Will Shale Gas Be Damaged by Too Many Fraccing Complaints?

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By the late 1960s, a number of natural resource doomsayers were predicting the swift exhaustion of U.S. natural gas supplies. Indeed, in 1967, proved reserves peaked at about 293 trillion cubic feet (TCF), and production peaked at 22 TCF by the time of the 1974 OPEC oil embargo. But a funny thing happened after natural gas prices, which had been tightly regulated, were gradually decontrolled starting in 1978, with passage of the Natural Gas Wellhead Decontrol Act.

Although proved reserves continued to decline slowly for the next 15 years, reaching a nadir of just over 160 TCF in 1993, drilling technology continued to improve. By the early 1990s, the country was awash in gas, and the supply "bubble" persisted for the remainder of the decade. Since that time, proved gas reserves have continued to increase, and increase at a faster rate. In June 2009, the Potential Gas Committee released its findings of its most recent biennial review of gas reserves, and calling the increases in those reserves "unprecedented," in part because of rapidly growing availability of so-called unconventional gas supplies, especially shale gas.[1] Yet today, the vast supplies that shale gas promises are increasingly under attack, because of the potential air and, especially, water pollution issues that shale gas drilling critics have raised.

Shale gas is one of three major types of unconventional gas. The other two are coal-bed methane and gas found in "tight" sands. But it is shale gas that has garnered the most attention, because it is found in abundance across the continental United States. Of the major shale gas deposits, the most developed is the Barnett Shale, located in northeastern Texas. However, perhaps the largest of all shale deposits is the Marcellus Shale, a 54,000-square-mile area extending from New York through Pennsylvania, Ohio, and into West Virginia.[2]

Although shale gas supplies are abundant, extracting gas from shale deposits is possible only because of advances in horizontal drilling technology and hydraulic fracturing, or "fraccing."[3] Fraccing injects water, sand, and chemicals under high pressure into drilled wells to fracture tightly compacted shale, thereby releasing the trapped natural gas. Fraccing itself is an old drilling technique, having first been used in the 1960s to increase oil production. Moreover, fraccing has been used in other types of unconventional natural gas production, including coal-bed methane.

There have been previous studies on the potential environmental impacts of fraccing on underground drinking-water supplies.[4] However, it is only recently that the tenor of these concerns has increased significantly. In mid-February, the U.S. House Energy and Commerce Committee opened an investigation to determine whether fraccing can lead to "environmental and public health problems," principally whether the water used for fraccing will contaminate drinking-water supplies.

And while the primary environmental focus has been on water quality, some are raising air quality issues, too. The city of Fort Worth, Texas, for example, claims to have measured extremely high levels of benzene, a carcinogen, in two of 94 drilling sites. Nineteen other sites were found to have raised levels of benzene, but not at high enough levels to be an immediate concern.

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IMPERMEABILITY OF SHALE GAS DEPOSITS PROTECTS GROUNDWATER SUPPLIES

The growing environmental concerns over shale gas development and groundwater supplies can leave the impression that groundwater supplies commingle with the shale gas. In fact, groundwater supplies typically lie thousands of feet above shale gas deposits.[5] For example, much of the Marcellus Shale deposit lies 7,000 feet below ground. In fact, the depth of shale gas deposits is why it is only recently that drilling technology has improved enough to make shale gas production economic. Moreover, the layers of shale between groundwater and shale gas deposits act as a natural barrier. The fluids used to fracture shale gas deposits are simply not going to suddenly migrate into groundwater supplies.

This does not mean that one ought to mix one's evening cocktail with the water used in fraccing, which when pumped to the surface is a nasty, chemical-laden brine. Thus, neither should this brine be rubbished into the nearest river, lake, or pond. There are legitimate concerns as to whether typical municipal wastewater treatment facilities can treat this brine effectively and, if not, how to dispose of the brine effectively.[6] But that is a far different issue, and one that is not new, from concerns over groundwater contamination.

CONGRESS APPEARS TO BE ON YET ANOTHER ENVIRONMENTAL WILD GOOSE CHASE

The importance of natural gas as an energy feedstock cannot be underestimated. Not only is natural gas a primary source of heating fuel for consumers, but it is also used in many industrial processes. Of course, natural gas–fired generating plants have become increasingly important to meeting U.S. electric needs. Natural gas turbine technology has improved greatly with energy-conversion efficiencies exceeding 50 percent. Moreover, natural gas–fired generating plants emit minimal air pollutants, including the lowest levels of carbon dioxide of any fossil fuel.

The virtual ban on new coal-fired power plants that has been imposed by state and federal environmental regulators—despite the continuing revelations of the "Climategate" scandal—and the need to "firm" renewable generating plants whose output cannot be scheduled in advance mean that natural gas–fired generating units must play an increasingly important generation role. To fulfill this increasing demand, new supplies of natural gas must be developed. And that means unconventional resources like shale gas.

Thus, why the sudden increase in environmental scrutiny of hydraulic fracturing of shale gas deposits? The EPA's 2004 study of groundwater contamination from coal-bed methane drilling found no evidence of any contamination. Given the relative impermeability of shale, it seems unlikely that shale gas drilling would somehow lead to groundwater contamination when coal-bed methane drilling did not.

Perhaps, therefore, the raised levels of environmental growling are meant to be yet another roadblock to increasing quantities of affordable, domestic energy supplies, whether fossil-fuel or renewable.[7] Or perhaps, finding the road to its carbon cap-and-trade program blocked, Congress has decided to pursue another environmental wild goose chase. But if environmental concerns are allowed to cripple shale gas production, our energy future is going to become that much more expensive.

NOTES

1. Colorado School of Mines, Potential Gas Committee. (2009, June 18). Potential Gas Committee reports unprecedented increase in magnitude of U.S. natural gas resource base. Press release. Available at http://www.mines.edu/Potential-Gas-Committee-reports-unprecedented-increase-in-magnitude-of-U.S.-natural-gas-resource-base.
2. Source: Navigant Consulting. (2008, July 4). North American natural gas supply assessment. Available at http://www.navigantconsulting.com/downloads/knowledge_center/North_American_Natural_Gas_Supply_Assessment.pdf.
3. A detailed discussion of horizontal drilling and fracturing techniques applied to the Marcellus Shale can be found in Arthur, J., Bohm, B., & Layne M. (2008, September 24–28). Hydraulic fracturing considerations for natural gas wells of the Marcellus Shale. Paper presented at the Ground Water Protection Council, 2008 Annual Forum. Available at http://www.wvgs.wvnet.edu/www/datastat/GWPC_092008_Marcellus_Frac_Arthur_et_al.pdf.
4. For example, in 2004, the U.S. Environmental Protection Agency issued the results of a study (begun in 1997) of the potential impacts from fraccing of coal-bed methane deposits on underground water supplies. The report concluded that the "EPA did not find confirmed evidence that drinking water wells have been contaminated by hydraulic fracturing fluid injection into CBM wells," and recommended no further regulatory action. See (2004, June). Evaluation of impacts to underground sources of drinking water by hydraulic fracturing of coalbed methane reservoirs. Report No. EPA 816-R-04-003. The complete study can be downloaded from http://www.epa.gov/ogwdw000/uic/wells_coalbedmethanestudy.html.
5. Groundwater refers to underground water resources, rather than surface water resources like rivers and lakes.
6. A discussion of different treatment options for brine can be found in Soeder, D., & Kappel, W. (2009, May). Water resources and natural gas production from the Marcellus Shale. U.S. Geological Survey Fact Sheet, USGS 2009-2032. Available at http://md.water.usgs.gov/publications/fs-2009-3032/index.html.
7. See my previous column, (2009, February). Renewables, becoming cheaper, are suddenly passé. *Natural Gas & Electricity,* pp. 30–32.

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