

SEPTEMBER 2022

CARBON CAPTURE NEWSLETTER



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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Carbon Negative Shot Summit

The U.S. Department of Energy (DOE) hosted its first-ever Carbon Negative Shot Summit in July 2022. With more than 1,700 people from 39 countries in attendance, and 39 total speakers across the keynote sessions and panel discussions, the day brought together leading innovators, advocates, stakeholders, and policymakers to discuss how to advance commercially viable, just, and sustainable [carbon dioxide removal](#) (CDR) in the United States. One theme emphasized repeatedly throughout the day was how the push to advance CDR will not be limited to a single approach. Video of the full Summit is now [available](#). Try out DOE's new resources—the [Carbon Matchmaker Tool](#) and [Carbon Management Interactive Diagram](#)—to learn about new carbon management provisions and funding opportunities.

Interagency News and Updates

DOE Announces Programs Supporting President Biden's Justice40 Initiative

DOE announced 146 programs that support President Biden's Justice40 Initiative, which aims to ensure federal agencies deliver 40% of the overall benefits of climate, clean energy, affordable and sustainable housing, clean water, and other investments to disadvantaged communities. The Justice40 Initiative provides a pathway for equitable clean energy deployment to benefit communities that are overburdened, underserved, and have been disproportionately impacted by climate change and environmental injustice. DOE's Justice40-covered programs underscore the department's commitment to accelerating pollution reduction and decarbonization efforts, spurring economic growth in underserved areas, and prioritizing equity and inclusion to meet President Biden's climate goals.

Transformational Carbon Capture Technologies Matured in NETL Collaboration

Through a series of projects made possible with National Energy Technology Laboratory (NETL) funding and oversight, ION Clean Energy Inc. (ION) has matured transformational carbon capture systems from early-stage research to pilot-scale testing. NETL has been a part of many successful carbon capture projects undertaken by ION, and the development of their next-generation ICE-21 and ICE-31 solvent capture systems is another example of how the laboratory works with industry to progress research and development of advanced systems.



NETL Leadership Highlights Decarbonization at 2022 Clearwater Clean Energy Conference

NETL Director Brian Anderson, Ph.D., and Thermal Science Team Supervisor Ronald Breault, Ph.D., highlighted NETL's contributions in building hydrogen (H_2)-based energy infrastructures and power systems of the future during the keynote address to the 2022 Clearwater Clean Energy Conference held Aug. 1–4, 2022, in Clearwater, Florida. With more than 200 technical presentations held over the four-day event, both in person and virtually, the Clearwater Clean Energy Conference was a one-stop shop for collaboration between industry, academia, and government agencies and laboratories to share the latest developments that will make the nation's transition to a clean power sector possible.

DOE Scholars-Internships Open for Applicants

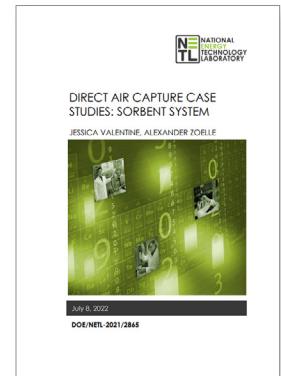
DOE's Office of Fossil Energy and Carbon Management (FECM) seeks motivated students and postgraduates to participate in projects at the forefront of the clean energy transition, helping to address the climate crisis. FECM research priorities include point source carbon capture, CDR, CO₂ conversion into products, reliable CO₂ storage, blue H₂ production, and critical mineral production from industrial and mining waste.



Interagency News and Updates (continued)

NETL Explores Sorbent-Based DAC Systems

A case study conducted by NETL examined the performance and cost of different sorbent-based direct air capture (DAC) system configurations that remove carbon dioxide (CO_2) from the atmosphere. Atmospheric concentrations of CO_2 (~ 415 parts per million) are much lower than those found in effluent streams from point sources in the power and industrial sectors, presenting a greater technical and cost challenge for technologies to concentrate the CO_2 to the degree necessary for storage or utilization. DAC is a priority for DOE and figures prominently in the Bipartisan Infrastructure Law (BIL), in which \$3.5 billion has been dedicated to development of regional DAC hubs that will each capture at least 1,000,000 metric tons of CO_2 from the atmosphere.



DOE Awards Funding for 10 High-Performance Computing Projects

DOE announced \$3 million in funding for 10 high-performance computing projects that will advance cutting-edge manufacturing and clean energy technologies. As part of the High-Performance Computing for Energy Innovation (HPC4EI) initiative, the selected projects will leverage the expertise and computing capabilities of DOE's national laboratories to improve manufacturing efficiency and explore new materials for clean energy application through state-of-the-art modeling, simulation, and data analysis.



Secretary Granholm Teams Up with Robert Downey Jr. on LinkedIn Account Launch Video

U.S. Secretary of Energy Jennifer M. Granholm teamed up with actor, producer, and climate advocate Robert Downey Jr. on LinkedIn to recruit climate professionals to join DOE's Clean Energy Corps. The Clean Energy Corps will help DOE deploy the transformative \$62 billion investment from the BIL to meet the nation's goals of a carbon-free power sector by 2035 and a decarbonized economy by 2050.



2022 Research Experience in Carbon Sequestration

Founded in 2004, the Research Experience in Carbon Sequestration (RECS) Program is supported by FECM and NETL. The program offers graduate students and early career professionals the opportunity to learn about all aspects of carbon capture, utilization, and storage (CCUS). RECS 2022 will include interactive content on a range of CCUS topics and will incorporate CCUS site tours at a power plant, coal mine, capture facility, and injection wellhead; geology field exercises; and live lectures, discussion, and group projects. Some of the nation's leading CCUS experts from DOE's national laboratories, the energy industry, CCUS project developers, and academia will also join the program. They will discuss key CCUS research, development, and demonstration projects; commercial deployment trends; and how policy and business drivers impact the field.



Interagency News and Updates (continued)

Best Practices for Life Cycle of DACS Report

As one of the performance elements of the Carbon Negative Shot, robust life cycle greenhouse gas (GHG) accounting is a critical element for CDR. Life cycle analysis/assessment (LCA) is an existing framework that is well suited to evaluate the environmental implications of CDR. By design, LCA provides a holistic perspective of the potential environmental impacts of a product or process across different life cycle phases. A new LCA report is envisioned as a complement to International Organization for Standardization (ISO) standards to address issues that are specific to applications of those standards to direct air capture with storage (DACS) analysis.

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U.S. and International Events

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.



Global Clean Energy Action Forum

The United States will host the first ever Global Clean Energy Action Forum Sept. 21–23, 2022, a joint convening of the [13th Clean Energy Ministerial](#) and [7th Mission Innovation](#) ministerial. Governments, international organizations, the private sector, academia, innovators, civil society, and early career researchers and policy makers will join in a three-day event that features a high-level plenary, topical roundtables with energy and science ministers from 31 countries, side events, technology demonstrations, and other activities.



Global Manufacturing and Industrialisation Summit

The Global Manufacturing and Industrialisation Summit (GMIS) America, to be held Sept. 21–23, 2022, in Pittsburgh, PA, will focus on the twin transition in the context of manufacturing and beyond to realize a prosperous, greener future for all. The summit will explore a number of sub-themes that inform the dialogue on how Fourth Industrial Revolution (4IR) technologies and human intervention can advance the twin transition.

U.S. and International Events (continued)

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, H₂ fuel production and delivery, emissions quantification, and the feasibility of recovering rare earth elements. 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 to 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 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. Bios for GHGT keynote speakers are now [available](#).



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.

U.S. and International Events (continued)

2022 Appalachian Hydrogen & Carbon Capture Conference

The Appalachian Hydrogen & Carbon Capture Conference, to be held Nov. 10, 2022, in Pittsburgh, PA, explores issues surrounding H₂ 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 CO₂ 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.

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Business and Industry News

DOE Invests Funding to Study Clean Hydrogen Power Generation

DOE will partner with private companies to research advanced technology solutions to make H₂ a more available and effective fuel for power generation. NETL will manage the selected projects that will study, develop, and test a new H₂ production plant that produces 99.97%-pure H₂ and captures 90–99% of CO₂ emissions; the use of ammonia-H₂ fuel mixtures in gas turbines; the combustion challenges of gas turbine components using natural gas-H₂ fuel mixtures of up to 100% H₂; the effectiveness of natural gas turbine engine components in high-temperature rigs using natural gas-H₂ fuel mixtures; and an ammonia-fired gas turbine combustor that generates low nitrous oxide emissions.

Frontier Supercomputer to Model Large-Scale Clean Carbon Capture

America's first exascale supercomputer, the 21-megawatt Frontier at Oak Ridge National Laboratory, will model the feasibility of moving clean carbon capture from a small-scale lab experiment to much larger scale.

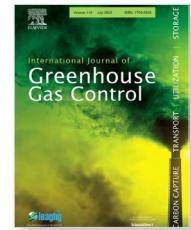


NETL's small experimental carbon capture system is already functional, but as reactor size increases, particle sizes remain the same while changing flow conditions. Changes, therefore, have to be made to the geometry and flow behavior to get appropriate mixing for heat transfer, chemical reactions, and other processes.

Publications

Physical solvents and techno-economic analysis for pre-combustion CO₂ capture: A review

KATHRYN H. SMITH, HUSAIN E. ASHKANANI, BADIE I. MORSI, NICHOLAS S. SIEFERT, INTERNATIONAL JOURNAL OF GREENHOUSE GAS CONTROL, VOLUME 118, JULY 2022, 103694. (SUBSCRIPTION MAY BE REQUIRED.)

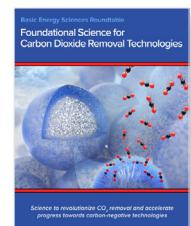


Adapting Technology Learning Curves for Prospective Techno-Economic and Life Cycle Assessments of Emerging Carbon Capture and Utilization Pathways

GRANT FABER, ANDREW RUTTINGER, TILL STRUNGE, TIM LANGHORST, ARNO ZIMMERMANN, MITCHELL VAN DER HULST, FARID BENSEBAA, SHEIKH MONI, LING TAO, PERIODICAL TITLE, FRONTIERS IN CLIMATE: SEC. NEGATIVE EMISSION TECHNOLOGIES, APR. 14, 2022.

Synergistic direct air capture of CO₂ with aqueous guanidine/amino acid solvents

DIANA STAMBERGA, NIKKI A. THIELE, RADU CUSTELCEAN, MRS ADVANCES, MAR. 8, 2022. (SUBSCRIPTION MAY BE REQUIRED.)



Foundational Science for Carbon Dioxide Removal Technologies

DOE OFFICE OF SCIENCE, BASIC ENERGY SCIENCES ROUNDTABLE, 2022.

Multiscale Electricity Modeling for Evaluating Carbon Capture and Sequestration Technologies (MEME-CCS)

STUART COHEN, HAIBO ZHAI, WANYING WU, JONATHAN HO, MARTY SCHWARZ, PRESENTED AT THE JANUARY 2022 ADVANCED RESEARCH PROJECTS AGENCY – ENERGY (ARPA-E) 2022 FLEXIBLE CARBON CAPTURE AND STORAGE (FLECCS) ANNUAL MEETING, FEB. 7, 2022.



Decarbonizing the Coal-Fired Power Sector in China via Carbon Capture, Geological Utilization, and Storage Technology

NING WEI, ZUNSHENG JIAO, KEVIN ELLETT, ANTHONY Y. KU, SHENGNAN LIU, RICHARD MIDDLETON, XIAOCHUN LI, ENVIRONMENTAL SCIENCE AND TECHNOLOGY, VOLUME 55, ISSUE 19, SEPT. 22, 2021.

About DOE Carbon Capture:

DOE/NETL is developing the next generation of advanced CO₂ 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
- CCSI²
- Systems Analysis
- Conference Proceedings
- Accomplishments Posters
- Fossil Energy Techlines

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