MARCH 2021

CARBON CAPTURE NEWSLETTER

U.S. DEPARTMENT OF ENERGY | OFFICE OF FOSSIL ENERGY | 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.

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

Novel Carbon Capture System to Be Field-Tested at TCM

A National Energy Technology Laboratory (NETL)-supported project to develop a transformational carbon capture technology will culminate in an engineering-scale test campaign at Norway's Technology Centre Mongstad (TCM). The Non-Aqueous Solvent (NAS) technology, which is being developed by RTI International researchers with support from U.S. Department of Energy's Office of Fossil Energy (FE) and NETL, could substantially reduce energy consumption in carbon capture operations. The NAS technology was already successfully field tested at the National Carbon Capture Center and SINTEF Tiller Plant in Norway. Modifications to the system include a carbon dioxide (CO_2) absorber intercooler to reduce the temperature bulge, increase rich loading, and reduce amine loss from the absorber. The addition of a forced recirculation pump and piping to the thermosyphon reboiler is also planned to improve heat transfer and reduce process energy demand. A successful project could demonstrate the technology's scalability and commercial potential of the NAS carbon capture process. JANUARY 2021

Interagency News and Updates

DOE Announces Funding Opportunities for Direct Air Capture Technologies

DOE announced federally funded financial assistance for cost-shared R&D projects under Funding Opportunity Announcement (FOA) DE-FOA-0002402, "Carbon Capture R&D: Bench-Scale Testing of Direct Air Capture Components and Initial Engineering Design for Carbon Capture, Utilization and Storage Systems from Air." NETL will manage the projects, which will develop lower-cost, scalable technologies for CO_2 capture from air and support DOE's Carbon Capture Program. The FOA focuses on two areas of interest (AOIs): AO1: Bench-Scale Testing of Structured Material Systems or Component Designs for Optimized Direct Air Capture, and AO_2: Initial Engineering Design of Carbon Capture Utilization and Storage Systems for Direct Air Capture. JANUARY 2021

DOE Announces Funding Opportunities for Transformative Clean Energy Solutions

DOE announced funding for transformative clean energy technology research and development via its Advanced Research Projects Agency-Energy's (ARPA-E's) OPEN 2021 funding opportunity (DE-FOA-0002459). Concept papers are due on April 6, 2021. Please see FOA document "Category 4: POWER GENERATION AND ENERGY PRODUCTION: FOSSIL/NUCLEAR" which includes subcategory F: "Technologies for carbon capture, use, and storage, excluding biological/agricultural carbon management." Refer to the OPEN 2021 website for more information: https://arpa-e.energy.gov/open-2021. FEBRUARY 2021

New Analysis Provides Detailed Blueprint for U.S. to Become Carbon Neutral by 2050

Researchers at DOE's Lawrence Berkeley National Laboratory, the University of San Francisco, and the consulting firm Evolved Energy Research created a detailed model of the entire U.S. energy and industrial system to produce the first detailed, peer-reviewed study of how to achieve carbon-neutrality by 2050. The researchers developed multiple feasible technology pathways that differ in remaining fossil fuel use, land use, consumer adoption, nuclear energy, and bio-based fuels use, but that also share a key set of strategies. Findings were published in the paper "Carbon Neutral Pathways for the United States" in the scientific journal *AGU Advances*. JANUARY 2021

Top NETL Researcher Paves the Way for Women in Science

As one of NETL's most prolific researchers, Ranjani Siriwardane is listed as co-inventor of 25 U.S. patents, six U.S. patent applications, and has co-authored 92 peer-reviewed publications. She has earned numerous scientific awards for discoveries that have had a profound impact on the production of clean and affordable electricity. Siriwardane has earned three Research and Development (R&D) 100 Awards and was recently named among the top 2% of scientists in the world for citation impact (how many times a scientist's published work is cited in other articles or books) by the journal PLOS Biology. Throughout her 33-year career at NETL, Siriwardane has actively encouraged women to take science, technology, engineering and mathematics (STEM) courses and consider STEM careers.

Ranjani Siriwardane

U.S. and International Events

15th International Greenhouse Gas Control Technologies Conference

The International Energy Agency Greenhouse Gas R&D Programme (IEAGHG) signed an agreement with Khalifa University for the university to host the 15th International Greenhouse Gas Control Technologies Conference (GHGT-15) in Abu Dhabi. The conference dates have been revised and the event will now take place March 15–18, 2021.

Westminster Energy, Environment, and Transport Forum

The Westminster Energy, Environment, & Transport Forum, titled "Next steps for carbon capture, usage and storage in the UK–market development, regulation, and the low-carbon economic recovery policy agenda," will be held virtually March 16, 2021. The forum will discuss the next steps for developing the carbon capture, utilization, and storage (CCUS) market in the United Kingdom (UK). Expected speakers and attendees will include senior government and regulatory officials, as well representatives from power generation, energy retail, heat production and energy networks, heavy industry, construction and infrastructure firms, science and innovation platforms, investors, legal and consultancy groups, environmental and sustainability groups, and researchers in academia and higher education.

Appalachian Hydrogen and Carbon Capture Conference

The Appalachian Hydrogen and Carbon Capture Conference, to be held April 8, 2021, in Pittsburgh, Pennsylvania, will explore challenges in hydrogen and carbon capture in the Appalachian region. Panelists include John Litynski, Deputy Director for Advanced Fossil Technology Systems (confirming); and Angelos Kokkinos, Associate Deputy Assistant Secretary, Clean Coal and Carbon Management Office of Fossil Energy (confirming).

Gordon Research Conference: Permanently Removing CO_2 from Our Emissions and Atmosphere

The fourth installation of the CCUS Gordon Research Conference series, to be held May 30–June 4, 2021, in Waterville Valley, New Hampshire, will examine the following questions: (1) Can the U.S. decarbonize safely and with a variety of approaches appropriate for the variety of power and industrial challenges?; and (2) Can the U.S. develop methods to clean up the atmosphere in time to keep within reasonable temperature limits?

Carbon Capture Technology Conference and Expo

The Carbon Capture Technology Conference & Expo is a two-day event to be held June 9–10, 2021, in Stuttgart Messe, Germany. 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.

Trondheim CCS Conference

Trondheim CCS Conference (TCCS) is a global scientific CCS technology conference. The conference typically has 150 oral presentations, five or six parallel sessions, more than 100 posters, and keynote speakers. The 11th conference, TCCS-11, will be held June 22–23, 2021, in Trondheim, Norway. The objective of TCCS-11 is to bring forward, present, and discuss work undertaken within R&D institutions, universities, and industry.

Business and Industry News

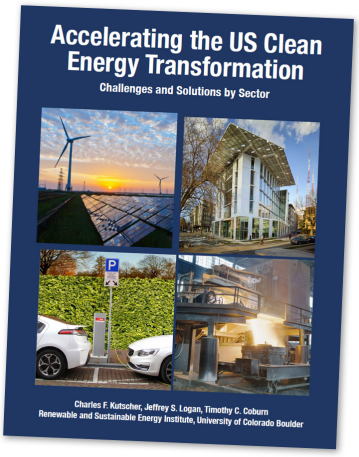
U.S. Treasury Releases Final Regulations on 45Q Carbon Capture Credits

On January 6, 2021, the U.S. Department of the Treasury and the Internal Revenue Service issued final regulations under Section 45Q of the Internal Revenue Code of 1986, as amended (Section 45Q), which allows a credit for carbon oxide storage. The final regulations generally are responsive to stakeholder comments and, among other changes and clarifications, (1) simplify the definition of carbon capture equipment; (2) allow taxpayers to aggregate smaller carbon capture facilities for purposes of meeting minimum capture requirements; (3) reduce the Section 45Q credit recapture period to three years; (4) clarify taxpayer eligibility to claim the Section 45Q credit by contractually ensuring carbon oxide capture, storage, injection, or utilization, as well as the transferability of such credit; and (5) clarify the scope for utilization of carbon oxide and life cycle analysis for measuring utilized carbon oxide. Accordingly, the final regulations provide greater certainty for developers and investors to move forward with CCS projects and seek Section 45Q credits. JANUARY 2021

Funding Available Through DOE's Loan Program Office for Innovative Technologies

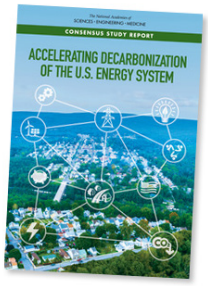
Funding has been made available through DOE's Loan Program Office for applicants seeking financing for innovative fossil energy projects, nuclear energy projects, or renewable energy and energy efficiency projects; for fuel-efficient, advanced technology vehicle manufacturers; or for Tribal energy development projects. To qualify for the renewable energy or energy efficiency loans or loan guarantees, under Title XVII of the Energy Policy Act of 2005, a project must meet a set of requirements: (1) employ new or significantly improved technologies as compared to commercial technologies in service in the United States at the time the guarantee is issued; (2) avoid, reduce, or store anthropogenic emissions of greenhouse gases (GHGs); (3) be located in the United States (foreign ownership or sponsorship of the projects is permissible as long as the projects are located in one of the 50 states, the District of Columbia, or a U.S. territory); and (4) provide a reasonable prospect of repayment. JANUARY 2021

Report Outlines Solutions for Curbing U.S. Carbon Emissions



Researchers at University of Colorado Boulder's Renewable & Sustainable Energy Institute released a report, titled "Accelerating the U.S. Clean Energy Transformation: Challenges and Solutions by Sector," outlining key steps the United States can take to reduce CO_2 emissions. The report explains why comprehensive action is needed; describes low- and zero-carbon solutions in the electricity, buildings, transportation, and industrial sectors; and presents policy options for each. It also provides an overview of technologies that have the potential to remove the levels of CO_2 that already exist in the atmosphere. DECEMBER 2021

Publications



Accelerating Decarbonization in the United States: Technology, Policy, and Societal Dimensions

NATIONAL ACADEMIES OF SCIENCES, ENGINEERING, AND MEDICINE, 2021. (SUBSCRIPTION MAY BE REQUIRED.)

Beyond 90% capture: Possible, but at what cost?

PATRICK BRAND, MAI BUI, JASON P. HALLETT, NIALL MAC DOWELL, INTERNATIONAL JOURNAL OF GREENHOUSE GAS CONTROL, VOLUME 105, FEBRUARY 2021. (SUBSCRIPTION MAY BE REQUIRED.)

A direct coupled electrochemical system for capture and conversion of CO_2 from oceanwater

IBADILLAH A. DIGDAYA, IAN SULLIVAN, MENG LIN, LIHAO HAN, WEN-HUI CHENG, HARRY A. ATWATER, CHENGXIANG XIANG, NATURE COMMUNICATIONS VOLUME 11, 2020.

The Economic Accessibility of CO_2 Sequestration through Bioenergy with Carbon Capture and Storage (BECCS) in the U.S.

MATTHEW LANGHOLTZ, INGRID BUSCH, ABISHEK KASTURI, MICHAEL R. HILLIARD, JOANNA MCFARLANE, COSTAS TSOURIS, SRIJIB MUKHERJEE, OLUFEMI A. OMITAOMU, SUSAN M. KOTIKOT, MELISSA R. ALLEN-DUMAS, CHRISTOPHER R. DEROLPH, MAGGIE R. DAVIS, ESTHER S. PARISH, LAND, VOLUME 9, ISSUE 9, 2020.

Hybrid Absorption–Crystallization Strategies for the Direct Air Capture of CO_2 Using Phase-Changing Guanidium Bases: Insights from in Operando X-ray Scattering and Infrared Spectroscopy Measurements

MEISHEN LIU, RADU CUSTELCEAN, SOENKE SEIFERT, IVAN KUZMENKO, GREESHMA GADIKOTAE, ENG. CHEM. RES., VOLUME 59, ISSUE 47, NOVEMBER 11, 2020. (SUBSCRIPTION MAY BE REQUIRED.)

About DOE's Carbon Capture Program

NETL's Carbon Capture Program is developing the next generation of advanced carbon dioxide (CO_2) capture technologies. The U.S. Department of Energy's (DOE) Fossil Energy Program has adopted a comprehensive multi-pronged approach for the research and development of advanced CO_2 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
- CCSI^2
- Systems Analysis
- Conference Proceedings
- Accomplishments Posters
- Fossil Energy Techlines

Contact Us

DOE Carbon Capture contacts:

Dan Hancu, NETL Technology Manager, 412.386.7363
Lynn Brickett, DOE Program Manager, 412.386.6574

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

3610 Collins Ferry Road
P.O. Box 880
Morgantown, WV 26507-0880
304-285-4764

626 Cochrans Mill Road
P.O. Box 10940
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 Program:

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