

KGS Assessing Carbon Sequestration

GREAT BEND, KS.—The Kansas Geological Survey is studying the potential to sequester carbon dioxide in the deep saline aquifers that underlie much of the state, as well as the potential for CO₂-enhanced oil recovery in a mature oil reservoir. Hopefully, said KGS Senior Scientific Fellow Lynn Watney, it can lead to new opportunities for the state of Kansas and its oil and gas industry.

"With the right incentives and government support, sequestration has the potential to become a major industry in Kansas," Watney told the Kansas Independent Oil & Gas Association during a midyear meeting technical session on April 22 in Great Bend.

In a second technical session, representatives from IMA Financial Group and Euler Hermes ICA discussed a new accounts-receivable insurance product being made available to Kansas producers.

Under a grant from the U.S. Department of Energy, Watney said the KGS was evaluating the CO₂ sequestration potential of the Ozark Plateau Aquifer System in South-Central Kansas as well as BERESEXCO Inc.'s mature Wellington oil field in Sumner County.

He said KGS will build geomodels of the mature Mississippian oil reservoir in the Wellington Field, of the Arbuckle saline aquifer underlying the Wellington Field, and the regional Arbuckle saline aquifer system that encompasses 20,000 square miles in Kansas. The KGS will conduct simulation studies to estimate the CO₂ sequestration potential of the saline aquifer underneath the Wellington Field, along with a miscible CO₂ flood in the field as well as incremental oil recovery. In addition, Watney said, the KGS will identify and model potential sites

for CO₂ sequestration within the regional Arbuckle saline aquifer.

Watney commented that he had waited 20 years for a pipeline to bring natural CO₂ to Kansas for enhanced oil recovery. Now with the interest in carbon capture and sequestration, "We may have an anthropogenic source in our backyard," he remarked.

Kansas has a number of coal-fired power plants that are expected to remain active—and producing CO₂—Watney pointed out. In addition, the Midwest Governors

Association and the U.S. Department of Commerce have a task force studying carbon capture and sequestration infrastructure. "One of their options is moving CO₂ to Kansas from other places in the Midwest because we have a large sequestration capacity," he said.

Not only does the oil and gas industry have expertise in CO₂ injection, but Watney suggested that mature oil fields overlying saline aquifers held the potential for additional sequestration. "It might be a source of income outside of oil and gas production," he mused.

CO₂ Unknowns

Watney noted published estimates that saline aquifers accounted for 92-98 percent of North America's potential CO₂ sequestration capacity. By comparison, he said, unminable coal seams and mature oil and gas reservoirs represent 1-4 percent each.

But, he opined, there is a lot not yet known as well as some misinformation going around about the space CO₂ occupies as a free-phase gas (super- or subcritical state) when it is injected several thousand feet below the surface at pressures exceeding 1,000 psi. "It is not like a geologist working out the volumetrics on the back of an envelope," Watney said. "It is going to require dynamic simulation studies to understand how much CO₂ can be stored, at what rate, and how the CO₂ (plume) moves in the subsurface. We are gathering data to develop robust geomodels for input in the simulation studies."

He said Saibal Bhattacharya, the other principal KGS investigator on the project, would be responsible for the essential simulations.

Risk analysis is another part of KGS's project, Watney continued. Everyone from



The Kansas Geological Survey is evaluating the carbon sequestration potential of the Ozark Plateau Aquifer System in South-Central Kansas as well as the sequestration and enhanced oil recovery potential for the Wellington Field in Sumner County, Senior Scientific Fellow Lynn Watney advises KIOGA.

legislators making policy to regulators writing rules, as well as project managers has questions, he said. "How long do you, as an oil operator, manage a property that is injecting?" he posed. "Who is the responsible party down the road?"

In particular, Watney said the project would address a number of important questions:

- How much CO₂ remains in a free-phase state that could potentially migrate vertically to the surface or laterally, hundreds and even thousands of years after injection stops?

- How much CO₂ gets sequestered by dissolving in the brine?

- How much becomes mineralized?

- How much CO₂ is trapped in fine pores as residual gas?

"Answers will depend on the rock and fluid properties at and around the injection site," Watney commented. "Thus, detailed subsurface characterization is critical in this evaluation process."

KGS's project began in December 2009 and runs through December 2012. "The first year is data collection," Watney reported. "In the second year, we will focus on the EOR sequestration potential of the Wellington Field as well as the underlying saline aquifer. We will evaluate regional sequestration potential in the third year."

He said 3-D seismic and high resolution gravity surveys of the Wellington Field were concluded in April. In addition, Noble Energy donated a significant 3-D survey from the nearby Anson and Bates fields, Watney mentioned. Collecting magnetic data and doing a 2-D shear-wave survey are scheduled for June. KGS also is digitizing well logs to build the geomodel and integrate it with the seismic data, he added.

He said KGS would drill two wells in the Wellington Field to basement to collect water samples from different Arbuckle intervals and core the pre-Pennsylvanian-to-basement interval for extensive rock and fluid property analyses. "The geomodel for the Wellington Field is going to be built this summer," Watney told KIOGA.

Credit Insurance

Oil and gas producers caught holding the bag when SemGroup Corporation filed bankruptcy in 2008 may have looked at it as a once-in-a-lifetime event. Unfortunately, remarked Mark Isern, a senior agent with Euler Hermes ICA in Overland Park, Ks., that is not the case.

"U.S. bankruptcies have been rising at a rate of almost 50 percent a year

Ray Merz (left), president of IMA Financial Group Special Risk Division, and Mark Isern, a senior agent with Euler Hermes ICA, discuss the new KIOGA credit risk insurance program.



since early 2007," Isern advised KIOGA members during a second midyear meeting technical session. "It looks like 2010 will be another record year for insolvencies."

Isern and Ray Merz, president of IMA Financial Group Special Risk Division in Wichita, Ks., outlined a new credit risk program being made available to KIOGA members.

To illustrate the impact of a receivables loss on a low-margin business, Isern calculated, "If you have a 2 percent gross profit margin and you lose \$50,000 off your bottom line, it is going to take \$2.5 million in additional production to offset that. It takes \$25 million of new production to offset a \$500,000 loss."

Companies can manage receivables with in-house experts, or may rely on third-party rating agencies such as Dunn & Bradstreet, Isern offered. They can set aside reserves or use financial instruments such as letters-of-credit to protect against losses. "The final option is credit insurance, which probably is the more viable option," he opined.

Credit insurance will pay the policyholder in the event of a purchaser bankruptcy, Isern said, and may also pay in the case of protracted default such as a slow-pay. "Having a large insurance company on your side can bring a lot of leverage when you are dealing with a slow-pay," he contended.

In addition to insuring cash flow, Merz offered, "One of the most important services Euler Hermes provides is information about the people you are doing business with."

Risk assessment is part of Euler Hermes' normal underwriting due diligence, Isern reflected, commenting, "We can sound a warning when a purchaser our clients are working with becomes a credit

risk, and hopefully get them away before a loss occurs."

He pointed out that prior to Enron's infamous 2001 collapse, Euler Hermes had reduced its insureds' exposure from more than \$200 million to less than \$10 million.

KIOGA Program

Isern said the package being offered to KIOGA members could range from "whole portfolio coverage" that includes full credit management to insuring specific losses. "Maybe you are more concerned about your natural gas purchasers than your crude oil purchasers," he posed. "We can insure only your gas sales and not your oil sales."

He said pricing typically ranged from \$0.12 to \$0.35 per \$100 of coverage, or about \$0.10-\$0.28 per barrel based on an \$80 a barrel oil price.

Policies carry some form of risk sharing. "I suspect in your industry we are going to see maybe a 10 percent co-insurance," Isern offered.

"We will set credit limits on the people you sell product to," he added.

Merz pointed out that drilling and well servicing contractors could participate in the KIOGA program as well. "Maybe you have a contract to drill 30 wells for XYZ Petroleum. You can insure that contract," he illustrated.

Finally, Isern said, the program offers a good credit renewal discount. "Policyholders that have sales of \$5 million or less can earn up to a 5 percent credit each year," he reported. "Policies greater than \$5 million in sales will be eligible for up to a 10 percent renewal credit." □