

# The BAKKEN

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## PRODUCTS & TECHNOLOGY



**TECHNO DEMO:** ElectraTherm's Power+ generator was unloaded in 90 minutes and running the same day using captured gas to produce electricity.  
PHOTO: ENVIRONMENTALLY FRIENDLY DRILLING

## THE CASE FOR NEW GAS CAPTURE TECH

ElectraTherm and Gulf Coast Energy worked with Hess and the Environmentally Friendly Drilling program to demonstrate a unique gas-capture technology in the Bakken.

By Patrick C. Miller

When it comes to getting gas flaring under control in the Bakken, the idea that opposites attract might provide the best solution to what has become a constant issue for the oil and gas industry. An unlikely coalition of organizations has completed a successful test of a waste-heat-to-energy system that marries an old technology with a new one.

In mid-November, a demonstration project conducted by Environmentally Friendly Drill-

ing—a Texas-based organization that includes major oil producers, research entities and environmental groups—was completed at a Hess Corp. well site in McKenzie County. The test system combined a low-tech industrial boiler with a high-tech generator that used produced gas to generate electricity.

The system was developed by ElectraTherm Inc. of Reno, Nevada. The equipment was set up at the North Dakota well site and operated by Gulf Coast Green Energy, an ElectraTherm

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**EXPERIENCE IN THE FIELD:** Richard Haut, HARC program director for energy production, used his industry experience and ties with industry pioneers to lead the North Dakota efforts.

PHOTO: HOUSTON ADVANCED RESEARCH CENTER

distributor headquartered in Bay City, Texas. Project funding was provided by the U.S. Department of Energy's Research Partnership to Secure Energy for America program and the Houston Advanced Research Center through its EFD program.

Although the concept of using well-site gas to generate electricity isn't new, ElectraTherm's approach of using an industrial boiler paired with its Power-plus Generator is unique and has helped other industries such as landfills and waste water treatment facilities deal with their waste-gas problems. John Fox, ElectraTherm CEO, says the North Dakota test was the first time the company's system was used in a gas-flaring operation.

"Lots of businesses have this same problem," he says. "They don't know what to do with waste

methane gas. We can do something that's not capital intensive by using industrial boilers to handle untreated gas. If there are fluctuations in the gas content or flow, the boiler doesn't care."

ElectraTherm applies the Organic Rankine Cycle and proprietary technologies to generate power from low-temperature heat ranging from 170 to 252 degrees Fahrenheit. At the oil well, natural gas that would otherwise be flared is used to fuel an industrial boiler. The boiler heats water to run the Power-plus Generator, and produces clean energy that is used for on-site processes, offsetting the cost of electricity from the grid or expensive diesel generators.

In addition, Fox says, "The emissions profile of the site is greatly improved, the power is consumed on site and the equipment is easy to install and maintain."

Richard Haut, HARC program director for energy production, considers the demonstration a complete success.

"I'm amazed at how well it's gone," he says. "The little amount of downtime we've had, for this being a pilot project and how well it's functioned, it's been first-class all the way through."

Loy Sneathy, CEO of GCGE, says that from his company's perspective, the demonstration of ElectraTherm's technology proved that it could work with Bakken gas with few problems and minimal involvement by the well-site operator.

"What surprised us is how lit-

tle we needed to learn about what we're doing," he explains. "It's not a complicated process; it's fairly straightforward. The good news is that we didn't find any issues that we weren't able to remedy very quickly."

**'The Hess employees have been a big help to us. I would suspect that we haven't taken more than an hour to an hour and a half of their time in the three months we've been up there. They've been very good to work with. They're always energetic and eager to go check on how the thing's running or make sure the boiler's running.'**

Loy Sneathy, CEO of GCGE

Aside from a few minor problems such as tuning the boiler to work with the gas, a failed sensor and electrical power fluctuations in the local grid, Fox says the technology demonstration worked as expected.

"We weren't being challenged in any way," he says. "The fuel we're giving the Power-plus Generator is hot water and it's doing all the hard work. As long as the hot water's supplied to the generator, we don't know we're in this semi-challenging environment. That's what I like

about the project. It proves that using 100-year-old boiler technology and some newer technology married together is a good simple offering."

The research project took place at a Hess well site in the Blue Buttes area on the south side of the Missouri River, northwest of Mandaree and east of Watford City. The remote location was in the heart of the Bakken where it makes the most economic sense to drill during the low-oil-price environment. But as Lynn Helms, director of North Dakota's Division of Mineral Resources, notes, increased oil production also comes with higher gas production in an area of the Bakken not well supported by gas-gathering infrastructure.

"Not only is northeastern McKenzie County and southeastern Williams and northwestern Dunn County the best area for producing oil, but it also has more gas associated with the oil," Helms said during one of his monthly reports this fall. "As rigs have migrated and completions have migrated into that area, there's been a lot of upward pressure on gas volumes."

During the summer, three critical pieces of infrastructure that could ease the volume of flaring in the Bakken had yet to come online. Helms says the completion of ONEOK's gas plants at Lonesome Creek (first quarter 2016) and Bear Creek (third quarter 2016), as well as a Hess gas pipeline crossing of the Missouri River will help signifi-

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cantly.

However, as a result of the likely failure of the industry to meet the state's gas capture goals, the North Dakota Industrial Commission in September moved the 85 percent gas capture goal from Jan. 1, 2016, to November of next year.

Helms has expressed disappointment that some of the well-site technologies being deployed have underperformed, both in terms of capture rates and operating time. He's also noted that the economics aren't currently favorable for building gas-processing facilities and infrastructure. That's why the successful demonstration of ElectraTherm's technology could be a significant development.

Haut says his team at HARC looked at various technologies that would make sense for a scalable pilot project in the Bakken. GCGE's experience with using ElectraTherm's technology in the energy industry appeared to be a good fit.

"We thought about all the flaring going on and thought that if we could take that natural gas and burn it in a boiler—no moving parts like a turbine or anything else—just something real simple, we could then take that heat and put it through an Organic Rankine Cycle and generate electricity," he says.

Hess, one of EFD's industrial sponsors, offered a well site in western North Dakota for the project. Montana-based GTUIT, a Hess partner, was already at the

site with its gas capture and natural gas extraction units when the EFD team arrived to install and commission the ElectraTherm test unit. GTUIT allowed them to tie into a gas line that provided the test system with 10 percent of the gas.

**'Hess is wonderful to work with. They are on top of this issue and want to do the right thing. They've got good people and they recognize that they need to get it right. It's a great organization.'**

**Richard Haut**, HARC program director for energy production

"GTUIT was already taking the flared gas and stripping out the natural gas liquids, then giving us the dry gas," says Satish Ravindran, HARC research associate and energy engineer. "We were secure from the gas surges because we were downstream from GTUIT."

Sneary believes the simplicity of the ElectraTherm technology makes it attractive to operators, and results of the demonstration project helped further reinforce his belief. He says it took about 90 minutes to unload the equipment and less than a day to get it running. In addition, he says it would take less than a day to move the entire system to nearby site with a large forklift.

A 65-kilowatt generator was used to generate electricity that

could either be used at the well site or sent back into the electrical grid through a connection provided by McKenzie Electric.

To emphasize the simplicity of the technology and its ease of operation, Fox says his technical support team never needed to visit the test site during the 90-day demonstration. When remote monitoring indicated that a sensor had failed, "We had a spare part there and someone who didn't even know our equipment went out and changed that in about an hour's worth of work."

Fox notes that power fluctuations from the local electrical grid sometimes tripped the entire well site offline or could cause the Power-plus Generator to shut down. However, even that proved to be a relatively easy problem to solve. For Hess employees at the site, it was as simple as pressing a button to restart the generator.

The ability to remotely monitor and control the equipment also meant that there was often no need to contract anyone at the site for assistance.

"Sometimes the site would go down and we would remotely restart the machine in Reno or Loy would start it from Texas," Fox says. "As long as we knew the boiler was making hot water, we'd just turn it back on. One of the Hess employees said that we weren't intrusive at all."

Sneary stresses another advantage of ElectraTherm's technology. "The neat thing is that I

can call up that machine on my phone," he notes. "With the right pass codes, I can control it.

"Whoever the owner is, their field personnel can check it any time and see what the status is," he continues. "If it's gone down for some reason such as a power grid problem, they just punch a button on their phone to start it up again and then go on about their business. It's just amazingly simple."

**'Without Hess, we wouldn't be doing this project. Unlike the public perception of the oil and gas industry, every Hess person that I spoke to wants to reduce flaring.'**

**John Fox**, ElectraTherm CEO

It's the ease of operation that has attracted other industries dealing with waste gas problems to GCGE customers.

"When we turn the keys over to the customer, they really like the simplicity," Sneary says. "Operators have been pleased with lack of time they've had to spend on the equipment."

Fox emphasizes the ability of ElectraTherm's technology to scale up to meet the needs of new wells with high IPs and—because of its mobility—the option to quickly move units to well sites as they become more mature and gas production is reduced.

"If we went after those ma-

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## ENVIRONMENTALLY FRIENDLY DRILLING COMES TO NORTH DAKOTA

In 2005, Rich Haut thought he was going to retire after many years working in the oil and gas industry. He was part of the Houston Advanced Research Center founded 35 years ago and today continues to serve as its program director for energy production.

But a conversation over a beer with Todd Mitchell with the Mitchell Development Co.—the business instrumental in starting the shale fracking boom—got him involved with the Environmentally Friendly Drilling program under HARC, which was established by Todd's father George.

Haut teamed up with Tom Williams, former vice president of technology for Noble Drilling, and Dave Burnett of Texas A&M with the university's Global Petroleum Research Institute. They formed what—on the surface—appears to be an unlikely mixture of industry, science, academia and environmental organizations working to develop energy in an environmentally friendly manner.

"We're a total non-profit research organization here to provide unbiased science to ensure that environmental and societal issues are being addressed throughout oil and gas opera-

tions—everything from site selection all the way through gas compression and beyond," Haut explains. "We get funding from state, local and federal governments, from foundations, from industry and from environmental organizations."

Of the 20 field operations being conducted by EFD, two are in the Bakken. One is the recently completed demonstration of ElectraTherm's gas capture technology with Gulf Coast Green Energy at a Hess Corp. well site in McKenzie County and the other is a case study for a compressed natural gas project.

The EFD program creates a partnership between national laboratories and key university partners to develop and disseminate critical new technology to accelerate development of domestic reserves in a safe and environmentally friendly manner. Its sponsors and advisors not only include major energy and oilfield services companies, but also environmental groups such as the Environmental Defense Fund, The Nature Conservancy and Ducks Unlimited.

ture sites with one or two of our units, we could knock those flares completely out," he says. "I think that would be a great statement on the simplicity and deployability of the equipment."

Haut, Fox and Sneary had nothing but praise for Hess and the on-site workers who assisted them.

"The Hess employees have been a big help to us," says Sneary. "I would suspect that we haven't taken more than an hour to an hour and a half of their time in the three months we've been up there. They've been very good to work with. They're always energetic and eager to go check on how the thing's running or make sure the boiler's running."

"Hess is wonderful to work with," Haut adds. "They are on top of this issue and want to do the right thing. They've got good people and they recognize

that they need to get it right. It's a great organization."

Fox says, "Without Hess, we wouldn't be doing this project. Unlike the public perception of the oil and gas industry, every Hess person that I spoke to wants to reduce flaring."

Fox and Sneary say that although the project opened the door for discussions with Hess, at this point it's difficult to predict if or how ElectraTherm's technology will be used in the Bakken.

"I feel optimistic that someone in the oil and gas industry is going to recognize this as a viable solution," Sneary says. "It could compliment other technologies that have been proven to do flare reduction. I'm confident that companies are going to pick this up and see that it's a good, viable solution."

Fox hopes that the oil and gas industry will look at the big

picture when evaluating ElectraTherm's technology.

"What we truly want to offer—and what our primary goal is—is a clean-burning utilization of an improved emissions profile and some on-site generation," he says. "We're sitting here hopeful, but the proof is in the pudding of what these oil and gas companies are going to do at the end of the day to meet their regulatory requirements."

The value of the research project in the Bakken, Fox says, is that it successfully demonstrated that the technology is easy to install, is non-intrusive and mobile. However, it's ultimately up to industry to decide if the economics make sense.

"We don't know what the economic value comparison is," he says. "We've heard things are tough; they're complex. Other approaches producers have tried aren't as available as they'd like

and can be maintenance intensive. We've heard all those things. We haven't heard those things about us, which is great."

Sneary notes that because of the project's DOE funding, the contract with HARC and EFD requires the business entities involved to engage in technology transfer.

"Part of our responsibility is getting the technology transferred out into the oil and gas industry so they know about it," he explains.

Time will tell if the demonstration leads to a technology breakthrough that enables the oil and gas industry in the Bakken to acceptable levels. But the groundwork has been laid to scientifically analyze the results and determine its value to industry.

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