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The shale gas boom: Energy exploration in Carolina



Staff photo by Michael Conti

A wellhead stands in a clearing in an area near Sanford where natural gas is abundant in shale.

By Michael Futch
Staff writer

For now, state geologists are finished with their research in central North Carolina.

After studying 59,000 acres in the Deep River basin for 15 years, they have concluded that Lee, Chatham and Moore counties could produce enough natural gas from shale to make North Carolina self-sufficient for 40 years at current levels of consumption.



"That's what we think," said Kenneth Taylor, chief of the N.C. Geological Survey. "We could become a net exporter."

Staff photo by Michael Conti [\[+\] click to enlarge](#)

John Diemer, left, and David Heffner examine rocks during a tour in Lee County by geologists and landowners exploring possible natural gas

The geologists recently sent their findings to the U.S. Geological Survey in Denver which is being asked to assess the full potential of the Sanford sub-basin, a shale formation near the center of the Deep River basin. The sub-basin has the potential to hold the state's richest natural gas deposits, though exploration will continue elsewhere in the state.

Taylor said an assessment and fact sheet is expected from the U.S. Geological Survey by July.

The assessment would then be made available to energy companies eager to explore and begin commercial gas production in the sub-basin.

The findings could one day lead to riches for landowners - many of whom already have signed land-lease deals with the energy companies - and huge revenues for the state.

"The benefits from revenues that the state of North Carolina would gain from a productive natural gas industry would be immeasurable," said state Rep. Michael Stone of Lee County. "Citizens owning property with natural gas will benefit directly, while all people in our area will benefit indirectly."

But with the potential rewards come significant risks. The process of extracting natural gas from shale combines a relatively new technology, horizontal drilling, with a controversial process called fracturing - or fracking - that involves using chemicals and vast amounts of water to force natural gas out of the shale.

Earlier this month, a Duke University study concluded that fracking appears to elevate methane levels in groundwater wells near gas drilling sites. New York has put a moratorium on the practice.

Fracking and other controversies surrounding natural gas excavation have not gone unnoticed in North Carolina.

"We have to protect the environment in which we live and not at the expense of having another fuel source," said Russ Patterson, chief geologist with Patterson Exploration Services of Sanford. "We live here. We live on planet Earth. We have to take care of it."

Before any drilling could occur in North Carolina, state laws would have to change. The state does not allow horizontal drilling or fracking, though bills recently introduced in the General Assembly by Stone and other lawmakers could change that.

Although drilling still may be years away, one thing is becoming clear: North Carolina has an abundance of high-quality natural gas.

"The first thing about it: Do we have a total petroleum system?" Taylor asked. "Do you have rocks with high enough total organic carbon above a certain value. Above 1.4 percent? Our samples are running 3, 5, 15 percent hydrocarbon."

"It's good stuff."

In Lee County, deposits of natural gas lie trapped in prehistoric geological formations known as Triassic rock.

About 250 million years ago, the rocks in the Sanford area were formulated around the equator. That was when the continents formed one vast supercontinent, known as Pangea.

Once Pangea split up, continental plates separated into the world's various continents.

"What we had was - when the whole continent of Pangea began to break up, a series of rifts occurred before it actually broke up," said Taylor, the state geologist. "Basically, a series of basins, very steep sides, thin, linear, began to fill with sediment - organic, rich sediment from lots of tropical plant matter, like a compost pile. It accumulated over thousands of feet. Over millions of years, more sediment was put on top of that and pressed down and cooked that with heat and pressure to turn it into natural gas."

Along with the gas, petroleum and other deposits formed deep in the ground.

Interest in Lee County from the energy industry focuses on a kind of shale laid down from 210 million to 235 million years ago, during the initial stages of the opening of the Atlantic Ocean.

Black or dark gray shale, which can be made to yield natural gas, is found associated with the coal bed of the Cumnock formation of the Deep River basin.

The Cumnock, Taylor said, is akin to the "chocolate icing" between two other layers - the Sanford formation and the Pekin formation.

Taylor said the shale in the Cumnock formation is about 800 feet thick in one area. "That's considered a large amount," he said. "Look at the Marcellus (shale formation). Even though it covers millions of acres, actually the Marcellus unit is like 35 feet thick."

The Marcellus is a rock bed the size of Greece some 6,000 feet beneath Pennsylvania, New York, Ohio and West Virginia. The formation is one of the nation's most promising sources of natural gas. Other major areas for natural gas extraction include the Barnett shale formation in Texas and the Utica area in New York.

Taylor said the U.S. Geological Survey's attention on the Marcellus has delayed its assessment and fact sheet on North Carolina's shale basin.

The Whitmar Exploration Co. ranks as the biggest player in the scurry to secure land-lease rights from property owners in Lee County. The private energy company, based in Denver, drills for oil and natural gas throughout the country.

The company has signed land-lease deals with 63 property owners in the Deep River Basin, giving it access to about 6,055 acres.

By comparison, the upstart N.C. Oil and Gas of Sanford is looking to establish a name.

Founded in May 2010, the company was created by twin brothers Rob and Russ Knight and family friend Ray Covington. All three are Lee County landowners, born and raised in the area.

To date, N.C. Oil and Gas has entered agreements with a half dozen people who own about 2,000 acres in the basin.

Like the larger companies, the founders of N.C. Oil and Gas know it's going to take more than traditional vertical drilling to mine natural gas in Lee County.

"I don't think it can be done by vertical drilling. I don't think it would be economically viable," said Russ Knight, who is 50. "We think it has to be a horizontal drill and hydraulic fracture."

Whitmar officials did not respond to repeated telephone messages.

For 66 years, the laws on drilling in North Carolina have never been revised to keep pace with oil and gas exploration practices.

The Oil and Gas Conservation Act, which became state law in 1945, allows only vertical drilling and effectively outlaws fracking. State requirements pertaining to permits and related fees for wells and drilling are based on the same statute.

"Our laws are based on laws put in place in the 1940s. They've never been changed or brought up to date because there are no wells here," Russ Knight said.

That soon could change. Bills that might allow fracking and horizontal drilling have been introduced in both chambers of the General Assembly.

"Everybody understands there needs to be good legislation put in place, and it's going to be a slow process," said Covington of N.C. Oil and Gas. "Therefore, oil and gas companies signing leases at this time are uncertain when they're going to drill. We need to educate as many people as possible with the pros and cons on what is happening in the industry."

State Rep. Stone, for one, supports drilling for natural resources here. But, he's quick to add, as long as it's done safely and residents are protected.

He said he plans to file legislation soon to create a study commission to evaluate horizontal drilling.

"Without hydrofracking," Stone said, "we will not be able to tap the vast deposit we have in our area. However, the study commission that will be created from the bill will be introducing will be doing extensive research before any bill is entered to allow new types of drilling."

Stone already has introduced a bill in the House proposing that the bond amounts for companies to drill vertically be doubled from \$5,000 to \$10,000. In part, the bond ensures that whoever drills the well abandons it properly.

The bill also would give the state major control over permitting and fees, but the county could have a role in terms of zoning and soil erosion and sedimentation control regulations. House Bill 242 passed the first reading in the House and has been re-referred to the Finance Committee.

Meanwhile, an energy jobs bill that contains a fracking provision cleared the state Senate on May 10.

Senate Bill 709 calls for the state Department of Environment and Natural Resources to review state laws and regulations pertaining to "issues related to shale gas exploration, development and production, including hydraulic fracturing. It calls for an inventory and evaluation of water supplies and the potential impact c

other water users in any area of shale gas interest, as identified by state geologist or the U.S. Geological Survey.

The bill passed the Senate on a 38-12 vote. It must be approved by the House and signed by Gov. Bev Perdue before it can become law.

From the 1920s through the 1950s, Howard Butler toiled in the Carolina Coal Co. mine on the Deep River as the operation's general superintendent.

The Egypt Coal Mine, the oldest of several mines built in the Deep River coalfield, opened in 1852. The coalfield ran along both sides of the river through Lee, Moore and Chatham counties.

By 1952, most of the mines had closed. They were covered up in 1987.

Dan Butler, the coal miner's son, now owns the mineral rights to 2,715 acres in Lee County in the Sanford sub-basin.

"This is the only area in North Carolina that is proven to have both coal and gas," he said. "This is more than potential. There is coal and gas in this area. I still feel they'll be mining coal there one day."

Like plenty of other property owners, the 67-year-old Southern Pines resident is anxious to see the exploration and production of untapped natural gas reserves.

"This is the best thing that's happened to central North Carolina," he said.

About six months ago, Butler signed a lease agreement with Whitmar Exploration.

"Whitmar is the only company that is an active oil and gas exploration company looking at this property to spend approximately \$20 million on four to five wells," he said. "They are ready, but they can't do anything until the legislation is changed. They must do horizontal drilling, and they must frack."

Other companies positioning themselves to drill gas wells in Lee County include Tar Heel Natural Gas of Charlotte and the Old North State Energy Co. of Sanford. They, too, have approached landowners about land-lease rights.

"There are hundreds and hundreds and hundreds of owners of that piece of the pie," Taylor said. "Everybody wants to make money. I like free enterprise, but let's be respectful."

Susan Conclin, director of the Lee County Agricultural Extension Service, said her office has been trying to provide information to the community. She cautions property owners to know what they are signing before entering a lease agreement

"Why are you selling your mineral rights away? Don't jump on the bandwagon so fast," Conclin advised. "Can you sell your land after signing a contract? What is the environmental impact? What legacy are you leaving to your grandkids?"

Benny Lee still is considering his options.

Lee, who is 62, owns what he called "hundreds of acres" just across the Deep River in Chatham County. The Cumnock formation runs beneath his property.

In late March, he joined a group of 23 geologists, land owners and oil and gas representatives on a field trip to the Sanford sub-basin.

"I'm going to get more information. There's a lot not understood about this basin still," Lee said. "Three or four drill wells have been drilled since the '80s. They've just been test wells. There just needs to be a lot more drilling done."

Lee said he has been contacted by oil and gas companies interested in locking up the natural gas rights to his land. But Lee, who has discovered that the issue is bigger than he first thought, is in no hurry.

"Here's the way I look at it," he said. "God has done all this. He's the creator of all things, and God put things on this Earth for mankind to use in a safe and effective manner. If he didn't want it here, he wouldn't put it here. It's here to use. The technology is here."

"My thing is, let's use it for the benefit of North Carolina."

Fracking is a much-debated technology - one that creates micro-fractures in dense reservoir rock formations and allows energy companies to recover bubbles of natural gas thousands of feet below the surface. In the process, a soup of water, chemicals and sands is injected underground at high pressure to crack open the shale.

While fracking has been around for more than 60 years, it has come under increasing scrutiny as drilling crews swarm to the lucrative Marcellus and other shale regions of the United States.

What's in the controversial chemical cocktail that energy companies are using in hydraulic fracturing?

That question has been as secret as the Colonel's recipe for Kentucky Fried Chicken.

The Clean Water Act, known as part of the "Halliburton loophole," states that energy companies are exempt from disclosing the chemical components used in fracking, though some have recently begun to reveal their secrets.

Most of those privy to the chemical components work for the industry, said Edward Kokkelenberg, a professor emeritus of economics at State University of New York in Binghamton. Kokkelenberg writes regularly on the environmental dangers of fracking and horizontal drilling.

"It would be nice to know what's in this stuff," he said. "They say it's proprietary, but that's what patents are for."

Kokkelenberg, who worked for international oil companies as a younger man, said the drilling methods create "a whole host of problems."

Researchers are unsure if the discharges involved in fracking are dangerous to humans or wildlife. Environmentalists say questions on soil erosion and depletion of water supplies also must be addressed.

Critics claim the chemicals, coupled with a lack of regulation, endanger the environment and the health of those who live near drilling operations.

The process can require millions of gallons of water for just one well.

"There's a demand," Kokkelenberg said, "on much of the countryside."

On April 20, a blowout at a natural gas well in rural northern Pennsylvania spilled thousands of gallons of chemical-laced water. Officials asked seven families who lived near the well site, outside Canton, to evacuate as crews struggled to stop the gusher, The Associated Press reported.

"I'm not saying companies are totally irresponsible," said Kokkelenberg. "There is risk with all kinds of energy."

Daphne Magnuson, a spokeswoman for the Natural Gas Supply Association, supports the industry.

"If my mom were to call me and say there was a (natural gas) development taking place near her, I would have no qualms saying it was a safe and clean process," Magnuson said. "I point back to our overall record. I think natural gas producers recognize it could always be improved. But I think our record is, overall, excellent."

Knight, of N.C. Oil and Gas, said the last thing he wants is for a gas driller to come in and create groundwater problems in Lee County.

His business, according to the company website, was created out of concern for the protection of land and landowner rights with regard to oil and gas exploration.

Fracking reportedly is used in about 90 percent of the gas and oil wells in the United States.

Should North Carolina change its laws to allow fracking and horizontal drilling, the largely elongated strip of land that makes up the Sanford sub-basin could transform into prime property.

"Yes, there really is gas here and, yes, it will burn. And, hopefully, if we all act together we can extract this gas together for the benefit of North Carolina. It needs to be done right," said Patterson of Patterson Exploration Services. "We have no gas production. We have no petroleum production whatsoever. Our only production is a little hydro and nuclear power.

"This could produce our total energy needs for many, many years."

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Dave Hayes

I have family (my mother's cousins) in northeastern PA where the Marcellus Shale Basin is being fracked. One cousin owned land over deposits and was paid \$250,000 upfront for drilling right (royalties to follow). The other was not so fortunate in the position of his property. So it has been for the community as a whole, some getting big paydays, some nothing.

Of course, the people who get the money spend it (the fortunate cousin is building a new house) and it is having an indirect benefit on the local economy.

The biggest side effect of the boon has been the appearance of hundreds of tractor trailers hauling water from the Susquehanna River out to drilling sites. Predictably, opinion is split on the net benefit of this.

I think NC is lucky in some ways to be coming in second to the Marcellus drilling boon. Drilling companies and local/state governments can learn from mistakes made there.

5/22/2011 7:55:56 AM

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RangerAirborneMSG

This government has got to get out of the way of new energy exploration and development. We MUST pursue our own interior energy sources unless we want to go back to the gas lines of the 70s and the Carter days. 2012 can't come too fast for change in the White House. Herman Cain for President!!

5/22/2011 8:15:18 AM

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bigal0228

And it starts. Bad Gubment, move out of the way, no regulations cause we be needs this stuffs! Don't worrrryyyy, them big oils n gasses peoples will look out for us, even if it means they gots to spends a lots of moneys to protects us. They ALWAYS looks out for us firstest!

NOTHING needs to be done immediately except step back, take a deep breath and start doing some serious inquiries. Maybe our legislators will do the right thing as they seem to be doing now and require some checking and studying to see how this is going to affect not just the landowners, but everyone else in the areas concerned.

My gut instinct is that this is going to turn out badly for all concerned, but I can also say with some amount of sadness that the drilling will probably start sooner rather than later because big biz will not stand for our government sitting around and twiddling its thumbs. Payoffs, threats, you name it. The FIRST thing we'll hear is that every day we aren't drilling is costing NC jobs

and revenue. And when the lawmakers hear "Revenue" you betcha they are gonna be falling over themselves to work out a deal. No one wants to be known as the senator who lost us all those immigrant jobs or lost out on tens of thousands in new fees and taxes.

5/22/2011 9:00:43 AM

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HemiHead66

You people would have to be crazy to let these money grubbing greedy vultures drill on your land. There is no safe when it comes to this process. That's why Dick Cheney, and his back-room energy policy buddies exempt it from the safe water act. You're talking about 500 different chemicals in that fracking fluid. And some are very toxic. They even used diesel fuel when they knew it was illegal. Just look what's going on all across the country. Cows falling down dead after grazing. Gas spewing out of people's land. Their water wells contaminated. These gas cronies have contaminated aquifers in more than 5 states already. People are getting sick. Then they have to get rid of the fracking fluid that's mixed with radioactive elements found deep underground. You're talking about billions of gallons of this stuff. They've been dumping that right into the very rivers and streams that supply drinking water to millions of people. Sometimes right upstream from water intake plants. And those intake plants only test the water every 6 or 9 years, and they don't check for radiation or chemicals they don't know about. Of course the gas cronies will give you the ol, we treated SOME of it at waste-water treatment plants. But those treatment plants aren't designed to treat that toxic radioactive mess. And since it's cheaper to pay the fine and dump it untreated, that's what they been doing. Read the 5 page investigation by the NYT based on gas industry, state & EPA records. The EPA even hid damaging studies from the public. Just like the gas companies are so secretive about the chemicals they use. They do this so people can't prove their case in court when they become sick. These people are going to finish off this country. God help the next generation that will have to live with this. There is no fixing it once the damage is done.

www.nytimes.com/2011/02/27/us/27gas.html?pagewanted=1&_r=1

5/22/2011 9:04:17 AM

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bigal0228

One other thought. Maybe the person who wrote the headline wasn't thinking, but "Gas" and "Boom" just should not be placed together in the same sentence.

5/22/2011 2:37:53 PM

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Paul

I grew up in the bituminous region of Pennsylvania and watched the pollution caused by greedy coal companies. The streams were filled with rusty looking water full of acid mine drainage. All life in and near the streams had ceased to be. The black smoking mountains of useless sub-bituminous trailings reeked of sulfur dioxide and hydrogen sulfide gases and killed every tree

within a half mile. Now such towns are rundown bedroom communities of people who exist on the government dole.

When the mines were opened, people of the areas saw it as a boon, however only a few people made the big bucks while others labored in the pits to later die of black lung. The cancer rates were horrible due to the fouled environment.

Pennsylvania now has a moratorium on such gas production and one must ask why? I still have many friends in the northern part of the Commonwealth and every once of them tells of poisoned wells and foul tasting water that this cracking process has brought to the area.

This truly is a harbinger of the pollution this state will get to make a few fortunate people in the shale areas rich and the energy companies even richer.

I know we need the fuel, but at what cost? Before this resource is tapped, we'd best look at what can be done to amortize the damage. Explore, tap, and use the gas, but not in an exploitative manner.

5/22/2011 4:41:23 PM

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DEFENDOR

There are abundant energy resources everywhere. The question is how do we keep the Global Bankers, that is the government agencies, out of the equation?

5/22/2011 5:35:21 PM

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Magpie

As another Pennsylvania native with relatives still living in the Marcellus shale region, I am deeply saddened to see this gas drilling destruction heading for North Carolina. The NE Pennsylvania region is undergoing a transformation into an energy sacrifice zone and it is a horror to behold it unfolding day by day. Fracking is a dangerous destructive process -- don't let anybody try to tell you anything different.

There are some PA landowners who are collecting handsome proceeds from their gas leases, but many other landowners were swindled by sweet-talking land men who came from TX and OK to rob them blind. The gas least con artists got them to sign leases with hidden loopholes and weasley fine print. There are already poisoned water sources, and nobody is tracking the NORMs (naturally-occurring radioactive materials) that are getting dredged up with each frack of the wells there. Millions of gallons of water are getting mixed with toxic pollutants, then dumped into water treatment facilities that are not at all designed to remove the impurities that have been mixed into the water. Where does that stuff end up? In the Susquehanna River, and more importantly, in the tap water downstream. Get ready for cancer rates to skyrocket.

The question is this: will the legislators of NC be smart enough to realize that there are going to be some places in this country that are left inhabitable with useable drinking water, and the rest of the country will be trashed by these greedy gas drillers. Which category will North Carolina be in? How much

does safe drinking water matter to us? How much do we care if we can eat the fish from the rivers and streams, and how much does recreation/tourism/agriculture matter to our state? Do we care if everybody has to relocate elsewhere because the water sources are all contaminated? A big problem with fracking is the disposal of the used fluid, and there has not yet been a safe method proposed for reclaiming the water that has been contaminated.

We don't need to look any further than PA to see what the consequences are.

If you need verification firsthand, by all means go to PA and check it out. Just be sure to bring all your drinking water with you . . . ours here in NC is still safe to drink, for the moment. Stay tuned.

5/22/2011 10:40:59 PM

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Magpie

In Pennsylvania, the gas drilling frenzy is benefitting a small number of land owners, and the gas company execs, but there has been no net benefit to the rest of the residents.

State forests are being fracked, state game lands, and even some parts of state parks. The governor of PA suggested that the state university system drill and frack on their campuses to try to fill the giant budget gap this year! So much for the gas helping the PA revenues.

Heavy truck traffic is on the roads because water haulers are everywhere, taking clean water from the streams and lakes, and then mixing it with toxic chemicals and hauling it to the well sites. The roads are wearing out with big potholes (which the taxpayer\$ have to pay to fix).

Nearly all of the jobs (supposedly the big reason to do the drilling in PA) are actually going to crews that have been brought in from out of state -- Texans and Oklahoma workers who live in camps and don't set up residence in PA. They are there to just make a buck, trash the place, and leave.

Potable water has to be hauled in from out of state to replenish the "water buffaloes" on the front lawns. That is the local name for the big tank of replacement water that is on the lawn of each household with contaminated water. How long are the companies going to continue to pay to bring it in? Anybody with a tainted well is stuck with the situation -- you can't sell your property if it is a Superfund site because of the fracking poison in your water from the drilling that is going on nearby.

If you are a land leaser and you got a good upfront payment, the shrewd thing to do is to relocate your family to a part of the country with no shale gas deposits and no thread of this extremely hazardous process of drilling/fracking. NC has been one of safe places so far -- will it continue to be?

5/22/2011 11:16:27 PM

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