

CARBON CAPTURE NEWSLETTER

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



Sameh K. Elsaidi, Ph.D., in the lab.

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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Next Generation of Carbon Capture Technologies Being Developed at NETL

U.S. Department of Energy (DOE) National Energy Technology Laboratory (NETL) researchers have developed a method to custom-formulate low-cost membranes to more effectively separate carbon dioxide (CO₂) from nitrogen in a high volume of flue gas. This ability to achieve both high selectivity and high permeability during post-combustion carbon capture operations is one of the most difficult problems facing membrane researchers today. The NETL group solved the challenge by chemically binding multiple membrane components with different critical properties into one high-performance material (selectivity of 24 and permeability of greater than 16,000 Barrer) that can be easily scaled-up to reduce the costs of large-scale carbon capture operations. The work was recently featured in the journal [Cell Reports Physical Science](#).



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Interagency News and Updates

DOE Invests in Carbon Capture Technologies

DOE/NETL announced the award of federal funding to support the development and advancement of carbon capture technologies under two funding opportunity announcements (FOAs). Under this cost-shared research and development (R&D), DOE is awarding funding to nine projects for coal and natural gas power and industrial sources. In addition, DOE is also awarding funding to 18 projects for technologies that remove CO₂ from the atmosphere, a process known as direct air capture (DAC). The full list of selected projects and their descriptions is [available online](#).

Novel 3D-Printed Device Demonstrates Enhanced Capture of CO₂ Emissions

DOE's Oak Ridge National Laboratory (ORNL) researchers have designed and additively manufactured a first-of-its-kind aluminum device that enhances the capture of CO₂ emitted from fossil fuel plants and other industrial processes. Results have been [published](#) in the AIChE Journal. *ORNL NEWS RELEASE, AUGUST 2020.*

ARPA-E Energy Briefs: FLExible Carbon Capture and Storage Program

The Advanced Research Projects Agency-Energy (ARPA-E) Energy Briefs webinar series hosted a discussion of the FLExible Carbon Capture and Storage (FLECCS) Program and the goal of developing carbon capture and storage (CCS) technologies that enable power generators to be responsive to grid conditions in a high variable renewable energy (VRE) penetration environment. *ARPA-E ENERGY BRIEFS WEBINAR SERIES, SEPTEMBER 2020.*

As part of the Susteon FLECCS project, NETL's Institute for the Design of Advanced Energy Systems (IDAES) will lead the model development and simultaneous optimization of design and operating conditions for a highly flexible system that couples natural gas combined cycle (NGCC) with a rapid temperature swing adsorption carbon capture technology.

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Upcoming U.S. and International Conferences

DOE/NETL 2020 Virtual Integrated Project Review Meeting to Showcase Fossil Energy Innovation

The 2020 Virtual Integrated Project Review Meeting, a series of free virtual sessions organized by DOE/NETL, began August 17, 2020, and is continuing into the fall with sessions highlighting technologies for efficient and cleaner uses of fossil energy resources and value-added products. Projects from several DOE Office of Fossil Energy (FE) portfolios, including Crosscutting Technologies, Rare Earth Elements, Advanced Energy

Systems, Carbon Capture, Carbon Storage and Carbon Utilization, and Oil and Natural Gas Research, will be reviewed over a 12-week period. Proceedings from the Carbon Capture session (August 17-19, 2020) are [available online](#). The agenda for the Carbon Capture sessions (October 5-7, 2020) is also [available online](#).



Virtual DOE InnovationXLab CarbonX Summit – October 21-22, 2020

The exchange of ideas and networking to pioneer new energy technologies and partnerships continues as DOE/NETL's Office of Technology Transitions (OTT) virtually hosts the 2020 DOE InnovationXLab CarbonX Summit. The event showcases, primarily for members of industry, DOE technologies and the national laboratories' capabilities at the heart of the domestic energy economy, from production to utilization to reuse. Two virtual meetings were held, with the third upcoming. Register for the no-cost summit by contacting InnovationXLab@netl.doe.gov with your name, email, and organization. More information, including prior session presentations, is available on the [summit's website](#).



International Conference on Carbon Capture and Storage Technologies and Applications (ICCCSTA) – October 22-23, 2020

The 14th International Conference on Carbon Capture and Storage Technologies and Applications (ICCCSTA) in Istanbul, Turkey, aims to bring together leading academic scientists, researchers, and research scholars to exchange and share their experiences and research results on all aspects of CCS technologies and applications. It also provides a premier interdisciplinary platform to present and discuss the most recent innovations, trends, and concerns, as well as practical challenges encountered and solutions adopted, in CCS technologies and applications.

VERGE Carbon – October 26-30, 2020

VERGE 20 is offering plenaries, breakouts, tutorials, virtual tours, networking opportunities, and a virtual expo in five market areas: clean energy, electrified transportation, the circular economy, carbon removal, and sustainable food systems. For the carbon tract of the event, VERGE Carbon focuses on unlocking value of carbon waste by using it to create innovative products, materials, and services. The conference brings together professionals from carbon markets, CCS, product and materials innovation, building and construction, land management, energy production, forestry, food and agriculture, and supply chains.

IDAES/CCSI² Virtual Stakeholder Workshop Thursdays in October

The combined Institute for the Design of Advanced Energy Systems (IDAES)/Carbon Capture Simulation for Industry Impact (CCSI²) Stakeholder Workshop will include four focused CCSI² events beginning at 11 a.m. EST each Thursday from October 1-22, 2020. This will be conducted in parallel to the NETL Carbon Capture Review meetings being held October 5-7, 2020. All CCSI² sessions will highlight how the CCSI² tools have been specifically designed to enable technology developers using commercially available process simulation tools to perform far more effective and advanced simulations. The highlighted capabilities will include uncertainty quantification; high-quality reduced order models; process and equipment optimization; and streamlining technology development using the most advanced design of experiments capabilities. Please register in advance for this webinar [online](#).

Business and Industry News

Successes at CCS Facilities Discussed

A recent blog entry discussed the successes of both Petra Nova's CCS facility (despite its reserve shutdown status) and SaskPower's Boundary Dam 3 CCS Facility (BD3). Petra Nova's CCS facility achieved a 92.4% CO₂ capture efficiency, surpassing its 90% CO₂ capture target, among other operational successes. Also, in July 2020, SaskPower's BD3 CCS facility, captured 75,503 metric tons of CO₂ with an average daily capture rate recorded at 2,435 metric tons per day (when the plant was online 99.8% of the month, coming offline for 1.5 hours temporarily), with a peak one-day capture rate of 2,627 metric tons. *INTERNATIONAL CCS KNOWLEDGE CENTER BLOG, SEPTEMBER 2020.*



CCS facility at Petra Nova. Photo courtesy of NRG.

Publications

NETL Releases 2020 Compendium of Carbon Capture Technology

NETL's [2020 Compendium of Carbon Capture Technology](#), which provides a technical summary of its Carbon Capture Program, is now available. The document allows stakeholders in corporations, small businesses, universities, other national laboratories, nonprofit organizations, and government agencies to learn more about the activities of NETL's Carbon Capture Program. Developing advanced CO₂ capture technologies is critical to keeping fossil energy-based power generation affordable and reducing greenhouse gas (GHG) emissions. In the 2020 Compendium of Carbon Capture Technology, R&D efforts highlighted include the development of sorbents, solvents, membranes, and novel concepts for both post- and pre-combustion CO₂ capture.

DOE/NETL NEWS RELEASE, AUGUST 2020.



Uncertainty analysis in the techno-economic assessment of CO₂ capture and storage technologies. Critical review and guidelines for use

Mijndert van der Spek, Timothy Fout, Monica Garcia, Vishalini Nair Kunchekanna, Michael Matuszewski, Sean McCoy, Joshua Morgan, Shareq Mohd Nazir, Andrea Ramirez, Simon Roussanaly, Edward S. Rubin, *INTERNATIONAL JOURNAL OF GREENHOUSE GAS CONTROL*, VOLUME 100, 100113, SEPTEMBER 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 (CO₂) 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 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 success of this research will enable cost-effective implementation of carbon capture technologies that can be applied to the existing fleet of fossil fuel-fired plants, new plants, industrial facilities, and the removal of CO₂ from the atmosphere. Cost-competitive carbon capture technologies have the potential to support the fossil sector while advancing U.S. leadership in high efficiency, low-emission generation technologies.

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

Carbon Capture Infographics contain visual representations of the program and its associated technologies. These are designed to help convey program highlights in a compact and shareable form. [Check out the latest!](#)



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www.netl.doe.gov

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