



## 1. BUSINESS: Pricy oil means boom time for CO2 (03/18/2008)

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Some substances get no respect.

Consider carbon dioxide: Scientists say accumulations of man-made CO2 are causing climate change by trapping more of the sun's heat in the atmosphere. The Supreme Court has condemned it as a pollutant. Environmental groups damn industries and car owners for pumping more of it into the air. Congress is plotting ways to restrict these emissions.

Despite all this, the CO2 business is booming. Last year was a record year, according to the industry that sells this invisible, odorless gas. Companies that have CO2 are getting rich on what most people consider a waste. Those that need it are bidding up the price to the point where there is a shortage.

"There is an interesting convergence of interesting things going on right now," explained Bob Mannes, president of Core Energy LLC, a Travers City, Mich., company. In the late 1990s he found that an area gas plant was venting almost pure CO2 into the air -- an unwanted byproduct of the natural gas purification process. Mannes made an offer: He would take the CO2 off their hands.

He pipes it to a series of played-out oil fields he owns in the area, sometimes re-drilling collapsed wells dug many years ago. Pumped into the ground under pressure, CO2 acts like a solvent, freeing up previously unrecoverable crude oil so it can be pumped up into a world where refiners will pay more than \$100 a barrel for it.

"Everybody wins," explained Mannes. Someday, he thinks, Michigan may be able to recover as much as 500 million barrels of oil trapped in the state's old wells. Some of the new oil money could be used to solve Michigan's looming electricity shortage, he believes, by spurring the development of coal-fired power plants that can separate CO2 from their emissions.

The spike in CO2 prices, which have gone from roughly \$12 to \$24 a ton in four years (there is no formal market that sets the price of CO2), is giving other people headaches. In general, the Department of Energy says CO2 will be a valuable tool, not only for pushing more oil out of domestic wells but also for pushing natural gas out of deep, unminable coal seams.

### The hunt for more CO2

To work out the technology and safety standards for doing that, DOE has 28 experiments under way to inject CO2 into the ground. Some of them are designed to improve oil and gas production, others are to inject unneeded CO2 into deep, saline, underground aquifers, where scientists think it can be stored forever. The problem is that all these experiments need CO2.

John Litynski, who coordinates the projects for DOE's National Energy Technology Laboratory, worries that some companies involved might pull out because the CO2 they need has gotten too expensive. "There's nothing official yet, but conversations about this are going on," he explained.

The shortage is severe enough that some companies are buying truckloads of CO2 from firms that normally supply extra pure CO2 to beer brewers and soda pop manufacturers. "The minute you put it on a truck, you add at least \$50 per ton," sighed Litynski, who explains that CO2 is much cheaper when it is moved in pipelines.

The leaders in developing the CO2 technology are oil companies, which have been injecting the gas into reservoirs, particularly in Texas' Permian Basin, for two decades. Lately, as oil prices explore the uncharted territory beyond \$110 a barrel, oil companies have begun scouring the country to find more CO2. According to DOE, a typical reservoir will yield about 30 to 40 percent of its oil when producers pump it and then inject water to help push more oil out.

But then if they inject CO2 into the well, they can pump out an additional 10 to 15 percent. Denbury Resources Inc., a Plano, Texas, oil and gas company, got into the CO2 business in 1993, buying a large natural deposit of CO2 in Mississippi and then using the gas to extract more oil from wells in the surrounding area.

### A market full of fizz

Later this year Denbury plans to start building what it calls the "Green Pipeline," a 314-mile, \$650 million project to ship CO2 to played-out oil fields in Texas, where it holds options to purchase them. It hopes to supplement its supply of natural CO2 by connecting the pipeline with two proposed plants that will make chemicals and synthetic diesel fuel from petroleum coke, a waste product from oil refineries. Denbury wants the plants' byproduct, a stream of CO2.

"We figure we're going to have a gap that we will need to fill with anthropogenic [man-made] CO2," explained Tracy Evans, a Denbury senior vice president. Producers and buyers of CO2 are looking to meet increasing demands with other man-made CO2 sources. Plants that make ethanol from corn are one of their targets because they release almost pure CO2.

Matt Hartwig, spokesman for the Renewable Fuels Association, which represents ethanol producers, estimates that about a quarter of them already sell their emissions. Pure CO2 is sought after by beer and soda companies that buy the gas to put the fizz in their drinks. It is also used to make dry ice.



Alstom and the Electric Power Research Institute have opened this plant in Wisconsin to test the use of chilled ammonia to capture CO2 from power plant emissions. Photo courtesy of Electric Power Research Institute.

The biggest question in this fizzy, inflated market is what will happen when power plants that can separate the CO2 from their emissions become a commercial reality. These "clean burning" power plants, which may eventually be required by federal climate regulations, could flood the demand for the CO2 market because a coal-fired power plant can produce 1.9 million tons of CO2 every day.

"We figure that to sell that much you'd have to get every man, woman and child in the U.S. to drink nine more cans of cola every day," said Chuck Fox, a vice president of Kinder Morgan CO2 Co., which finds and sells CO2. It is a subsidiary of Houston-based Kinder Morgan Energy Partners LP.

On paper, coal-fired power plants produce so much CO2 that they will have to bury a substantial portion. But without new technology to capture the gas, they are locked out of the current CO2 boom.

Fox sees it as an environmental Catch-22: "You can't pull the CO2 out of a smokestack at a price that an oil producer can pay and still remain profitable, even with \$100 barrel oil. When oil prices go up your energy prices go up and energy is a huge part of capturing CO2."

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