NATURAL GAS DRILLING
FACTS AND ISSUES
LEAGUE OF WOMEN VOTERS OF TARRANT COUNTY
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At our annual meeting in May 2006, the League of Women Voters of Tarrant County (LWV-TC) adopted a new study on the impact of gas well drilling in Tarrant County. The scope covers the extent of drilling, the technical process and amount of land needed for drilling, legal and safety issues for current and potential land owners including real estate values, impact on environment and measures to alleviate the impact, and economic costs and legal aspects for energy producers.

Introduction

Natural gas is a relatively clean burning source of energy that is used for electric generation, heating, cooking and many manufacturing processes. It currently provides about 25% of all energy used in the United States. The demand for natural gas and other energy sources is rapidly increasing as world population grows, the standard of living rises, and the world economy expands. At present, Texas is expected to reach its electric generating capacity by 2011. While there are many alternative fuels – coal, wind, solar, water, biomass fuels, and most importantly, conservation and more efficient use of energy – these, by themselves, will not meet the demand for power in the foreseeable future. Therefore, the demand for natural gas will continue to rise. However, like everything else, natural gas production comes at a cost. And today, in Tarrant and surrounding counties, thanks to Barnett Shale, we are reaping both the benefits and the disadvantages of being a major natural gas supplier.

Barnett Shale

Barnett Shale is potentially the largest gas development in the lower 48 states and rivals the Alaska's North Slope in potential gas resources. The producing area covers 15 counties in North-Central Texas (Bosque, Cooke, Denton, Ellis, Erath, Hill, Hood, Jack, Johnson, Montague, Palo Pinto, Parker, Somervell, Tarrant, and Wise). In 2005, the United States Geological Society estimated undiscovered natural gas resources at 26.2 trillion cubic feet. Production in the field was 494 billion cubic feet in 2005 (8 percent of Texas production) and 334 billion cubic feet in the first seven months of 2006.

According to the Texas Railroad Commission web site, as of October 2006 there were 5,205 gas wells and 2,612 permitted locations in the Newark East (Barnett Shale) production area. as of September 2006, county statistics list 820 wells in Tarrant County. As a result, gas drilling companies have opened and/or expanded their offices primarily in downtown Fort Worth. Gas drillers are also hiring oil field workers to drill the wells, landmen to lease mineral rights from current owners, etc. One source estimates 5,000 new jobs have been created in the area. Local property owners including governmental jurisdictions such as the City of Fort Worth are also leasing their mineral rights to drillers and receiving signing fees and royalties. A recent *Wall Street Journal* article compared the economic impact of the natural gas field to the location of a Fortune 500 company in Fort Worth.

The Drilling Process

Most of you have now seen a drilling rig working somewhere in the area. They are hard to miss at 120 to 140 feet high, and are actually quite lovely to see with all their lights ablaze, provided one isn't in your backyard. The rigs require 1,500 horsepower diesel engines to drive the drill bit, and must run 24-hours per day once drilling begins. These engines emit smog producing chemicals. The North Central Texas Council of Governments has offered some grants to encourage large-scale drillers to reduce their emissions.

The Fort Worth permit regulation requires that the noise be no more than five decibels higher during the day than the ambient (background) noise and three decibels higher at night. No such regulations exist in the county. Wells are usually situated as near a road as possible to minimize road construction costs and in the City of Fort Worth this also results in an area with higher ambient noise level.

The drill pads range from one to five acres. The drill site or pad is cleared of all vegetation, access and service roads built, and pipes and electric lines secured. A water storage pond is created to hold the millions of gallons of water needed during drilling. A water well is drilled or water is trucked to the site. The drilling company trucks the drilling rig onto the prepared site and centers the drill platform over the selected drill point. The well is drilled and then water and chemicals are pumped into the well to fracture the shale, freeing the trapped gas. Some of the approximately 4.5 million gallons of water is used in the drilling process, but most is used to fracture the well. After the fracturing is complete the flow-back water, which is now black and full of pollutants, must be trucked away for disposal or recycled on site.

After the gas is flowing, the well head remains a tangle of pipes with a collection tank, hardly an ornament to anyone's front yard. In addition, a sludge pit, piles of rock from construction, and drilling and other surface destruction can occur. The Texas Railroad Commission requires that the distance between the well head and a house must be at least 200 feet. The City of Fort Worth requires 300 feet minimum and 600 feet in high impact areas without special approval. Flower Mound requires 1,000 feet separation.

Apparently spacing is largely dependent on the level of risk that each jurisdiction or entity considers acceptable. Some experts feel the distance for minimum spacing should be at least 1,300 feet (.246 mile) to minimize the risk of possible explosions.

Legal and Equity Aspects

Under Texas law, mineral rights are dominant over surface rights. When the estates have different owners, the mineral lessee has the implied right to use as much of the surface as is "reasonably necessary" for exploration and development of the mineral below the surface. The surface owner does not need to consent to the land usage, and the mineral lessee is liable for surface damages only in limited situations. Texas courts have ruled that "reasonable use" includes use of any water found above or below the surface;

installation of necessary structures and pipelines; and the right of entry and egress onto the property. The lessee is not liable for failing to restore the surface when operations cease, completely draining underground aquifers, or causing subsidence. Typically, mineral reserves are located in rural areas with limited surface development thus diminishing the potential conflict between surface and mineral right owners. However, the Barnett Shale deposit is located in an area with a 2005 population of over 2 million.

Another problem with drilling in an urban area involves parity in signing bonuses and royalty percentages. An article in the Business Section of the *Fort Worth Star-Telegram* on January 8, 2007, noted that amounts granted for signing a lease range from $125 for those signing early, to $400 for residents in organized neighborhoods. Royalties vary as much as 10% between leaseholders. The article suggested that landmen might be taking advantage of less informed residents.

Legal conflicts can also arise when a gas well pumps gas from the property of an adjoining mineral rights owner. Reports indicate such an occurrence in Johnson County.

Water and Gas Drilling

Water is a very critical component of gas drilling for the following reasons: (1) The drilling/fracturing process has the potential to pollute existing aquifers; (2) The drilling/fracturing (fracing) process for one well requires an average of 4.5 million gallons of water; (3) The water disposal process has the potential to pollute existing aquifers. The Railroad Commission is the agency charged with regulating the disposal of oil and gas waste as well as the entire gas drilling process outside cities.

The gas drilling/fracing process has the potential to pollute both the shallow and deep aquifers in this area. The space between the production casing and the earth creates a passageway for gas to escape into different areas (horizons). Gas can work its way up the crack and poison large shallow fresh water reserves. If the drill or fracing process goes too deep it hits the Ellenberger Zone of water. If water seeps into the well it is ruined for gas production, so drillers take every precaution to prevent this from happening.

The water usage for drilling and fracing the 5,205 active wells in the area equates to annual average water usage for at least 185,000 households. In fiscal year 2005, the City of Fort Worth sold 577,133.4 cubic feet of water to gas drillers for $996,699.10. In the fall of 2005, the City put a moratorium on contract meters for gas drillers. However, the existing meters can follow the gas drilling activities, though each new meter connection must be supervised by Water Department personnel**.** The City of Fort Worth charges $2.33 per 100 cubic feet plus a monthly service charge for a 4-inch meter of $82. If residential users consumed the vast amount of water used by gas drillers in a month, their average rate would be $2.83 per 100 cubic feet plus an $8.00 service fee.

The drilling process is a one-time usage; however, fracing may be required after two or three years of production. The number of wells continues to rise with up to 250 wells in planning on DFW Airport alone.

The Fort Worth area is already using all the existing available surface water in this area and must import a large supply of its water from East Texas, a situation that is only going to worsen. The Texas Demographer estimates that the population of Region C, which is now under 6 million, will balloon to 13.3 million by 2050. This will require an estimated $20 billion in capital investment for new water sources. Water conservation projects will also be necessary to meet at least 30 percent of the new demand. The new water sources will require flooding irreplaceable bottom lands in East Texas. Needless-to-say, the residents of East Texas will not give up their land willingly.

In the past 18 months, water supply issues have been exacerbated by severe drought conditions in the Fort Worth area. Parker County water well levels have dropped significantly over the past year, due to a combination of rapid residential development and industrial uses such as gas wells. Local and state officials are considering the formation of a water conservation district to try to control the amount of water pumped from local aquifers. Texas law gives the right of capture for groundwater to property owners, making controls problematic.

According to a September 18, 2006, article in the *Fort Worth Business Press*, Devon Energy, XTO Energy and Pitts Oil Co., have formed a group called the Barnett Shale Water Conservation and Management Committee, which will work with the Gas Technology Institute of Des Plaines, Ill., to examine methods to conserve and recycle water used in the fracturing of rock during the drilling process. Devon is already working with a company that uses evaporator units to treat the water, and several companies are experimenting with using smaller amounts of water when fracing.

Most of the water used in fracing operations must be transported in by trucks prior to a fracture treatment, and then transported away for disposal afterwards. For the most part, these vehicles travel county and local roads, sharing space with normal traffic. A single well will have more than 100 water-haulers servicing the well during fracture stimulation creating noise and possible safety issues**.**

Disposal of the flowback water is of great concern. The drilling and fracing process pollutes the millions of gallons of water used at each drill site with at least 26 chemicals including carcinogens such as benzene. Currently most of that water is hauled away to be injected into deep dry wells. There is concern that, if done improperly, this highly polluted water will migrate into existing aquifers, reducing the supply of ground water in Texas. In any case, the injected water is lost to the surface water system.

The City of Fort Worth is considering ways to sell partially-treated water from the Village Creek waste-water plant to oil drillers. Impediments include the cost of new pipes to deliver the water and possible pumping costs. This, of course, does not solve the disposal issue. A better alternative, which at least its proponents feel is cost-effective, is a portable water recycling unit at or near the drill site.

Water Recycling At this point, there are two types of portable water recycling units; one using an evaporative method and the other reverse osmosis. Last year, the Texas Railroad

Commission approved a pilot project in Wise County with the Fountain Quail Water Management of Jacksboro. It uses an evaporative unit manufactured by a Canadian company. Texas A&M has developed a portable unit that uses reverse osmosis to decontaminate the flow-back water. The recycled water can be used for livestock, agriculture, and industrial uses, reducing the truck traffic for water disposal and the need to inject the polluted water into a deep-water well. As the cost of water and water disposal increases, these units become more and more cost-effective. From a public standpoint, they probably are already more cost-effective by reducing (a) water usage, (b) the loss of water to the water cycle, (c) truck-traffic in and out of the drill site, and (d) the risks associated with deep well injection of the flow-back water.

Safety Issues

Towering above Fort Worth's urban setting, new drilling derricks pop up in a new location daily. Though we may not have personal experience with a well-drilling operation in our neighborhood, most of us recognize the inherent safety risks associated with this process. Although we all want the income and economic benefits of the gas wells, community safety, not profit, must be the chief concern of local government.

Background Methane, otherwise known as Natural Gas (NG), is odorless, colorless and lighter than air. As used today, Natural Gas appears to be benign and safe when handled properly. In reality, NG continues to be a very dangerous substance.

In March 1937 in New London, Texas, a public school was heated using NG. A pipe leaked in the school's boiler room and natural gas accumulated. *A* spark in the wood shop triggered an explosion killing over 300 children and their teachers.

This tragedy spurred state legislation to encourage the development of an odorant additive which would allow easy detection of NG's presence. The odorant developed, secondary butyl mercaptan, helped give NG a reputation for safety. Of course, it remains a hazard for those with no sense of smell.

Recent Concerns On April 22, 2006, an explosive rupture at a drilling site in Forest Hill killed one employee and necessitated the evacuation of all residents within one-half mile of the drill site. Explosions such as this are rare, probably in part because drillers use utmost care to mitigate risks. Close proximity to homes and businesses makes such precautions even more important. Drill-site workers have an added incentive because they are the most likely to be injured in any drill-site accident.

Gas Collection The safest, most efficient way to collect natural gas extracted from completed wells is to transport it by a network of piping to a central collection point. The necessary pipeline construction scars the landscape and is harmful to natural flora and fauna.

The pipeline collection system can be visualized as a network of pipes in varying sizes that carries the gas to initial dewatering tanks, then to pump stations where the line

pressure is increased, transporting greater volumes of compressed NG onward to other processing stages (odorizing the NG) and ultimately into a network of distribution to end users.

This network of buried ferrous-based piping must be protected from numerous corrosive conditions such as acidic or alkaline soil, as well as galvanic action, which weaken pipe walls by thinning and/or pitting. The resulting unstable piping has the potential to leak or rupture, an enormous safety issue.

Gas pipeline ruptures occur every year in some part of the nation, typically as a result of some type of construction-induced rupture or deterioration of the pipes. The more pipes, the more chance for ruptures. Buried piping must be identified, including signage at the surface to prevent inadvertent damage by unrelated construction activities. Pipeline damage has occurred with hazardous releases of NG under pressure, occasional explosions, and fires due to improper activity on unidentified pipeline locations. The very nature of an urban environment demands careful planning, location, and construction of any pipeline network. To tolerate less would worsen an already-marginally safe system. Obviously, space is far more cramped in an urban setting than in a rural setting. In either, vigilant planning and continual monitoring are essential.

Associated Concerns Gas drilling requires a massive number of trucks to haul equipment and water to and from drilling sites. Often these heavy trucks traverse roadways not designed for the excessive weights and high traffic volume, shortening the life of these roads. The personal vehicles sharing these roads are exposed to serious safety issues from the trucks themselves as well as the poor road conditions they create. Additional truck traffic also pollutes the air and increases noise along roadways. These hazardous conditions, integral throughout the drilling process and as the pipeline network develops, continue long after the well is completed, although at somewhat lower levels, due to the support required by producing wells. Though not a human safety issue, the loss of habitat and food sources caused by burying pipelines is an environmental hazard with serious consequences to wildlife and to the land. Pipelines also devalue contiguous property.

Summary

The need for more energy will increase along with population and economic growth. Given the advantages of natural gas as a fuel, drilling in the Barnett Shale will continue. The conflict arises because this is the first time that a large quantity of a valuable natural resource has been discovered beneath a major metropolitan area and is exacerbated by Texas law which, developed in an era when the exploitation of these resources was encouraged, has consistently favored mineral rights over other considerations. In this study we are working toward finding compromises between competing interests and alleviating the adverse effects of drilling on people and the environment.

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