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What you need to know about carbon capture, and how companies plan to use it

Kyra Buckley, Staff writer

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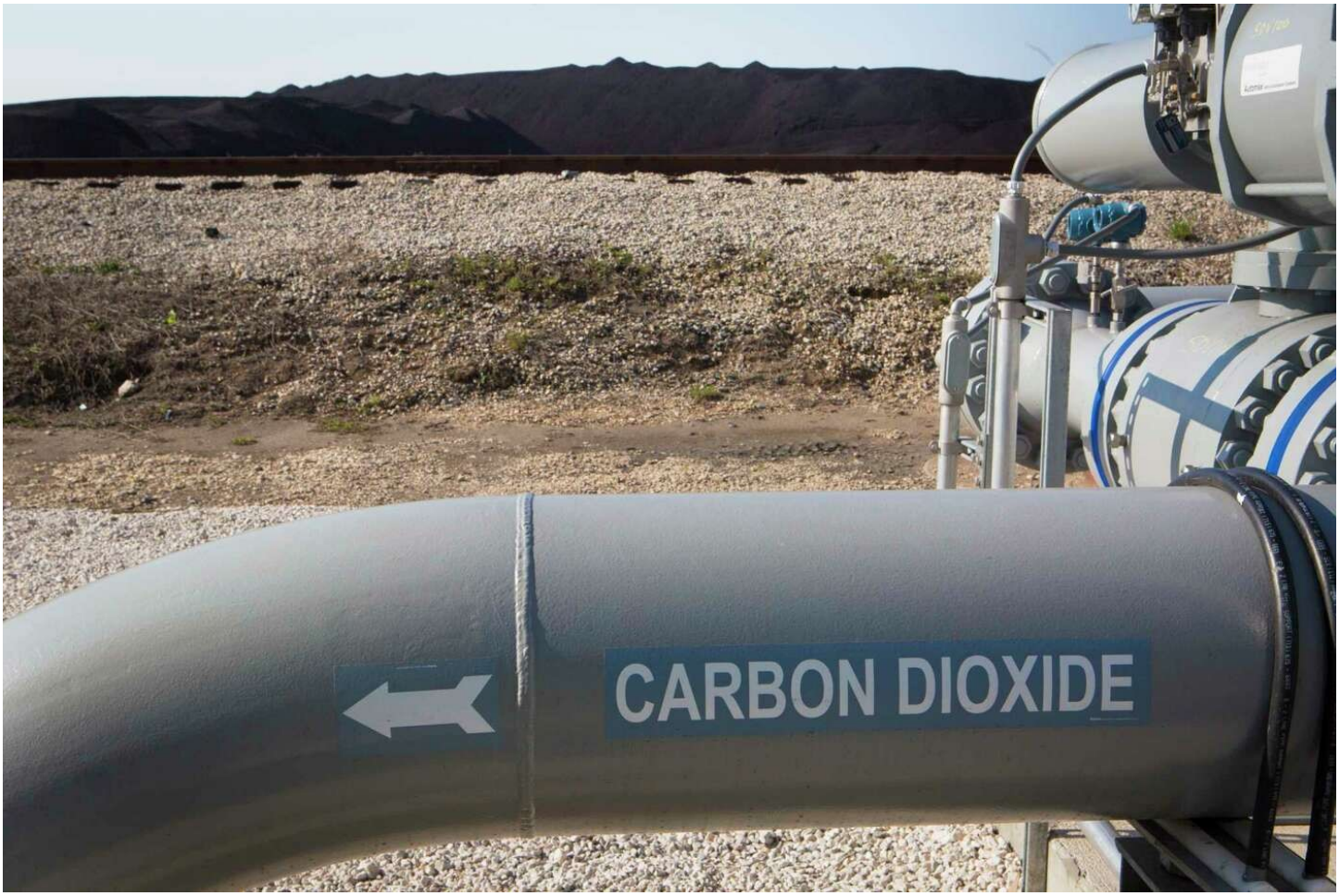

WA Parish plant infrastructure at Fort Bend County. NGR Energy and JX Nippon Oil & Gas Exploration Corporation have built the Petra Nova Carbon Capture Project. The project is a commercial-scale carbon capture system that captures carbon dioxide in the processed flue gas from an existing unit at the WA Parish power plant. Tuesday, Dec. 20, 2016, in Houston.
Marie D. De Jesus/Houston Chronicle

It's a buzz phrase in the energy world these days: carbon capture, utilization and storage, or CCUS. Projects are being developed along the Gulf Coast, the Houston Ship Channel and the Permian Basin, among others, and some of the world's biggest oil and gas companies are seeking to lead the way in creating large-scale CCUS projects.

The practice of capturing CO2 isn't new. Beginning in the 1970s natural-gas processing plants in Texas started selling carbon to local oil producers to use for enhanced oil recovery, according to the International Energy Administration.

Now, more than 40 metric tons of carbon dioxide are captured each year from CCUS facilities around the globe, the IEA reports. And additional projects are on the way as companies and governments move to combat climate change. Norwegian firm Rystad Energy expects more than $50 billion to be spent on CCUS projects over the next few years.

What exactly is carbon capture, utilization and storage?

The process starts with, as the name suggests, capturing carbon – from the point of emission, or directly from the atmosphere. The IEA lists eight ways in development or in practice to capture CO2, with the most widely used being chemical absorption and physical separation. The technologies aim to grab carbon generated from places like industrial facilities or power plants using fossil fuels.

The captured carbon is compressed and transported via pipeline, rail, truck or ship to be used or stored. CO2 can be pumped into the ground to help boost oil production or can be converted into a chemical or aviation fuel.

Mostly, though, it will be stored thousands of feet underground, onshore or

offshore such as under the Gulf of Mexico. That process is nothing new, according to sedimentary geologist and research scientist Susan Hovorka with the Bureau of Economic Geology at University of Texas.

“This is a novel application to try to turn around the damaging trend of CO2 build-up in the atmosphere,” Hovorka said. “We want to stop it and turn it around, so that's novel. But the injection itself is old stuff.”

For decades companies have been injecting liquids back underground while keeping it isolated from drinking water, she said, and scientists like her have been studying how rock formations interact with different materials.

“Most of the time when you do the calculation,” she said, “if you're doing it (carbon capture) in a big way, you need to re-inject it and return what was once from the subsurface back to the subsurface, so it becomes more of a closed loop system rather than a one-way transfer.”

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How will companies make money from CCUS?

First, before making any money, companies have to develop and build CCUS projects.

“The challenge is this is a cost - that's the reality,” said Chris Powers, vice president of CCUS at Chevron New Energies. He adds that it’s going to take a combination of government policy, innovation and partnership between companies and other organizations to create a robust CCUS market.

The carbon capture tax credit, right now set at $50 for every ton of CO2 stored underground, is a start. Many companies and investors hope congress will bump it up to $85.

From there, companies are still figuring out how they will deploy CCUS while making it profitable. Powers says at Chevron they’ll work to decarbonize existing operations, but also grow a new third-party CCUS service business for industrial companies like chemical, steel and cement manufacturers.

Is it controversial?

Yes and no. The technology is sound, according to scientists like Hovorka and international agencies like the IEA and United Nations Intergovernmental Panel on Climate Change. However, environmental advocates and some officials have expressed concern that the oil and gas industry is relying too heavily on technology like carbon capture instead of focusing on developing renewable fuel sources. More so, even with the amount of projects expected to come online, a lot more will be needed to meet climate goals set by the IEA.

Who are the big players?

Most oil majors, along with many other energy companies, are in some stage of development of CCUS projects.

A group of companies including Exxon Mobil, Chevron and Shell are looking to build a carbon capture hub along the Houston ship channel, capable of storing about 100 million metric tons of CO2 by 2040.

Talos Energy is planning a series of projects along the Gulf Coast, including Bayou Bend CCS, which the company says could store 275 million metric tons of carbon dioxide.

Occidental Petroleum is planning the world's largest direct-air capture project in the Permian Basin that could remove 500,000 tons of CO2 directly from the air.

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Kyra Buckley is an energy reporter for the Houston Chronicle.

Kyra specifically covers the region's oil and gas companies, focusing on drilling and oil field services. Before joining the Chronicle's business desk in April 2022, Kyra covered energy at Houston Public Media for two years. She previously worked at NPR member stations in Colorado and Oregon, and is a 2015 graduate from the University of Oregon in journalism and political science.

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