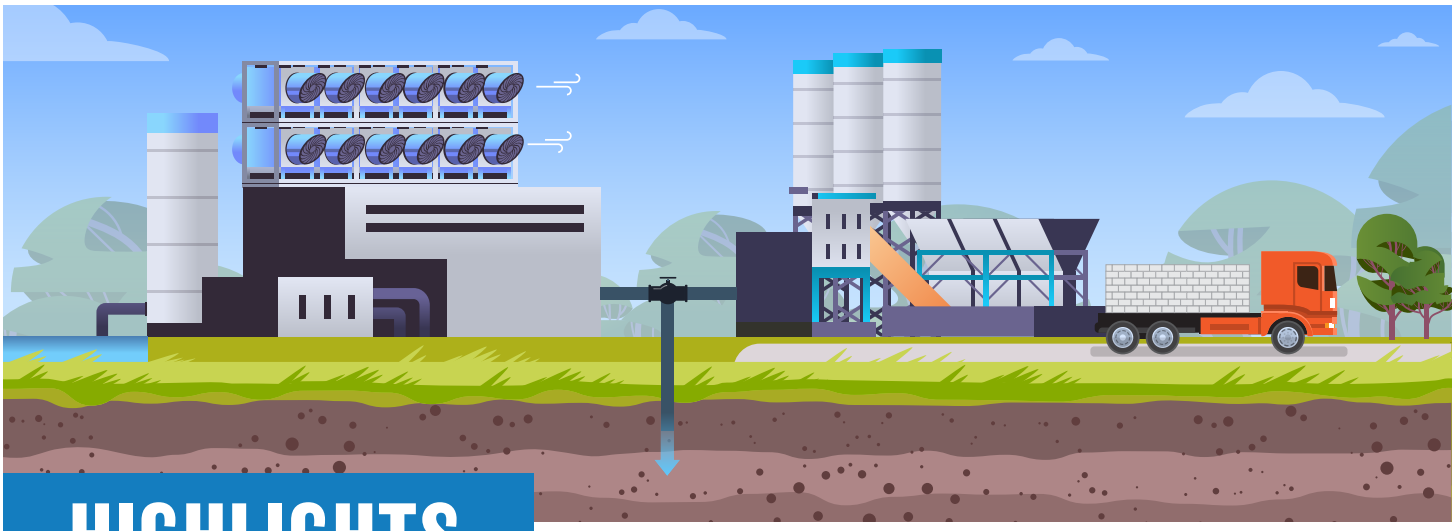
NATIONAL ENERGY TECHNOLOGY LABORATORY

MAY 2023

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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Regional Hubs to Demonstrate Value of DAC Technologies for Decarbonization

With $3.5 billion from the Bipartisan Infrastructure Law (BIL), the U.S. Department of Energy (DOE) Office of Fossil Energy and Carbon Management (FECM), DOE's Office of Clean Energy Demonstrations, and the National Energy Technology Laboratory (NETL) are creating four regional direct air capture (DAC) hubs to help achieve a net-zero greenhouse gas (GHG) economy by 2050 in a cost-effective, reliable, and efficient manner, and to maximize the benefits of the clean energy transition. The hubs will demonstrate processing, transport, secure geologic storage, and/or conversion of carbon dioxide (CO_2) captured from the atmosphere with DAC technology and accelerate commercialization of those technologies. Each hub will be able to remove and store and/or utilize at least 1,000,000 metric tons of CO_2 from the atmosphere annually from a single unit or multiple interconnected units and have the potential to be developed into a regional or interregional carbon network.

Interagency News and Updates

NETL-Managed Projects Advance New DAC Tests

Field tests of NETL-funded and managed DAC technology projects in California and Alabama are helping to advance the realization of a carbon-neutral economy and energy sector. In Fountain Valley, California, Electricore Inc. is leading a 12-month field test of an intensified DAC system at a Kiewit facility to capture operational data on the novel process and material combination under real conditions. AirCapture LLC designed an integrated DAC system that will use energy recovery and support services at the National Carbon Capture Center (NCCC) in Wilsonville, Alabama.

Integrated DAC System test plant from Electricore, Inc. project no. DE- FE0031959

NETL and ORNL Researchers Join Forces for Decarbonization

NETL is teaming with Oak Ridge National Laboratory (ORNL) to jointly explore a range of technology innovations for carbon management and strategies for economic development and sustainable energy transitions in the Appalachian region. NETL Director Brian Anderson, Ph.D., and ORNL Deputy Director for Science and Technology Susan S. Hubbard, Ph.D., signed an official memorandum of understanding Mar. 17, 2023. The new agreement will establish cooperative efforts in the areas of carbon management, including carbon dioxide removal (CDR); critical minerals; industrial emissions; clean energy technologies, including smart manufacturing; digital manufacturing technologies and advanced data analytics; and energy transition in the Appalachian region.

NETL Director Brian Anderson, Ph.D., and ORNL Deputy Director for Science and Technology Susan S. Hubbard, Ph.D., signed an official memorandum of understanding.

NETL Director Addresses Decarbonization and IWG Progress at CMU Energy Week

NETL Director Brian Anderson discussed NETL's ongoing efforts to advance carbon management technology in hard-to-decarbonize sectors of the economy such as steel and cement production and petrochemicals in a keynote address during Carnegie Mellon University's (CMU) Energy Week in Pittsburgh. Anderson also serves as executive director of the Biden-Harris Administration's Interagency Working Group (IWG) on Coal and Power Plant Communities and Economic Revitalization. During CMU Energy Week, he highlighted decarbonized energy and job opportunities it can bring to the nation and especially the region of Appalachia, a historic producer of energy and hotbed of industry.

Cheers for CO_2 Podcast, Episode 2 Available

Episode 2 of the Cheers for CO_2 podcast features FECM Principal Deputy Assistant Secretary Jennifer Wilcox. The conversation covers main CO_2 emissions concepts such as carbon-neutral and carbon-negative emissions, carbon utilization, CCS, and more. Secretary Wilcox offers insights into the challenges and opportunities of working in policy and academia.

Interagency News and Updates (continued)

Video Highlights How NCCC Drives Innovation

NETL expertise and oversight have played major roles in the ongoing success of the NCCC, a cornerstone of U.S. innovation in the development of carbon management technologies. Created by DOE/NETL in 2009, the NCCC works with innovators from around the world to accelerate the development and deployment of technologies that reduce GHG emissions from power plants and industrial sources and to promote carbon conversion and DAC solutions. Southern Company operates the site in Wilsonville, Alabama, through a cooperative agreement with FECM and NETL. A new video produced by Southern Company highlights the development of the NCCC as a unique test bed that bridges the gap between laboratory research and large-scale demonstrations of cost-effective, technically viable carbon management technologies.

Digital Compendium of Carbon Capture Technology

The Carbon Capture Technology Compendium is compiled biannually to provide a technical summary of CO_2 capture technology research and development (R&D) sponsored by NETL's Point Source Carbon Capture (PSCC) Program and CDR Program. The projects span the PSCC, CDR, and Research and Innovation Center (RIC) program areas, as well as R&D collaborations for exploring multiple approaches to CO_2 capture and modeling the economic and emissions reduction impacts. Now a digital interface, the compendium can be searched by program area, ending scale, key technology, and application.

NETL Providing Technical Expertise for DAC Prize Competitions

NETL will provide technical support and expertise to award the American-Made DAC Prizes, a series of interconnected competitions offering funding to advance CDR technologies from hard-to-decarbonize sectors of the U.S. economy. Funded by FECM, the DAC Pre-Commercial Prizes offer up to $15 million split among two competitions: the DAC Pre-Commercial Energy Program for Innovation Clusters Prize offering cash prizes, is open to incubators and accelerators with impactful ideas to develop resources for energy startups and DAC entrepreneurs (deadline to apply for the first phase is June 22, 2023); and the DAC Pre-Commercial Technology Prize, offering cash prizes and technical assistance, is accepting applications for innovative, scalable technology solutions that address critical needs in the DAC industry (deadline to apply for the first phase is Sept. 29, 2023). An informational webinar on the DAC Pre-Commercial Technology Prize is scheduled for May 16, 2023.

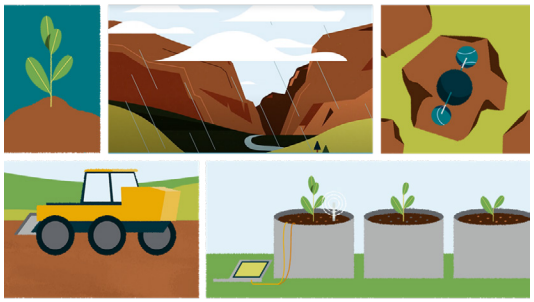
Bipartisan Infrastructure Law Hub

The BIL represents the most dramatic changes to DOE since its founding in 1977. In the next few 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 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.

Interagency News and Updates (continued)

Science In Motion: Can Enhanced Weathering Help Slow Climate Change?

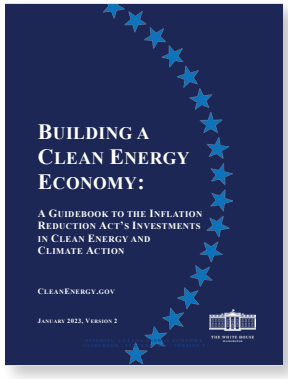
Lawrence Berkeley National Laboratory's (Berkley Lab) "Science in Motion" video series focuses on real approaches, technologies, and solutions that Berkeley Lab is using to solve complex challenges for science, people, and the planet. Discussed in the newest video, Berkeley Lab researchers are exploring the effectiveness of enhanced weathering as a climate change solution by employing expertise in advanced sensing, computer modeling, and techno-economic analysis to address key knowledge gaps to deployment.



Credit: Jenny Nuss

Inflation Reduction Act Guidebook

On August 16, 2022, President Biden signed into law the Inflation Reduction Act (IRA)—aimed at building a better America and making sure the United States remains the global leader in clean energy technology, manufacturing, and innovation. The Inflation Reduction Act Guidebook provides an overview of the clean energy, climate mitigation and resilience, agriculture, and conservation-related tax incentives and investment programs in the IRA, including who is eligible to apply for funding and for what activities. The Biden-Harris administration is working to design, develop, and implement these programs; as such, the information in the guidebook is current as of publication. New developments will be published on www.CleanEnergy.gov.



Limiting Global Warming to 1.5°C Requires Deep Decarbonization Across All Sectors

Eight Berkeley Lab scientists contributed to research behind the United Nations' Intergovernmental Panel on Climate Change (IPCC) "Synthesis Report of the Sixth Assessment Report," which finds that renewable energy, energy efficiency, electric vehicles, recyclable materials, alternative fuels, and carbon capture and storage (CCS) are needed to slow climate change. The synthesis report provides policymakers with the most up-to-date knowledge on climate change, including impacts and future risks, along with strategies to mitigate those risks.

Latest Edition of NETL SSAE Newsletter Now Available

The Strategic Systems Analysis and Engineering (SSAE) directorate provides the decision science and analysis capabilities necessary to evaluate complex energy systems. SSAE's capabilities address technical, economic, resource, policy, environmental, and market aspects of the energy industry. These capabilities are critical to strategic planning, direction, and goals for technology R&D programs and the generation of market, regulatory, and technical intelligence for NETL senior management and DOE. SSAE offers a range of multi-criteria and multi-scale decision tools and approaches for this support.

Interagency News and Updates (continued)

EIA Projects U.S. Energy-Related CO_2 Emissions Will Fall Through 2050

U.S. energy-related CO_2 emissions will drop 25% to 38% below what they were in 2005 by 2030, according to projections in the U.S. Energy Information Administration's (EIA) Annual Energy Outlook 2023 (AEO_2023). By the end of the AEO_2023 projection period, 2050, U.S. energy-related CO_2 emissions are 17% lower in 2023's AEO Reference case compared with 2022's Reference case, after accounting for many effects of the IRA, energy technology costs and performance updates, a changed macroeconomic outlook, and other factors. EIA also published a separate "Issues in Focus" paper that examines the impacts of the IRA, taking into account uncertainty around some of the policy provisions.

FECM's Engagement Home Page

FECM fosters and leverages connections with international and domestic partners; collaborates within DOE and the broader U.S. government; supports community, tribal, and stakeholder engagement; and encourages public-private partnerships to assist in meeting the Biden-Harris administration's climate goals. FECM's Engagement page includes links to upcoming events, news and blogs, and other resources.

Apply to Review FECM Funding Opportunity Applications

FECM is looking for a diverse pool of individuals to review the equity, justice, jobs, and community engagement sections of funding opportunity applications. To apply to review, send a resume to SCI_FECM@NETL.DOE.GOV. Reviewers should have academic, subject matter, and/or practitioner experience in at least one of following areas: diversity, equity, inclusion, and accessibility; community and stakeholder engagement; workforce development and quality jobs; and/or environmental justice.

DOE STEM Portal

DOE is building pathways for a diverse workforce to pursue science, technology, engineering, and mathematics (STEM) careers. DOE seeks to engage learners at all levels to promote STEM and energy literacy and to attract, inspire, and develop a STEM identity and a sense of belonging in STEM. DOE is committed to promoting and supporting people from all backgrounds and perspectives, including individuals and communities that have been historically underrepresented in STEM fields and activities at DOE.

How Copper Catalyst Converts CO_2 Into Liquid Fuels

A research team led by Berkeley Lab has gained new insight by capturing real-time movies of copper nanoparticles (copper particles engineered at the scale of a billionth of a meter) as they convert CO_2 and water into renewable fuels and chemicals (ethylene, ethanol, and propanol, among others). The work was reported in the journal *Nature*. For more Berkeley Lab innovation, watch this video.

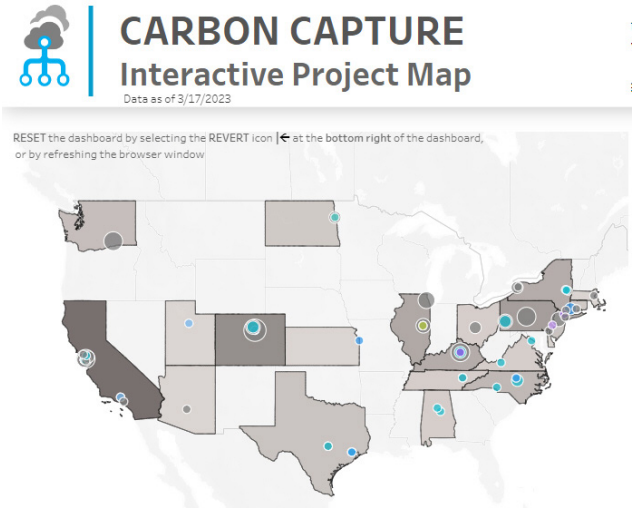
Career Opportunities at NETL

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)

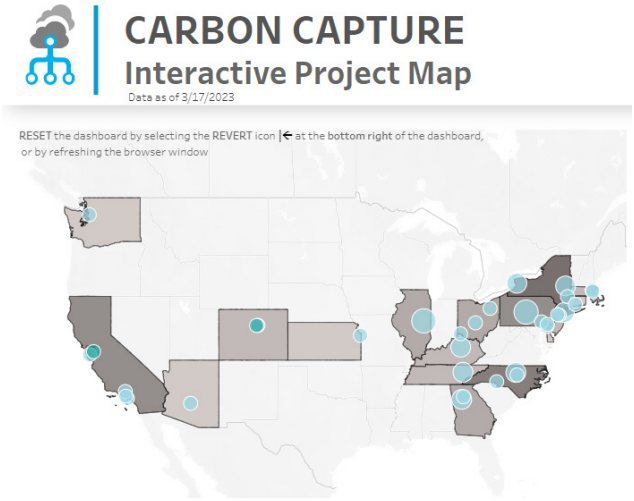
PSCC Interactive Project Map

The PSCC interactive project map contains information for active and inactive projects managed under NETL's PSCC Program. The map data can be filtered to view specific information related to projects with certain criteria, such as the point source capture approach, technology, ending scale, application type, and key technology.



CDR Interactive Project Map

The CDR interactive project map contains information for active and inactive projects managed under NETL's CDR Program. The map data can be filtered to view specific information related to projects with certain criteria, such as the carbon dioxide removal approach, technology, ending scale, application type, and key technology.



FECM/NETL Carbon Management Project Review Meeting

The FECM/NETL 2023 Carbon Management Project Review Meeting will be held Aug. 28–Sept. 1, 2023, at the David L. Lawrence Convention Center in Pittsburgh, Pennsylvania. This meeting will share knowledge and insights from the following FECM R&D programs: PSCC, CDR, Carbon Conversion, and Carbon Transport and Storage. A mixture of plenary, multi-topic breakout, and interactive poster sessions will be used to share research results and provide opportunities for discussion and collaboration on the subject research efforts, both domestic and international. In addition to the project researchers, participants may include employees of other government agencies, electric utilities, research organizations, and industry.

See https://netl.doe.gov/events/23CM for more information.


David L. Lawrence Convention Center

U.S. and International Events

GRC on Carbon Capture, Utilization, and Storage

The fifth edition of the Gordon Research Conference (GRC) on Carbon Capture, Utilization, and Storage—"Transformative Science for the New Carbon Economy"—will be held May 28–June 2, 2023, in Les Diablerets, Switzerland. The conference will examine scientific advances covering all dimensions of the anthropogenic carbon cycle, from capturing hard-to-abate CO_2 emissions to using CO_2 as feedstock and generating negative emissions by removing CO_2 from the atmosphere and oceans.

2023 IEW

The 41st edition of the International Energy Workshop (IEW), to be held in Golden, Colorado, June 13–15, 2023, will be co-hosted by the Colorado School of Mines and the National Renewable Energy Laboratory. Researchers and practitioners from countries around the world are invited to submit original papers with new and innovative results on scientific, technical, and practical experience on the economics of energy and climate systems.

Carbon Capture Summit 2023

The key focus for the Carbon Capture Summit 2023, to be held June 26–27, 2023, in Amsterdam, The Netherlands, will be "working in collaboration with industry" by sharing expertise, building capacity, and providing advice and support so carbon capture, utilization, and storage (CCUS) can play an integral role in reducing carbon emissions. Government agencies, global corporations, research bodies, and non-government organizations (NGOs) committed to learning and adopting CCUS technologies will participate in the event.

Carbon Capture Technology Expo

The Carbon Capture Technology Expo, to be held June 28–29, 2023, in Houston, Texas, 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 CDR technologies as a key solution on the pathway to net-zero carbon emissions.

Hydrogen Technology Conference & Expo

The Hydrogen Technology Conference & Expo, to be held June 28–29, 2023, in Houston, Texas, is dedicated to discussing advanced technologies for the hydrogen and fuel cell industry. The event brings together the entire hydrogen value chain to focus on developing solutions and innovations for low-carbon hydrogen production, efficient storage and distribution, and applications in a variety of stationary and mobile applications.

Clearwater Clean Energy Conference

The 47th Clearwater Clean Energy Conference, to be held July 23–28, 2023, in Clearwater, Florida, provides essential information to power generators who must meet the challenges of energy utilization in the 21st century. The conference will include more than 200 technical presentations in four days, all offered both in-person and virtually.

U.S. and International Events (continued)

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PCCC-7

The International Energy Agency Greenhouse Gas R&D Programme (IEAGHG) PCCC-7 will be in person, Sept. 25–27, 2023, in Pittsburgh, Pennsylvania. DOE/NETL will co-host the event with IEAGHG. The conference format will consist of a two-stream program for oral presentations, a poster session, and a small exhibition area.

Pittsburgh Coal Conference

The 2023 International Pittsburgh Coal Conference, to be held in Istanbul, Turkey, Oct. 4–6, 2023, 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.

Business and Industry News

Quantum Computing Quests for Carbon Capture Compounds

Researchers from NETL and the University of Kentucky are using a quantum computer algorithm to find useful amine compounds for improved atmospheric carbon capture. If the efficiency of those amine compounds can be optimized, it could lead to the capture of billions of tons of additional CO_2. The findings were published in *Quantum Science*.

Oxy Updates DAC 1 Plant Design

Occidental Petroleum (Oxy) provided an update on their DAC facility being built in Texas. Oxy's "DAC 1" is due for start-up in mid-2025 and is designed to capture 500,000 tons of CO_2 per year. Future facilities are expected to be at least twice the size.

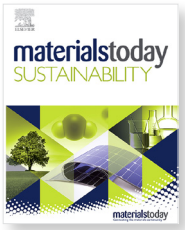
Publications

Cost and Performance of Retrofitting NGCC Units for Carbon Capture – Revision 3

TOMMY SCHMITT, SALLY HOMSY, NETL, MAR. 17, 2023.

Diverse carbon dioxide removal approaches could reduce impacts on the energy–water–land system

JAY FUHRMAN, CANDELARIA BERGERO, MARIDEE WEBER, SETH MONTEITH, FRANCES M. WANG, ANDRES F. CLARENS, SCOTT C. DONEY, WILLIAM SHOBE, HAEWON MCJEON, NATURE CLIMATE CHANGE, VOLUME 13, PAGES 341–350, MAR. 9, 2023. (SUBSCRIPTION MAY BE REQUIRED.)



Energy-efficient and water-saving sorbent regeneration at near room temperature for direct air capture

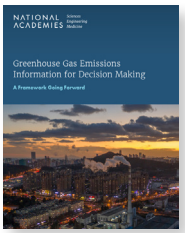
T. JI, H. ZHAI, C. WANG, C.M. MARIN, W.C. WILFONG, Q. WANG, Y. DUAN, R. XIA, F. JIAO, Y. SOONG, F. SHI, M. GRAY, MATERIALS TODAY SUSTAINABILITY, VOLUME 21, MARCH 2023. (SUBSCRIPTION MAY BE REQUIRED.)

Effect of SO_2 on the CO_2 Capture Performance of Self-Supported Branched Poly(ethyleneimine) Scaffolds

PAVITHRA NARAYANAN, RYAN P. LIVELY, CHRISTOPHER W. JONES, ENERGY FUELS, MAR. 15, 2023.

Accurate prediction of carbon dioxide capture by deep eutectic solvents using quantum chemistry and a neural network

MOOD MOHAN, OMAR DEMERDASH, BLAKE A. SIMMONS, JEREMY C. SMITH, MICHELLE K. KIDDER, SEEMA SINGH, GREEN CHEMISTRY, FEB. 28, 2023. (SUBSCRIPTION MAY BE REQUIRED.)



Greenhouse Gas Emissions Information for Decision Making: A Framework Going Forward

NATIONAL ACADEMIES OF SCIENCES, ENGINEERING, AND MEDICINE, 2022.

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 (PSCC) and advancing a diverse set of CDR approaches to directly remove CO_2 emissions from the atmosphere through NETL's Carbon Dioxide Removal Program.

The Digital 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 searchable database.

Carbon Capture Reference Materials

- Carbon Dioxide Removal Program Fact Sheet
- Carbon Capture Infographics
- Interactive Project Maps: PSCC and CDR
- Compendium of Carbon Capture Technology
- Carbon Dioxide Capture Handbook
- CCSI^2
- Systems Analysis
- Conference Proceedings
- Accomplishments Posters: PSCC and CDR

Contact Us

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

CUSTOMER SERVICE: 1-800-553-7681

www.netl.doe.gov

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