NATIONAL ENERGY TECHNOLOGY LABORATORY

FEBRUARY 2022

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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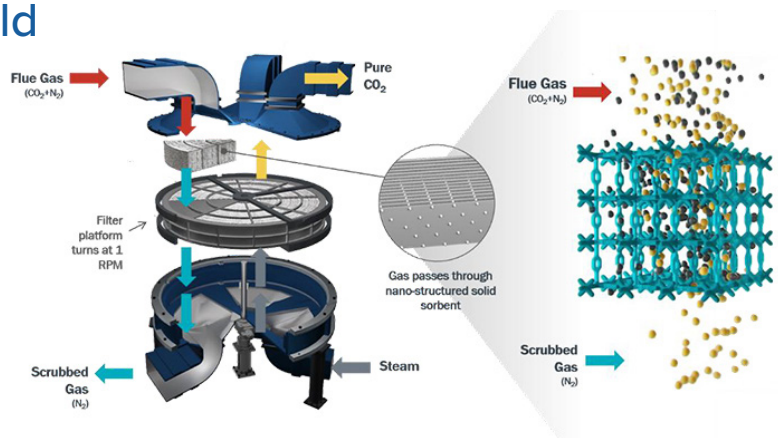
Statement by Secretary Granholm on the President's Executive Order Catalyzing America's Clean Energy Economy Through Federal Sustainability

The U.S. Department of Energy (DOE) supports the Biden-Harris Administration's whole-of-government strategy to address the climate crisis and drive cleaner, healthier, and resilient operations. "President Biden is leading by example and working on behalf of the American people to tackle the climate crisis...," says U.S. Secretary of Energy Jennifer M. Granholm. "Through our Federal Energy Management Program, DOE is ready to help the federal government rebuild American supply chains and create jobs by using U.S.-made products to reduce carbon pollution." The executive order and accompanying Federal Sustainability Plan have five primary goals: (1) 100% carbon pollution-free electricity by 2030, (2) 100% zero-emission vehicle acquisitions by 2035, (3) net-zero emissions from federal procurement no later than 2050, (4) a net-zero emissions building portfolio by 2045, and (5) net-zero emissions from overall federal operations by 2050.

Interagency News and Updates

NETL-Industry Partnership Accelerating Transition to Lower-Carbon World



National Energy Technology Laboratory (NETL) project partner Svante Inc. is rapidly scaling up a new sorbent and intensified process technology to capture carbon dioxide (CO_2) from power generation and industrial point sources. Svante offers companies an engineered solution to rapidly capture CO_2 with filters incorporating structured adsorbents. The filters are installed in a continuous rotary adsorption machine that separates CO_2 from flue gas streams and generates high-purity CO_2 in about 60 seconds. Captured CO_2 can then be stored permanently in the subsurface or reused as a feedstock for high-value chemicals and other applications.

DOE Establishes New Office of Clean Energy Demonstrations Under the Bipartisan Infrastructure Law

DOE has established the Office of Clean Energy Demonstrations to help deliver on President Biden's climate agenda; create new, good-paying jobs for American families and workers; and reduce pollution while benefitting disadvantaged communities. This investment is part of the Bipartisan Infrastructure Law that supports DOE's work on clean energy demonstrations to deliver cutting edge clean technologies to communities and businesses across the country.

DOE Announces Funding to Support Energy-Relevant Research in EPSCoR Jurisdictions

A new DOE Funding Opportunity Announcement (FOA) will provide up to $24 million for new grants under the Established Program to Stimulate Competitive Research (EPSCoR). The grants, to be awarded competitively on the basis of peer review, are aimed to help institutions in EPSCoR-eligible states to conduct research while building capabilities to enable these regions to compete more successfully for other federal research and development (R&D) funding awards. These awards will support early-stage, fundamental scientific and engineering research relevant to DOE's energy mission. Through collaborative partnerships with DOE national laboratories, EPSCoR advances the geographic diversity of researchers conducting competitive, energy-related research.

Interagency News and Updates (continued)

DOE Announces Funding to Small Businesses for Climate, Energy, and Scientific R&D

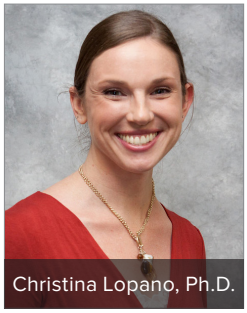
DOE announced a plan to provide $54 million for small businesses pursuing climate and energy R&D projects, as well the development of advanced scientific instrumentation through an FOA. Areas of Interest (AOIs) include renewable energy, carbon management, fusion and nuclear energy, advanced grid technologies, and cybersecurity. This funding will be administered by DOE's Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, which were established to encourage participation of diverse communities in technological innovation, as well as to increase technology transfer between research institutions and small businesses.

DOE Announces Funding for Environmental Microbiome Research to Facilitate Predictions of Microbial Interactions and Behavior

DOE announced a plan to provide up to $36 million for basic research into microbial processes and community interactions in natural systems. The research will elucidate fundamental principles to advance understanding of regulatory, metabolic, and signaling networks among microbes, microbe-plant interactions, the capture and storage of carbon in soils, and the conversion of nutrients and other elements. The FOA (DE-FOA-0002602) is sponsored by the Office of Biological and Environmental Research within DOE's Office of Science.

NETL Researchers Receive DOE Secretary's Honor Awards

Christina Lopano—a scientist advancing technology to recover rare earth elements (REEs), NETL's Energy Data eXchange (EDX) Development and Operations Team—a team incorporating big data capabilities into a platform to accelerate discoveries, and NETL's Multi-Functional Sorbent Technology (MUST) Team—researchers who developed a suite of sorbents to remove contaminants, are NETL's recipients of Secretary's Honor Awards from DOE. Secretary Granholm noted the annual awards recognize outstanding achievements of individuals and teams who have gone above and beyond in fulfilling DOE's mission and serving the nation.


Christina Lopano, Ph.D.

FECM Discussed Key Carbon Management Efforts During Webinar

The Office of Fossil Energy and Carbon Management (FECM) hosted a Carbon Management Webinar on December 1, 2021, (12.01) to discuss key initiatives FECM is undertaking to address the climate crisis. This event date was chosen because 12.01 is the atomic mass of carbon and carbon management is essential to meeting the Biden Administration's goal of net-zero emissions by 2050. A recording of the presentation is available on FECM's website.

SSAE Newsletter

NETL's Strategic Systems Analysis and Engineering (SSAE) directorate provides the decision science and analysis capabilities necessary to evaluate complex energy systems. The directorate's capabilities address technical, economic, resource, policy, environmental, and market aspects of the energy industry. SSAE's January 2022 newsletter is now available.

U.S. and International Events

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.

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

The fourth installation of the Carbon, Capture, Utilization, and Storage (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?

Appalachian Hydrogen & Carbon Capture Conference

The Appalachian Hydrogen & Carbon Capture Conference, to be held April 21, 2021, in Pittsburgh, Pennsylvania, will explore challenges in hydrogen and carbon capture in the Appalachian region. Lynn Brickett, DOE Carbon Capture Program Manager, and Bob Schrecengost, Senior Program Manager in FECM's Advanced Energy and Hydrogen Systems, are scheduled panelists.

Hydrogen & Carbon CAPTURE Conference

ASME's Turbomachinery Technical Conference & Exposition

The American Society of Mechanical Engineers (ASME) Turbomachinery Technical Conference and Exposition, to be held June 13–17, 2022, in Rotterdam, Netherlands, attracts the industry's leading professionals and key decision-makers, whose innovation and expertise help to shape the future of the turbomachinery industry. The three-day expo will include hundreds of live presenting authors, as well as recorded video presentations on demand.

CEM13/MI7

The 13th Clean Energy Ministerial (CEM) and the ministerial for Mission Innovation (MI)—a collective effort by the public and private sector to rapidly create the net-zero economy that leaves no community behind—will be held September 2022, in Pittsburgh, Pennsylvania. CEM is a platform for members to help shape the global clean energy agenda and advance the deployment of specific clean energy technologies and solutions.

CEM13/MI•7
USA 2022

U.S. and International Events (continued)

Carbon Capture Technology Conference & Expo

The Carbon Capture Technology Conference & Expo is a two-day event to be held October 19–20, 2022, in Messe Bremen, Germany. The event will bring together leading engineering firms, technology manufacturers and suppliers, energy firms, the oil and gas sector, heavy industry, chemical companies, various manufacturing organizations, research groups and non-governmental organizations, consultants, and government bodies to explore how to rapidly accelerate the deployment and commercialization of carbon-removal technologies as a key solution on the pathway to net-zero carbon emissions.

16th Greenhouse Gas Control Technologies Conference

The 16th Greenhouse Gas Control Technologies (GHGT) Conference, to be held October 23–27, 2022, in Lyon, France, has established itself as the principal international conference on greenhouse gas mitigation technologies, especially carbon capture and storage (CCS). The GHGT conferences are held every two years in member countries, rotating between North America, Europe, and Asia. Each conference is a forum for technical discussions related to the field of GHGT.

Business and Industry News

Sustaera Secures Financing to Develop Low-Cost DAC Technology

Seed R&D funding, provided by DOE and North Carolina's Department of Commerce, will be used to accelerate Sustaera's R&D program and build its first pilot plant. Sustaera's direct air capture (DAC) system is powered by carbon-free energy and differentiated by use of abundantly available natural minerals repurposed as CO_2 capture sorbents, as well as use of a modular component design to allow Sustaera to rapidly scale this technology using existing supply chains and manufacturing infrastructure. Sustaera's sorbent can be regenerated with renewable electricity at lower temperatures, thus, significantly reducing the amount of energy required.

Honeywell, UT-Austin Join on New Carbon Capture Technology

Honeywell and the Texas Carbon Management Program Group (TxCMP) at the University of Texas (UT)-Austin are working to advance carbon capture from power plants. The companies announced a licensing agreement under which they will work on an advanced solvent technology that will capture CO_2 generated from combustion flue gases at coal-, natural gas-, and oil-fired power plants, as well as from steel and cement manufacturing sites and other industrial facilities. UT Austin's patented solution utilizes an advanced solvent. The point source CO_2 removal technology can be retrofitted within existing plants or included as part of a new installation.

Business and Industry News (continued)

UW's SER Receives Funding from DOE for Clean Hydrogen Research

FECM recently granted funding for the University of Wyoming (UW) School of Energy Resources (SER) to assess the economic impacts of fossil energy production in Wyoming and evaluate opportunities and research needs to deploy clean hydrogen technologies. SER's Hydrogen Energy Research Center (H_2ERC) will focus on all forms of clean hydrogen, including low-cost coal via gasification, massive natural gas resources via methane reforming, and relatively high-capacity wind energy via electrolysis, as well as potential for solar, nuclear, and more.

Svante Partners with Kiewit to Develop Industrial-Scale Carbon Capture Projects in North America

Svante and Kiewit Energy Group Inc. have entered into a Memorandum of Understanding (MOU) to establish a strategic alliance to pursue industrial carbon capture projects under development by industrial carbon emitter clients in the United States and Canada, including cement, steam methane reforming hydrogen, refineries, chemicals, steel, ammonia, and pulp and paper facilities. The carbon capture projects will employ Svante's solid sorbent technology to capture CO_2 directly from industrial post-combustion diluted flue gases as a non-intrusive, "end-of-the-pipe'' solution to produce pipeline-grade pure CO_2 for safe storage.

NMSU to Develop New CO_2 Technologies

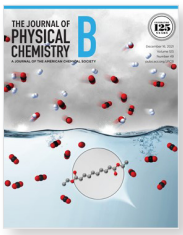
Alongside New Mexico State University (NMSU), the University of Louisiana at Lafayette, the University of New Mexico, and West Virginia University are working on the Tri-State Research Institute of Manufacturing for Managing CO_2 project. The project's proposed research goal is to create innovative manufacturing processes to advance carbon capture and utilization and entails the development of three technologies that will (1) capture CO_2 while producing electricity, (2) utilize CO_2 for storing electric energy, and (3) convert CO_2 to high-value chemicals that can be used in the production of other materials. The research program will benefit from close interaction with industry and collaboration with national research centers, including NETL and Idaho National Laboratory.

Scientist Leads Collaboration Aimed at Reducing CO_2 from Earth's Atmosphere

DOE awarded Burcu Gurkan—the Nord Distinguished Associate Professor in Chemical Engineering at the Case Western Reserve University School of Engineering—and her team a three-year grant to investigate a new technology using novel materials to remove CO_2 from ambient air. The Case Western Reserve-led team proposes to use a chemical process that involves capturing CO_2 onto hybrid materials using certain liquids contained in polymeric films. The team also plans to use microwave energy for the process in order to capture and release CO_2 with minimum energy.

Publications

Computational Screening of Physical Solvents for CO_2 Pre-combustion Capture

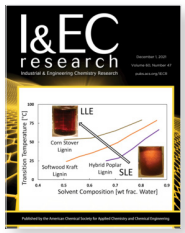


WEI SHI, SURYA P. TIWARI, ROBERT L. THOMPSON, JEFFREY T. CULP, LEI HONG, DAVID P. HOPKINSON, KATHRYN SMITH, KEVIN RESNIK, JANICE A. STECKEL, NICHOLAS S. SIEFERT, J. PHYS. CHEM. B, VOLUME 125, ISSUE 49, NOVEMBER 4, 2021, 13467–13481. (SUBSCRIPTION MAY BE REQUIRED.)

A scalable metal-organic framework as a durable physisorbent for carbon dioxide capture

JIAN-BIN LIN, T. T. NGUYEN, RAMANATHAN VAIDHYANATHAN, JAKE BURNER, JARED M. TAYLOR, HANA DUREKOVA, FARID AKHTAR, ROGER K. MAHOMID GHAFFARI-NIK, GEORGE K. H. SHIMIZU, SCIENCE, VOLUME 374, ISSUE 6574, DECEMBER 2021. (SUBSCRIPTION MAY BE REQUIRED.)

Corrosion Prevention of Additively Manufactured Aluminum Packing Devices Developed for Process Intensification of CO_2 Capture by Aqueous Amines



GYOUNG G. JANG, JIHEON JUN, YI-FENG SU, JONG K. KEUM, VINCENT DEFELICE, TONY DECARMINE, JONAARON JONES, COSTAS TSOURIS, IND. ENG. CHEM. RES., VOLUME 60, ISSUE 47, NOVEMBER 15, 2021, 17036–17044. (SUBSCRIPTION MAY BE REQUIRED.)

Direct air capture with bis-iminoguanidines: From discovery to commercialization

RADU CUSTELCEAN, CHEM, VOLUME 7, ISSUE 11, 11 NOVEMBER 2021, 848–2852. (SUBSCRIPTION MAY BE REQUIRED.)

Biological Parts for Plant Biodesign to Enhance Land-Based Carbon Dioxide Removal

XIAOHAN YANG, DEGAO LIU, HAIWEI LU, DAVID J. WESTON, JIN-GUI CHEN, WELLINGTON MUCHERO, STANTON MARTIN, YANG LIU, MD MAHMUDUL HASSAN, GUOLIANG YUAN, UDAYA C. KALLURI, TIMOTHY J. TSCHAPLINSKI, JULIE C. MITCHELL, STAN D. WULLSCHLEGER, GERALD A. TUSKAN, BIODESIGN RESEARCH, 2021. (SUBSCRIPTION MAY BE REQUIRED.)

2021 Standard Scenarios Report: A U.S. Electricity Sector Outlook

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A Research Strategy for Ocean-based Carbon Dioxide Removal and Sequestration

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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) Office of Fossil Energy and Carbon Management 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

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

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