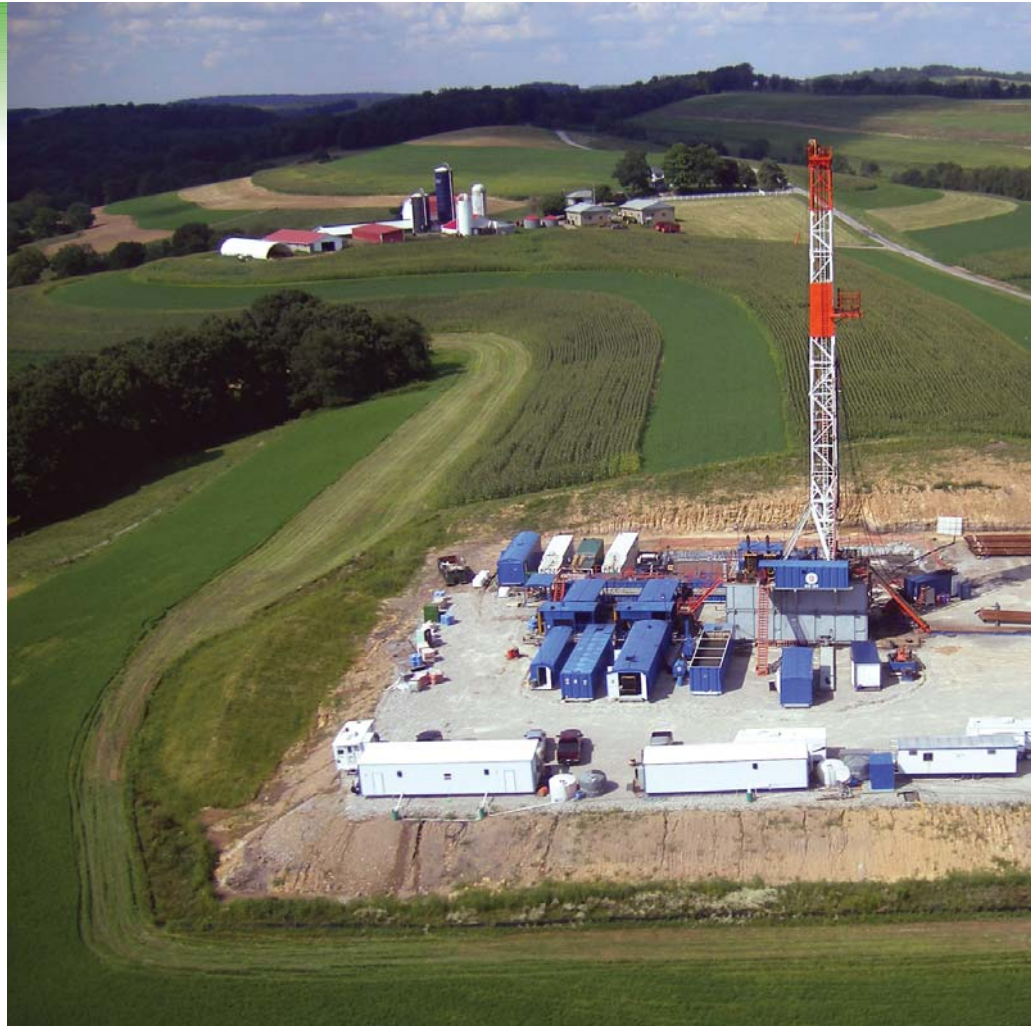


In 2004, a natural gas exploration and production company in Southwestern Pennsylvania went to work developing the first well in the Marcellus Shale. It was a gamble.

The vast underground formation, long known by geologists to have the potential to contain natural gas, had gone unexplored. It was assumed the formation posed too many risks: too expensive to drill and too complicated to produce quantities of gas to justify the cost.

Six years later, the Marcellus Shale is the largest and potentially most successful shale gas reserve in North America, due in large part to significant advances in exploration and production technology over the past two decades, tested and perfected in other parts of the country with shale formations.

Currently, Marcellus production stands at approximately 500 million cubic feet of natural gas per day, about equal to all production from Pennsylvania's 50,000 traditional gas wells. Already, Marcellus production has doubled natural gas production in the state. This home-grown resource will allow Pennsylvania to become a net exporter of natural gas by 2014. The industry continues to add a significant number of jobs to Pennsylvania's economy – an estimated 48,000 in 2009 alone. Landowners across the Commonwealth are enjoying the financial benefits of leasing their land.



A Marcellus Shale drilling rig operating in Washington County.

Natural gas and the future of Pennsylvania

Critical facts about hydraulic fracturing

By **Kathryn Z. Klaber**

Hydraulic fracturing has made drilling into the Marcellus Shale possible, yet the process is not well understood by the general public and, unfortunately, subject to speculation.



Drill pad restoration: A restored well pad typically takes up the space of a two-car garage.

None of this would be possible without the use of hydraulic fracturing. Yet this process is not well understood by the general public and, unfortunately, subject to speculation. It is time for Pennsylvanians to get the facts about this critical aspect of natural gas production.

Hydraulic fracturing involves pumping large quantities of water, sand, and additives through a small underground wellbore and into tiny fissures that have been forced open in a gas-bearing formation such as shale. These fissures act as pathways for natural gas molecules to escape into the wellbore and rise to the surface. This technique, often called “fracking,” was pioneered near Clarendon, PA during World War II. It is now used in 95 percent of all wells drilled throughout the world.

The fracking process takes place after a well has been drilled to its desired horizontal and/or vertical depth. In advance of fracking,

numerous measures are taken to ensure the well will be completed safely and protective of the environment.

Natural gas production companies invest millions of dollars to develop a single well. Protecting that investment through safe operations and successful completion is in the best interests of the business and its owners. Environmental protection is integral to the economic success of the enterprise—a fundamental part of doing business in the 21st Century.

The first layer of protection in the Marcellus is natural geology: the shale lies 6,000-8,000 feet below the ground surface in Pennsylvania. The deepest freshwater aquifer is typically less than 200 feet deep, which means all production activity in the Marcellus Shale is separated from freshwater resources by at least a mile of solid rock. It is all but impossible for fracturing to impact freshwater aquifers, as stated in a June 9, 2009 letter from the Department of Environmental Protection to the Groundwater Protection Council and confirmed by countless environmental protection agencies nationwide.

continued on page 24

Critical facts about hydraulic

continued from page 23

The second layer of protection comes from the well-casing design. A Marcellus Shale well is isolated from the surrounding geology by up to five layers of progressively smaller-diameter steel casing and layers of cement that are forced down each length of casing and outside the wellbore, filling the annulus—the space between the casing and the earth. These layers of steel and cement extend the entire length of the well up to the surface, thereby creating an impermeable barrier between groundwater and the natural gas flowing up the well.

The final step in developing a well prior to fracturing is to perforate, or “perf” the casing and cement in the shale formation. This takes place after a series of tests, including pressure tests, to ensure the integrity of the well casing and cement layers. Then a perforating gun is placed down the wellbore at a specific location in the deep shale. A charge, similar to a rifle shot, perforates the casing, cement and the shale formation to create the fissures that contain natural gas. The fissures must then be propped open with sand and/or ceramic beads used in hydraulic fracturing. Fracture crews are on hand at all times to monitor the fracture process, which may take up to a week of round-the-clock activity.

Natural gas production companies invest millions of dollars to develop a single well. Protecting that investment through safe operations and successful completion is in the best interests of the business and its owners. Environmental protection is integral to the economic success of the enterprise—a fundamental part of doing business in the 21st Century.

Proposed legislation would deal a permanent and severe blow to the industry

But because natural gas development is not widely understood, we are seeing lawmakers and special interests push new requirements on the industry, even with a thorough set of

regulations and laws already on the books. For example, members of Congress have proposed a bill, called the “FRAC Act,” that would impose new federal regulations on hydraulic fracturing, resulting in higher costs for natural gas production without any additional environmental benefit. According to a study by IHS Global Insight, the FRAC Act would deal a “permanent and severe” blow to the natural gas industry, reducing domestic production by 45 percent, and result in the U.S. importing more natural gas from countries without the stringent environmental laws developers must follow here in Pennsylvania and in other states.

There is little question that this kind of legislation would cost Pennsylvanians thousands of well-paying jobs and hundreds of millions of dollars in state and local tax revenues. And it would discourage development of the very domestic energy supply we should be promoting in this country.

The facts simply do not justify such prohibitive legislation:

- 1,000,000 natural gas wells have been hydraulically fractured in the United States since the first commercial fracturing treatment was performed in 1949.
- Zero freshwater aquifers have been contaminated by hydraulic fracture stimulation in the past 60 years.

The next time the topic of Marcellus Shale comes up and conversation turns from the economic benefits to environmental protection, consider these additional facts:

Land conservation: As many as 16 horizontal wells can be drilled from a single drilling pad, draining natural gas from areas as large as 1,000 acres. This modern approach creates disturbance of only about 1 percent of the drained area. Achieving a similar rate of production from vertical wells would require disturbance of about 20 percent of the surface area. Horizontal drilling in the Marcellus creates very little surface disturbance to access a tremendous amount of clean-burning fuel—

in one year, a well generates enough natural gas to heat approximately 24,000 homes.

Water Use: Water withdrawals for hydraulic fracturing are regulated by DEP, in addition to the Delaware and Susquehanna River Basin Commissions. Water withdrawn from a stream or river is limited to a restrictive rate to ensure a healthy flow is maintained in those waterways, preventing adverse impacts to fish and aquatic life.

Flowback Water Management: The management of flowback water starts with regulations that require drilling companies to account for every aspect of their water use, treatment and disposal. The approach is similar to a manifest system used to regulate many different material handling operations across the country. The Marcellus industry in Pennsylvania has pioneered new recycling capabilities, with drilling companies now able to recycle in excess of 60 percent of the total flowback. Water requiring treatment is sent to a permitted industrial water treatment facility, or in very small quantities, to sewage treatment plants permitted to accept it. Additional dedicated treatment capacity is being developed in several areas of the state to maintain pace with drilling activity. The treatment and discharge process is monitored by the state DEP.

We are fortunate at this time in Pennsylvania to be able to realize economic prosperity for our businesses, citizens and communities. The Commonwealth is also blessed to have the professional and technical expertise to develop the resource using modern technology for environmental protection. For years, we have asked our elected and civic leaders to deliver economic growth. Now that we have such an opportunity at our doorstep, let’s celebrate our collective good fortune. ♦

■ **Kathryn Klaber** is president/executive Director of the Marcellus Shale Coalition.