

# The Way Forward for Carbon Capture

Storing carbon may give way to using it as an ingredient in salable—and profitable—products



Carbocrete traps carbon in concrete blocks by using it with water in a cold curing process that replaces the traditional heat and steam. PHOTO: CARBICRETE

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What if companies that are capturing and storing carbon have it all wrong? What if, instead of finding a place to store carbon—at a cost—they could profit from it by using it in the manufacture of marketable and environmentally safe products?

Researchers at a variety of companies are working on using carbon as an ingredient in a range of products including concrete, biofuel—even food.

Efforts to reduce greenhouse-gas emissions haven't been abandoned since President Donald Trump signed an order to reverse the Clean Power Plan, a key environmental regulation from the Obama era. U.S. energy companies are still under pressure from state and local governments, investors and the public to clean up their operations. Many utilities also anticipate new rules from Washington in the next decade or so to limit emissions.

To prepare, one utility in the coal-rich Powder River Basin in Montana and Wyoming is helping develop technologies that can cheaply capture carbon from power-plant emissions and recycle it into usable products, thus enabling it and other utilities to burn coal and still reduce their carbon footprints.

“We see the world as moving toward a carbon-constrained environment,” says Matt Greek, senior vice president of engineering at the utility, Basin Electric Power Cooperative, of Bismarck, N.D. Basin Electric currently operates one of the few commercial carbon capture and storage projects in the U.S. at a 25-year-old plant in Beulah, N.D. The plant uses older technology to convert lignite coal into synthetic natural gas and other gases that it uses to make fertilizers, solvents and other products. It ships the carbon that it captures by pipeline to an oil field in Canada, where it is used to push oil up to the surface. “We want to have as many different opportunities as we can to manage our carbon footprint,” Mr. Greek adds.

Perhaps more important for its future, meanwhile, the utility also is offering up its Dry Fork coal plant in Gillette, Wyo., as a test center for the NRG Cosia Carbon XPrize, a global competition offering \$20 million in prizes to the developers of the best technologies that can convert carbon into usable products. Cosia stands for Canada's Oil Sands Innovation Alliance. The prize is backed by [NRG](#) NRG **+2.93%** Energy Inc. and a group of oil companies operating in Canada, including [ConocoPhillips](#) , COP - **0.96%**[Royal Dutch Shell](#) PLC, [Devon Energy](#) Corp. DVN **-1.65%** and [Suncor Energy](#) Inc.

Carbon capture and storage is seen as having failed in the U.S., in part because of high costs, says Marcius Extavour, technical operations director for the Carbon XPrize. If valuable products can be made cheaply from carbon waste, he says, thus turning emissions reduction from a cost to an asset, it will turn “what it means to reduce emissions on its head.”

At the Carbon XPrize test center in Wyoming, and at a second testing facility at a natural-gas plant in Calgary, Alberta, 25 research teams hope to be selected to set up shop early next year to demonstrate technologies that capture and convert carbon into concrete, biofuels and other products.

A panel of judges will pick 10 finalists to be divided into two groups of five. Each group will receive \$2.5 million in cash to be divided among the contestants, helping them with costs as they compete for a \$7.5 million grand prize—one for each group—to be awarded in 2020.

One contestant, a Montreal-based startup called Carbicrete, traps and recycles carbon by using it in concrete blocks. The method involves using steel slag—a byproduct of steel production—as a binding agent, and curing the concrete with carbon and water in a cold process rather than the traditional heat and steam.

“It took a long time to get the recipe right,” says Chief Executive Chris Stern.

Another competitor, Kiverdi Inc., a biotech startup from Hayward, Calif., uses carbon dioxide and microbes to make oils and protein for food products. The company plans to make fish food for the XPrize competition, but eventually it wants to use its oils and protein to make processed food for humans. Kiverdi developed its technology with help from the Lawrence Berkeley National Laboratory and funding from the U.S. Energy Department, the California Energy Commission, other government agencies and private investors.

Efforts at carbon capture and storage have largely stalled in the U.S., as big utilities have switched from coal to cheap and cleaner-burning natural gas and renewable

power. [Southern](#) Co.'s Kemper County coal plant in Mississippi has a carbon capture and storage component. But the project, which cost \$7 billion and took nearly seven years to build, is a poster child for how testing out new technology on a commercial scale can be costly.

NRG earlier this year unveiled a much smaller, \$1 billion capture and storage effort at its Parish coal plant near Houston. The project, which obtained \$190 million in federal grants and is a joint venture with JX Nippon Oil & Gas Exploration, is designed to pull 90% of the carbon emissions from a 240-megawatt portion of the plant, or about 1.4 million metric tons of CO<sub>2</sub> a year. The captured carbon dioxide goes by pipeline to a nearby oil field where it is pumped deep underground to force oil up to the surface. But NRG, based in Princeton, N.J., says it has no plans to fund similar projects unless the economics can be improved.

Instead, in line with its support for the Carbon XPrize, the company plans to open one or more of its coal plants to researchers who want to test their capture and recycling technologies, says Dave Knox, an NRG spokesman.

"We're not an R&D company," Mr. Knox says, "but we can help companies who are doing this by giving them a living laboratory."

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