

# Scientists: CO<sub>2</sub> could be stored underground in Iowa

Current plans call for long pipelines going out of state

By Erin Jordan, The Gazette

Iowa is at the center of two proposed pipelines that would gather carbon dioxide from ethanol plants and transport it to other states for sequestration underground — one strategy for reducing greenhouse gasses that cause climate change.

But scientists with the Iowa Geological Survey say the state has the underground infrastructure for sequestration here, which would allow Iowa companies to keep more of the federal tax credits for CO<sub>2</sub> storage and build fewer miles of new pipelines.

“It boils down to economics,” said Ryan Clark, a geologist with the Iowa Geological Survey at IIHR — Hydroscience & Engineering at the University of Iowa. “They can get \$50 per ton for sequestered carbon, but that’s only if they store it geologically.”



**Ryan Clark**  
Iowa Geological  
Survey

Navigator, a Texas company, is proposing a 1,300-mile pipeline that would pass through 36 Iowa counties, including Linn, Benton, Cedar, Delaware and Iowa, capturing carbon dioxide at ethanol and fertilizer plants. The gas would be put under pressure, turned into liquid and piped to a site in south-central Illinois.

Summit Carbon Solutions is planning a 2,000-mile CO<sub>2</sub> pipeline through Iowa to North Dakota. The company announced last week it has started drilling test wells in three places in the Williston Basin in North Dakota.

## WHY NOT IOWA?

Elizabeth Burns-Thompson, Navigator vice president of government and public affairs, said at a meeting last week Iowa isn’t suited for carbon

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# Carbon dioxide/Sequestration may be viable in Iowa

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sequestration.

"We're blessed here in Iowa with a lot of great things," she said. "This geological profile is not one of them."

Clark and Keith Schilling, a research engineer with the Iowa Geological Survey, disagree.

Layers of porous rock topped by non-permeable rock, or capstone, are needed for holding the CO<sub>2</sub> underground. Iowa has that, Clark said. The Mt. Simon Aquifer already being used to sequester carbon near Decatur, Ill., in a pilot project also runs under Iowa.



**Keith Schilling**  
Iowa Geological Survey

Southwest Iowa is particularly promising because the desirable rock formations are far enough below the surface — a half-mile or more — to provide the necessary pressure to keep CO<sub>2</sub> from changing from a liquid back to a gas, researchers say.

The Iowa Geological Survey published a 78-page technical report on the possibility of carbon storage here.

Because Iowa isn't an oil-producing state, there hasn't been much exploratory drilling to take samples of underground rock. Although geologists know about major underground aquifers they need to know more about the porousness of the sandstone below 2,700 feet — the minimum depth for CO<sub>2</sub> storage.

"There are more unknowns here in the state," Schilling said.

Clark and Schilling estimate it could cost \$1 million to drill a 10,000-foot boring and study the rock samples col-

## CARBON SEQUESTRATION QUESTIONS AND ANSWERS

### **Q: Why are we considering carbon sequestration in the United States?**

A: Nations around the world must reduce atmospheric CO<sub>2</sub> considerably and in short order to hold global warming to less than 1.5 degrees Celsius, which would prevent some of the worst impacts of climate change, such as flooding island nations. Scientists agree we need a multipronged approach, including cutting emissions and storing carbon dioxide. Sequestration can be done by restoring wetlands and forests — which naturally store CO<sub>2</sub> — or by capturing carbon dioxide from industrial processes and pumping it into the ground.

### **Q: How do you transport a CO<sub>2</sub>, a gas, through a pipeline?**

A: The gas is captured at ethanol and fertilizer plants and dehydrated. Then the gas is pressurized, so it becomes liquid. Liquid takes up less space than gas and can be transported by pipeline to a sequestration site.

### **Q: How does sequestration work?**

A: Companies inject the liquid CO<sub>2</sub> into rock formations more than half a mile underground. The liquid can be pumped into depleted oil or gas reservoirs or into aquifers with water too saline to drink. These horizontal pockets are beneath layers of non-permeable stone, such as shale, that keeps the CO<sub>2</sub> under pressure and from coming back to the surface. In some cases, the carbon dioxide may turn into minerals and become part of the rock.

### **Q: Where is CO<sub>2</sub> sequestration being done now?**

A: Pilot projects are happening across the

country. ADM and the University of Illinois announced earlier this year they had succeeded in capturing and storing 1 million metric tons of CO<sub>2</sub> over a three-year period at a site near Decatur, Ill. The CO<sub>2</sub>, equivalent to annual emissions from about 1.2 million passenger cars, comes from ADM's nearby corn-processing plant, the partners reported.

### **Q: Will carbon sequestration cause earthquakes?**

A: The United States Geological Survey found small levels of seismic activity at the ADM's Decatur sequestration site, which it started monitoring in 2013. Increased activity along existing fault lines isn't considered a risk for a large earthquake, but there are concerns it could create cracks that would release stored CO<sub>2</sub>. The U.S. Department of Energy in May announced nearly \$4 million for research on predicting and detecting seismic disruptions at carbon storage facilities, as well as protecting groundwater.

### **Q: Why can't we just plant more trees?**

A: While trees do take in carbon dioxide and store it in leaves, bark and roots, we would need to plant more than a half-trillion trees worldwide to reduce atmospheric carbon dioxide by 25 percent, NASA reported in 2019. Planting that many trees — an area the size of the United States and Canada combined — could take hundreds of years. Reforesting just Cedar Rapids after the 2020 derecho is expected to cost \$37 million and take 10 years. Scientists say reforestation should be part of the solution, but it cannot replace emission reduction or other efforts.

— Erin Jordan

"Since the storage needs to hold for 100's of years, these get into a type of regulation and law that has little precedent," Stanier said in the email.

But Stanier thinks the Iowa-based study is a good example of the type of research needed to see if carbon sequestration is a viable long-term solution.

## SEISMIC MOVEMENT

Sequestering carbon dioxide in Iowa also means taking on the potential risks of seismic activity — a concern many Iowans have mentioned in connection with the proposed pipeline projects.

Seismic activity has increased at the CO<sub>2</sub> sequestration site in Decatur — near the endpoint of Navigator's proposed pipeline — but not to a level that would cause major earthquakes. The bigger concern is whether movement at existing fault lines might release stored CO<sub>2</sub>.

Iowa already has at least two sites where companies inject pressurized liquid into underground cavities.

Northern Natural Gas in Redfield, in Dallas County, stores natural gas in sandstone and limestone aquifers underground. The natural gas is injected under naturally-occurring domes that formed at a fault line near Redfield. The company stores the gas during the offseason and then withdraws it during the winter when natural gas is in demand for heating homes and other buildings.

The Mid-America Pipeline Company stores liquid propane underground at a facility off American Legion Road southeast of Iowa City.

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lected. Seismic surveys and surveys from the air also can provide details about the rock formations underground.

This research isn't cheap, but time is probably the bigger concern as companies want to take advantage of the federal tax credits, Schilling said. He and Clark have approached members of Iowa's Carbon Sequestration Task Force, but haven't gotten much traction.

## QUESTIONS REMAIN

Charles Stanier, a UI professor of chemical and biochemi-

cal engineering who serves on the state task force, said he doesn't think the group has discussed storage in Iowa, but it should be considered among other options.

"Capture was discussed generally to make Iowa agriculture more competitive, but other than the fact that the CO<sub>2</sub> would go into a pipeline to be geologically sequestered (GS) somewhere, the specifics of the GS location were not discussed," Stanier said in an email. "The absence of a geologist (in a discussion that

included sequestration) was an oversight."

Other questions remain for sequestration — in Iowa or elsewhere, Stanier said.

- Which agency regulates the injection (short term) and storage (long term) of CO<sub>2</sub>?

- Who owns the underground pore space where CO<sub>2</sub> is stored?

- Who does the research necessary before such a project begins, and is that information public?

- Who monitors for leakage and for how long?