

Drill, Baby, Drill?

Questions abound as Marcellus Shale regulations weighed, debated

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Development of the Marcellus Shale natural gas play has sparked a natural resource "boom" in western and northern Pennsylvania, along with neighboring states West Virginia, Ohio and Maryland. It could do the same in the southern tier of New York.

But the rapid pace of natural gas development has provoked concern over its environmental consequences. Recent events in western Pennsylvania and West Virginia, coupled with the analogy that the press and regulators have quickly drawn to the well blow-out in the Gulf of Mexico, have reinforced the concern.

Well before these recent events, legislators and regulators in Pennsylvania, surrounding states and Washington have struggled with an appropriate response to this increased (some would say "new") activity.

As distinguished from New York, for example, Pennsylvania has not sought to stop Marcellus development nor has it responded to pressure specially to regulate this industrial activity differently from others until recently.

However, on May 17, the Pennsylvania Environmental Quality Board approved several regulations, some of which dealt with the "total dissolved solids" in wastewater from development of Marcellus Shale natural gas wells. For purposes of this column, think of "total dissolved solids," also known as "TDS," as salts.

All other discharges would meet a standard of 2,000 milligrams/liter ("mg/l), but well development water would be required to meet a standard more stringent than the health-based drinking water standard. In effect, if this rule becomes final, the discharge of "frac" water from a natural gas well would have to contain fewer salts than would be permitted in tap water.

The EQB's action reflects caution.

Pennsylvania regulators do not want this "new" activity to make environmental conditions "worse." Therefore, on this thinking, we should not allow "new" activity unless the proponent of that activity convinces regulators that the activity is safe — often known as the "precautionary principle."

That caution only makes sense if one believes that the environmental status quo is pretty good. If current activities create environmentally unacceptable conditions, then one would want to do something different.

Change is more likely to be an improvement than a worsening. Delaying change imposes environmental risk.

A question exists as to whether regulators should take the risk of delay into account when setting regulatory standards or considering permit applications. On the other hand, a question also exists as to whether the Environmental Rights Amendment to the Pennsylvania Constitution permits them not to consider the risks of holding up beneficial projects.

Three EPA scientists — David Kargbo, Ron Wilhelm and David Campbell — conveniently reviewed the environmental risks and benefits of shale gas development in a widely circulated article published June 2 on the Internet and forthcoming in the journal, *Environmental Science & Technology*.

In it, they began with an important point — burning natural gas offers many environmental benefits over burning coal to make electricity or industrial process steam.

Coal combustion — even in a new facility (and we have a lot of old ones) — emits more greenhouse gases, particulates, oxides of sulfur and other pollutants than does burning natural gas to produce the same heat equivalent. In addition, burning natural gas to power vehicles offers a number of environmental and geopolitical benefits over burning oil (or gasoline).

A large supply of natural gas at a stable, relatively low price would cause substitution away from coal and oil.

However, Kargbo, Wilhelm and Campbell also catalogue several problems with natural gas wells. They focus most heavily on water resources — where the water comes from to develop the well and where the dirty water goes once it has been used.

The Pennsylvania TDS rules would address this last issue in part by limiting the concentration of TDS in wastewater discharged from hydraulic fracturing of natural gas wells drilled in Pennsylvania.

The rules have been approved by the Independent Regulatory Review Commission and are awaiting the final steps before publication in the *Pennsylvania Bulletin*.

The EQB's action did not come in a vacuum.

In a parallel policy move, the Department of Environmental Protection's Bureau of Air Quality is considering an aggregation policy that would require the treatment of all air pollution sources in a natural gas pipeline system as a single source for purposes of granting air pollution permits.

Other regulators have imposed or attempted to impose moratoriums on Marcellus Shale development.

The New York Department of Environmental Conservation has a moratorium on new Marcellus Shale well drilling approvals pending completion of an environmental study. The department's commissioner, Pete Grannis, announced on April 15 that no action would be taken until late summer and said DEC would be unlikely ever to approve wells in the watersheds of the New York City or Syracuse water supplies.

On May 5, the Delaware River Basin Commission, which controls water resources in the eastern part of the Pennsylvania, decided that it would not approve any further withdrawals of water to support Marcellus Shale development until DRBC adopts new regulations.

Further, in April 2009, the United States Forest Service, in settlement of a lawsuit, imposed a moratorium on new gas wells in the Allegheny National Forest until after completion of an environmental impact statement, although litigation by the natural gas industry has resulted in an injunction against that moratorium.

Several Pennsylvania legislators have called for a moratorium on leasing of new state land for gas development, and Sen. Robert P. Casey Jr., D-Pa., has sponsored a bill to subject hydraulic fracturing to federal regulation.

Why all the fuss? And is it even a good idea?

The Marcellus Shale lies approximately one mile below the surface and runs in an arc from southwestern Pennsylvania and bordering West Virginia, Maryland, and Ohio, to the north under Lake Erie, and then to the east across the northern tier of Pennsylvania and the southern tier of New York and across the Delaware River.

Pennsylvania State University estimates that enough natural gas lies embedded in that rock to supply the entire United States' demand at current rates for a generation. Using current drilling technology, that gas seems to be economic to produce at prices well below the current market (about \$4.00/thousand cubic feet at the wellhead).

A natural gas well used to resembled a straw placed vertically into the underlying rock that sucked the "milk shake" made famous in *There Will Be Blood* from a cone of influence around the bottom of the straw.

In recent years, however, drillers have developed the ability to turn their drill bits so that the straw can pivot and run horizontally within the target geological formation. Indeed, it can run horizontally for a mile or more, and a single well pad can contain multiple wells with laterals

running in different directions. So, one spot on the surface can drain a much larger area underground than had been possible with conventional drilling techniques.

When Colonel Drake drilled the first well in Titusville in 1859, the oil flowed easily into the well bore.

By the 1950s, the natural gas resources being developed came from formations tight enough that they were only economic to produce if the rock were broken up so that the "milk shake" would flow more freely into the straw. Drillers accomplish this by "hydraulic fracturing." Frac'ing involves placing water, a "propping agent" like sand and lubricating chemicals into the well at pressure to break the rock apart. About half the water returns up the well bore, and when it does it contains hydrocarbons, salts, and a small amount of naturally occurring radiation.

Natural gas is embedded within shales, so they do not yield their gas without hydraulic fracturing. Indeed, a Marcellus Shale well requires approximately three million gallons of water to develop, about half of which will return full of contaminants.

The volume of water potentially necessary to develop the Marcellus Shale in Pennsylvania at the rate that it could be developed would, if not regulated, threaten to dewater some streams in the Marcellus region.

In addition, if the water were returned to streams without treatment, it would threaten to overwhelm the ability of any given waterbody to assimilate it and might overwhelm the entire assimilative capacity of all streams in Pennsylvania. The Department of Environmental Protection claims that a discharge of water used in hydraulic fracturing to the Monongahela River contaminated the intakes of a public drinking water source beyond the ability of the treatment system to cope.

That incident has motivated the latest regulatory action by the EQB to regulate discharges of used water to the secondary drinking water standard, meant to protect esthetic values, and much more stringent than the primary, or health-based, drinking water standard.

That action may face some legal challenges.

The standard chosen applies only to one industry without a demonstration that other sources might not contribute substantially similar loadings of TDS. In addition, effluent limitations under the clean water statutes tend to have two forms. They may be "technology-based," requiring all dischargers within an industry to apply "best" technology. The TDS rule is not technology-based; it is based upon a drinking water standard.

Alternatively, an effluent limitation may be "water quality based," requiring dischargers not to cause the concentration of a pollutant in a stream to increase above some threshold. The TDS rules are not water-quality based either; they apply uniformly no matter the quality or size of the receiving stream. Therefore, their authorization is a bit obscure.

But are the TDS rules and all the other proposals to slow Marcellus development not good ideas nevertheless? Should we not act cautiously under the "precautionary principle" to take no action until we are confident that it will cause no harm?

Again, natural gas burns much more cleanly than coal or oil.

If gas displaced coal or oil, even at the margins, it would improve air quality and reduce acid rain and greenhouse gas impacts. Also, among the lessons of the tragic events in the Gulf of Mexico and the unfortunate events of this month in the Marcellus Shale is that, while humans err and their machines fail, drilling for natural gas on land seems to pose less environmental risk to sensitive receptors than drilling for oil in the ocean.

The precautionary principle has a very ambiguous application to the Marcellus Shale.

Unless we are prepared to garage our cars and to turn off our lights, the status quo is not very attractive or sustainable environmentally. If abundant, cheap, domestic natural gas — to quote the commercial — really is an improvement, should we not develop it with a sense of urgency?

In Pennsylvania, all levels of government are required to undertake some balancing of the benefits of a project against its environmental risks under Article I, section 27, of the Constitution. At least theoretically, that Environmental Rights Amendment may obligate the state government to feel that sense of urgency to preserve the environment by developing natural gas.

Urgency does not imply carelessness or regulatory inattention. However, we have more than a hundred years of natural gas development and transportation through Pennsylvania, and more than sixty years of experience with hydraulic fracturing.

Viewed through that prism, the current regulatory activity raises questions. •

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