

NC STATE ECONOMIST

COLLEGE OF AGRICULTURE & LIFE SCIENCES

Shale Gas in North Carolina: Issues in Law, Economics and Policy

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New technologies introduced in the last decade and a half have resulted in recent, dramatic increases in domestic oil and gas production. Hydraulic fracturing — commonly called fracking — has allowed economically viable extraction of oil, natural gas, and natural gas liquids trapped in hydrocarbon-bearing shales.

Hydraulic fracturing has been the focus of substantial recent debate in North Carolina as the General Assembly considers whether or not to revise laws that currently prohibit its use. This issue of the *NC State Economist* discusses key economic issues related to fracking, particularly as they relate to land owners in locations where that activity is feasible.

Hydraulic Fracturing Technology

While hydraulic fracturing has been used for many decades to renovate vertical wells with declining production, its commercial application to hydrocarbon-bearing shales has only occurred since the late 1980s (U.S. Energy Information Administration 1993). The technique used today for all hydrocarbon-bearing shales was developed by George P. Mitchell, an independent energy producer based in Houston. The three important components of the technology are the hydraulic fracturing (fluid injection into the shale under high pressure), horizontal drilling, and the development of proprietary drilling fluids.

Horizontal drilling techniques have been developed to the point that lateral lines can be drilled horizontally through the shale found thousands of feet below the surface of the earth. These lateral pipes may extend for more than a mile. The path of the drill head is followed in real time as it moves laterally through rock thousands of feet below the surface of the earth. This ensures that lateral gathering lines remain within the hydrocarbon-bearing rock. Once the laterals are drilled as far as intended, the horizontal pipe is perforated to allow fluid injected under high pressure to flow into the shale where it creates and expands fractures.

A proprietary mix of water, sand, surfactants, and other chemicals is then injected into the shale so that the fractures in the shale will remain open; this in turn allows gas to flow into the lateral pipe and up the vertical pipe where it can be collected. The sand lodges in the fractures in the shale and helps to keep those fractures open so that the gas can flow. Surfactants reduce the surface tension of liquids in the shale, which also makes it easier for the gas to flow. Various detergents in the drilling fluid remove organic deposits in the fractures in the shale that might impede the flow of gas. Different fluids are designed for the particular physical and chemical characteristics of each deposit. As

successful fluids can confer significant competitive advantages on the producers that develop them, the recipes for these fluids are usually guarded as trade secrets.

Hydraulic Fracturing in North Carolina

There is no history of commercial natural gas production in North Carolina. While it has been known for many decades that the Triassic basins of North Carolina contain hydrocarbon bearing shales, these could not be exploited with conventional vertical well technology. The advent of hydraulic fracturing has made the possibility of extracting the gas technically and economically feasible. Lee, Chatham, and Moore Counties have well-documented deposits of hydrocarbon-bearing shales. There are also known deposits in portions of Durham, Anson, Wake, Orange, Montgomery, Richmond, Rockingham, and Stokes Counties. The need for large quantities of sand, water, and gravel to support gas production may affect many other counties if gas production comes to North Carolina. Sand and water are key components of the fluids used for hydraulic fracturing. Gravel is used in large quantities for access roads, parking and other facilities. There will also be a need for worker housing, both permanent and temporary.

Under current North Carolina law, the NC Oil and Gas Conservation Act prohibits both injection of fluids into wells and horizontal drilling. Session Law 2011-276, enacted in 2011, required the NC Department of Environment and Natural Resources (DENR) to study issues related to natural gas production and produce a report by May 1, 2012. This session law also included some important protections for landowners as well as addressing other issues related to gas and oil production. (The DENR shale gas page may be found at <http://portal.ncdenr.org/web/guest/shale-gas>). The Energy Policy Issues Committee of the N.C. General Assembly Legislative Research

Commission issued its report and proposed legislation on April 18, 2012.

Economic Feasibility of Hydraulic Fracturing in North Carolina

Even if the General Assembly amends or replaces the NC Oil and Gas Conservation Act, it is unlikely that drilling will come to North Carolina in the next few years. Natural gas prices are currently around \$2 per thousand cubic feet, the lowest price seen in more than a decade. For 'dry gas' production this is almost certainly below the cost of production for most producers. Dry gas is gas that is primarily composed of methane. The U.S. Energy Information Administration forecasts that gas prices will mostly likely remain below \$5 per thousand cubic feet through 2023. (www.eia.gov/forecasts/aeo/er/early_prices.cfm). Although estimates vary widely, \$5 per thousand cubic feet is probably about the breakeven price. Thus, current prices are too low to support the investment of \$1 to \$10 million dollars that it takes to drill a well. In addition the state will be required to spend many millions of dollars on developing a regulatory structure, ensuring payments to rights holders and those with losses resulting from accidents and water contamination, and upgrading emergency response capabilities prior to the commencement of drilling. All of these costs to the state must be paid from existing tax revenues without any guarantee that the state will ever receive any revenue from gas production.

The picture improves somewhat should deposits consist of 'wet gas' containing natural gas liquids that can be sold in the chemical feedstock market. Wet gas prices are tied to the price of oil, not natural gas. However, with falling or stable oil prices, it is unlikely that anyone will want to make this very risky investment of millions of dollars. If on the other hand the gas is 'sour gas' that is high in sulfur compounds, then expensive additional processing is required before it can be used.

Almost all of the data on North Carolina shale gas comes from a small number of wells. There is not enough data to make any definitive statements about the composition of the gas or the actual volume available for production. An additional factor that affects whether the resource will be exploited soon is that the Triassic Basin deposits are tiny and unproven, lacking any production data, compared with deposits in Texas, Louisiana, Arkansas, North Dakota, Pennsylvania, and elsewhere. There are certain costs associated with developing a new deposit that are relatively fixed. For small deposits these costs must be spread over fewer wells, thus increasing the per unit cost of production. Furthermore, both interstate pipelines and existing storage capacity are near capacity. This makes bringing more production online problematic because existing capacity is already under contract for handling production elsewhere.

Issues for NC Landowners

There are currently only a very limited number of companies seeking exploration and production rights in North Carolina. Most of these companies are relatively small. However, Penn State Extension has noted that oil and gas rights owners typically see the best lease terms when there are several companies making competing offers. (Liss 2011).

Production of natural gas using existing hydraulic fracturing technology requires units of land that range between 640 and 1000 acres. The fragmented nature and small size of land holdings in North Carolina means that considerable effort would be required in most cases to assemble adequately sized production units. Such land consolidation efforts are often undertaken by so-called "landmen." Landmen may be paid on per-day or on a commission basis to acquire leases in sufficient blocks to support gas exploration and development. It is not unusual for landowners to receive unsolicited offers to lease their gas and oil rights from landmen. Such offers should be

treated with caution by landowners and should be reviewed by an NC-licensed attorney retained by the landowner who is familiar with oil and gas law.

The process of assembling sufficient units for oil and gas exploration is complicated by issues of ownership of the resource. Many landowners do not own the rights to any oil or gas under their land; and many such landowners may be unaware of that fact. This is not the first time in the history of North Carolina that there has been oil and gas exploration activity so it is possible that the rights were previously transferred. Historically, many transfers of property have been made in North Carolina that included only surface rights where subsurface rights were retained by another owner. Due to a variety of factors, it is often difficult even for an experienced attorney to determine ownership of these rights with complete certainty.

A landowner who warrants that he owns the oil and gas rights or water rights in an agreement with a lessee may be required to pay the costs of any lawsuit that is filed by another claimant to those rights, even if the claim is ultimately proven to be invalid. If the claimant to the rights wins the lawsuit, the liability of a person who guaranteed ownership of oil and gas rights to a lessee can be staggering. For example, there has been considerable litigation over ownership of rights to natural gas that has been produced from the Marcellus Shale in Pennsylvania.

Leasing of land for gas production by farmers and other landowners may conflict with existing obligations. This is often the case where the property serves as security for either a private loan or a direct loan from the Farm Service Agency (FSA). FSA may require that payments from gas production royalties be used to repay existing loan obligations. This may create serious financial hardship if the landowner has no other funds from which to pay taxes on the royalties.

In addition, some private financing arrangements prohibit gas leasing. The reluctance of lenders to make loans on property subject to gas leases may jeopardize future attempts to sell the property. If there is a conservation easement on any of the property proposed for the gas lease, signing the lease likely violates the terms of the conservation easement. Where the landowner has put conservation practices in place with cost-share from the federal or state sources it may be necessary to repay those moneys if the land is leased for oil and gas production.

For landowners whose land is enrolled in the North Carolina's present use value (PUV) tax program, gas exploration and production activities may invalidate continuation of all or part of that land in the PUV program. If so, then gas exploration and production activities may result in much higher property taxes. Moreover, in addition to higher taxes in the year that the land use changes, the landowner will be liable for rollback tax – that is, repayment of taxes not paid over the previous three tax years that the property was in the PUV program.

The impact of hydraulic fracturing on both the quantity and quality of local water resources is an additional concern, particularly for farmers who irrigate, users of private wells, and operators of groundwater-based community water systems. Hydraulic fracturing requires large volumes of water. A lease that fails to restrict water use by the gas production company may result in restrictions on the landowner's access to water for agricultural operations. Gas production sometimes results in groundwater contamination primarily as the result of defective well casings. Surface water may be contaminated by spills and other accidents of return flow fluids that contain both the chemicals used for the hydraulic fracturing process and any chemicals acquired from contact with the gas-bearing shale.

Disruption of the farming operation from gas exploration and production activities has been a recurring issue in locations where

hydraulic fracturing has taken place (http://live.psu.edu/story/59331#rssMarcellus_s_hale). Drilling pads may take up ten acres or more on at least a temporary basis. Additional space is needed for parking, space for equipment storage, access roads, pipelines, waste storage, water storage, and other activities related to gas production. Pipelines need to be below plow depth to minimize disruption to agricultural operations. Even so damage done to soils in placing feeder pipes may reduce yields.

Finally, allocation of liability to third parties that may arise from accidents from gas exploration and production activities is an important issue. Indemnification clauses in leases can help protect landowners if they are required to pay legal fees, costs, and any judgment arising from legal actions related to an accident. Even if the lease contains an indemnity clause it may not apply to a subsequent purchaser of the lease. And if the production company files for bankruptcy protection, an indemnification clause may be of little use.

Concluding Remarks

Gas production has proven to be an excellent economic opportunity for landowners in some states. Whether this proves to be the case for North Carolina landowners will depend upon the factors discussed above, as well as action that might be taken by the N.C. General Assembly in the near future.

If the General Assembly passes a new law allowing hydraulic fracturing and fluid injection for natural gas production, the manner in which the legislation is crafted will be important to whether or not a gas industry is economically viable within the state. Most of the major oil and gas producing states have some form of compulsory pooling or unitization. These laws are designed to combine ownership interests into production units large enough to reduce physical and economic waste. Such legislation is always controversial, however, because it

requires the use of the power of eminent domain to force resource owners into production units. With hydrocarbon-bearing shale, a holdout owner can limit extraction of a significant portion of the resource within a given geographic area. This generally means that additional wells will be needed to circumvent the holdout; it also usually means that some of the resource will remain as stranded gas.

For more information:

Extension faculty of the Department of Agricultural and Resource Economics have created a natural gas information website at <www.ag-econ.ncsu.edu/gasleasing.html>

References

Liss, J. 2011. "Negotiating the Marcellus: The Role of Information in Building Trust in Extractive Deals."

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U.S. Energy Information Administration. 1993. "Drilling Sideways -- A Review of Horizontal Well Technology and Its Domestic Application." <http://www.eia.gov/pub/oil_gas/natural_gas/>