NATIONAL ENERGY TECHNOLOGY LABORATORY

JANUARY 2025

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.

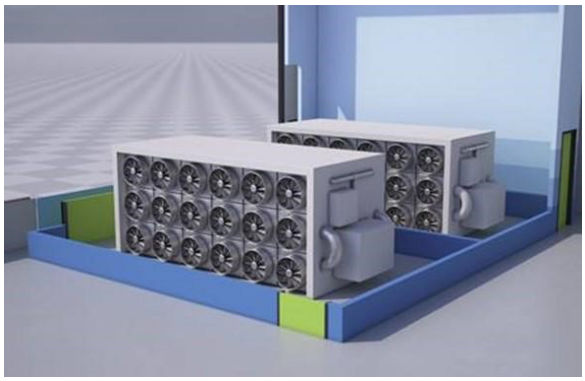
To subscribe, click here.

NETL, Partners Complete First DAC Field Test at NCCC

The expertise and oversight of the U.S. Department of Energy's (DOE) National Energy Technology Laboratory (NETL) played a significant role in completing the first successful field test of a direct air capture (DAC) technology at the National Carbon Capture Center (NCCC). Results of the field test—completed in July—advanced the development of a system that has potential to lower the cost of DAC while reducing atmospheric levels of carbon dioxide (CO_2). Project partners tested a solid amine sorbent-based DAC system in an environment expected to be the same as a commercial operation reflecting everyday conditions. The technology employs a solid-amine CO_2 adsorption-desorption cycle using a honeycomb-type monolithic contactor impregnated with a solid polyethylenimine polymer that forms polymeric amine capture sites within the contactor. The project team tested its system for 3,300 hours over 137,000 cycles across a range of environmental conditions and with a total available operational uptime of 94%.

Interagency News and Updates

NETL's DAC Center Advancing Projects to Address Climate Change at Home and Abroad



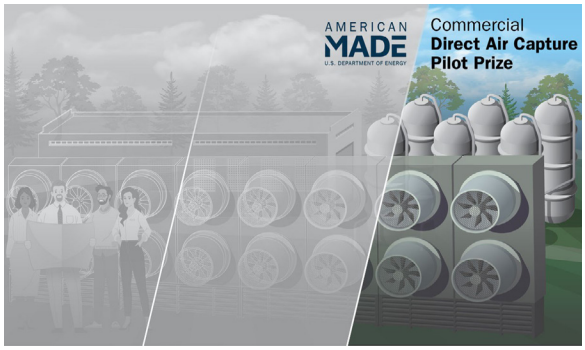
This artist rendering depicts environmental chambers at the NETL DAC Center able to test prototype units across a range of climate conditions.

A growing roster of technology companies from around the globe are partnering with NETL to unleash DAC as a powerful tool in the fight to mitigate the climate crisis. The mission of NETL's DAC Center is to advance technologies from across DOE's Office of Fossil Energy and Carbon Management's (FECM) Carbon Dioxide Removal (CDR) Program and the industry as a whole. In projects carried out under Contributed Funds Agreements, the NETL DAC Center performs work for outside parties, for which NETL is fully reimbursed. The center is currently working on one such project with Octavia Carbon, based in Kenya. At the core of Octavia's DAC approach is a patent-pending sorbent with low regeneration temperature allowing Octavia to integrate the DAC technology more easily with Kenya's inexpensive, abundant geothermal heat that would otherwise remain untapped.

Primer on CDR Credits

Building on its suite of commercial CDR programming, FECM's "Primer on Carbon Dioxide Removal Credits" underscores how CDR is essential for a net-zero world. The primer is tailored toward audiences looking to make a meaningful CDR purchase on behalf of their organization. DOE welcomes input and feedback on the contents of the primer, directed to voluntary CDRchallenge@hq.doe.gov.

Funding Notice: Commercial DAC Pilot Prize



FECM announced up to $52.5 million to advance CDR technologies that reduce legacy CO_2 by removing it directly from the atmosphere to counter-balance emissions from hard-to-abate sectors, such as aviation and shipping. The Commercial DAC Pilot Prize will provide capital to support DAC pilots that have exceeded the technology readiness levels (TRLs) eligible for Pre-Commercial DAC Prizes but are not sufficiently demonstrated or commercially de-risked enough to be deployed in the Regional DAC Hubs Program. The submission deadline for Phase 1 is Feb. 7, 2025.

Interagency News and Updates (continued)

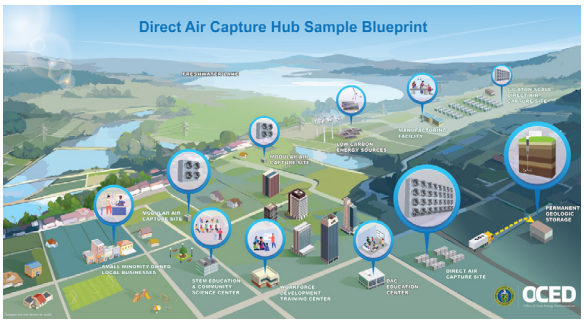
DOE Announces Awards for Two Regional Clean Hydrogen Hubs

DOE announced up to $2.2 billion in award commitments for two Regional Clean Hydrogen Hubs (H_2Hubs) that will help accelerate the commercial-scale deployment of low-cost, clean hydrogen. The two awardees—Gulf Coast H_2Hub and Midwest H_2Hub—are critical pillars of DOE's H_2Hubs program, which was created by the Bipartisan Infrastructure Law (BIL) to kickstart a national network of clean hydrogen producers, consumers and connective infrastructure while supporting the production, storage, delivery and end-use of clean hydrogen.

Rendering of clean hydrogen storage tanks

OCED Seeks Public Input on Approaches to Catalyze DAC Technology Commercialization

DOE's Office of Clean Energy Demonstrations (OCED) issued a request for information (RFI) to obtain public input regarding additional approaches that current and future DOE programs could implement to help DAC technology developers address challenges in raising project investment capital and achieving sustained facility operations. The goal of the RFI, which will help inform the Regional DAC Hubs Program, is to understand how federal funding may complement existing DOE funding mechanisms supporting development, construction and partial operations funding for first-of-a-kind commercial demonstrations, and supplement other government incentives in support of DAC technology commercialization and spurring the development of the Regional DAC Hubs.



NOI to Issue a NOFO: University Training and Research for FECM

FECM released a notice of intent (NOI) to issue a Notice of Funding Opportunity (NOFO) in support of its University Training and Research Program. If released, the NOFO its expected to focus on the following R&D activities: Curriculum to Grow Carbon Management Education Capacity, Critical Mineral Supply Chain Career Awareness Outreach Program, Soil Carbon Sequestration: Establishing Technical and Social Baselines to Enable Broader Adoption, and Using Artificial Intelligence and Machine Learning to Advance Point Source Capture and Train the Next Generation of Engineers.

Photo Credit: NETL

Interagency News and Updates (continued)

DOE Announces Collaboration with Tribal Leaders to Reduce Greenhouse Gas Emissions and Strengthen National Security

DOE announced the formation of the Tribal FECM Working Group, which will provide ongoing advice and expertise to DOE on the best ways to assist tribal decarbonization efforts and utilization of their natural resources. DOE's technical assistance will help tribes spur local economic development; provide workforce training for local, high-wage, middle class jobs; and support tribal technical capacity for fostering energy, economic and community development opportunities. The working group will initially include representation from eight federally recognized tribes with significant fossil energy reserves and reliance on revenue from those resources, including Jicarilla Apache; Crow Nation; Navajo Nation: Caddo Nation; Hopi Nation; Southern Ute; Arctic North Slope Iñupiat; and Mandan, Hidatsa and Arikara (MHA) Nation.

NETL Plans to Issue a NOFO for Carbon Capture R&D and FEED Studies for Power Generation and Industrial Point Sources

NETL released an NOI to issue the NOFO "Carbon Capture Research and Development and Front-End Engineering Design Studies for Power Generation and Industrial Point Sources." Efforts sought under this notice will build upon and expand R&D that DOE has invested in since 2009 to support achievement of CO_2 emissions reduction targets. Areas of interest will be Engineering-Scale Testing of Transformational Carbon Capture Technologies at Natural Gas Power Generation and Industrial Facilities; Enabling Technologies for Carbon Capture Systems; Testing of Low-Cost, High Capture Efficiency, Flexible Capture Systems for Electricity Generation and Industrial Facilities; Preliminary Front-End Engineering Design Studies (pre-FEED) for Flexible Carbon Management Systems; and FEEDs for Oxygen-Driven (Chemical Looping/Oxy-Combustion) Hydrogen Production Pre-Commercial Pilot Scale Systems.

DOE Announces Funding for Projects to Advance Development of Mixed Algae for Biofuels and Bioproducts

DOE's Bioenergy Technologies Office and FECM announced $20.2 million in funding for 10 university and industry projects to advance mixed algae development for low-carbon biofuels and bioproducts. Located in seven states, selected projects will address high-impact research and development (R&D) focused on converting algae, such as seaweeds and other wet waste feedstocks, to low-carbon fuels, chemicals and agricultural products that can decarbonize domestic transportation and industry. These research projects will help overcome feedstock conversion challenges and support building biomass supply chains, and ultimately improve CO_2 conversion to algae and enable greater volumes of sustainable aviation fuel. Details on selected projects are available here.

Demand for jet fuel is expected to balloon over the next three decades. SAF can help meet goals for cutting GHG emissions from domestic and international aviation.

Interagency News and Updates (continued)

Brad Crabtree's Remarks at Pennsylvania Conversation on Industrial Decarbonization


FECM Assistant Secretary Brad Crabtree

Assistant Secretary of Energy for FECM Brad Crabtree spoke at the Pennsylvania Conversation on Industrial Decarbonization on Oct. 16, 2024, highlighting the importance of partnerships in advancing industrial decarbonization in Pennsylvania and the Appalachian Region. He discussed the significant federal funding and incentives available for carbon management projects, including the BIL and Inflation Reduction Act (IRA). Crabtree also emphasized the role of Pennsylvania in the clean energy transition, with projects in carbon capture, hydrogen production, CDR and conversion, among others. He discussed the challenges facing industrial decarbonization in the region, such as geology and access to renewable energy sources, but highlighted the progress being made and the potential benefits for the workforce and economy. Crabtree encouraged meaningful community engagement, workforce development and the potential for Pennsylvania to lead in industrial decarbonization.

DOE Showcases Clean Energy Achievements at COP29

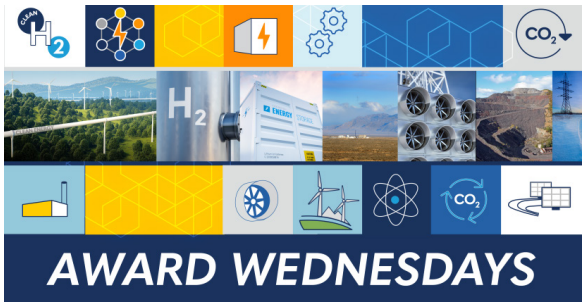
Secretary Jennifer Granholm and Deputy Secretary Dave Turk led the DOE delegation to Baku, Azerbaijan, for the 29th Conference of the Parties to the United Nations Framework Convention on Climate Change (COP29). DOE announced and highlighted a range of initiatives, including that DOE has committed more than $95 billion in funding made available from the landmark BIL-IRA climate legislation. Additional areas include global goals on energy storage and grids, nuclear energy, and clean hydrogen, all in the service of ensuring a durable and long-lasting transition to clean energy around the world. Highlights include spurring multilateral commitments to keep 1.5 within reach, partnering to accelerate clean energy transitions, and investing and innovating to reach net-zero at home.

DOE Announces Intent to Fund Pilot-Scale Projects that Convert Carbon Emissions into Value-Added Products

FECM issued an NOI to provide funding from the BIL for large-scale conversion of carbon emissions into environmentally responsible and economically valuable products. Projects will develop the sustainable feedstocks and conversion technologies necessary to produce crucial fuels, building materials and other carbon-based products that are better for the environment than current products. If issued, this funding opportunity will support pilot-scale projects that advance carbon conversion technologies with a high TRL that are capable of achieving significant carbon mitigation via biological, catalytic or mineralization pathways.

Interagency News and Updates (continued)

OCED Award Wednesdays



OCED awarded the Zero Waste Advanced Aluminum Recycling project with more than $3 million to begin Phase 1 activities. This project aims to build a processing plant on the backend of an existing aluminum recycling facility to enable salt slag components, which are typically sent to landfills, to be recycled back into the aluminum recycling process or beneficially used in other industries such as cement.

OCED awarded the Carbon Capture Pilot at Big Spring Refinery project with $4 million to begin Phase 1 activities. The project aims to capture at least 145,000 metric tons of CO_2 each year from the refinery's fluidized catalytic cracking unit.

OCED awarded the Clean Energy in the Northwest Arctic project with more than $9 million to begin Phase 1 activities. The project plans to install more than 2.7 megawatts (MW) of solar photovoltaic, more than 7.5 megawatt-hours (MWh) of battery energy storage systems, and approximately 850 heat pumps across 11 villages in the Northwest Arctic region. The proposed project strives to replace a 10-mile overhead distribution tie-line between the villages of Kobuk and Shungnak, facilitating greater interconnection in this remote region.

OCED awarded the Gulf Coast H_2Hub $22 million to begin Phase 1 activities. The hub plans to leverage the region's abundant energy resources to drive down the cost of hydrogen and proposes to use the hydrogen for fuel cell electric trucks, industrial processes, ammonia production, refining and petrochemical production, and marine fuel.

OCED awarded the Midwest H_2Hub with $22.2 million to begin Phase 1 activities. The hub plans to leverage the region's diverse energy sources (including renewable wind energy, natural gas and nuclear energy) to support the decarbonization of industries including steel and glass production, manufacturing, power generation, refining and heavy-duty transportation across Illinois, Indiana, Iowa and Michigan.

DOE STEM Portal

DOE is building pathways for a diverse workforce to pursue careers in science, technology, engineering and math (STEM). 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.


Photo Credit: DOE

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. The BIL is standing up 60 new DOE programs, including 16 demonstration and 32 deployment programs, and is expanding 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

CLIMIT Summit 2025

CLIMIT Summit 2025, to be held Feb. 25–27, 2025, in Larvik, Norway, will focus on international collaboration and its impact on the development of carbon, capture and storage (CCS) and CDR globally. Day one of the summit will be the international CDR conference in partnership with Mission Innovation CDR, with public and private-sector representatives from the United States, Canada, the European Union and the United Kingdom, among others. During the conference, there will also be a separate session on the Mission Innovation CDR's student initiative—the Student Monitoring and Reporting Technology for CDR Competition—where the final student teams will present their innovative ideas to the audience, who will vote on the best ideas.

POWERGEN 2025

POWERGEN 2025, to be held Feb. 11–13, 2025, in Dallas, Texas, serves as a business and networking hub for 8,000 electricity generators, utilities and solution-providers engaged in power generation—providing a platform to discuss in-depth challenges faced by all energy stakeholders and helping them find a path from where the industry is now to where the new emerging and leading trends will take it.

CCUS 2025

Carbon Capture, Utilization, and Storage (CCUS), to be held March 3–5, 2025, in Houston, Texas, highlights current CCUS work and addresses related challenges. Keynote speakers and lunch panels will drive the discussions of the future of energy. Work presented at the event will demonstrate the ongoing need for skilled petroleum geologists, geophysicists and engineers to help define the future of carbon management.

Co-creating Sustainable Carbon Management Solutions for a Thriving Climate

Carbon Capture, Utilization and Storage
Gordon Research Conference
Co-creating Sustainable Carbon Management Solutions for a Thriving Climate

Co-creating Sustainable Carbon Management Solutions for a Thriving Climate, to be held April 6–11, 2025, in Ventura, California, is an international scientific conference focused on advancing the frontiers of science through the presentation of innovative and unpublished research. In addition to premier talks, the conference has designated time for poster sessions from individuals of all career stages.

Carbon Capture & Storage Summit

The Carbon Capture & Storage Summit, to be held June 9–11, 2025, in Omaha, Nebraska, offers attendees a comprehensive look at the economics of CCS, the infrastructure required to make it possible, and the financial and marketplace impacts to participating producers.

U.S. and International Events (continued)

Carbon Capture Technology Expo

The Carbon Capture Technology Expo, to be held June 25–26, 2025, in Houston, Texas, is dedicated to discussing the increasing role that CCUS will play in the transition to a net-zero carbon economy. Leading 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.

Carbon Capture Global Summit

The Carbon Capture Global Summit 2025, to be held Sept. 2–3, 2025, in London, England, is dedicated to galvanizing a strategic global alliance that drives CCUS deployment further. Building upon the successes of 2024, the summit will convene a diverse assembly of more than 800 of the foremost leaders from the industry, including policymakers, CCUS developers, investors, financiers, offtakers and key technology and supply chain influencers. These decision-makers will unite in high-level discussions centered around pivotal markets, while highlighting tangible advancements in ongoing CCUS projects.

CCUS Conference 2025

The CCUS Conference, to be held Oct. 8–9, 2025, in Houston, Texas, will bring together leaders from carbon-emitting industries; policy makers; upstream players; project developers; financiers; engineering, procurement and construction companies; and midstream transportation, storage and utilization providers to discuss the costs and economic feasibility of projects.

Employment Opportunities

Explore Career Opportunities with FECM

FECM is looking for enthusiastic, driven professionals to join the team and help define the future of energy. Learn more about FECM's Workforce Programs and sign up for FECM career alerts to receive the newest vacancies. Text FECM CAREERS to 468311 to receive text message alerts or subscribe here.

Photo Credit: FECM

Explore 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.

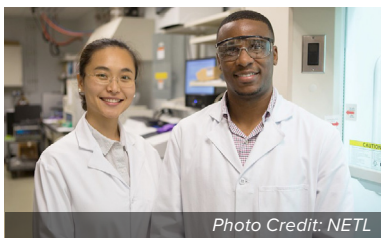


Photo Credit: NETL

Business and Industry News

World's Largest Membrane-Based Carbon Capture Plant Completed Near Gillette

Wyoming Integrated Test Center

Membrane Technology and Research (MTR) Carbon Capture completed the construction of a carbon capture plant at the Wyoming Integrated Test Center (ITC) north of Gillette in October 2024. MTR Carbon Capture employs a physical membrane, which intercepts the flue gas from the plant and filters contaminants. The plant will capture up to 150 tons of CO_2 per day from a coal-fired power plant at Basin Electric's Dry Fork Station, producing 99.9% pure liquid CO_2 with a 90% capture rate. When it starts up later this year, the system will be the first commercial-scale membrane capture plant to be put into operation. The MTR Carbon Capture system at the Wyoming ITC is part of DOE's large-scale pilot carbon capture program and is funded through a grant.

NCCC Plays Pivotal Role for Projects in DOE's Development of Enabling Technologies FOA for Carbon Capture From Industrial & Electric Generation Sources

National Carbon Capture Center

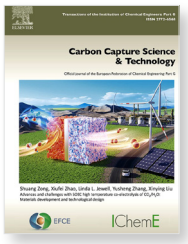
FECM recently announced $29 million in federal funding for 12 R&D projects. Five projects will focus on developing and testing technologies such as engineering and advanced process control approaches to address non-greenhouse gas emissions in the context of carbon capture. Three of these five projects will be tested at the NCCC. DOE funding will concentrate on two carbon management priorities. First is converting CO_2 into environmentally responsible and economically valuable products; second is developing lower-cost, highly efficient technologies to capture CO_2 from industrial sources and power plants for permanent storage or conversion. NETL, under the purview of FECM, will manage the selected projects.

Prometheus Materials Awarded Role in DOE Grant for Carbon CDR in Cement and Concrete

DOE is providing $10 million in funding to the National Renewable Energy Laboratory, Oak Ridge National Laboratory and Lawrence Livermore National Laboratory to collaborate with Prometheus Materials to establish methods for monitoring, verifying and reporting CDR and CO_2 storage in cement and concrete. Through this initiative, the company expands its role as a leader in the decarbonization of cement and concrete.

Publications

Research Goals for Minimizing the Cost of CO_2 Capture when Using Steam Methane Reforming for Hydrogen Production

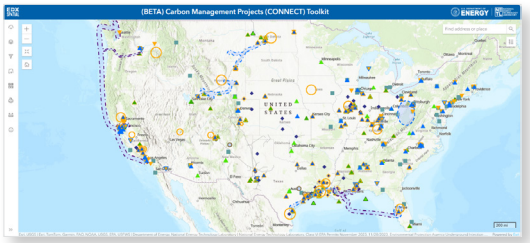


Hari Mantripragada, Sally Homsy, Rafael De Leon, Alexander Zoelle, Mark Woods, Eric Lewis, Timothy Fout, Travis Shultz, Eric Grol, CARBON CAPTURE SCIENCE & TECHNOLOGY, NOVEMBER 2024.

Single-Pass Demonstration of Integrated Capture and Catalytic Conversion of CO_2 from Simulated Flue Gas to Methanol in a Water-Lean Carbon Capture Solvent

Dushyant Barpaga, Jaelynne A. King, Jotheeswari Kothandaraman, Johnny S. Lopez, Benjamin M. Moskowitz, Michael L. Hubbard, Richard F. Zheng, Deepika Malhotra, Phillip K. Koech, Andy J. Zwoster, Robert A. Dagle, David J. Heldebrant, ACS OMEGA, VOLUME 9, ISSUE 46.

Carbon Management Projects (CONNECT) Database and Explorer

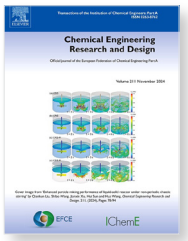


Maneesh Sharma, Jennifer Pramuk, Olivia Marcelli, Jay Anonio Oliver, Zach Jackson, Caleb Malay, Jacob Darrah, Kevin Kuhn, Ayaka Jones, Dan Hancu, Jennifer Bauer, Chad Rowan, Kelly Rose, NETL, DEC. 3, 2024.

Putting the genie back in the bottle: Decarbonizing petroleum with direct air capture and enhanced oil recovery

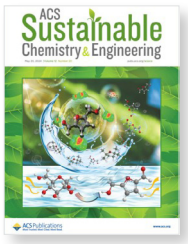
Jayant Singh, Udayan Singh, Gonzalo Rodriguez Garcia, Vikram Vishal, Robert Anex, INTERNATIONAL JOURNAL OF GREENHOUSE GAS CONTROL, VOLUME 139, DECEMBER 2024. (SUBSCRIPTION MAY BE REQUIRED.)

CO_2-selective membrane reactor process for water-gas-shift reaction with CO_2 capture in a coal-based IGCC power plant



Oscar Ovalle-Encinia, Gregory B. Raupp, Jerry Y.S. Lin, CHEMICAL ENGINEERING RESEARCH AND DESIGN, VOLUME 212, DECEMBER 2024. (SUBSCRIPTION MAY BE REQUIRED.)

Ionic Liquid–Glycol Mixtures for Direct Air Capture of CO_2: Decreased Viscosity and Mitigation of Evaporation Via Encapsulation



Cameron D. L. Taylor, Aidan Klemm, Luma Al-Mahbobi, B. Jack Bradford, Burcu Gurkan, Emily B. Pentzer, ACS SUSTAINABLE CHEMISTRY & ENGINEERING, VOLUME 12, ISSUE 20.

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

Dan Hancu, Division Director, Point Source Carbon Capture, 240.220.1186

Rory Jacobson, Acting Division Director Carbon Dioxide Removal, 240.805.7382

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