

From: Bill Podulka, Ph.D.
To: Ed Hanlon, US EPA
Date: 4/6/10
Subject: Comments on Scope of US EPA Hydraulic Fracturing Research Plan

Dear Mr. Hanlon,

I am a physicist and landowner living in upstate New York. My family and I live in a rural area of Tompkins County that is considered by the natural gas industry as a prime target for Marcellus and Utica shale development. I ask that the committee members be extremely careful and thorough in their review because their decisions will affect the health and welfare of millions of citizens like myself who happen to be living on or near shale gas beds. In general, the examples given in the scoping materials for the initial design of the EPA research study for potential research questions raise the kinds of important issues that must be resolved before hydraulic fracturing is used more extensively. I commend the committee for tackling these important questions.

For the public to have faith in the results of this review of the relationship between drinking water and hydraulic fracturing, it is extremely important that there be no hint of political influence in the committee's deliberations. As part of that effort, the public must feel they are welcomed with open arms into the process. The committee should be sure to include as stakeholders those most directly affected by shale gas development using hydraulic fracturing: rural and urban residents of areas subject to development; businesses affected (not just urban business centers, but also rural businesses such as farming, wineries, and the tourist and recreation industries), and municipal governments, as well as grassroots groups that have logged countless hours educating themselves and the public about the amount of risk in and likely impacts of shale gas development. Local citizen groups can be particularly valuable in identifying important candidates for case studies for this review.

I strongly support the EPA's proposal to use a Life Cycle Assessment approach to identify and evaluate the various impacts of shale-gas extraction using hydraulic fracturing. I am sure that the gas industry will argue for a very narrow interpretation of the Congressional mandate and suggest that it is only the actual act of fracturing the rock that needs to be studied. However, hydraulic fracturing is an integral part of an entire process of extracting natural gas from impermeable strata; ignoring the steps required by and that depend on hydraulic fracturing would be an incomplete study of the "relationship between hydraulic fracturing and drinking water."¹ From an environmental safety and public health perspective, it is what happens in actual practice in the field when a shale-gas reservoir is developed that must be analyzed to determine the relationship between hydraulic fracturing and drinking water.

It is important to realize that though current high-volume hydraulic fracturing is an outgrowth of what came before, the particular techniques and chemical mixes were only developed as recently as the 1990's. Shale gas extraction is different enough from what has happened before that a careful review is essential. The huge volumes of water and chemicals used, the wide geographic area, and the intensity of development over a short period of time are all important factors that differentiate shale-gas bed development from other, historical gas exploration. The pairing of horizontal drilling with hydraulic fracturing leads to a 200 to 400 times increase in the amount of water, and consequently the amount of chemicals used, compared to "traditional" hydraulic fracturing. Thus, impacts that may have been negligible or easily mitigated in non-shale-bed reservoirs now merit close scrutiny. Similarly, rapid

development over a wide area means the cumulative effects of small (for a single well) impacts on water quantity and quality must be evaluated. The full development of the Marcellus shale, for example, would mean 8 to 16 wells per square mile over much of Pennsylvania and southern New York² drilled over the next 10 to 20 years (it is difficult to estimate time horizons because of uncertainty in market conditions and how many drill rigs will be mobilized to the Marcellus area, but in 2009 approximately 1000 wells were drilled in Pennsylvania alone).

Air quality must be included as part of this review because air quality affects water quality. Rain entraining atmospheric pollutants can clearly affect municipal water-supply reservoirs. Groundwater is recharged by surface waters; I am glad to see that the review recognizes that there are interconnections between surface and groundwater.

I am sure the review board will review evidence on the toxicity and environmental persistence of many of the chemicals used in hydraulic fracturing. A number of the products used³ or their breakdown products⁴ either mimic or disrupt hormones in humans and other animals, meaning these chemicals have measurable biological effects at environmental concentrations of parts per million or less. The EPA review must evaluate the ability to test for such low concentrations and evaluate requirements for preventing even such low concentrations from occurring.

While at first glance global warming would appear to be beyond the scope of the Congressional mandate, global warming can impact drinking water supplies by changing rainfall patterns and raising the sea level. The committee should give serious consideration to conducting a life-cycle greenhouse gas emission study as part of their review. I believe that a preliminary assessment of the greenhouse gas impact of shale gas extraction by Professor Robert Howarth of Cornell University has already been forwarded to the committee. Prof. Howarth calculates that, due to the combustion of fuels used to extract the methane plus the global warming impact of methane leaked during production and transport, shale-bed natural gas has roughly the same global warming impact as coal. Would it not be a shame if we ran health risks for a fuel that is not actually “greener” than coal?

It is also likely that industry will argue that regulating gas development should be left to the states and that states have a good track record in maintaining environmental safety and public health. But that argument presupposes that the review being conducted by this committee will find no impact of hydraulic fracturing on water supplies. If the committee finds no impact, then it may be that state regulators have provided adequate safeguards (it might also be that the gas industry has self-regulated appropriately, or that we have simply been lucky so far). But if the committee finds impacts, then certainly state regulations have not been adequate to protect the public. A thorough review must first answer the question of the relationship between hydraulic fracturing and drinking water before issues of regulatory authority are addressed. There a number of reasons to believe that state regulators are vulnerable to political pressures that push for weaker regulations. One factor is that many states are financially strapped and desperate for the income generated by gas production. Another is that since regulations are done on a state-by-state basis, companies threaten to “walk” to a state where they are more “welcome.”

I hope that one outcome of this review is not just an enumeration of any risks identified, but a quantification of the level of risk. In deciding what to do based on the identified level of risk, it is crucial to err on the side of caution. Before we embark on a grand experiment of using these relatively new techniques over additional widespread areas

of the country, we must be certain that they do no harm, as opposed to merely being uncertain as to whether they do harm.

The land above the shale gas reservoir with which I am most familiar, the Marcellus, is not a pristine, never-before-been-touched-by-human-hands wilderness. It is, however, a predominantly rural area that has not seen heavy industrial activity like shale gas extraction. Compared to urban areas, the water, air, and soil here are relatively clean and are a major factor in making this area attractive to citizens like myself. Maintaining this high quality of environment begs for erring on the side of caution. There are already many industrial chemicals building up in the environment, often carried far from their point of origin. Before we undertake any industrial activity anywhere, we should make sure that it does not add yet more chemicals that are either known to be toxic or have unknown health effects.

While according to their charge the committee need only consider how hydraulic fracturing impacts on the water, air, and soil affect drinking water, there are also important environmental justice concerns that should cause the committee to consider broadening the scope of their inquiry. If the quality of life is reduced due to the impacts of extensive shale gas drilling, then it is very likely that there will be a preferential emigration of the more employable and financially secure residents. Thus, the rural poor—the ones least able to cope with the health impacts, and least able to replace their water supplies—will be left to deal with the impacts of gas drilling. If hydraulic fracturing negatively impacts drinking water supplies, the poor will bear the brunt of it.

Finally, I ask that the committee remember that there are limits to science and our ability to model complex processes. For many years I conducted research in plasma physics, an area full of complicated three-dimensional fluid problems. Simulations were a valuable research tool, but I saw over and over again that models are only good as what goes into them and don't capture physics that is left out. Many, many scaling "laws" for plasma fusion devices were developed based on existing experimental data and verified by computer modeling, only to be thrown out when the next bigger machine was built and found to not conform to the "laws." Do not trust the models, go out and get statistically significant data on what is actually happening in the field, and add in some extra factors of safety since the next new formation will have something different about it not captured by prior experience. Scientists must be modest, not grandiose, in evaluating how certain they are.

Thank you for your consideration,

Bill Podulka

¹ Fiscal Year 2010 Appropriation Conference Committee Directive to EPA.

² Engelder, T. 2009. "Marcellus 2008: Report Card on the Breakout Year for Gas Production in the Appalachian Basin," *Fort Worth Basin Oil & Gas Magazine*. August, 2009, pp. 19-11.

³ TEDX—The Endocrine Disruption Exchange
<http://www.endocrinedisruption.com/chemicals.fracturing.php>

⁴ New York State Water Resources Institute http://wri.eas.cornell.edu/gas_wells_waste.html