

CO2: A bane and a boon to Wyo energy

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If Wyoming one day achieves commercial-scale carbon capture and storage development, it may have oil to thank for it.

Dozens of oil companies are eagerly awaiting additional carbon dioxide supplies from Wyoming sour gas processing facilities owned by Exxon Mobil and ConocoPhillips.

They want to inject CO2 into oil reservoirs, sweeping millions of barrels of known reserves that remain after initial production via pumpjacks and water-flooding. With a price of \$60 per barrel or more, the endeavor is commercially viable in most instances, according to industry officials.

Wyoming is in the fortunate position of having both sources of CO2 and oil fields where CO2 can be injected for enhanced oil recovery.

"We're seeing some sources of CO2 with immediate places to put it," said Steve Melzer of Melzer Consulting.

Melzer was a keynote speaker at the Wyoming Enhanced Oil Recovery Institute's third annual CO2 conference last week in Casper.

He said the drop in the price of oil from \$140 per barrel to \$40 per barrel was scary for nation's oil producers. But with oil forecast to average around \$60 to \$70 per barrel, the industry will continue to scout the world for reliable sources of CO2.

Several years of injecting CO2 into a handful of aging oil fields in Wyoming -- the historic Salt Creek field among them -- turned the state's decades-long oil production decline into the first annual increase in 2007, to the tune of about 13 million barrels.

Although oil is a source of greenhouse gas emissions, using CO2 to develop more oil may actually build much of the infrastructure needed for carbon sequestration. This build-out could eventually allow Wyoming to capture anthropogenic CO2 from coal-plant smokestacks for geologic sequestration.

For now, nearly all industrial sources of CO2 in Wyoming are spoken for, and the industry is eagerly awaiting additional volumes. The first additional volume is expected to come from Exxon Mobil's Shute Creek gas plant in southwest Wyoming. A \$72 million compression project there will shift about 110 million cubic feet per day of CO2 from being vented into the atmosphere to a small pipeline network for the enhanced oil recovery market in Wyoming.

DKRW Advanced Fuels' proposed Medicine Bow Fuel & Power coal-to-gasoline plant in Carbon County is expected to add another 200 million cubic feet of CO2 per day to the local market, according to Bob Kelly of DKRW.

"It's critical to develop this technology and export it to other countries," Kelly said.

Kelly said DKRW and partner Arch Coal own enough coal reserves in the Hanna Basin to produce the equivalent of 360 million barrels of oil. In the plant's first phase of development, it will produce about 21,000 barrels per day of ultra-low-sulfur diesel fuel.

And marketing the CO2 from the process is all part of the economic equation for the project.

So far, there's no carbon credit for storing CO2 in oil fields for enhanced oil recovery. So the oil industry is mostly focused on developing CO2 for oil production.

However, Melzer said that could soon change.

Although the CO2 infrastructure for enhanced oil recovery is expanding, it will require a massive investment to expand that to a wider network to capture coal-based CO2 for deeper geologic sequestration. A first step that may help, according to Melzer, would be to offer some carbon credits to oil companies that store CO2 in old oil fields.

"CO2 sourcing is still a challenge because you don't get credit for storage right now. That's changing very, very, very rapidly," Melzer said.

State efforts

State officials say capturing carbon dioxide -- the main greenhouse gas contributing to global warming -- is key to preserving Wyoming's coal industry. And they say they're beginning to see results in efforts to push carbon capture and storage technology to commercial development.

The University of Wyoming and GE Energy, for example, will begin construction on a coal-gasification research center near Cheyenne in 2010. The university is also partnered with Exxon Mobil to explore Wyoming's potential for the geologic sequestration of carbon dioxide.

And for the past several years, the Wyoming Legislature has taken on the difficult questions of liability, ownership and regulatory oversight -- which places Wyoming years ahead of the federal government on these issues.

"We've decided as a legislature that carbon capture and sequestration is going to be a focus," said Rep. Tom Lockhart, R-Casper.

Lockhart serves on the minerals committee, which has crafted several new laws in recent years dealing with CO2. He's also on the board of directors for Arch Coal Inc. and serves on the University of Wyoming's Energy Resource Council and the Clean Coal Research Task Force.

He acknowledged that many in Wyoming still doubt the science of global warming, but said the Legislature came to terms several years ago with the fact that the issue had been decided politically on the national and international level.

"The political tide has changed and the market has changed," Lockhart said.

Lockhart discussed several bills that address carbon capture and storage in Wyoming:

- * One made clear that the surface owner also owns the underground pore space where CO2 may be injected.
- * Another is a work in progress attempting to spell out which agencies oversee carbon capture and storage activities.
- * There's one that makes clear that carbon capture and storage activities do not interfere with Wyoming's long-standing legal view that the mineral estate is dominant over the land and pore space estate.
- * A bill attempts to address liability issues, stating that the entity injecting the CO2 is responsible for the CO2.
- * And finally, one would allow for unitization for carbon storage.

In a follow-up interview, Lockhart said both Wyoming lawmakers and the Gov. Dave Freudenthal administration are doing everything they can to develop energy resources in an appropriate manner.

"We're trying to look at the long-term benefits to the state, nation and the world because we're pushing new energy technologies," Lockhart said.

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SECOND STORY

Greenhouse gas revitalizes Salt Creek field

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MIDWEST -- For decades the Salt Creek oil field was known for its rotten-egg odor and its metallic jungle appearance with rocking pumpjacks everywhere and power lines sloppily flung from unit to unit.

Oil was first discovered seeping to the surface at Jackass Draw Springs in the late 1800s. Ever since, men and women have toiled to collect the black gold any way they can, from dipping it with a ladle to twisting steel into 10 different producing zones from 22 feet below the surface to 4,500 feet.

"There's so many wells, we don't even know about all of them," said Ken Hendricks, senior staff engineer for Anadarko Petroleum Corp.

A drive through the field today reveals a less chaotic scene. The herd of pumpjacks is gradually being replaced with less intrusive wellheads. A stubble of power poles remains, but the overall appearance of the field is clearing up.

And the rotten-egg smell is gone.

You can only get so much oil by dipping a sucker-rod into the reservoirs and flooding them with water. Production at Salt Creek was all but dead by 2002 when Anadarko paid \$265 million for Howell Corp. and acquired the history-rich oil field at Midwest.

Anadarko launched a \$200 million CO2 recovery project aimed at sweeping some 100 million barrels of oil unattainable through conventional methods. The effort requires Anadarko seek out hundreds of historic, unrecorded wells and generally clean up the field in order to ensure the CO2 it injects makes an efficient sweep.

In fact, much of the CO2 that will be injected into the field might have otherwise been vented into the atmosphere, thus offsetting the equivalent of one year's emissions from 500,000 cars, according to Anadarko.

"This is a brownfield revitalization," Hendricks said.

To tap the CO2, Anadarko had to build a new segment of pipeline tapping into a pipeline at Bairoil, which connects to Exxon Mobil's Shute Creek sour gas processing plant in southwest Wyoming. Shute Creek was the sole source of CO2 for enhanced oil recovery in the region for about 10 years.

Now ConocoPhillips also supplies CO2 to Wyoming oil producers. After some pressure from the Wyoming Oil and Gas Conservation Commission, both Exxon Mobil and ConocoPhillips will switch more CO2 volumes from their venting stacks to pipelines for Wyoming's local enhanced oil recovery market.

After several years of work, Anadarko's Salt Creek field now produces about 9,000 barrels of oil per day.

"We use an amazing amount of manpower," Hendricks said.

He estimated that the new CO2 injection program has created jobs for about 400 workers, directly and indirectly. Currently, about a dozen workover rigs busily retool wells.

Hendricks said the program has also served as a revitalization for the nearby towns of Midwest and Edgerton.

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