GRESHAM COLLEGE
Founded 1597

The Regulation of Shale Gas Extraction Transcript

Date: Monday, 23 March 2015 - 1:00PM

Location: Museum of London

23 March 2015

The Regulation of Shale Gas Extraction

Professor Terence Centner

Today I want to share with you some information and observations from what has been occurring in the United States over the past decade. The development of shale gas resources concerns the United Kingdom because the country has significant shale gas reserves. It also concerns all of us because some countries in Europe may want to reduce their dependency on current energy suppliers by developing their shale gas reserves. Yet many people are concerned about health and environmental quality. So today I will share with you some information about hydraulic fracturing and its risks.

Now let's return to our question of whether the extraction of shale gas can be done responsibly and safely. For activities with dangers, we rely on governments and institutions (laws and regulations) to safeguard people and the environment. The extraction of shale gas is dependent on hydraulic fracturing, horizontal drilling, and a distribution system for the recovered gas. We want to learn about the technologies and operations used for developing shale gas resources.

We have had widespread drilling for oil and gas deposits for more than 100 years in the United States. Until the 1990s, most of this recovery has occurred from conventional wells that were drilled down to a rock formation from which hydrocarbons could be pumped to the surface. However, the discovery of hydraulic fracturing in the late 1940s was later accompanied by technology that allowed horizontal drilling. This has been perfected over the past two decades. There are numerous shale plays in the United States from which shale gas can be extracted, and firms are busy drilling wells in many areas of the country. Shale gas has become a major source of natural gas produced and used in the United States and currently accounts for approximately 40 percent of the natural gas used by the country.

Of course, other deposits of shale gas exist in the world, with noteworthy deposits in China, Russia, Brazil, and Argentina. While the United Kingdom's deposits are not as impressive as those in some of the noted countries, they are significant enough that firms would like to produce shale gas.

The Technologies

From my discussion, you have gathered that shale gas is natural gas (methane) in rock formations deep underground that previously was not feasible to extract. Its extraction today depends on hydraulic fracturing and horizontal drilling. Hydraulic fracturing is the use of pressure to force liquids containing proppants (often sand) into rock strata so hydrocarbons are available for extraction. Current technology uses water, sand, and miscellaneous fluids, some of which are toxic. These materials must be imported to the well site. A wellbore is drilled and then the fracturing fluid is forced through holes in the casing into the shales. High pressures are used to create fissures where the proppants are deposited to hold open fissures so that hydrocarbons can be released. Hydraulically fracturing occurs in a number of stages and the fracturing fluid is forced into a small portion of the wellbore at each stage.

After the hydraulic fracturing is completed, some of the fracturing fluid comes back up the well. Because the flowback and wastewater from a well normally contain toxic materials, it must be disposed of in a manner that does not create any health, safety, or environmental problems.

Choices in Embracing Hydraulic Fracturing

In the United States, many areas have embraced hydraulic fracturing due to the jobs, economic development, less expensive energy, and the reduction on foreign supplies of energy. More than 47,000 new wells were drilled in the U.S. in 2013, more than one million "frac jobs" have been performed in the U.S., and more than two million "frac jobs" have been performed in the world.

The development of the U.S. shale gas resources has had a large impact on the American economy. For 2015, it is estimated that the development of America's shale gas resources will employ 869,000 people. The shale gas industry will have capital expenditures of $48 billion and pay more than $28 billion in federal and state taxes this year. Due to shale gas, the U.S. is using less coal and the country's electricity costs have been lowered by about ten percent. Shale gas has also contributed to a decrease in imports of foreign natural gas. So the development of American shale gas deposits has been accompanied by notable benefits.

Yet everything is not positive. The development of shale gas resources is associated with toxic pollutants and environmental problems. First, it needs to be mentioned that the American federal and state governments were not prepared for the problems that accompany shale gas development. The lack of sufficient regulatory oversight allowed some unfortunate situations and damages that could have been prevented. Governments have responsibilities to their citizens and in my opinion should not be allowing an industry to foist unreasonable damages on workers and people living in the area where energy resources are being developed. This is the topic of my presentation today. I want to share with you problems from the United States so can we discern whether it is possible to handle risks associated with shale gas production sufficiently to allow firms to engage in hydraulic fracturing.

European countries are approaching hydraulic fracturing more cautiously. Governments and people have concerns about health, communities, and the environment. Many people feel there is not enough information to show that the technology can be used safely. The most notable concern is human health given the toxic fluids used in hydraulic fracturing and the air pollutants generated in developing natural gas resources. There are also environmental and community issues that need addressing. Given the lack of complete information on the problems accompanying shale gas development, different people will reach different conclusions on whether governments should allow hydraulic fracturing to proceed.

Providing Oversight for Safe Activities

Let's look at the activities involved in shale gas development to gather information on whether it is safe to extract these natural gas deposits. Safety depends on governmental institutions being in place to protect people and the environment from harm and damages that may accompany shale gas development.

Sites where wells will be drilled for extracting shale gas are associated with problems. They often cover about 2 hectares and involve traffic, noise, light, dangerous equipment, and toxic chemicals. The activities and conditions at a site create a potential for contamination and environmental degradation. The risks of damages to humans and the environment form a justification for opposing hydraulic fracturing.

So why are the United States and Canada allowing hydraulic fracturing and European countries are still considering whether to allow firms to employ this technology? Americans are more familiar with oil production and are more receptive to accompanying technologies. They accepted hydraulic fracturing and felt the unintended consequences could be managed. Europeans are waiting until the activities and technologies can be done safely. On both continents, governments are balancing economies, social institutions, and environmental quality. Given different conditions and priorities, they balance things differently. Europeans embrace a sustainability model that requires additional information before determining whether hydraulic fracturing might be a beneficial activity.

Turning to experiences in the United States, the absence of suitable federal controls has meant that the individual state governments have needed to undertake adopting the requisite institutions to protect people and environmental quality. Developing regulatory controls is a cumbersome, politically influenced regulatory and legislative process. States have had to develop expertise and learn how to manage the risks that accompany hydraulic fracturing. In many cases, industries operating within the state have exerted too much influence in developing regulatory controls. Hundreds of lawsuits concerning property rights, damages, and other controversies have been filed against firms engaged in hydraulic fracturing.

Concerns and Risks

What are the concerns accompanying hydraulic fracturing? People are worried about health, environmental quality, and community impacts. These concerns do not simply relate to hydraulic fracturing but also involve other activities. People's concerns involve the (1) drill pad construction and operation; (2) groundwater contamination; (3) hydraulic fracturing and flowback water management; (4) blowouts and hose explosions; (5) water consumption and supply; and (6) spill management and surface water protection. Because these activities accompany the use of hydraulic fracturing for shale gas development, the public associates hydraulic fracturing as being the cause of these problems.

The major risk involves damages from the toxic chemicals used in hydraulic fracturing. The fracking fluid is approximately 99.5 percent water and sand (or other proppant) and 0.5 percent additives used to enhance hydrocarbon recovery. An average of 5000 gallons of chemical additives may be used to frack a well. The additives might include an acid, biocide, breaker, corrosion inhibitor, friction reducer, gel, iron control, oxygen scavenger, ph adjusting agent, scale inhibitor, and surfactant. Some of the additives contain chemicals that are toxic. Since different chemicals and different amounts are used at each well, the toxicities may vary. This is important since toxicity is the degree to which a substance can damage an organism.

Under U.S. federal law, the chemicals used at a well are exempted from full reporting requirements. Under most state laws, the supplier or the service company of a fracturing operation must disclose information unless the chemicals are claimed as a trade secret. In 2012, it was estimated that in approximately two-thirds of the cases, the complete chemical compositions were not reported.

Chemical secrecy is a problem because persons working at wells and persons who come into contact with chemicals used at a well do not have sufficient information to know whether they need medical attention. Without timely information of the chemicals involved in a spill or release, first responders to emergencies, health professionals, and property owners may lack key information for deciding what actions they should take. Moreover, there have been cases where emergency and medical personal are required to sign written confidentiality agreements before they are granted access to all of the information on the chemicals that were used at a site. Sometimes, the agreements preclude emergency personnel from sharing information with others who may be able to offer assistance.

In February 2015, the Ground Water Protection Council and Interstate Oil and Gas Compact Commission announced a plan to reduce the amount of data kept hidden as trade secrets. While this should help some people exposed to toxic materials, it doesn't completely respond to the issue of secrecy. It is not clear that the need for trade secrets justifies the benefits that would accrue from full disclosure of toxics present at a gas well. Full disclosure would allow for earlier and more complete medical assistance, and might spur the development of less toxic alternatives that could replace the use of toxic chemicals at wells.

Management Practices

Issues are also being raised about the need for better management practices to reduce the risks that accompany shale gas development. Hundreds of best management practices have been identified to employ during energy development and extraction. Currently, most of these are voluntary. Should governments and firms be doing more to protect people and the environment? In the absence of mandatory management practices covering all of the stages of shale gas development, there are not sufficient assurances that people and the environment are adequately protected against health and safety problems. By adopting more mandatory management practices, the industry may be able to reduce the risks to show that shale gas development would be beneficial.

The idea of voluntary best management practices has been adopted in a certification program administered by the Center for Sustainable Shale Development. This Center is located in Pittsburgh, Pennsylvania, and was formed as a collaborative effort among environmental organizations and energy companies to encourage prudent and responsible development of shale gas resources in the Appalachian region. In 2013, the Center advanced 15 performance standards for air and water delineating superior management practices to be used in shale gas production. The Center operates an independent third-party evaluation and verification program for certifying operators based on their compliance with the Center's performance standards. Certification is valid for 24 months, after which operators can seek renewal.

Two performance standards can be noted to show how they encourage better practices. One standard addresses recycling wastewater with the requirement that operators maintain a plan to recycle flowback and produced water to the maximum extent possible. For 2015, an operator must recycle a minimum of 90% of the flowback and produced water from its wells in all core operating areas in which the operator is a net water user. A second standard concerns the use of pits for drilling fluids on the surface. The Center requires that after 20 March 2015 operators contain drilling fluid and flowback water in a closed loop system at the well pad. This standard precludes the use of pits that have been known to contaminate soil resources.

Lessons from the American Experiences

The American experiences can be helpful in discerning whether the United Kingdom might proceed with shale gas development. The activities connected with developing shale gas can be assessed to learn about the risks, dangers, and problems that need to be addressed. Then, existing laws and regulations can be evaluated to determine their probable success in addressing the risks. Additional regulations can be developed if they are needed. Firms and governments can be required to adopt best management practices. Governments can require disclosure of dangerous materials used in hydraulic fracturing and establish funding mechanisms to pay for regulatory oversight and for providing monies to be used to remedy future damages.

I suggested that hydraulic fracturing might have beneficial economic consequences. Looking at the United States, there have been benefits but the costs to people and communities are not fully known. The costs will depend on future unknown medical problems. For the UK and countries of the European Union, the American experiences provide some insights on general problems from shale gas development that need to be addressed more successfully: groundwater monitoring, pits and surface impoundments, costs to communities, venting, air pollutants, disclosure of toxics, clean-up costs, and funding for future damages. But these problems are not insurmountable.

Whether a region or a country would benefit from hydraulic fracturing to develop shale resources depends on its priorities. Each will have to make its own decision. It is probable that some countries will decide that health and environmental concerns outweigh economic advantages associated with new natural gas supplies. However, other countries can attain benefits from hydraulic fracturing by securing domestic energy sources to supplement natural gas currently coming from monopolistic suppliers.

People within a country may also have different answers as to whether to proceed with hydraulic fracturing. Some will be risk averse and fear future health damages while others may favour new economic development that would accompany the extraction of shale gas. These divergences of opinion raise another important question: who will make the decision of whether to allow hydraulic fracturing? Decisions might be made by communities, a regional government, or a higher level of government.

In the United States, communities are being sued due to their restrictions on shale gas development. State and local governments are arguing whether there is a role for local governments in overseeing shale gas development. A fundamental tenant of our democracies is citizen participation and the question is whether participation needs to be available at the local level in prescribing conditions for the use of hydraulic fracturing. In my opinion, local governments deserve to be able to respond to citizen concerns about local health and environmental issues. State legislatures advancing comprehensive regulatory systems over hydraulic fracturing need to proceed cautiously to avoid trammelling options that are needed to control negative externalities at the local level.

However, regardless of whether the participation is at the local, regional, or state level, we are fortunate that we live in societies with options under which the development of shale gas resources can be debated in public forums. I celebrate this good fortune and forums such as this for discussing our views.