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WMU partners with energy company to inject carbon dioxide underground, flush out leftover oil

[Chuck Miller](#) | [MLive.com](#)

By [Yvonne Zipp](#) | [yzipp@mlive.com](#) on March 15, 2014 at 6:00 AM, updated March 18, 2014 at 10:15 PM

KALAMAZOO, MI – It sounds like a science project designed by Al Gore: Take excess carbon dioxide, liquidize it and inject it into abandoned oil fields, filling the porous rocks beneath with the CO₂ and -- not so incidentally -- flushing out the oil that remains.

A Michigan company has used the technique to retrieve 1.6 million barrels of oil that, its owner says, would not otherwise have been produced.

Core Energy, based in Traverse City, says it is the only company east of the Mississippi River doing this kind of Enhanced Oil Recovery (EOR) — with the help of [Western Michigan University's](#) Michigan Geological Repository for Research and Education. Around the U.S., about 80 projects reportedly produce 230,000 barrels of oil per day using this technique.

"The potential in Michigan is tens of millions of barrels," said Bob Mannes, president and CEO of Core Energy LLC, and a third-generation Michigan oilman.

"It's a win-win. It's absolutely the right thing to do," Mannes said. "It's the ultimate recycling project because we utilize existing well bores wherever possible."

That said, the company does often drill additional wells, he said. The carbon dioxide Core Energy uses comes from natural gas production from the Antrim Shale in northern Michigan.

A study done by Clean Wisconsin found that crude oil produced from CO₂ EOR creates 40 percent less carbon dioxide than conventional crude oil.

There are potentially 800 Michigan oil fields where the technique could be used, William Harrison, professor emeritus of geosciences and director of MGRRE, said. So far, Core Energy has used EOR on seven.

"We think the potential is phenomenal," Harrison said on a recent tour of the repository, which is essentially a library or archives for rocks. It houses 500,000 feet of core samples, as well as an additional 20,000 samples. The facility is also home to the former University of Michigan collections and the Michigan Geological Survey, which was transferred to WMU in 2011, making the MGRRE the primary geological resource in the state.

"That's additional oil that never would have been recovered otherwise," Harrison said.

WMU's research suggests that 180 to 200 million barrels of "stranded" oil in old fields in the state could be recovered through this technology, Harrison said.

MGRRE originally teamed up in 2005 with Core Energy and Battelle Memorial Institute, an Ohio-based company, in a public-private partnership to study geologic carbon sequestration. The effort, known as the Midwest Regional Carbon Sequestration Partnership, collects data and samples of Michigan's geological formations relevant to CO₂ storage, containment and potential for enhanced oil recovery.

The regional partnership is one of seven established by the U.S. Department of Energy's National Energy Technology Laboratory to study carbon sequestration as an option for mitigating climate change.

In 2009, they received more than \$600,000 in federal funding secured with the assistance of U.S. Rep. Fred Upton, R-St. Joseph.

Suggesting that energy companies should pay to store carbon dioxide underground hasn't proved terribly popular with the industry, Harrison said.

The big question: Why should we spend hundreds of millions of dollars to get rid of carbon dioxide?

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"The cost was phenomenal," said Harrison. "We needed to find some way for it to pay for itself."

Enter the enhanced oil recovery effort.

In a process known as "piggy-backing," after a company such as Core Energy made a profit from the oil, another organization — such as the state or federal government or a nonprofit — potentially could then use the drill and other infrastructure already installed as a carbon dioxide dispersal well, Harrison explained.

"To me, this is an enormously logical and ecologically driven approach," Harrison said.

Mannes said that no federal money has gone toward Core Energy's exploratory efforts. The company also uses 3-D seismic technology in its exploration, which it says allows it to be more accurate when drilling, leading to fewer negative environmental effects.

The partnership with MGRRE has been a tremendous help, he said, calling Harrison's more than three decades of work collecting samples from all over the state "invaluable."

"They're a valuable resource. Their contributions to the state of Michigan go beyond the regional partnership," Mannes said. "Michigan is very fortunate to have that facility in the state.

"We're always looking for ways of further understanding of Michigan geology and MGRRE is the tool to do that in the state of Michigan," he said. "The usefulness of that organization goes far beyond the oil and gas industry."

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Lt. Gov. Brian Calley signs law offering incentives for enhanced oil recovery at Western Michigan University

By [Yvonne Zipp](#) | yzipp@mlive.com on April 01, 2014 at 2:48 PM, updated April 01, 2014 at 4:12 PM

KALAMAZOO, MI – With half a million linear feet of core samples as a backdrop, Michigan Lt. Gov. Brian Calley signed a package of bills into law Tuesday that provides incentives for an oil recovery method that retrieves more oil and natural gas from existing wells while sequestering carbon dioxide deep underground.

Western Michigan University's Michigan Geological Repository for Research and Education, where Public Act 82 was signed, **is part of a regional partnership set up by the federal government** to study carbon capture and sequestration. Since 2011, it also has been home to the Michigan Geological Survey.

"I must say, you have a really cool rock collection going," Calley told WMU President John Dunn before the signing.

"It's an honor to be back on campus," Calley said. The signing "recognizes the strength of the partnership state has with WMU. This is an outstanding place for us to take a step forward help both entrepreneurs and the government to make intelligent, scientific, fact-based policy decisions."

Saying that MGRRE had "played a critical role in the legislation being signed today," Dunn called the repository "an amazing resource for Michigan's citizens."

Under a bill sponsored by state Rep. Aric Nesbitt, R-Lawton, enhanced oil recovery projects will be taxed at a 4 percent severance rate, rather than 6.6 percent for oil and 5 percent for natural gas. The oil and gas severance tax generates about \$60 million for the general fund each year.

The process is more expensive than traditional methods, but is considered the most cost-efficient method of carbon capture and sequestration, Calley said.

With enhanced oil recovery, liquidized carbon dioxide is injected more than 2,000 feet underground, often in existing oil and natural gas well-bores, allowing companies to retrieve about 20 percent more of the

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"stranded" oil left behind by conventional drilling. The carbon dioxide remains behind, sequestered underground.

"In the case of CO₂, there is the added benefit that CO₂ that would otherwise be emitted into the atmosphere is being sequestered in geologic formations that have proved capable of storing it for 300 million years," said John Wilson, one of the founders of Core Energy, of Traverse City, at Tuesday's signing.

In an interview with the Kalamazoo Gazette last month, Core Energy said that, since 1997, it has used the process on seven old oil fields in Michigan to retrieve 1.6 million barrels of oil that otherwise would not have been retrieved. Wilson estimated that an additional 200 million barrels in the state potentially could be captured using the process – about 30 times Michigan's annual output. At today's prices, he said, the potential value of the oil is \$20 billion.

"Michigan is committed to the wise use of its natural resources," Calley said. "Providing incentives to fully develop old, traditional oil fields benefits consumers and our economy. Protecting our environment while fueling our economy is a win for everyone."

On Tuesday, Calley also signed three additional bills that promote the use of enhanced oil recovery. HB 5254, sponsored by state Rep. Rick Outman, R-Six Lakes; HB 5255, sponsored by state Rep. Thomas Stallworth III, D-Detroit; and HB 5274, sponsored by state Rep. Peter Pettalia, provide for the exercise of eminent domain when laying pipelines to transport carbon dioxide.

After the signing, Nesbitt pointed to the fact that his bill passed the state House 85 to 25 as an example of its bipartisan support and thanked Stallworth for his work on the issue. Nesbitt said he believed the incentives were necessary, since the process is more expensive than conventional drilling.

"I believe this is a valuable first step," he said, calling it a "win-win-win" for jobs, domestic energy output and the environment. "This will help put Michigan on the map."

The law does not apply to the controversial practice of hydraulic fracturing, commonly known as fracking.

However, after the laws' passage, environmentalists and Democrats questioned the need to offer more incentives to oil companies. They said any environmental benefits from carbon sequestration should be weighed against new pipeline construction, well conversions, additional air pollution and costs and environmental impacts of increased transport of oil.

"Giving more tax breaks to big oil companies just shows that this administration is out of touch, and has the wrong priorities for Michigan," said Mark Schauer, the Democratic candidate for governor, in a statement. "At a time when dozens of Michigan school districts are in deficit because of Snyder's education cuts, the last thing we should be doing is giving more handouts to big oil companies. Instead, we should be investing in clean, renewable energy sources to reduce our dependence on foreign oil and create good Michigan jobs."

The Sierra Club's Michigan Chapter and Clean Water Action also expressed dismay about the law's signing. "Our elected officials should not be reducing state revenue and giving tax breaks to companies who put our Great Lakes, rivers, and streams at risk," said Nic Clack, Michigan director of Clean Water Action. "We should be moving Michigan away from our dependence on corporate oil to clean energy, not pandering to oil and gas companies."

And the Sierra Club specifically took issue with the extension of eminent domain.

"This law poses an alarming new threat for all Michigan residents who are facing aggressive oil, gas and related pipeline construction in their communities. The Sierra Club strongly opposes the expansion of eminent domain authority to private oil and gas companies at the expense of the rights of private property owners and the public," said Anne Woiwode, director of the Sierra Club Michigan Chapter, in a statement. "Giving oil and gas companies more ability to take lands for the transportation of fossil fuels and carbon dioxide pipeline development is the wrong decision for Michigan, for clean water, and for property owners."

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For his part, Nesbitt pointed to a 2008 National Resources Defense Council paper that found that "to date, no significant documented environmental impacts from CO₂ injections, such as groundwater sources, have been reported."

The report went on to note that, "as with any other oil-extraction process, responsible operations are essential and sound regulations can help minimize any surface or subsurface risks."

Geologists' mission in Kalamazoo and Northern Michigan is still a bit below the surface

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Courtesy Photo William B. Harrison III, at right, talks Wednesday to geologists from industry and government who attended a shale workshop presented at the Eastern Section of the American Association of Petroleum Geologists. In the wooden framing are shale samples.

KALAMAZOO — Rocks, gas and geology are not necessarily exciting stuff. But the importance of work being done with them in Michigan appears to be rising to the surface.

Attention has been focused on Michigan and its potential for greater natural gas and oil production since a major discovery of shale was announced last spring in the northern Lower Peninsula. It led to unprecedented participation by exploration companies in the state's spring 2010 auction of oil and gas leases on state-owned lands.

The May 4 auction for the rights to explore on state-owned land in 22 northern Michigan counties netted the state \$178 million, explains William B. Harrison III, emeritus professor of geosciences at Western Michigan University. That rivals some \$190 million the state has raised cumulatively in such auctions over the last 80 years, he said.

Money from the auction goes into a trust (the Natural Resources Trust Fund) that is used for recreational areas, she said.

"It means that companies that have never come to Michigan looking to explore for natural resources are going to look to Michigan," said Harrison, who co-chaired the annual meeting of the Eastern Section of the American Association of Petroleum Geologists, held this past Saturday through Wednesday at the Radisson Plaza Hotel & Suites in downtown Kalamazoo.

The meeting attracted 510 petroleum geologists, researchers, educators and business people, with the geologists, from 22 states and three Canadian provinces, attended any of 72 technical talks, three workshops and three field trips to learn about Michigan rocks, new technology and how to do their work in environmentally sensitive and respectful ways, said Linda K. Harrison, manager of the Michigan Geological Repository for Research and Education at Western Michigan University.

"They hoped to find out how to explore in Michigan and other basins (and) how to produce gas from shale formations and hydrocarbon-bearing (oil and gas rich) limestones," said Linda Harrison, who is also William Harrison's wife. Her organization, the MGRRE, is a repository of the greatest amount of subsurface rocks and data in the state. A part of WMU's Department of Geosciences, it is at 5272 W. Michigan Ave. in the university's College of Arts and Sciences.

"We do applied research in a number of fields," Linda Harrison said. That includes CO₂ sequestration.

Carbon-dioxide is among the primary gases blamed for causing global warming, via the greenhouse effect.

The result of explorations that are to be done in northern Michigan on what is being called the Collingwood Shale, could mean lots of new jobs, involving the explorations, the drilling and related endeavors, the Harrisons said.

"It could be a huge economic boost for the state," she said.

The Collingwood Shale is a rock formation that is 3,000 to 10,000 feet below the surface of the northern third of Michigan's Lower Peninsula, William Harrison said. Shale has tiny pockets that may be filled with gas.

Michigan Geological Survey - Michigan Geological Repository for Research and Education (MGRRE) – September 17, 2014 Testimony documentation. H.R. 5066

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“This could be one of the few bright spots in the Michigan economy,” Linda Harrison said.

The American Association of Petroleum Geologists meeting here was hosted by the Michigan Basin Society of Geologists, WMU's Department of Geosciences, and the MGRRE

Discussion among geologists at the meeting included the theory that Michigan may have huge, untapped reservoirs of natural gas.

Co-chairing the meeting with William Harrison was Robb Gillespie, WMU assistant professor of geosciences

The theme of the gathering, “Perseverance — the Pipeline to Prosperity,” called attention to challenges petroleum geologists face in “exploring for, developing and responsibly utilizing energy resources in the mature basins of the eastern United States and eastern Canada,” according to information provided by the MGRRE.

Petroleum geologists are the people involved in the science of finding and unearthing useful oil and gas products, an industry that has been in great focus since the disaster in the Gulf of Mexico and the Enbridge oil spill into the Kalamazoo River.

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Director of Michigan Geological Repository Bill Harrison points out different well locations on a map throughout Michigan inside the warehouse at the repository Friday. Harrison and WMU are the lead researchers in a project to capture carbon dioxide and store it underground.

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