&D) projects to support making hydrogen a more available and effective fuel for electricity generation. The industry-sponsored projects will advance the development of technologies to improve the performance, reliability, and flexibility of hydrogen technologies. This includes improving capture of CO<sub>2</sub> associated with hydrogen production from carbon-based resources and technologies to more efficiently use hydrogen in gas turbines for electricity generation.



## DOE Announces Funding for Small Businesses Pursuing Clean Energy and Climate Solutions

DOE announced funding awards for 259 diverse small-business projects across 38 states to pursue advanced scientific instrumentation and technologies to address climate change, including a CO<sub>2</sub> DAC system. The funding is administered by DOE's Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs to fund technological innovation, encourage participation of diverse communities, and facilitate technology transfer between research institutions and small businesses.

## DOE Announces Funding to Launch Decarbonization Initiative at National Laboratories

U.S. Secretary of Energy Jennifer Granholm announced DOE funding to begin decarbonizing four of the 17 national laboratories—Idaho National Laboratory (INL), the National Energy Technology Laboratory (NETL), the National Renewable Energy Laboratory (NREL), and Pacific Northwest National Laboratory (PNNL). The Net-Zero Labs (NZL) Pilot Initiative will lay the foundation for addressing hard-to-decarbonize industries and is expected to be the basis of net-zero solutions that can be replicated at facilities across DOE and federal, state, and local governments. As part of the initiative, NETL is working to advance carbon removal technologies and will incentivize carbon-free electricity production within its three geographic regions by entering into power purchase agreements.



## Removing CO<sub>2</sub> from the Atmosphere

Radu Custelcean, an organic chemist at Oak Ridge National Laboratory (ORNL), is working with colleagues to develop an energy-efficient and sustainable method for DAC using novel bis-imino-guanidine materials (BIGs). The research spans the full spectrum, from basic science that advances understanding of materials and answers fundamental questions about how they work and how to make them more efficient, to applying those discoveries to develop and scale up DAC technologies in collaboration with industry.

# Interagency News and Updates (continued)

## NETL Researcher Fighting Climate Change Shaped by Experiences as Snowboarding Instructor, Stem Tutor, and Entrepreneur

NETL's Krista Hill draws on her wide range of life experiences to manage a portfolio of transformational DAC and point source carbon capture research projects. As a member of NETL's Carbon Capture Team, Hill is advancing projects with game-changing potential. One of these projects, advanced by SRI International and other industry partners with NETL oversight, leverages an advanced mixed-salt process (MSP) for use as a unique carbon capture solvent with enhanced efficiency.



## NETL's Carbon Storage Newsletter Available for Subscription

Published monthly, NETL's Carbon Storage Newsletter provides information on recent activities and publications related to carbon storage. It covers domestic, international, public sector, and private sector news. Subscription information is [available online](#).



## Bipartisan Infrastructure Law (BIL) 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.



## LBNL Researcher Proposes Novel Scheme for Capturing CO<sub>2</sub> and Combating Climate Change

A scientist at Lawrence Berkeley National Laboratory (LBNL) is researching ways to remove CO<sub>2</sub> from the oceans to enable them to continue absorbing excess CO<sub>2</sub> from the atmosphere. For his ocean capture proposal, Peter Agbo was awarded a grant through LBNL's Carbon Negative Initiative, which is aiming to develop breakthrough negative emissions technologies.

## Perovskites Minerals Open New Avenues of Energy Research

Researchers at INL have developed protonic ceramic electrochemical cells (PCECs) that can convert excess electricity and water into hydrogen, or they can operate in reverse to convert hydrogen into electricity. The electrochemical cells could eventually be used for grid-scale electricity storage. The hydrogen produced by these cells can also be used as fuel for heat, vehicles, chemical production, or other applications.

# U.S. and International Events

## Carbon 2022

The World Conference on Carbon (Carbon 2022), to be held July 3–8, 2022, at Imperial College London, brings together scientists from around the globe to discuss advancements in the field of carbon science and technology for a greener future.

## DOE Carbon Negative Shot Summit

DOE's Carbon Negative Shot Summit, to be held virtually on July 20, 2022, will convene a diverse set of perspectives to discuss the development and deployment of CO<sub>2</sub> removal in the United States, as well as explore justice and equity principles and workforce development opportunities.



## Clearwater Clean Energy Conference

The 46th Clearwater Clean Energy Conference, to be held Aug. 1–4, 2022, in Clearwater, Florida, presents an extensive overview of emerging, evolving, and innovative technologies, fuels, and/or equipment in the power generation industry.

## NETL Multiphase Flow Science Workshop

NETL's 2022 Virtual Workshop on Multiphase Flow Science, to be held Aug. 2–4, 2022, will bring together international leaders from industry, academia, and government laboratories working in multiphase flow sciences to discuss current research projects and future R&D needs.



## NETL Carbon Management Project Review Meeting

NETL's 2022 Carbon Management Project Review Meeting will be held Aug. 15–19, 2022, at the Westin Pittsburgh Hotel, in Pittsburgh, Pennsylvania. Registration is available online. The draft agenda is now available.

## Pittsburgh Coal Conference

The 2022 International Pittsburgh Coal Conference, to be held virtually Sept. 19–22, 2022, is an outgrowth of a series of conferences spanning more than three decades, dealing with coal utilization, both in the United States and internationally. The conference is dedicated to providing a unique opportunity for in-depth and focused exchange of technical information and policy issues among representatives from industry, government, and academia throughout the world.



## CEM13/MI7

The 13th Clean Energy Ministerial (CEM) and the 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 Sept. 22–23, 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.



# U.S. and International Events (continued)

## 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 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 Oct. 23–27, 2022, in Lyon, France, has established itself as the principal international conference on greenhouse gas (GHG) mitigation technologies, especially carbon capture and storage (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.

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## Business and Industry News

### NCCC Supports Successful Commercialization of CarbonBuilt Low-Carbon Concrete Technology

Bolstered by successful testing at the National Carbon Capture Center (NCCC), CarbonBuilt and Alabama-based Blair Block reached an agreement to use CarbonBuilt's revolutionary low-carbon concrete technology at Blair Block's concrete masonry production facility in Childersburg. The retrofit of one production line at Blair Block will enable the annual manufacturing of approximately 2.3 million 8-inch block-equivalents. Each block will permanently store approximately 0.55 pounds of CO<sub>2</sub>, resulting in the annual removal of more than 600 metric tons of CO<sub>2</sub> per year.



### Illinois Tech Researchers Awarded Grant to Scale Up Innovative Carbon Capture and Conversion Process at the Source

Illinois Institute of Technology Assistant Professor of Chemical Engineering Mohammad Asadi received funding from the Advanced Research Projects Agency—Energy (ARPA-E) to scale up a process that he developed in the lab for capturing CO<sub>2</sub> directly from exhaust gas sources and converting it into valuable products. Existing processes capture and convert CO<sub>2</sub> in separate steps; Asadi's catalyst, which utilizes low-cost transition metals modified with an organic compound, revolutionizes this idea by facilitating both the capture and conversion in one step, reducing the complexity of the process.

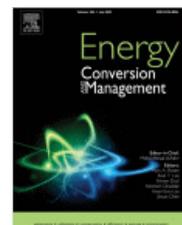
### Scientists Devise Sponge-Like Materials to Capture CO<sub>2</sub> in Cavities

The porous, sponge-like materials used in an international collaboration led by Phillip Milner, assistant professor of chemistry and chemical biology in the College of Arts and Sciences, can trap CO<sub>2</sub> in their cavities while letting other gases like nitrogen flow through. The [new research](#) is centered on sponge-like materials with hydroxide sites in their pores. Typically, hydroxide salt solutions reversibly react with CO<sub>2</sub> to generate bicarbonate salts, like baking soda, which trap the CO<sub>2</sub>.

# Publications

## Cooling analysis of an axial turbine for a direct fired sCO<sub>2</sub> cycle and impacts of turbine cooling on cycle performance

SELCUK C. UYSAL, CHARLES W. WHITE, NATHAN WEILAND, ERIC A. LIESE, ENERGY CONVERSION AND MANAGEMENT, VOLUME 263, JULY 1, 2022. (SUBSCRIPTION MAY BE REQUIRED.)



## Amphiphilic Water-Lean Carbon Capture Solvent Wetting Behavior through Decomposition by Stainless-Steel Interfaces

MANH-THUONG NGUYEN, KATARZYNA GRUBEL, DIFAN ZHANG, PHILLIP K. KOECH, DEEPIKA MALHOTRA, SARAH ALLEC, ROGER ROUSSEAU, VASSILIKI-ALEXANDRA GLEZAKOU, DAVID J. HELDEBRANT, CHEMSUSCHEM, VOLUME 14, ISSUE 23, DEC. 6, 2021. (SUBSCRIPTION MAY BE REQUIRED.)

## Carbon Dioxide Capture Chemistry of Amino Acid Functionalized Metal-Organic Frameworks in Humid Flue Gas

HAO LYU, OSCAR LU-FAN CHEN, NIKITA HANIKEL, MOHAMMAD HOSSAIN, ROBINSON W. FLAIG, XIAOKUN PEI, AMEER AMIN, MARK D. DOHERTY, REBEKAH K. IMPASTATO, T. GRANT GLOVER, DAVID R. MOORE, OMAR M. YAGHI, JOURNAL OF THE AMERICAN CHEMICAL SOCIETY, VOLUME 144, ISSUE 5, FEB. 9, 2022. (SUBSCRIPTION MAY BE REQUIRED.)



## New-Generation Carbon-Capture Ionic Liquids Regulated by Metal-Ion Coordination

XIAN SUO, ZHENZHEN YANG, YUQING FU, CHI-LINH DO-THANH, DMITRY MALTSEV, HUIMIN LUO, SHANNON M. MAHURIN, DE-EN JIANG, HUABIN XING, SHENG DAI, CHEMSUSCHEM, VOLUME 15, ISSUE 2, JAN. 21, 2022. (SUBSCRIPTION MAY BE REQUIRED.)

## Superior CO<sub>2</sub>/N<sub>2</sub> separation performance of highly branched Poly(1,3 dioxolane) plasticized by polyethylene glycol

WENJI GUO, THIEN N. TRAN, HIMANGSHU MONDAL, SKYE SCHAEFER, LIANG HUANG, HAIQING LIN, JOURNAL OF MEMBRANE SCIENCE, VOLUME 648, APR. 15, 2022. (SUBSCRIPTION MAY BE REQUIRED.)



# About DOE's Carbon Capture Program

NETL's Carbon Capture Program is developing the next generation of advanced carbon dioxide (CO<sub>2</sub>) 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<sub>2</sub> 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<sup>2</sup>
- Systems Analysis
- Conference Proceedings
- Accomplishments Posters
- Fossil Energy Techlines

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