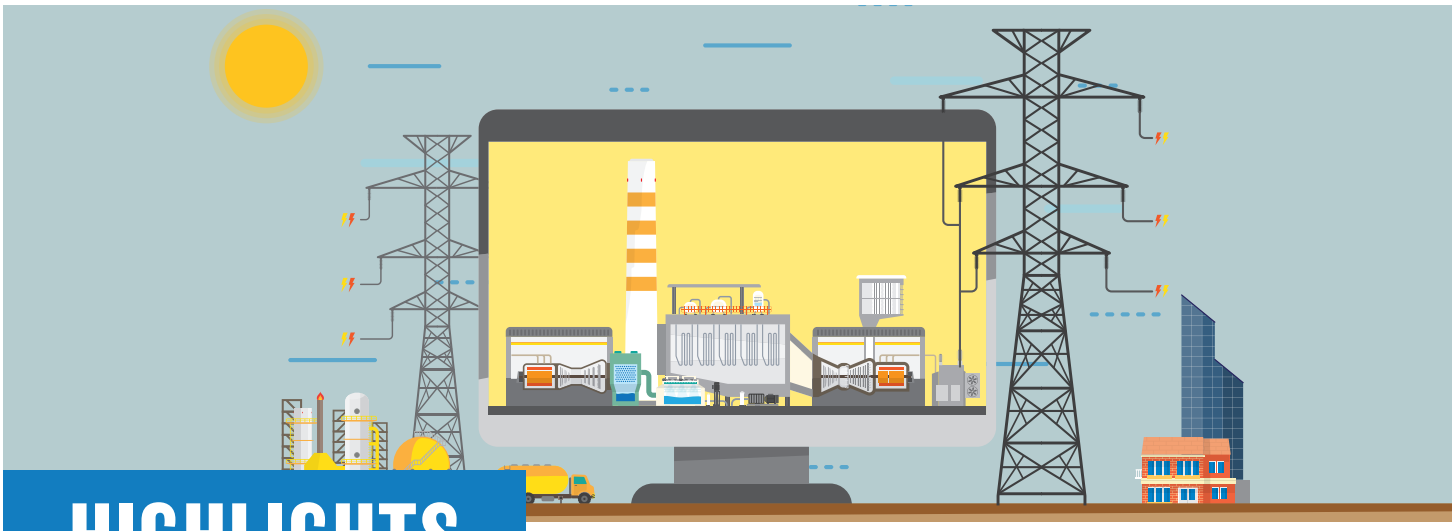
NATIONAL ENERGY TECHNOLOGY LABORATORY

JUNE 2021

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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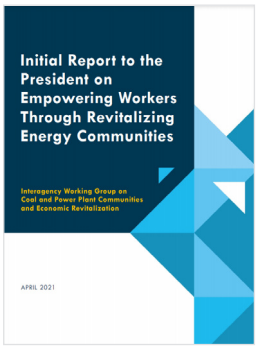
DOE Announces Funding to Accelerate Technologies for the Decarbonization of the Natural Gas Power and Industrial Sectors

The U.S. Department of Energy's (DOE) Office of Fossil Energy (FE) announced $75 million in Federal funding for cost-shared research and development projects under Funding Opportunity Announcement (FOA) DE-FOA-0002515, Carbon Capture R&D for Natural Gas and Industrial Sources and Front-End Engineering Design Studies for Carbon Capture Systems at Industrial Facilities and Natural Gas Plants. Notably, this FOA, for the first time, will require applicants to submit a comprehensive summary of both environmental justice implications and jobs impacts. Selected projects will fall under three areas of interest (AOIs): AOI-1: Carbon Capture R&D: Bench-Scale Testing of Highly Efficient Components and Processes for NGCC Plants; AOI-2: Engineering-Scale Testing of Transformational Post-Combustion CO_2 Capture Technologies for Industrial Carbon Capture; and AOI-3: Front-End Engineering Design Studies for Carbon Capture Systems. Responses are due June 21, 2021. More information on this FOA can be found here.

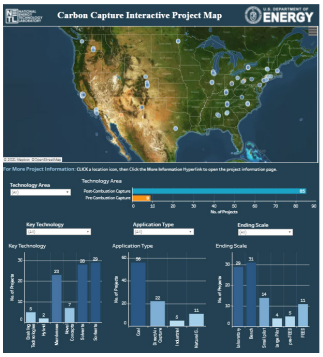
Interagency News and Updates

DOE Announces Funding to Support Jobs and Economic Growth



In connection with a White House report on economic revitalization in coal and power plant communities, DOE announced funding for projects that directly support job creation in communities impacted by changes in the energy economy. Complementing investments in hydrogen, carbon capture, and environmental remediation proposed in the American Jobs Plan, the White House report lays out a national roadmap to partner with local communities to ensure that the shift to a clean energy economy creates good-paying union jobs; spurs economic revitalization; and supports energy workers in coal, oil and gas, and power plant communities. In the near term, it recommends creating jobs through remediation projects for oil and gas wells and coal mines—work that energy workers are well-suited for — and allows economic development of under-utilized land. For the medium and long terms, the report calls for investing in low-carbon industries through technologies such as carbon capture and hydrogen.

NETL's Carbon Capture Program Project Map



NETL's Carbon Capture Interactive Project Map is available on the program's website. This map includes all active projects in NETL's Carbon Capture Program in an interactive format. Project information can be explored by clicking on the icons, with links to additional project information available. Projects can also be sorted by Technology Area, Key Technology, Application Type, and Ending Scale via graphs and pull-down menus.

Energy 101 Webinar Highlighting CCUS Efforts

The NETL Regional Workforce Initiative held the "Energy 101 Webinar—Carbon Capture, Utilization and Storage (CCUS)" on April 29, 2021. In this webinar, Dan Hancu, NETL Technology Manager for Carbon Capture, discussed the program's mission, technologies, and timeline, along with the potential for economic and workforce development opportunities that successful research, development, and commercialization can bring.

NETL Energy Analysis Experts Work to Improve Understanding of Carbon Capture Costs

NETL researchers, in partnership with industrial research institutes, universities, and other organizations, co-authored a newly released comprehensive white paper ("Towards improved guidelines for cost evaluation of carbon capture and storage") providing updated costing guidelines for carbon capture and storage (CCS) technologies. The new white paper is global collaboration effort to provide a complementary set of CCS costing guidelines for advanced low-carbon technologies and CCS from industry; and improved guidelines for uncertainty analysis of carbon capture and storage techno-economic studies.

Interagency News and Updates (continued)

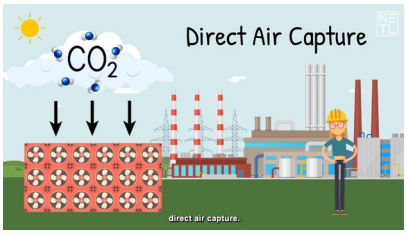
Primer on Carbon Dioxide Removal Provides Vital Resource at Critical Time

Carbon dioxide removal (CDR), often referred to as negative emissions technologies, encompasses a broad array of techniques and practices, such as geologic storage, direct air capture, bioenergy with carbon capture, and improved forest management. The CDR Primer, a new resource on the fundamentals of CDR and its role in addressing the potential climate crisis, is available for free as a digital, open-source book. Dr. Jennifer Wilcox, DOE's Acting Assistant Secretary for Fossil Energy (ASFE) and Principal Deputy Assistant Secretary (PDAS) for Fossil Energy, served as co-editor on the CDR Primer.

DOE Awards Funding for Demonstration of Large-Scale Pilot Carbon Capture Technologies

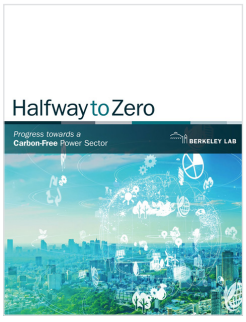
The U.S. Department of Energy (DOE) announced the selection of two projects to receive federal funding. The projects will advance to Phase III (construction/operation) of funding opportunity announcement (FOA) DE-FOA-0001788, "Fossil Fuel Large-Scale Pilots." For the project "Large Pilot Testing of Linde/BASF Advanced Post-Combustion CO_2 Capture Technology at a Coal-Fired Power Plant," the Board of Trustees of the University of Illinois will build and operate a 10-megawatt-electric (MWe) capture facility based on the Linde/BASF post-combustion carbon capture technology at the City Water, Light, and Power plant in Springfield, Illinois. For the project "Large Pilot Testing of the MTR Membrane Post-Combustion CO_2 Capture Process," Membrane Technology and Research, Inc. (MTR) will build and operate a large pilot membrane-based carbon capture system developed by MTR at the Wyoming Integrated Test Center located in Gillette, Wyoming. The Office of Fossil Energy's (FE) National Energy Technology Laboratory (NETL) will manage the selected projects.

NETL STEM Lab Video—CCUS



NETL's Science, Technology, Engineering, and Mathematics (STEM) Education and Outreach Team released the latest animated "STEM Lab" video to introduce children to the basic concepts of CCUS including the technologies being investigated by NETL researchers.

U.S. Power Sector is Halfway to Zero-Carbon Emissions



As documented in a new report, the U.S. power sector has made significant progress in reducing carbon emissions. Direct power-sector carbon dioxide (CO_2) emissions in 2020 were 1,450 million metric tons—roughly 50% below earlier projections. By this metric, in only 15 years, the country's power sector has gone halfway to zero emissions. Other metrics also evolved differently than projected: total consumer electricity costs were 18% lower; costs to human health and the climate were 92% and 52% lower, respectively; and the number of jobs in electricity generation was 29% higher. Economic, technical, and policy factors contributed to this success, including sectoral changes, energy efficiency, wind and solar power, continued operations of the nuclear fleet, and coal-to-gas fuel switching.

U.S. and International Events

UKCCSRC Summer 2021 Web Series

The UK Carbon Capture and Storage Research Center (UKCCSRC) Summer 2021 Web Series runs online now through mid-July 2021, with weekly virtual guest lectures on Thursdays at 2:00–3:00 p.m. BST. Upcoming sessions include "The realities of deploying post-combustion CO_2 capture: Corrosion happens!" and "Cost reductions in CO_2 capture via the integration and the co-generation of hydrogen and power in CCUS cluster." Once registered, a delegate list is sent out on a weekly basis with instructions for joining each week's events.

Trondheim CCS Conference

The bi-annual Trondheim CCS Conference (TCCS) is a global scientific CCS technology conference that typically features 150 oral presentations, five or six parallel sessions, more than 100 posters, and keynote speakers. The 11th conference, TCCS-11, will be held June 22–23, 2021, in Trondheim, Norway. The objective of TCCS-11 is to bring forward, present, and discuss work undertaken within research and development (R&D) institutions, universities, and industry.

International Pittsburgh Coal Conference

The 2021 International Pittsburgh Coal Conference (PCC), sponsored by the University of Pittsburgh, Swanson School of Engineering, will be held virtually Sept. 20–23, 2021. The annual event is focused on all aspects of coal, energy, and the environment. It aims at fulfilling the ultimate goal of efficient and effective use of coal while protecting the environment. The PCC provides 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 Energy Show Exhibition & Conference

The Global Energy Show Exhibition & Conference, to be held Sept. 21–23, 2021, in Calgary, Canada, brings buyers, sellers, stakeholders, partners, young professionals, and the public together to share knowledge and fuel innovation in the energy landscape. The platform allows for collaboration from all energy sources to showcase innovation and technology that combats the dilemma of matching the increasing energy demand with the need for a transition to a lower-carbon economy.

IEAGHG 6th Post-Combustion Capture Conference

The International Energy Agency Greenhouse Gas R&D Programme's (IEAGHG) 6th Annual Post-Combustion Capture Conference will be held in the United Kingdom Oct. 19–21, 2021. The event will gather post-combustion capture experts to share their knowledge, findings, and expertise.

Carbon Capture Technology Conference and Expo

The Carbon Capture Technology Conference and Expo is a two-day event to be held Oct. 20–21, 2021, in Stuttgart Messe, Germany. Experts from around the world will discuss the latest advances in new technology for carbon capture, storage, and transport, as well as unique ways of utilizing CO_2 to produce net-zero fuels and for other manufacturing processes.

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 Oct. 24–29, 2021, in Waterville Valley, New Hampshire, will examine the following questions: (1) Can the United States decarbonize safely and with a variety of approaches appropriate for the assortment 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?

Business and Industry News

Carbon-Neutral Blue Hydrogen Can Be More Than a Bridge in a Transformed Hydrogen Economy

NETL has unique capabilities and experience to help realize the potential of a transformed hydrogen economy and is making investments across the value chain. NETL is already determining how to address near-term technical gaps with increased use of hydrogen in both pipelines and power plants. Work at NETL is enabling the next generation of turbines to operate efficiently with higher ratios of hydrogen fuel. NETL is targeting improvements to conventional natural gas reforming methods for hydrogen, as well as exploring more novel hydrogen production technologies, including methane pyrolysis with solid carbon co-production and coal/biomass co-gasification with CCUS for carbon-negative hydrogen. In the mid-term, NETL investment, and R&D in carbon capture technology, will enable blue hydrogen (derived from fossil fuels with CCUS) to be produced cost-effectively.

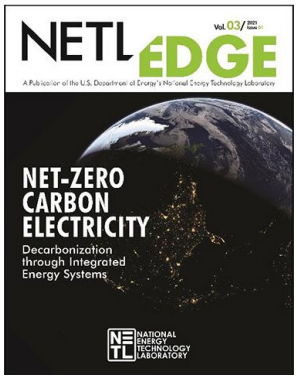
XPRIZE Carbon Removal

XPRIZE Carbon Removal is a four-year global competition that invites innovators and teams from anywhere on the planet to create and demonstrate solutions that can pull CO_2 directly from the atmosphere or oceans, and store it durably and sustainably. With $100 million in prizes, with support from the Musk Foundation, it is the largest incentive prize in history.

Publications

NETL's EDGE Magazine: Vol. 3, Issue 1, 2021

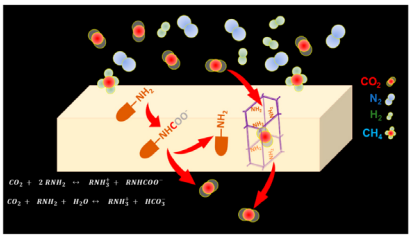
NETL'S EDGE MAGAZINE SHOWCASES THE IMPACT OF NETL RESEARCH AND ITS BENEFIT TO THE AMERICAN PUBLIC, RESEARCH COMMUNITY, AND ENERGY INDUSTRY. THIS ISSUE FEATURES: "NET-ZERO CARBON ELECTRICITY: DECARBONIZATION THROUGH INTEGRATED ENERGY SYSTEMS." SUBSCRIPTION INFORMATION IS AVAILABLE ONLINE.



Publications (continued)

Recent Developments in High-Performance Membranes for CO_2 Separation

ZI TONG, ALI K. SEKIZKARDES, MEMBRANES, VOLUME 11, ISSUE 2, FEB. 23, 2021.



Schematic of CO_2 and amine carrier interaction and an ultrafast CO_2-selective transport channel inside a facilitated transport membrane.

Highly selective hollow fiber membranes for carbon capture via in-situ layer-by-layer surface functionalization

NAVEEN K. MISHRA, NUTAN PATIL, SHOULIANG YI, DAVID HOPKINSON, JAIME C. GRUNLAN, BENJAMIN A. WILHITE, JOURNAL OF MEMBRANE SCIENCE, VOLUME 633, SEPT. 1, 2021. (SUBSCRIPTION MAY BE REQUIRED.)

U.S. Department of Energy National Carbon Capture Center, Supporting Technology Scale-up and International Collaboration

FRANK MORTON, MICHELE CORSER, JUSTIN ANTHONY, PROCEEDINGS OF THE 15TH GREENHOUSE GAS CONTROL TECHNOLOGIES CONFERENCE 15-18 MARCH 2021, APRIL 2, 2021. (SUBSCRIPTION MAY BE REQUIRED.)

Modulation of CO_2 adsorption in novel pillar-layered MOFs based on carboxylate–pyrazole flexible linker

ANDRÉS LANCHEROS, SUBHADIP GOSWAMI, MOHAMMAD RASEL MIAN, XUAN ZHANG, XIMENA ZARATE, EDUARDO SCHOTT, OMAR K. FARHA, JOSEPH T. HUPP, DALTON TRANSACTIONS JOURNAL, VOLUME 50, ISSUE 8, MARCH 2, 2021. (SUBSCRIPTION MAY BE REQUIRED.)

Solubility Behavior of CO_2 in Ionic Liquids Based on Ionic Polarity Index Analyses

XIAOYANG LIU, KATHRYN E. O'HARRA, JASON E. BARA, C. HEATH TURNER, J. PHYS. CHEM. B, VOLUME 125, ISSUE 14, APRIL 2, 2021. (SUBSCRIPTION MAY BE REQUIRED.)

Carbon dioxide capture with aqueous amino acids: Mechanistic study of amino acid regeneration by guanidine crystallization and process intensification

ABISHEK KASTURI, JORGE GABITTO, COSTAS TSOURIS, RADU CUSTELCEAN, SEPARATION AND PURIFICATION TECHNOLOGY, VOLUME 271, SEPT 2021. (SUBSCRIPTION MAY BE REQUIRED.)

Net Zero by 2050: A Roadmap for the Global Energy Sector

INTERNATIONAL ENERGY AGENCY, SPECIAL REPORT, MAY 2021.

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.

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

Contact Us

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

CUSTOMER SERVICE: 1-800-553-7681

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