Erasing Carbon a Project at a Time

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Some environmentalists would argue that we should severely limit or altogether eliminate (if it were determined possible) alleged climate-changing carbon emissions in the first place. After all, it is estimated that, on a global scale, we emit approximately 31 billion tons of carbon dioxide into the atmosphere every year.

But while many groups are diligently working toward that goal, the governments of the world are figuring out how to taper carbon emissions in the short-term. One admittedly temporary solution has sprung forth as feasible in the not-too-distant future — it is carbon capture and sequestration (or storage) technology, which is steadily advancing thanks, in part, to dedicated resources.

Before we delve into the topic and where it stands today, let’s properly define carbon capture and sequestration: It is the process by which carbon dioxide emissions are separated from their sources, transported to a storage area and isolated from the atmosphere for an indefinite amount of time.

There are several ongoing research projects and related commercial developments on carbon capture and sequestration, including: the NRG Energy, Department of Energy and University of Texas at Austin collaboration, as well as Air Products’ projects, and a carbon dioxide detection and tracking system from scientists working with the U.S. Department of Energy’s National Energy Technology Laboratory.

The University of Texas & NRG Energy Model

The University of Texas at Austin is slated to receive $19 million from the U.S. Department of Energy and NRG Energy to design and oversee a monitoring plan for a carbon capture and sequestration demonstration project in Texas. The project uses anthropogenic CO2, as opposed to naturally occurring CO2 for enhanced oil

recovery, which is a technique that involves injecting CO2 into declining oil fields to increase yield. The objective of this project is to ensure the long-term geologic storage of the injected CO2.

NRG Energy is also slated to receive up to $167 million to build a post-combustion CO2 capture demonstration unit at its WA Parish power plant in Houston. A portion of the CO2 from the plant will be scrubbed, transported to a nearby oil field and injected deep underground for enhanced oil recovery and long-term storage. The Bureau of Economic Geology's Gulf Coast Carbon Center will subcontract with NRG to monitor the CO2 during and after the injection.

NRG's WA Parish carbon capture and sequestration project will use a class of chemicals known as amines to strip CO2 from flue gas equal in quantity to that of a 60-megawatt power plant. It will be designed to capture more than 90 percent of the incoming CO2, or about 400,000 tons of CO2 annually.

Air Products' Solution

The goal of realizing a carbon capture and sequestration system recently became more attainable to Air Solutions as the company was selected to receive $253 million in Phase 2 funding under the Industrial Carbon Capture and Sequestration program, as part of the American Recovery and Reinvestment Act. Department of Energy funding is 66 percent of the approximate $384 million project.

Air Products plans to allocate the money toward the final engineering, design, construction and operation of the project through September 2015. So what is the project? The company says that it is a state-of-the-art system to capture carbon dioxide (CO2) from two steam methane reformers — located within the Valero Refinery in Port Arthur, TX — that produce hydrogen "to assist in the making of cleaner-burning transportation fuels by refinery customers on Air Products' Gulf Coast hydrogen pipeline network," according to the company.

Air Products designs the CO2 removal units and uses technology that must be retrofitted to each steam methane reformer unit. The company recovers and purifies the CO2 before transporting it to the Denbury Green Pipeline in Texas for enhanced oil recovery use.

"Approximately 1 million tons of CO2 annually will be recovered, purified and delivered," Air Products states, "via the pipeline for injection into Denbury Onshore's enhanced oil recovery projects."

CO2 Detection & Tracking

While some groups are busy trying to bury carbon underground, others are concerned about the chances of containers leaking and the prospective environmental impact, especially considering the effects it could have on groundwater.

Luckily, we are already prepared for that scenario. Scientists working with the U.S.

Department of Energy's National Energy Technology Laboratory recently unleashed one comforting technology that both detects and tracks carbon dioxide — even if it's deep underground. Therefore, even if we were to discover that stored carbon were leaking, we could at least pinpoint it, reassess the situation and potentially fix it, depending, of course, on the cause of leakage.

According to the Associated Press, the scientists use "colorless, nontoxic liquids called perfluorocarbon tracers to essentially fingerprint carbon dioxide that was injected into a coal seam. They follow the carbon dioxide's movements by tracking the tracers." These scientists are hoping to address or even dispel some insecurities about carbon capture and sequestration technology.

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