NATIONAL ENERGY TECHNOLOGY LABORATORY

OCTOBER 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.

To subscribe, click here.

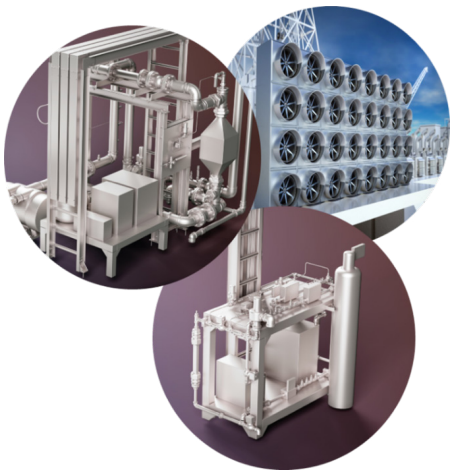
DOE Announces Funding for DAC Demonstrations in Texas and Louisiana

The U.S. Department of Energy (DOE) announced up to $1.2 billion to advance the development of two commercial-scale direct air capture (DAC) facilities in Texas and Louisiana. The projects represent the initial selections from the president's Bipartisan Infrastructure Law (BIL)-funded Regional DAC Hubs Program, which aims to kickstart a nationwide network of large-scale carbon dioxide removal (CDR) sites to address legacy carbon dioxide (CO_2) pollution and complement rapid emissions reductions. The DAC Hubs are expected to ensure meaningful community and labor engagement and contribute to the president's Justice40 Initiative. Together, these projects are expected to remove more than 2 million metric tons of CO_2 emissions each year from the atmosphere and create 4,800 good-paying jobs in Texas and Louisiana.

Interagency News and Updates

NETL to Discuss Plans to Accelerate Commercialization of DAC Technologies

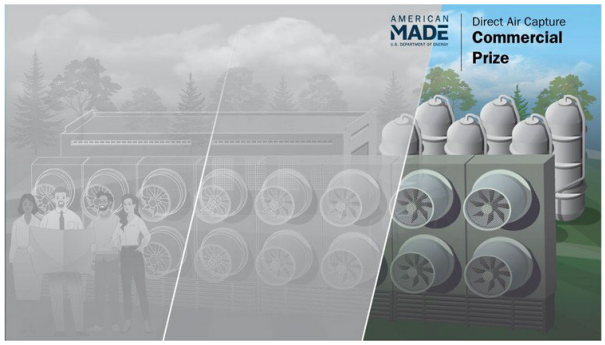
David Luebke, technical director of the DOE Office of Fossil Energy and Carbon Management (FECM) National Energy Technology Laboratory (NETL) DAC Center, discussed the laboratory's efforts to accelerate the commercialization of DAC technologies during a presentation Aug. 16, 2023, at the fall meeting of the American Chemical Society in San Francisco, California. The DAC Center will be designed with substantial flexibility to accommodate the rapidly evolving technological landscape. Testing systems will be available at three scales. It will also provide developers with the ability to simulate a wide range of conditions, which will enable better understanding of how various DAC technologies respond in different climates, from summer to winter and arid to tropical.



The NETL DAC Center will offer testing at the laboratory, bench, and pilot scales.

DAC Commercial Prize

The DAC Commercial Prize awards cash prizes to teams that already have a technology that can capture CO_2 and scale it up to achieve a removal target. Teams will win increasingly larger prizes as they successfully scale-up their DAC technologies over the course of four phases. Each phase requires compounding progress of the team's DAC technology development. Further details on the prize are forthcoming.



FECM Announces Intent to Launch a Responsible Carbon Management Initiative

FECM released a notice of intent (NOI) to launch a "Responsible Carbon Management Initiative." The Initiative aims to encourage and recognize project developers and others in industry to pursue the highest levels of safety, environmental stewardship, accountability, community engagement, and societal benefits in carbon management projects.

FECM Announces Intent to Issue Funding Opportunity: Carbon Negative Shot Pilots

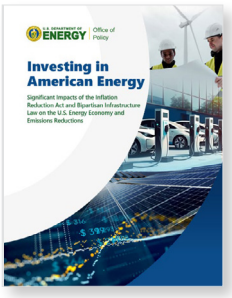
FECM intends to publish a series of funding opportunities announcements (FOAs) for projects and prizes focused on supporting the development and commercialization of a suite of CDR technologies. These efforts will collectively support the Carbon Negative Shot, part of DOE's larger Energy Earthshots Initiative. Any information contained in this NOI is subject to change without notice. Full applications are not being accepted at this time. The NOI has four areas of interest (AOIs): small biomass CDR and storage pilots, small mineralization pilots, multi-pathway CDR testbed facilities, and small marine CDR pilots.

Interagency News and Updates (continued)

FECM Invests in Projects with CDR from Industrial Facilities, Power Plants, Air, and Oceans

FECM announced 23 projects to receive a total of more than $13 million in funding supporting research and development (R&D) for carbon management technologies and applications that will reduce CO_2 emissions. The projects will be led by universities and private sector companies across the United States to advance technologies toward commercial deployment that will capture CO_2 from sources such as industrial facilities or power plants, or directly from the air and oceans, and convert the CO_2 into valuable products such as fuels, chemicals, and building materials.

Investing in American Energy: Significant Impacts of the IRA and BIL on the U.S. Energy Economy and Emissions Reductions Report Now Available



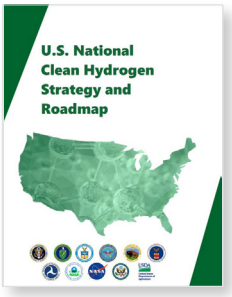
The Inflation Reduction Act (IRA) and BIL are revitalizing the U.S. energy system by investing in American energy supply chains, clean energy job creation, emissions reduction, and consumer energy savings. DOE's latest report, "Investing in American Energy: Significant Impacts of the Inflation Reduction Act and Bipartisan Infrastructure Law on the U.S. Energy Economy and Emissions Reductions," describes the key results from new analysis on the impacts of IRA and BIL in the Office of Policy - National Energy Modeling System (OP-NEMS), a customized version of the National Energy Modeling System (NEMS).

DOE Announces Funding to Transform Climate Pollution into Sustainable Products

DOE announced it is making $100 million available through President Biden's Investing in America agenda to support states, local governments, and public utilities in purchasing products derived from converted carbon emissions. The goal is to speed up adoption of advanced carbon management technologies, creating a market for environmentally sustainable alternatives in fuels, chemicals, and building products sourced from captured emissions from industrial and power generation facilities. This effort aligns with the Biden-Harris administration's historic climate and clean energy agenda.

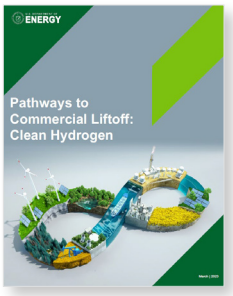
Interagency News and Updates (continued)

Biden-Harris Administration Releases National Clean Hydrogen Strategy and Roadmap



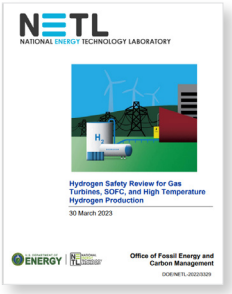
The Biden-Harris administration released the *U.S. National Clean Hydrogen Strategy and Roadmap*, a comprehensive framework for accelerating the production, processing, delivery, storage, and use of clean hydrogen. Estimates indicate that America's growing hydrogen economy has the potential to add 100,000 net new direct and indirect jobs by 2030. Developed by DOE, in partnership with other federal agencies, the U.S. National Clean Hydrogen Strategy and Roadmap underscores the president's whole-of-government approach to addressing the climate crisis and achieving a carbon-free grid by 2035 and a net-zero emissions economy by 2050.

Pathways to Commercial Liftoff: Clean Hydrogen Now Available



DOE's Pathways to Commercial Liftoff reports aim to establish a common fact base and ongoing dialogue with the private sector around the path to commercial liftoff for critical clean energy technologies. The goal is to catalyze more rapid and coordinated action across the full technology value chain. This volume discusses hydrogen's role in decarbonizing up to 25% of global energy-related CO_2 emissions.

NETL Hydrogen Safety Review Report Now Available



An analysis of the potential safety issues associated with using hydrogen sourced from America's vast energy resources to build a sustainable future is now available on NETL's website. The *Hydrogen Safety Review for Gas Turbines, SOFC, and High Temperature Hydrogen Production* was developed to review and summarize the unique safety challenges involved with the production, transportation, and storage of hydrogen as part of NETL's Hydrogen Safety Field Work Proposal to support FECM's strategic vision for safe, widespread and large-scale production and utilization of hydrogen as a carbon-free energy storage medium.

U.S. Energy Secretary Concludes Trip to India

Secretary of Energy Jennifer M. Granholm led the U.S. delegation to India July 17–22, 2023, to advance U.S. clean energy goals in four major international fora. In New Delhi, the Secretary joined India's Minister of Petroleum and Natural Gas Hardeep Puri and other ministries at the U.S.-India Strategic Clean Energy Partnership (SCEP) Ministerial. Both sides agreed to deepen collaboration on scaling and accelerating the deployment of hydrogen technologies through the public-private Hydrogen Task Force and related efforts across a broad range of clean energy sectors. Following SCEP, the Secretary traveled to Goa for Clean Energy Ministerial (CEM) and Mission Innovation (MI) joint ministerial meetings, where she shared updates on the Clean Energy Technologies Demonstration Challenge. A the G20 Energy Ministerial, Secretary Granholm announced efforts to launch the Global Biofuels Alliance focused on creating new markets, developing emerging markets, and expanding trade in emerging economies.

Interagency News and Updates (continued)

Award-Winning NETL Researcher Highlighted

Research chemist McMahan "Mac" Gray joined NETL in 1986 and has served as principal investigator for multiple innovations, including NETL's basic immobilized amine sorbent technology—a breakthrough discovery capable of capturing greenhouse gas (GHG) emitted by power plants that earned Gray an R&D 100 Award. Gray received the Federal Laboratory Consortium Mid-Atlantic Region Award for Technology Transfer, the Federal Laboratory Consortium National Award for Excellence in Technology Transfer, the Hugh Guthrie Award for Innovation as one of NETL's leading scientists, the Gold Medal for Outstanding Contribution to Science (Non-Medical) from the Federal Executive Board for Excellence in the Government, an Innovator Award from The Pittsburgh Business Times, and others.

Clean Energy Demonstration Program on CEML Applicant Informational Webinar

A video recording of the Clean Energy Demonstration Program on Current and Former Mine Land (CEML) Applicant Informational Webinar on July 11, 2023, features a clarification on expectations for CEML applicants. Visit the Office of Clean Energy Demonstrations (OCED) website to learn more.

Chairs Rodgers and Duncan Unveil Draft Legislation to Modernize and Expand U.S. Pipeline Infrastructure

House Energy and Commerce Committee Chair Cathy McMorris Rodgers and Energy, Climate, and Grid Security Subcommittee Chair Jeff Duncan unveiled draft legislation, titled Pipeline Safety, Modernization, and Expansion Act of 2023, which will help unleash clean, affordable American energy. The Pipeline Safety, Modernization, and Expansion Act of 2023 will ensure the United States can build more pipelines, protect this critical infrastructure, transport more energy, and lower energy prices.

FECM Engaging Communities, Stakeholders, and Tribes in Clean Energy Technologies

FECM is committed to meaningful engagement with communities, tribes, and other stakeholders that enables them to contribute to and be active participants in local energy and infrastructure projects. Meaningful local engagement in project design and development helps ensure that projects can better deliver tangible environmental, economic, and social benefits to those communities. Local support will, in turn, contribute to project success and ultimately help enable the levels of deployment of clean energy and industrial projects needed to reach the Biden-Harris administration's goal of net-zero GHG emissions by 2050.

Interagency News and Updates (continued)

EPA Proposing GHG Standards and Guidelines for Fossil Fuel-Fired Power Plants

The U.S. Environmental Protection Agency (EPA) is proposing Clean Air Act emissions limits and guidelines for CO_2 from fossil fuel-fired power plants based on cost-effective and available control technologies. The proposals would set limits for new gas-fired combustion turbines; existing coal, oil, and gas-fired steam generating units; and certain existing gas-fired combustion turbines. Consistent with EPA's traditional approach to establishing pollution standards for power plants under section 111 of the Clean Air Act, the proposed standards are based on technologies such as carbon capture and storage (CCS), low-GHG hydrogen co-firing, and natural gas co-firing, which can be applied directly to power plants that use fossil fuels to generate electricity.

DOE Opens Manufacture of Advanced Key Energy Infrastructure Technologies (MAKE IT) Prize for Submissions

Submissions are now open for DOE's $30 million Manufacture of Advanced Key Energy Infrastructure Technologies (MAKE IT) Prize, which seeks to catalyze domestic manufacturing of critical clean energy technology components, moving manufacturing facilities from planning to shovel-ready, and enabling strategies for vibrant manufacturing activity in communities. The Facilities Track will award teams that demonstrate being shovel-ready to build a clean energy manufacturing facility the fastest and most effectively. The Strategies Track will award teams who developed strategies to enable vibrant manufacturing activity in their communities. Deadline for submissions is Oct. 18, 2023, at 5 p.m., ET.

AMERICAN MADE CHALLENGES
U.S. DEPARTMENT OF ENERGY

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.

Bipartisan Infrastructure Law Hub

BIL HUB
Resources for the Bipartisan Infrastructure Law

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.

U.S. and International Events

2023 International Pittsburgh Coal Conference

The 2023 International Pittsburgh Coal Conference, to be held Oct. 4–6, 2023, in Istanbul, Turkey, 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 will provide opportunity for in-depth and focused exchange of technical information and policy issues among representatives from industry, government, and academia throughout the world.

Global Direct Air Capture Conference

Global Direct Air Capture Conference, to be held Oct. 16–17, 2023, in New York, New York, is dedicated to accelerating the responsible development and deployment of DAC to help address climate change. It aims to be a marquee annual event for knowledge-sharing and cross-sectoral discussions, bringing together global leaders and innovators from policy, finance, technology, civil society, and industry. The hosts will provide a structured space for agenda-setting, collaboration, and progress tracking, to catalyze action on emerging priorities.

Carbon Capture Summit USA 2023

The Carbon Capture Summit USA 2023, to be held Oct. 23–24, 2023, in Houston, Texas, will explore next-generation technologies for carbon capture, utilization, and storage (CCUS) and transportation to meet net-zero emissions targets. The key focus for 2023 will be "working in collaboration with Industry" by sharing expertise, building capacity, and providing advice and support so that CCUS can play an integral role in reducing carbon emissions. Government agencies, global corporations, research bodies, and non-government organizations committed to learning and adopting CCUS technologies will participate in this event.

American Carbon Capture, Utilization, and Storage Forum

The American Carbon Capture, Utilization, and Storage Forum, to be held Oct. 25–26, 2023, in Houston, Texas, will provide a platform to explore the benefits and challenges of developing available CCS solutions. The forum will cover the latest technological developments, ongoing and upcoming projects, and market forecasts of growing CCS project trends.

U.S. and International Events (continued)

2023 AIChE Annual Meeting

The 2023 American Institute of Chemical Engineers (AIChE) Annual Meeting, to be held Nov. 5–10, 2023, in Orlando, Florida, is an educational forum for chemical engineers interested in innovation and professional growth. Academic and industry experts will cover a wide range of topics relevant to cutting-edge research, new technologies, and emerging growth.

2023 NCCC & Expo

The 2023 National Carbon Capture Conference (NCCC) & Expo 2023, to be held Nov. 7–8, 2023, in Des Moines, Iowa, is a two-day event designed for companies and organizations advancing technologies and policy that support 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.

Appalachian Hydrogen & Carbon Capture Conference 2023

The Appalachian Hydrogen & Carbon Capture Conference, to be held Nov. 30, 2023, in Canonsburg, Pennsylvania, will feature several speakers who collaborate closely with DOE and understand the workings of both the government and the oil and gas industry.

UNFCCC COP 28

The 2023 United Nations Climate Change Conference (UNFCCC), to be held Nov. 30–Dec. 12, 2023, in Dubai, United Arab Emirates, will comprise the 28th meeting of the Conference of the Parties (COP 28); the fifth meeting of the COP serving as the Meeting of the Parties to the Paris Agreement; the 18th meeting of the COP serving as the Meeting of the Parties to the Kyoto Protocol; the 59th meeting of the Subsidiary Body for Implementation; and the 59th meeting of the Subsidiary Body for Scientific and Technological Advice.

PowerGen International

PowerGen International, to be held Jan. 23–25, 2024, in New Orleans, Louisiana, is a networking and business hub for power generation professionals and solution providers. Bringing together power producers, utilities, consultants, manufacturers, and large-scale energy users, it serves as a platform to explore innovative solutions amid the shift toward cleaner and more sustainable energy sources.

Business and Industry News

B&W Awarded Contract to Study BECCS Conversion for Coal Power Plant in Michigan

Babcock & Wilcox (B&W) has been awarded a contract by NorthStar Clean Energy to conduct a bioenergy with carbon capture and storage (BECCS) engineering study to convert a coal-fired power station in Filer City, Michigan, to use biomass fuel and retrofit the plant with B&W's SolveBright™ CO_2 capture process. The study is the first phase of a commercial-scale project partially funded by DOE. When the biomass and carbon capture conversion is complete, the power station will be able to provide power to more than 70,000 homes while producing net-negative CO_2 emissions.

SSEB and Partners to Establish the SEDAC Hub

FECM will enter negotiations with Southern States Energy Board (SSEB) and its partners to support the deployment of a regional DAC hub in south Alabama. Known as the Southeast DAC (SEDAC) Hub, the project will support the deployment of cutting-edge DAC technologies in Mobile County, Alabama. The SEDAC Hub is one of five Topic Area 2 projects chosen by the federal government to receive funding in order to establish a regional DAC hub. Mobile County is an ideal location to support the initial phases of a DAC hub as it is home to many industrial facilities, large tracts of available land, and appropriate subsurface geology to support the creation of a sustainable CO_2-based economy.

FECM Invests in 23 Innovative CO_2 Capture Technologies

FECM invested more than $13 million in 23 projects to support R&D for carbon capture technologies and their applications that can reduce carbon emissions. Universities and private sector companies across the country lead the projects to scale-up carbon capture technologies to commercial deployment. These technologies capture CO_2 from industrial sources like power plants, or directly from the air and oceans. They then transform the captured carbon into valuable products such as fuels and chemicals or use it to make building materials.

PRI to Conduct Feasibility Studies for Three Regional DAC Hubs

The Prairie Research Institute (PRI) at the University of Illinois Urbana-Champaign has been chosen by FECM to spearhead feasibility studies for three Regional DAC Hubs: the Illinois Basin Regional DAC, to be overseen by the University of Illinois, aims to capture CO_2 from the air and store it in the Illinois Basin; the Colorado (Pueblo) Regional DAC will similarly capture and store CO_2, building on previous geologic studies of the Denver-Julesburg Basin; and the Florida Regional DAC will store captured CO_2 in the Tuscaloosa Group, a deep saline aquifer.

Fact Sheets

NETL's PSCC Program Fact Sheet

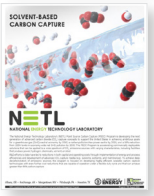
NETL's Point Source Carbon Capture (PSCC) Program fact sheet describes the program's advancement of technologies to minimize the environmental impacts of fossil fuel-based power generation and to decarbonize existing infrastructure in the power and industrial sectors.

Membranes for Carbon Capture Fact Sheet

The PSCC Program's Membranes for Carbon Capture fact sheet describes the three main innovation pathways along which advancements in membrane-based technology development are being pursued.

Solvent-Based Carbon Capture Fact Sheet

The PSCC Program's Solvent-Based Carbon Capture fact sheet describes the three main innovation pathways along which advancements in solvent-based technology development are being pursued.



Sorbents for Carbon Capture Fact Sheet

The PSCC Program's Sorbent fact sheet describes the three main innovation pathways along which advancements in sorbent-based technology development are being pursued.

NETL's CDR Program Fact Sheet

NETL's CDR Program fact sheet describes the laboratory's diverse portfolio of CDR approaches integral to the U.S. goal of achieving a net-zero carbon economy by 2050.

FECM's CDR Fact Sheet

FECM's CDR fact sheet describes the office's advancements on a suite of CDR approaches.

OCED's Regional DAC Hubs Fact Sheet

OCED's Regional DAC Hubs fact sheet provides an overview of OCED and its Regional DAC Hubs Program.

FECM's CCUS Fact Sheet

FECM's CCUS fact sheet describes FECM's deployment of carbon management technologies and infrastructure to capture, use, transport, and geologically store CO_2 at scale.

FECM's CDR Investments and Initiatives

FECM's CDR Investments and Initiatives fact sheet announces new actions and coordination with multiple offices across DOE and other federal agencies to accelerate CDR technologies across the entire innovation chain.

Publications

A series of cation-modified robust zirconium-based metal–organic frameworks for carbon dioxide capture

GUOYU ZHANG, FENG XIE, THOMAS M. OSBORN POPP, AKASH PATEL, EDER MOISÉS CEDEÑO MORALES, KUI TAN, RYAN CRICHTON, GENE HALL, JIANYUAN ZHANG, ANDREW J. NIEUWKOOPA, JING LI, CRYSENGCOMM, ISSUE 7, 2023. (SUBSCRIPTION MAY BE REQUIRED.)

Gradient Amine Sorbents for Low Vacuum Swing CO_2 Capture at Ambient Temperature

STEVEN CHUANG, NETL, JULY 31, 2023.

Targeted electrochemical reduction of carcinogenic N-nitrosamines from emission control systems within CO_2 capture plants

SHINO TOMA, AYOKUNLE OMOSEBI, XIN GAO, KEEMIA ABAD, SALONI BHATNAGAR, DALI QIAN, KUNLEI LIU, JESSE G. THOMPSON, CHEMOSPHERE, VOLUME 333, AUGUST 2023, 138915. (SUBSCRIPTION MAY BE REQUIRED.)

Laboratory aging of a dual function material (DFM) washcoated monolith for varying ambient direct air capture of CO_2 and in situ catalytic conversion to CH_4

MONICA ABDALLAH, YUANCHUNYU (IRIS) LIN, ROBERT FARRAUTO, APPLIED CATALYSIS B: ENVIRONMENTAL, VOLUME 339, DEC. 15, 2023, 123105. (SUBSCRIPTION MAY BE REQUIRED.)

Support Pore Structure and Composition Strongly Influence the Direct Air Capture of CO_2 on Supported Amines

*GUANHE RIM, PRANJALI PRIYADARSHINI, MINGYU SONG, YUXIANG WANG, ANDREW BAI, MATTHEW J. REALFF, RYAN P. LIVELY, CHRISTOPHER W. JONES, J. AM. C*HEM. SOC., VOLUME 145, ISSUE 13, 7190–7204, MARCH 27, 2023.

CO_2 Sorption in Aminopolymer-Based Direct Air Capture Composites Through Fluorescent Detection

WADE BRAUNECKER, GLORY RUSSELL-PARKS, NOEMI LEICK, BRIAN TREWYN, PRESENTED AT THE AMERICAN CHEMICAL SOCIETY SPRING MEETING, MARCH 26–30 2023, INDIANAPOLIS, INDIANA.

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

- Point Source Carbon Capture Program Fact Sheet
- 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

DOE Carbon Capture contacts:

Ron Munson, Point Source Capture Technology Manager, 412.386.9294

Andrew Jones, Carbon Dioxide Removal Technology Manager, 412.386.5531

Amishi Claros, Acting Director, CO_2 Removal and Conversion, 202.586.1888

Dan Hancu, DOE Senior Program Manager, Point Source Carbon Capture, 240.220.1186

1450 Queen Avenue SW
Albany, OR 97321-2198
541-967-5892

3610 Collins Ferry Road
Morgantown, WV 26507-0880
304-285-4764

626 Cochran Mill Road
Pittsburgh, PA 15236-0940
412-386-4687

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

CUSTOMER SERVICE: 1-800-553-7681

www.netl.doe.gov

Click here to subscribe or unsubscribe to the CCN.

Click here to submit questions, feedback or SUGGESTIONS.

Get Social with Us

There are several ways to join the conversation and connect with NETL's Carbon Capture activities:

U.S. DEPARTMENT OF ENERGY | NETL NATIONAL ENERGY TECHNOLOGY LABORATORY