

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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U.S. Launches Net-Zero World Initiative to Accelerate Global Energy System Decarbonization

The United States launched the Net-Zero World Initiative—a new partnership between countries working to implement their climate ambition pledges and accelerate transitions to net-zero, resilient, and inclusive energy systems. Through Net-Zero World, countries committed to raising their climate ambitions will work across the U.S. government and U.S. Department of Energy (DOE) national laboratories to create and implement highly tailored, actionable technology roadmaps and investment strategies that put net-zero within reach. Argentina, Chile, Egypt, Indonesia, Nigeria, and Ukraine are founding country partners (additional countries are on track to join soon). Through this initiative, DOE will mobilize state-of-art technology and world-class expertise from its national laboratories to help partnering countries: (1) develop and support ambitious technical, market, and investment roadmaps for clean energy transformation, and (2) deliver holistic support for immediate and sustained transformative projects that maximize overall impact for the region. The video announcement is available [here](#).

Interagency News and Updates

Secretary Granholm Launches Carbon-Negative Earthshots to Remove Carbon Pollution by 2050

U.S. Secretary of Energy Jennifer M. Granholm announced the DOE new goal to remove gigatons of carbon dioxide (CO₂) from the atmosphere and store it for less than \$100/ton of net CO₂-equivalent.



The “Carbon-Negative Shot,” the third target within DOE’s Energy Earthshots Initiative, is the U.S. government’s first major effort in CO₂ removal (CDR) and is an all-hands-on-deck call for innovation in the expanding field of CDR—a key facet of the plan to achieve net-zero emissions by 2050. Through Carbon-Negative Shot, the United States will accelerate CDR innovation and position itself as a leader in research, manufacturing, and demonstration. It will also create tailored place-based approaches that meet the needs of individual communities that could participate in or be affected by CDR. DOE will work to meaningfully engage with these communities and a wide array of stakeholders, including environmental and climate justice organizations, tribal nations, labor groups, industry, and academia. Carbon-Negative Shot also supports a whole-of-government approach and seeks alignment in federal, state, and local areas. The video announcement is available [here](#). The factsheet is available [here](#).

DOE Will Host 2022 Joint International CEM Innovation Ministerials in PGH

DOE will host the 2022 Clean Energy Ministerial (CEM) and the ministerial for Mission Innovation (MI) in Pittsburgh, Pennsylvania, September 2022. The announcement was made at the United Nations Conference of Parties (COP26) by Secretary of Energy Granholm. The combined ministerials leverage collective action in the public and private sector to rapidly accelerate clean energy innovation and deployment around the world. Hosting CEM and MI reinforces the return of U.S. leadership and commitment to international collaboration on clean energy deployment and innovation. The meeting will also highlight the gains made in implementing ambitious climate policies, while accelerating the research, design, and deployment of clean energy and carbon negative technologies. Together, the ministerial meetings represent an opportunity to enhance climate commitments through big bets on innovation that empower a net zero energy transition by 2050. CEM and MI together consist of 31 countries that work closely with the private sector, industry, research institutions, finance institutions, and philanthropic organizations to drive deployment and innovation of energy efficiency and clean energy, including renewables, nuclear, and abated fossil energy.

DOE Announces Funding Supporting DAC and Storage for Low-Carbon Energy Sources

DOE announced available funding to leverage existing low-carbon energy to scale-up direct air capture (DAC) technology combined with reliable carbon storage. This funding opportunity announcement (FOA), Direct Air Capture Combined with Dedicated Long-Term Carbon Storage, Coupled to Existing Low-Carbon Energy, will facilitate engineering studies of advanced DAC systems capable of removing 5,000 metric tons of CO₂ per year from the air—the equivalent of electricity used by more than 900 homes in the United States for one year. This FOA is a collaborative effort between DOE’s Office of Fossil Energy and Carbon Management (FECM), Office of Nuclear Energy, and Office of Energy Efficiency and Renewable Energy’s Geothermal Technologies Office. Read the full FOA [here](#).



Interagency News and Updates (continued)

DOE Awards Funding to Help States Deploy Carbon Capture and Storage

DOE announced funding for four projects working to accelerate the regional deployment of carbon capture, utilization, and storage (CCUS). The projects, representing all four corners of the country, are referred to as DOE's Regional Initiatives to Accelerate CCUS Deployment—an initiative designed to identify and address regional storage and transportation challenges facing the commercial deployment of CCUS. Battelle Memorial Institute is leading the Regional Initiative to Accelerate CCUS Deployment in the Midwestern and Northeastern United States, New Mexico Institute of Mining and Technology is leading the Carbon Utilization and Storage Partnership of the Western United States, Southern States Energy Board is leading the Southeast Regional Carbon Utilization and Storage Partnership, and the University of North Dakota Energy and Environmental Research Center is leading the Plains CO₂ Reduction project.

MLEF Program Now Accepting Applications

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



Participants complete a cutting-edge research project at one of DOE's national laboratories or DOE Headquarters in support of DOE's mission to minimize the environmental impacts of energy resource recovery and use while working towards net-zero emissions. The mission of the MLEF Program is to strengthen a diverse pipeline of future STEM professionals. The program has mentored nearly 1,000 of the best and brightest students from across the nation for future careers in the STEM workforce. All eligible candidates are encouraged to apply. Applicant information can be found [here](#).

Clean Water for Energy Communities is a Must for NETL

National Energy Technology Laboratory (NETL) researchers adapted a sorbent technology initially developed for carbon capture applications to remove contaminants and critical minerals from water sources, advancing environmental justice and spurring economic revitalization in energy communities. NETL's Multi-functional Sorbent Technology (MUST) comprises a suite of versatile and low-cost, regenerable sorbent materials that remove toxic elements such as lead and mercury, among others, from acidic mine drainage (AMD), preventing the effluent streams from polluting fragile ecosystems. NETL's MUST is one of the



many ways the laboratory is supporting critical priorities of the Biden Administration and the Interagency Working Group (IWG) on Coal and Power Plant Communities and Economic Revitalization. IWG, which is led by NETL Director Brian J. Anderson, is working to catalyze economic revitalization, create good-paying union jobs, and support work in energy communities, especially hard-hit coal, oil and gas, and power plant communities across the country.

U.S. and International Events

LEAP Workshop Virtual Proceedings Now Available

The 6th Low-Emission Advanced Power (LEAP) Workshop, held by NETL, focused on the transition to net-zero carbon and the associated technology development. The workshop comprised a three-day section (“Advanced Systems Integration”) focused on integrated energy systems and a two-day section (“Cyber-Physical Modeling”) focused on merging numeric and hardware simulations to develop cyber-physical models for accelerating technology development. Proceedings are available [here](#). Video proceedings for Day 1 are available [here](#). Video proceedings for Day 2 are available [here](#).

Climate Change 2021: The Push to Carbon Neutrality, Adaptation, and Resiliency

The Climate Change 2021 conference, to be held virtually Dec. 1–2, 2021, will address emerging policies and strategies for tackling climate change impacts, including mitigation, adaptation, and resiliency. Other topics will include global greenhouse gas policies and initiatives, innovative technologies, and solutions for mitigation and adaptation efforts.

2021 Midland CO₂ Conference

The 2021 Midland CO₂ Conference will be held Dec. 6–9, 2021, in Midland, Texas. Conference themes will include federal, state, and international advances in policy, legislation, and project planning, along with a look at the issues with and often unintended results of large-volume injection in deep saline formations. Events will include a field trip to Oxy Low Carbon Venture’s West Seminole CO₂-enhanced oil recovery (EOR) and CCUS flood in Gaines County, Texas.



NETL Pre/Post-Combustion Carbon Capture and Negative Emissions Technologies Webinar

Northwest Gas Association (NWGA) arranges guest speakers each month to present topics of interest to the natural gas and energy industry. Webinars are regularly scheduled for the third Thursday of the month at 12 p.m. (Pacific Time). Details for each webinar are emailed to registrants the morning of the webinar, approximately one hour before the start time. On Dec. 16, 2021, Dan Hancu, NETL’s Carbon Capture Technology Manager, will join NWGA to present on pre/post-combustion carbon capture and research that is happening in emerging areas, specifically related to negative emissions technologies.



ARPA-E Energy Innovation Summit

The Advanced Research Projects Agency-Energy (ARPA-E) Energy Innovation Summit, to be held March 14–16, 2022, in Denver, Colorado, is an annual conference and technology showcase that brings together experts from different technical disciplines and professional communities to discuss America’s energy challenges. In its twelfth year, the Summit offers a unique, three-day program aimed at moving transformational energy technologies out of the lab and into the market.

U.S. and International Events (continued)

Gordon Research Conference: Permanently Removing CO₂ from Our Emissions and Atmosphere

The fourth installation of the CCUS Gordon Research Conference series, to be held April 3–8, 2022, in Ventura, California, will examine the following questions: (1) can the United States decarbonize safely, and with a variety of approaches appropriate for the variety of power and industrial challenges? and (2) can the United States develop methods to clean up the atmosphere in time to keep within reasonable temperature limits?

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Business and Industry News

DOE Announces Investment to Further Develop Carbon Capture Technology via FEED Study

NETL selected the University of Illinois for federal funding for research and development to support a front-end engineering design (FEED) study. This commercial-scale carbon capture study is a partnership of the University of Illinois' Prairie Research Institute, LafargeHolcim in the United States, and Air Liquide Engineering and Construction. The FEED study analyzes a carbon capture retrofit that can separate up to 95% of CO₂ emissions at the plant. The captured CO₂ will be pipeline-ready for geological storage. Analysis of the project's socio-economic impact will also be part of the study. The design will employ Air Liquide's Cryocap™ flue gas system at the Holcim Ste. Genevieve cement plant in Missouri, which features the largest single kiln in the world. The Cryocap flue gas system combines the pressure swing adsorption (PSA) capabilities with cryogenic refrigeration technologies to achieve high CO₂ capture rates with high CO₂ purity rates.

ION Clean Energy Successfully Completes Six-Month CO₂ Capture Campaign at NCCC



ION Clean Energy (ION) successfully completed a six-month testing campaign for its third-generation solvent technology (ICE-31) at the National Carbon Capture Center (NCCC) in Wilsonville, Alabama, which was developed in partnership with NETL and Southern Company. ION tested post-combustion CO₂ capture from natural gas flue gas at NCCC's Pilot Solvent Test Unit (PSTU) using the neutral test facility's newly configured natural gas-fired infrastructure. ION and collaborators have previously conducted lab and small pilot studies with ICE-31, demonstrating its unique physical and chemical properties that result in low energy requirements and exceptional solvent stability for post-combustion CO₂ capture. The ICE-31 campaign at NCCC operated for more than 4,000 hours between March and September 2021 that included parametric and long-term steady-state testing using multiple flue gases (including natural gas combined-cycle surrogate flue gas, real gas-fired boiler gas, and real coal-fired flue gas).

Publications

The role of carbon dioxide removal in net-zero emissions pledges

GOKUL IYER, LEON CLARKE, JAE EDMONDS, ALLEN FAWCETT, JAY FUHRMAN, HAEWON MCJEON, STEPHANIE WALDHOFF, ENERGY AND CLIMATE CHANGE, VOLUME 2, ISSUE C, DEC. 1, 2021.

NETL Edge: Decarbonizing Our Energy Future

JENNY BOWMAN, JOE GOLDEN, CONOR GRIFFITH, ABBY HUMPHREYS, MARTIN KINNUNEN, NETL EDGE, VOLUME 3, ISSUE 2, 2021.

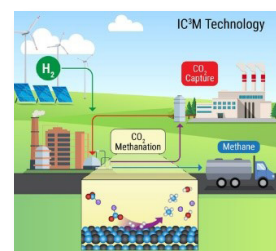


Economic, energetic, and environmental analysis of lignocellulosic biorefineries with carbon capture

CALEB H. GEISSLER, CHRISTOS T. MARAVELIAS, APPLIED ENERGY, VOLUME 302, ISSUE C, NOV. 1, 2021.

Integrated Capture and Conversion of CO₂ to Methane Using a Water-lean, Post-Combustion CO₂ Capture Solvent

DR. JOTHEESWARI KOTHANDARAMAN, DR. JOHNNY S. LOPEZ, DR. YUAN JIANG, DR. ERIC D. WALTER, DR. SARAH D. BURTON, ROBERT A. DAGLE, DR. DAVID J. HELDEBRANT, CHEMSUSCHEM, AUG. 21, 2021.

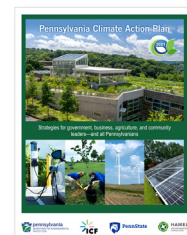


Estimation of CO₂ emissions from petroleum refineries based on the total operable capacity for carbon capture applications

ADHISH C. S. MADUGULA, DARSHAN SACHDE, SUSAN D. HOVORKA, TIMOTHY A. MECKEL, TRACY J. BENSON, CHEMICAL ENGINEERING JOURNAL ADVANCES, VOLUME 8, ISSUE C, NOV. 1, 2021.

Pennsylvania Climate Action Plan 2021

PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION WITH SUPPORT FROM ICF INTERNATIONAL, PENN STATE UNIVERSITY, AND HAMEL ENVIRONMENTAL CONSULTING, SEPT. 2021.



About DOE's Carbon Capture Program

NETL's Carbon Capture Program is developing the next generation of advanced carbon dioxide (CO₂) capture technologies. The U.S. Department of Energy's (DOE) Office of Fossil Energy and Carbon Management has adopted a comprehensive multi-pronged approach for the research and development of advanced CO₂ capture technologies that have the potential to provide step-change reductions in both cost and energy requirements as compared to currently available technologies.

The Compendium of Carbon Capture Technology provides a technical summary of the DOE/NETL's Carbon Capture Program, assembling carbon dioxide capture technology research and development (R&D) descriptions in a single document.



Carbon Capture Reference Materials

- Carbon Capture Program Factsheet
- Carbon Capture Infographics
- Compendium of Carbon Capture Technology
- Carbon Dioxide Capture Handbook
- CCSI²
- Systems Analysis
- Conference Proceedings
- Accomplishments Posters
- Fossil Energy Techlines

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

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