

NOVEMBER 2024

CARBON CAPTURE NEWSLETTER



HIGHLIGHTS

The newsletter is compiled by the National Energy Technology Laboratory to provide information on recent activities and publications related to carbon capture.

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NETL Awards 16 BIL-Funded Regional DAC Hub Projects

The U.S. Department of Energy (DOE) National Energy Technology Laboratory (NETL) awarded and is currently managing 16 regional Direct Air Capture (DAC) Hub projects throughout the country, putting into use the technologies developed by the laboratory and partner organizations. The 16 awarded DAC Hub feasibility and design projects are funded by the Bipartisan Infrastructure Law (BIL) and have a combined total award value of more than \$121 million. The proposed DAC Hub locations represent about a dozen states, concentrating across the Gulf Coast, Midwest, Four Corners (where Colorado, New Mexico, Utah, and Arizona meet) and Pacific Coast regions, representing various climate conditions. The goal of the Regional DAC Hubs initiative is to responsibly catalyze a commercial DAC industry in the United States and establish the nation as the global leader in developing and demonstrating the commercial viability of this critical climate technology.

Interagency News and Updates

OCED Issues NOI to Fund Transformational DAC Technologies

DOE's Office of Clean Energy Demonstrations (OCED) issued a Notice of Intent (NOI) to fund up to \$1.8 billion for the design, construction and operation of mid- and large-scale commercial DAC facilities and infrastructure scaling platforms. This funding supports a broad range of promising DAC technologies on their path to commercialization and deployment that can spur the growth of additional DAC hubs. The anticipated funding aims to (1) provide potential applicants with flexible and comprehensive pathways to spur the development of commercial DAC facilities, including DAC facilities at mid- to large-scale, along with supporting infrastructure; and (2) expand the Regional DAC Hubs program. OCED, in collaboration with the Office of Fossil Energy and Carbon Management (FECM), intends to offer funding in recurring openings across multiple years due to the rapidly advancing DAC field.



U.S.-India SCEP Ministerial Joint Statement

The Strategic Clean Energy Partnership (SCEP) Ministerial was convened by U.S. Energy Secretary Jennifer Granholm and Indian Minister of Petroleum and Natural Gas Hardeep Singh Puri in Washington D.C., Sept. 16, 2024. The sides reviewed the initiatives undertaken across the technical pillars under the SCEP, including power and energy efficiency, responsible oil and gas, renewable energy, emerging fuels and technologies, and sustainable growth. The two countries welcomed collaboration on the new National Centre for Hydrogen Safety in India and a partnership on the 2nd International Conference on Green Hydrogen held in September 2024. The ministers highlighted expanded bilateral expert exchanges on clean hydrogen research and development (R&D), cost-reduction efforts, and implementation of hydrogen hubs in both countries through the Renewable Energy Technology Action Platform.



U.S. Energy Secretary Jennifer Granholm and Indian Minister of Petroleum and Natural Gas Hardeep Singh Puri at the Strategic Clean Energy Partnership Ministerial in Washington, D.C.

FECM Issues NOI to Fund UTR R&D Activities

FECM released an NOI to issue a funding opportunity announcement (FOA) in support of its [University Training and Research \(UTR\) Program](#). The UTR Program encompasses the University Carbon Research and Historically Black Colleges and Universities and other Minority-Serving Institutions (HBCU-MSI) Programs. If released, the FOA is 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 (HBCU-MSI only). The potential FOA may include additional and/or revised areas of interest to those listed above.



Interagency News and Updates (continued)

NETL Interns Win DOE Prize to Commercialize Microwave Solvent Regeneration Technology

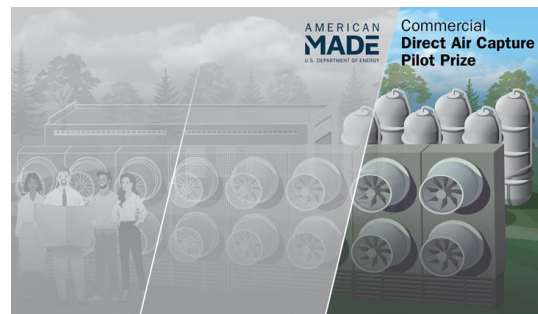
With NETL support, a team of interns won a \$75,000 phase II award from a DOE fellowship program that connects entrepreneurial talent from undergraduate universities with opportunities to commercialize new DOE technologies. The award, a DOE Minority Servicing Institution (MSI) Connect Commercialization project, will help the NETL team, known as the “NETL Bees,” pursue commercialization of a technology originating at NETL called “Microwave-Accelerated Aqueous Solvent Regeneration Using Microwave Absorbers for Carbon Capture.” The technology was invented by NETL researchers Fan Shi, McMahan L. Gray, Yee Soong, Yuhua Duan and Ji Tuo of the Leidos Research Support Team. The technology that the team will work to commercialize uses microwaves to accelerate aqueous amine solvent regeneration, which can result in a substantial reduction of expensive water and energy requirements of promising amine solvent-based CO₂ capture technologies.



Interns, left to right, Charrel Williams of Southern University at New Orleans, Ahmad Zaman of West Virginia State University and Diego Costoso of the University of Puerto Rico were awarded \$75,000 DOE Minority Servicing Institution Connect Commercialization project to commercialize an NETL-invented technology.

FECM Announces Funding to Catalyze Commercial CDR Technology

FECM announced funding of up to \$52.5 million to advance carbon dioxide removal (CDR) technologies that reduce legacy carbon dioxide (CO₂) by removing it directly from the atmosphere to counter-balance emissions from hard-to-abate sectors. The American-Made Commercial DAC Pilot Prize, funded by the BIL, will support the development and deployment of DAC pilot projects that have demonstrated commercial readiness. Phase 1 of the Commercial DAC Pilot Prize is currently accepting applications through February 7, 2025.



2024 FECM/NETL Carbon Management Research Project Review Meeting Proceedings

Proceedings are now available for the five-day 2024 FECM/NETL Carbon Management Research Project Review Meeting held in August 2024. This meeting provided attendees a chance to share in the knowledge and insights gained by more than 150 DOE-sponsored R&D projects from the following programs: Point-Source Carbon Capture (PSCC), CDR, Carbon Conversion, and Carbon Transport and Storage.



Interagency News and Updates (continued)

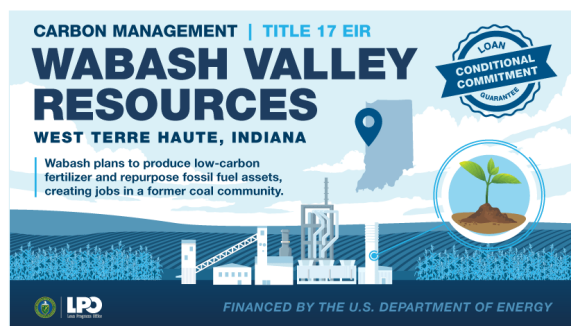
Appalachian Regional Clean Hydrogen Hub Makes Key Development Strides

The Appalachian Regional Clean Hydrogen Hub (ARCH₂)—one of three regional hydrogen hubs in which NETL is participating—recently took a major step forward with the opening of a program office in Morgantown, West Virginia. ARCH₂ is a Regional Clean Hydrogen Hub comprising 11 project development partners who will be building the hydrogen production, transportation, storage and end-use facilities that will make up the hub. NETL is included in ARCH₂'s Program Management Office and is primarily tasked with coordinating techno-economic and life-cycle analyses for the hub. In addition, NETL will perform market analyses to assist in balancing hydrogen supply and demand across the hub while minimizing overall cost and emissions, accelerating the commercial-scale deployment of low-cost, clean hydrogen across the region. More information on the NETL-supported hubs can be found [here](#).



LPO Announces Conditional Commitment to Wabash Valley Resources to Repurpose Fossil Fuel Infrastructure to Produce Low-Carbon Ammonia for Midwest Farmers

DOE's Loan Programs Office (LPO) announced a conditional commitment for a loan guarantee of up to \$1.559 billion to Wabash Valley Resources LLC. The loan guarantee would help finance a commercial-scale waste-to-ammonia production facility using carbon capture and storage (CCS) technology in West Terre Haute, Indiana. The project would repurpose an industrial gasifier to utilize petroleum coke while storing CO₂ to produce 500,000 metric tons of anhydrous ammonia annually. This project would play a critical role in securing domestic fertilizer supply for the region commonly known as the Corn Belt, contributing to both food security and climate goals. LPO's conditional commitment of up to \$1.559 billion would be part of a total investment of \$2.4 billion that Wabash Valley Resources would secure for the project through private investment.



DOE to Invest Funding to Develop Innovative Gasification Systems for Clean Hydrogen Production

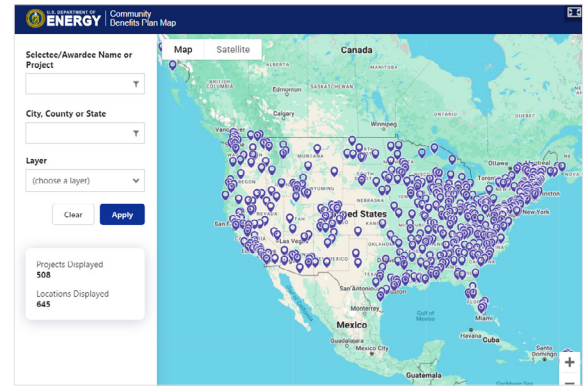
FECM announced up to \$15 million in federal funding to make clean hydrogen a more available and affordable fuel for electricity generation, industrial decarbonization, and transportation. Specifically, the funding opportunity will support R&D projects that convert feedstocks into synthesis gas to enable the low-cost production of clean hydrogen. The FOA solicits applications in two areas of interest: R&D toward demonstration of entrained flow gasification technologies for alternative feedstocks and R&D toward demonstration of fluidized bed gasification technologies for alternative feedstocks.



Interagency News and Updates (continued)

Community Benefits Map

The interactive Community Benefits map shows where, through BIL and Inflation Reduction Act (IRA) funding, DOE is investing in communities across the country. This map identifies where DOE's demonstration and deployment investments are occurring and includes high-level snapshots of the community benefits that may be associated with these investments. The projects on this map represent a subset of the publicly announced BIL and IRA selected and awarded projects requiring community benefits plans.



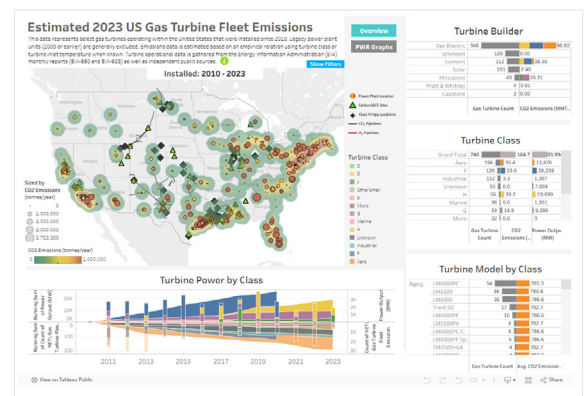
DOE Modifies FOA: Support Procurement of Commercial and Industrial Products Derived From Anthropogenic Carbon Oxides

DOE announced it modified a funding opportunity to award \$100 million to support states, local governments and public utilities in purchasing products derived from converted carbon emissions. This amendment will increase the maximum federal share up to \$5 million per award. 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. The current modification increases the potential award size, updates procurement and use definitions, updates terms and conditions, and changes community benefits reporting requirements.



Turbine Installation CO₂ Emission Interactive Map

The Turbine Installation CO₂ Emission Interactive Map represents gas turbines operating in the United States that were installed since 2010. The primary source of info for these turbines is Energy Information Administration (EIA) monthly generator data and electricity generation data up to December 2023. Additional installations were added based on information from the most recent (2024) Gas Turbine World Handbook. Entries are organized based on EIA's Plant ID and Generator ID for unique identifiers. Entries from sources other than EIA are given unique identifiers based on the primary source of the data. For convenience, only turbines within the continental United States, Hawaii and Alaska are considered.



Interagency News and Updates (continued)

MLEF Summer 2025 Application Is Open

DOE's Mickey Leland Energy Fellowship (MLEF) Program is a 10-week summer research internship for undergraduate and graduate students in science, technology, engineering and mathematics

(STEM) majors. Participants complete a cutting-edge research project at one of the department's national laboratories or DOE headquarters in support of the department's mission of minimizing the environmental and climate impacts of fossil fuels and industrial processes while working to achieve net-zero emissions. MLEF participants are mentored by DOE scientists and engineers while completing a research project over the course of the summer. At the end of the program, participants present their research findings at the MLEF Technical Forum. During the 10-week appointment, fellows receive a weekly stipend and may be eligible to receive travel and housing assistance. The mission of the MLEF Program is to strengthen a diverse pipeline of future STEM professionals. This program has mentored more than 1,000 students from across the nation. All eligible candidates are encouraged to apply.



DOE STEM Portal

DOE is building pathways for a diverse workforce to pursue careers in 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.



Bipartisan Infrastructure Law Hub

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.



Interagency News and Updates (continued)

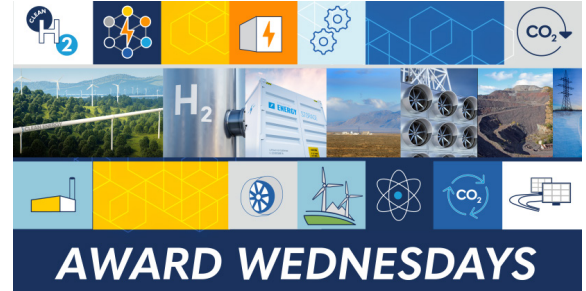


Office of Clean Energy Demonstrations

- PROJECTS

Award Wednesdays | September 12, 2024

On Wednesdays, OCED announces the latest projects that have successfully completed award negotiations. (OCED will only issue an Award Wednesday notification on weeks when an award has been finalized.)



Regional DAC Hubs Program: South Texas DAC Hub

OCED awarded the South Texas DAC Hub, led by 1PointFive, with \$50 million to begin Phase 2 activities. 1PointFive plans to build the South Texas DAC Hub at King Ranch in Kleberg County, Texas, with an initial removal capacity of 500,000 metric tons of CO₂ per year with the goal of capturing up to 1 million metric tons of CO₂ from the atmosphere each year at full capacity and storing it underground. During Phase 2 of the project, 1PointFive will conduct engineering design work, acquiring construction permitting—including air, water, and geologic storage permits—providing input to OCED’s National Environmental Policy Act review process, community engagement activities and workforce development.



The South Texas DAC Hub will utilize air contactors to draw in air for CO₂ capture. Image: OCED

Carbon Capture Large-Scale Pilot Projects Program: Carbon Capture Pilot at Cane Run Generating Station

OCED awarded the Carbon Capture Pilot at Cane Run Generating Station, led by Kentucky Utilities Company, with more than \$4.9 million to begin Phase 1 activities. The project plans to deploy a CO₂ capture system at Cane Run 7—a natural gas combined cycle power plant in Louisville, Kentucky. The Carbon Capture Pilot at Cane Run Generating Station would capture 95% of the CO₂ from a portion of the unit’s flue gas, using an advanced, heat-integrated technology developed by the University of Kentucky. During Phase 1 of the project, Kentucky Utilities Company plans to complete an integrated front-end engineering design (FEED) study to determine the technical specifications for incorporating carbon capture into the facility.



Cane Run Natural Gas Combined Generating Station in Louisville, KY. Image: OCED

Interagency News and Updates (continued)



Office of Clean Energy
Demonstrations

- PROJECTS

Carbon Capture Demonstration Projects Program FEED Studies: Four Corners Power Plant Integrated CCS

OCED awarded the Four Corners Power Plant Integrated CCS project, led by Navajo Transitional Energy Company LLC (NTEC), with more than \$6.5 million in federal funding to conduct a FEED study. OCED is working with NTEC to complete an integrated FEED study to determine the specifications for CO₂ capture, transport and storage at the Four Corners Power Plant—a coal-fired power plant located on the Navajo Nation near Fruitland, New Mexico. The FEED study will evaluate the use of amine-based, post-combustion carbon capture technology. The project aims to design a system capable of capturing a minimum of 10 million tons of CO₂ per year, achieving a carbon capture efficiency of more than 95%.



The Four Corners Power Plant located near Fruitland, NM, within the boundary of the Navajo Nation Reservation. Image: OCED

Carbon Capture Pilot at Dry Fork Power Station

The Carbon Capture Pilot at Dry Fork Power Station, led by TDA Research in collaboration with Schlumberger Technology Corporation, will deploy a carbon capture system adjacent to the Wyoming Integrated Test Center located outside of Basin Electric's Dry Fork Power Station—a coal-fired power plant near Gillette, Wyoming, with 405 megawatt-electric (MWe) capacity. TDA's carbon capture system uses a low-cost, physical adsorbent to remove CO₂ via a combination vacuum and concentration swing adsorption process. The proposed carbon capture system plans to be integrated with the power plant flue gas exhaust to remove more than 90% of the plant's overall carbon emissions, emissions from coal flue exhaust at high purity (+95%), capturing 158,000 metric tons of CO₂ each year.



Dry Fork Power Station plant in Gillette, WY. Image: OCED

Carbon Capture Pilot at Vicksburg Containerboard Mill

The Carbon Capture Pilot at Vicksburg Containerboard Mill—led by RTI International in collaboration with International Paper (IP), SLB and Amazon—aims to build a carbon capture system at IP's pulp and paper mill in Redwood, Mississippi. The Carbon Capture Pilot at Vicksburg Containerboard Mill intends to capture at least 90% of the CO₂ from the mill's power boiler flue gas using RTI International's nonaqueous solvent (NAS) technology. The project aims to capture 120,000 metric tons of CO₂ per year and transport it to a site for geologic storage. This project builds on previous DOE carbon capture R&D into RTI International's NAS technology, funded through FECM.



Vicksburg Containerboard Mill in Redwood, MS. Image: OCED

U.S. and International Events

Appalachian Hydrogen & Carbon Capture Conference

The Appalachian Hydrogen & Carbon Capture Conference, to be held Nov. 7, 2024, in Pittsburgh, Pennsylvania, will report on the latest projects coming out of DOE and major corporations. The evening prior will feature a reception acknowledging Marcellus's 20th anniversary, partnering with the Washington Chamber of Commerce to recognize Range Resources. View the agenda [here](#).



Meetings: Global CCS Institute 2024 Americas

The Global CCS Institute is an international think tank whose mission is to accelerate the deployment of CCS. The [Global CCS Institute 2024 Americas Finance Meeting](#) will be held Nov. 6, 2024, and the [Global CCS Institute 2024 Americas Member Meeting](#) will be held Nov. 7, 2024. Both will be held in Houston, Texas, and both will be followed by a reception.



Conference: Deploy24

Hosted by DOE, Demonstrate Deploy Decarbonize 2024 (Deploy24) will be held Dec. 4–5, 2024, in Washington, D.C. Deploy24 will bring together decision-makers from the private sector, government and the broader ecosystem dedicated to accelerating the deployment of critical energy and decarbonization technologies in the United States. The conference gathers fellow clean energy leaders from across the country to discuss how to effectively and equitably use federal and private sector investments to strengthen the energy system and secure a clean energy future. Register [here](#).



Midland CO₂ Conference

The CO₂ Conference, to be held Dec. 9–12, 2024, in Midland, Texas, attracts CO₂ leaders in the industry and provides a forum for highlighting the best practices the industry utilizes in all CO₂ applications. The agenda will include the interrelated subjects of CO₂ enhanced oil recovery (EOR); carbon capture, utilization and storage (CCUS)/carbon management; CO₂ reservoir cyclic injection; and residual oil zone exploitation.



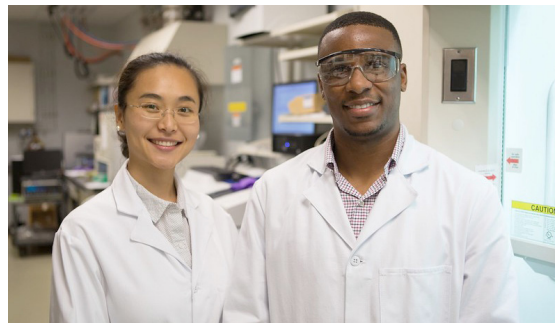
Employment Opportunities

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](#).

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](#).



Business and Industry News

New Developments in Membrane Technology Transforming Carbon Capture

NETL's PSCC Program is capturing CO₂ with permeable and semipermeable materials, improving their [resistance to thermal and physical changes](#), ability to withstand gaseous contaminants, and integration into hybrid systems. Some of the more recent material advancements include newer polymer membranes comprising [inorganic nanoparticles and organic polymer matrices](#) for better gas permeability, highly porous materials with effective CO₂ and nitrogen separation, ceramic membranes derived from inorganic materials like zirconia and alumina with high corrosion resistance and thermal resilience, ionic liquid-based membranes utilizing [liquid salts to form a polymer](#) and improve CO₂ solubility and selectivity, and biomimetic mineralization mimicking natural processes like photosynthesis to [capture and convert CO₂](#) into stable materials.



Publications

45Q Addendum to the NETL CO₂U LCA Guidance Document Version 2.0

Ashley Cutshaw, James Clarke, Joseph Chou, Scott Matthews, Michelle Krynock, Gregory Cooney, NETL, JULY 17, 2024.



Development of Advanced Solid Sorbents for Direct Air Capture

Mustapha Soukri, Paban Sitaula, Michael G. Izenon, Scott D. Phillips, NETL, JULY 1, 2024.

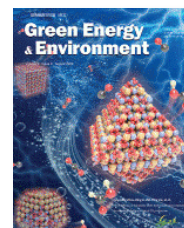


Engineering Scale Testing of Transformational Non-Aqueous Solvent-Based CO₂ Capture Process at Technology Center Mongstad

Marty Lail, NETL, AUG. 15, 2024.

Indispensable gutter layers in thin-film composite membranes for carbon capture

Gengyi Zhang, Haiqing Lin, GREEN ENERGY & ENVIRONMENT, VOLUME 9, ISSUE 8, AUGUST 2024.



Measure this, not that: Optimizing the cost and model-based information content of measurements

Jialu Wang, Zedong Peng, Ryan Hughes, Debansu Bhattacharyya, David E. Bernal Neira, Alexander W. Dowling, COMPUTERS & CHEMICAL ENGINEERING, VOLUME 189, OCTOBER 2024. (SUBSCRIPTION MAY BE REQUIRED.)



About DOE Carbon Capture:

DOE/NETL is developing the next generation of advanced CO₂ capture technologies through NETL's Point Source Carbon Capture Program (PSCC) and advancing a diverse set of CDR approaches to directly remove CO₂ 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
- CCSI²
- 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

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