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PERSPECTIVE

Science refutes fracking opposition

By Jeffrey Dintzer and Nathaniel Johnson

From the moment one documentary filmmaker dramatically lit water flowing from a residential tap on fire in "Gasland" in 2010¸ the spectacle of groundwater contamination caused by hydraulic fracturing., commonly known as "fracking," has been a central component of the anti-fracking narrative. That narrative was dealt a debilitating blow recently by a series of independent scientific studies that question the very possibility of groundwater contamination by fracking.

The release of these studies should serve as an essential reminder to policymakers: Instead of implementing reactionary regulations based on dubious environmental risks and unwarranted public hysteria, policymakers should carefully consider the objective science. More significantly, these studies go a long way toward providing a sound scientific basis for a legal framework for fracking that can effectively maximize the technique's powerful economic potential, as well as the environmental benefits of producing clean burning fuels, such as natural gas.

Fracking is the high-pressure injection of a mix of fluids and substances called "proppants" into an oil or gas reservoir, thereby fracturing the reservoir rock, and allowing otherwise inaccessible oil or gas to flow back to the well as proppants hold the fractures open. Conventional fracking techniques have been common in the U.S. for over 60 years. However, recent technological advances have drastically increased the amount of oil and gas accessible by fracking wells. Shale gas, for example, now constitutes roughly one-third of the country's total natural gas production.

This expansion of production has been a boon for the American economy, but it has also generated skepticism of the environmental integrity of the fracking process. As the U.S. Government Accountability Office recently noted, a substantial percentage of the nation's population gets its drinking water from underground aquifers, which has led to concerns that fracked wells will contaminate the nation's potable water. Concerns have been raised that fracking could result in contamination of groundwater either by the injected water or fracking fluid, or from fugitive oil or gas. It has been suggested that contamination could occur by flowing through fractures in the shale to groundwater supplies, or by leaking out of faulty wells. Coupled with dramatic stories of contaminated drinking water, prospective groundwater contamination has been the lynchpin of fracking opposition.

The unsubstantiated fear of groundwater contamination has had an undeniably negative impact on the growth of the fracking industry. For the state of Vermont, the specter of groundwater contamination was enough to prohibit the practice entirely, despite no evidence the state has underground natural gas reserves accessible by current fracking technology. Instead of prohibiting fracking, other state regulators have instituted a patchwork of chemical disclosure rules designed to minimize the potential risk to groundwater contamination allegedly posed by fracking. State disclosure rules typically force companies to reveal the chemical formulas of the fracturing fluid itself; formulas that often constitute valuable trade secrets. Even if companies are not forced to disclose trade secrets, state disclosure rules necessarily impose onerous and time-consuming conditions on companies that undermine the growth of this vital industry.

Unfounded worries about groundwater contamination have trickled down to even more draconian action at the local level. Municipalities across the nation are facing rising pressure from anti-fracking groups and concerned citizens to impose complete bans or temporary moratoria on fracking. In many cases, local officials have folded to this pressure. Without fail, concerns about drinking water lie at the heart of local regulations. For example, the Los Angeles City Council adopted recommendations requesting the city attorney to prepare an ordinance to ban fracking until the city could verify fracking would not harm public safety or local drinking water.

While the importance of America's groundwater supplies can hardly be overstated, groundwater's mere significance should not be used as a justification to recklessly hinder the growth of domestic oil and gas production. Rather, regulators at all levels should rely on sound science to craft carefully calibrated policy that supports growth of the fracking industry while ensuring environmental integrity. Three recent scientific studies can help regulators significantly in that regard.

The first study, published by the National Academy of Sciences, addressed the questions of whether fugitive gas measured in groundwater supplies resulted from natural or human sources and what those natural or human sources might be. Thomas Darrah, et al., "Noble gases identify the mechanisms of fugitive gas contamination in drinking water wells overlying the Marcellus and Barnett Shales," PNAS (2014).

The researchers tested 113 samples from drinking water wells overlying the Marcellus Shale and 20 samples from wells above the Barnett Shale. Among the samples, the research team found eight distinct clusters of fugitive gas contamination. Building on previous studies that identify the origination of fugitive gas using molecular and stable isotopic compositions (which are prone to decomposition), the researchers were able to determine whether the gas leaked through fractures in reservoir rock because of fracking. Fugitive gas caused by fracking, for example, has a distinct composition of noble gas elements and isotopes because the gas must travel so far through the Earth's crust to reach potable groundwater supplies.

The results of the study are heartening for the fracking industry. The research team's data "rule out" the possibility of groundwater contamination by upward migration of fugitive gas caused by fracking. Instead, for the eight contaminated water wells, "well integrity" issues, such as casing or cementing failures, accounted for the contamination. As the research team emphasized, "well integrity has been recognized for decades as an important factor in environmental stewardship for conventional oil and gas production." In other words, fracking does not pose a unique risk to groundwater supplies and consequently does not require uniquely restrictive regulations.

In addition to studying the potential of fugitive gas leaking through fractures in the Marcellus Shale, in the second study, researchers from the U.S. Department of Energy's National Energy Technology Laboratory also tested the possibility of "brine" leaking into groundwater supplies. NETL, "An Evaluation of Fracture Growth and Gas/Fluid Migration as Horizontal Marcellus Shale Gas Wells are Hydraulically Fractured in Greene County, Pennsylvania" (2014).

Brine is a salty wastewater generated by the fracking process that contains the cuttings from drilling through to the shale. These cuttings contain whatever minerals or toxins are present in the layers of earth drilled by the well operator, and fracking opponents have suggested that the resulting brine could theoretically migrate to potable groundwater through fractures in the shale rock created by fracking.

This study lays that concern to rest. Relying on five distinct types of data collection, the research team concluded that the available evidence indicates "that there has been no detectable migration of gas and fluids ... such as could be provided by open fractures or unplugged wells." Simply, the fractures in shale rock caused by fracking do not reach far enough to allow fugitive gas or brine to access potable groundwater supplies.

The third study considered the risk to groundwater supplies posed by the water injected underground to fracture the shale rock. Terry Engelder, et al., "The fate of residual treatment water in gas shale," Journal of Unconventional Oil and Gas Resources (2014). Most water injected into a fracked well remains underground, which has caused fracking opponents to speculate on the prospect of injected water rising upward through fractures in the shale rock to potable groundwater.

This study puts an end to the speculation. Not only are supplies of injected water too small to reach above groundwater, the shale rock acts like a "sponge" that compels the injected water downward into the rock, not upwards. The sponge-like qualities of shale rock are why oil and gas are so difficult to extract from shale in the first place. According to the lead researcher, "If one wants to dispose of fracking waters, one could probably not choose a safer way to do so than to inject them into gas shale."

Fracking offers substantial benefits for our economy, but opponents have relied on the unsubstantiated spectacle of groundwater contamination to undermine this booming industry at both the state and local levels. These three studies provide a sound basis for developing regulations that foster growth of the industry. Rather than prohibiting or restricting tried-and-true techniques, regulators should employ conventional regulatory principles to ensure well integrity. In this way, America can continue to enjoy the substantial economic benefits generated by the fracking industry, while effectively protecting its precious groundwater supplies for future generations.

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