Hydraulic Fracturing

By Karole McKalip, Elizabeth Lonoff, Rona Ackerman

What is it?

Hydraulic fracturing or fracking represents two methods of natural gas extraction. The first is a process that involves drilling a deep hole in dense shale rock and then blasting a mixture of water, sand, and chemicals down inside the hole at extremely high pressure to fracture or crack open the surrounding rock and release natural gas and in some cases oil into the water so it can be captured. A second technique called horizontal drilling allows companies to drill vertically, then laterally through shale formations. This second method also uses a mixture of water, sand, and chemicals. These methods can be applied to wells for shale gas, tight gas, tight oil, and coal seam gas. The term “fracking” is currently used to refer to either method. They are considered cost efficient ways to access natural gas and other fuel deposits that might otherwise be inaccessible. Fracking has increased known gas reserves. Some believe that these gas supplies will last for more than 100 years.

According to a New York Times article (The Facts on Fracking), “Many sandstones, limestones and shales far below ground contain natural gas, which was formed as dead organisms in the rock decomposed. This gas is released, and can be captured at the surface for our use, when the rocks in which it is trapped are drilled. To increase the flow of released gas, the rocks can be broken apart, or fractured. Early drillers sometimes detonated small explosions in the wells to increase flow. Starting in the 1940s, oil and gas drilling companies began fracking rock by pumping pressurized water into it. Approximately one million American wells have been fracked since the 1940s. Most of these are vertical wells that tap into porous sandstone or limestone. Since the 1990s, however, gas companies have been able to harvest the gas still stuck in the original shale source.”

Citing the benefits of hydraulic fracturing, the American Enterprise Institutes reports that “Although the first version of hydraulic fracturing was patented in the USA in 1949, it has come into greater use over the last decade in combination with other advances in drilling technology (such as horizontal drilling), which have made many reserves of oil and natural gas economically viable that were previously considered prohibitively difficult to exploit. These reserves are in many cases contained within shale, a formation low in permeability and porosity, which previously made tapping the gas and oil held within the formations very difficult.” Fracking has made many of these previously known formations commercially viable, and facilitated the discovery of new reserves as companies seek gas and oil in new locations.

For 2013, the US Energy Information Administration (EIA) estimated that 35.1 percent of America’s energy use by source came from petroleum, 26.6 percent from natural gas, and 18.1 percent from coal. Nuclear power accounted for 8.3 percent, and renewable energy—such as wind, solar geothermal, or hydropower—supplied 9.3 percent.
The EIA states that the numbers “may not add to 100 percent due to independent rounding.”

Fracking proponents cite economic benefits, to include not only making the United States more energy independent but also to allow for the exportation of natural gas. Opponents are primarily concerned about the impact of fracking to human health and the natural environment. World-wide reactions to its use are mixed; some countries allow fracking while others ban it.

The use of hydraulic fracturing has broad implications for our country: the economy, the environment, and human health. For citizens to have an impact public policy understanding how fracking works, its pros and its cons are critical.

Protecting the Public Health and Public Lands

While federal regulation of hydraulic fracturing has been stalled in Congress, the U.S. Department of Interior and the Bureau of Land Management have proposed rules to regulate it on public lands that are leased for energy production. According to its website, the U.S. Environmental Protection Agency (EPA) and the Departments of Energy and the Interior have been working together since 2012 to provide technical
guidance and implementation support to states and tribes to help ensure that natural gas extraction does not come at the expense of public health and the environment. The EPA’s focus and obligations under the law are to provide oversight, guidance and, where appropriate, rulemaking that achieve the best possible protections for the air, water and land. The Agency is investing in improving our scientific understanding of the potential impact of hydraulic fracturing on air, water quality, aquatic ecosystems, and health, providing regulatory clarity with respect to existing laws, and using existing authorities where appropriate to enhance health and environmental safeguards. The EPA expects to release a draft report on fracking’s potential impact on drinking water resources in December.

In May the EPA furthered its response to a 2011 petition from Earthjustice and 114 others in announcing that it is considering rules under the Toxic Substances Control Act requiring oilfield service companies to submit details on the health safety of their fracking chemicals. With continuing pressure from industry, the Agency said it instead might decide to use incentives or voluntary steps. Meanwhile, some states have enacted mandatory disclosure laws for the chemicals used in fracking.

According to the Natural Resources Defense Council, federal and state governments need to adopt strong enforceable laws and standards that protect the environment, public health, and communities. Protections based on robust scientific research on health and environment impacts are needed to:

- Reduce water pollution
- Reduce air pollution
- Protect communities and residential areas, i.e., keep fracking away from homes and schools
- Protect wilderness on federal public lands
- Dispose of hazardous waste properly and
- Require public disclosure of chemicals used

Many localities are taking initiatives to contain, control, or ban fracking. One successful example has occurred in Dryden, New York. The New York State Court of Appeals ruled in favor of Dryden and another town, Middlefield, in their clarification of zoning laws, road use regulations, noise limits, and environmental protections in order to ban hydraulic fracturing. This court ruling is expected to “reverberate nationally.” Other localities in California, Colorado, Michigan, New Jersey, Ohio, Pennsylvania, and North Carolina are passing resolutions and proposals to ban or limit fracking and the disposal of fracking waste. The New York Court ruling has significance beyond the state of New York in that it encourages other towns across the country to pursue limitations on fracking.

The Community Environmental Defense Council claims to have helped 200 New York municipalities to either ban or put a moratorium on fracking in accordance with the State’s Constitution. Its founder addressed a Norman, OK public meeting about fracking in August. He said that Oklahoma law allows cities to regulate for the health, welfare,
and safety of its citizens. He gave an example of some cities around the country having
used home rule to require setbacks of 3,000-5,000 feet for drilling operations.8

Several oil and gas companies want drilling permits to explore natural gas opportunities
in Garrett County, MD, where Deep Creek Lake is located. In 2011 Governor Martin
O’Malley issued an executive order establishing the Marcellus Shale Safe Drilling
Initiative to study drilling impacts before any natural gas wells could be built in
Maryland. The first report covered the desirability of legislation to establish revenue
sources, such as a State-level severance tax and standards of liability for damages caused
by gas exploration and production. In 2014 the University of MD contributed a report on
potential public health impacts which warns that drilling could pose a threat to air quality,
increasing the risk of “adverse birth outcomes including congenital heart defects, sinus
problems, eye burning, severe headaches, persistent cough and skin rashes.” The report
recommends strong police and state agency monitoring of fracking operations if they are
allowed Maryland. Later this year, Maryland’s last report will cover possible
contamination of groundwater, handling and disposal of wastewater, environmental
impacts, impact to forest and important habitats, greenhouse gas emissions and economic
impacts.9

Water is an integral component of the hydraulic fracturing process. The U.S.
Environmental Protection Agency’s (EPA) Office of Water regulates waste disposal of
recovered fracturing fluids (flowback) into surface waters under the Clean Water Act’s
National Pollutant Discharge Elimination System (point source) permit program and
sometimes the injection of fracturing fluids as authorized by the Safe Drinking Water Act
(SDWA). The Energy Policy Act of 2005 amended the SDWA to exclude from EPA’s
Underground Injection Control (UIC) program “the underground injection of fluids or
propping agents (other than diesel fuels) pursuant to hydraulic fracturing operations
related to oil, gas, or geothermal production activities.” This is known as the Halliburton
loophole, named after the company that invented fracking in the 1940’s and inserted at
the request of then-Vice President Dick Cheney, a former chief executive of Halliburton.
Any service company that performs hydraulic fracturing using diesel fuel must received
prior authorization through the applicable UIC program. Revised (Feb. 2014) guidance
and related information is available at
http://water.epa.gov/type/groundwater/uic/class2/hydraulicfracturing/hydraulic-
fracturing.cfm#guide.

The Energy Policy Act of 2005 created a rebuttable presumption that certain oil and gas
related activities authorized by the U.S. Department of the Interior in managing public
lands and the U.S. Department of Agriculture in managing National Forest System Lands
are subject to a “categorical exclusion” under the National Environmental Policy Act
(NEPA). Activities under the Mineral Leasing Act and exploration and extraction of
natural gas are exempt from NEPA because of a blanket finding of no significant impact
unless the public can prove otherwise. Wastes generated from crude oil and natural gas
exploration and production are generally subject to non-hazardous waste regulation under
the federal Resource Conservation and Recovery Act Subtitle D and excluded from
hazardous waste regulation under Subtitle C.
Over the last several years, many states have been developing and updating legislation and regulations in light of the increase in the use of hydraulic fracturing, including requirements related to waste management. EPA reviewed the waste-related provisions of state regulations as of March 2014 for oil and natural gas waste pits and storage tanks for 26 states with the most significant shale gas activity. In summary:

All 26 reviewed states have oil and gas regulations. State regulations vary greatly in scope and detail. Regulatory programs can include regulatory parameters such as liner requirements, clear definitions of waste fluids and characterization requirements, operational controls, maintenance, closure, and financial assurance requirements.

Several areas do not appear to have specific requirements, such as groundwater, air, or post closure monitoring. Numerous states have recently updated regulations to include disclosure requirements for the chemicals used in the practice of hydraulic fracturing. State regulations continue to evolve as hydraulic fracturing issues become more prevalent and additional information becomes available.

**Where is Fracking Taking Place?**

The National Resources Defense Council reports that “Fracking is currently taking place in approximately 30 states, without sufficient safeguards and typically under out-dated regulations and inadequate enforcement. The oil and gas industry is seeking to expand fracking nationwide to extract gas from previously inaccessible sites…Over the last decade, the industry has drilled tens of thousands of new wells in the Rocky Mountain region, the South, and the eastern United States. In the East, the latest hotbed of activity, the focus has been on a massive 600 miles-long rock formation called the Marcellus Shale, which stretches from West Virginia, through Ohio and Pennsylvania, and into New York State.”

In a report from livescience.com, Mark Lallanilla indicates that “In 2000, there were about 276,000 natural gas wells in the United States. But by 2010, that number had almost doubled to 510,000, according to the U.S. Department of Energy (DOE). And every year, about 13,000 new wells are drilled. The areas where fracking is most profitable include the Great Plains from Canada south into Texas, the Great Lakes region and an area known as the Marcellus Shale…according to the U.S. Energy Information Administration (EIA).”

The shale boom is not limited to the United States. Fracking is going global. The following chart was cited in an article in The Washington Post (The Face of Fracking in Britain by Edward Robinson, April 27, 2014). The data as of May 2013 came from Bloomberg company reports and the U.S. Energy Information Administration.

<table>
<thead>
<tr>
<th>Top shale oil finds</th>
<th>Top shale gas finds</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Billions of barrels)</td>
<td>(Trillions of cubic feet)</td>
</tr>
<tr>
<td>1. Russia, 75</td>
<td>1. China, 1,115</td>
</tr>
<tr>
<td>2. United States, 58</td>
<td>2. Argentina, 802</td>
</tr>
<tr>
<td>3. China, 32</td>
<td>3. Algeria, 707</td>
</tr>
</tbody>
</table>
In that same Post article, John Browne, a member of the House of Lords and a director in the British government’s Cabinet Office and a former chief executive of British Petroleum (BP) says “fracking would secure a new domestic energy source, create thousands of jobs, generate billions of pounds in tax revenue and be a cheaper alternative than constructing nuclear plants….Shale gas could be very, very important for this county; it could be transformative.”

**Fracking in the George Washington National Forest**

At nearly two million acres, The George Washington National Forest (GW) is the largest national forest in the East. “The GW plays an important role in providing water for much of our region as it is located entirely within the watershed of the James and Potomac Rivers, which supply drinking water to Richmond, VA and Washington, D.C., and ultimately flow into the Chesapeake Bay. It is a direct source of drinking water for over 262,000 people in local communities in and around Virginia’s historic Shenandoah Valley. Further downstream more than 4.5 million people in northern Virginia, the Washington, D.C. metro area, and Richmond rely on the forest to protect many headwaters of a safe, high-quality drinking water supply.”

Fairfax Water treats our drinking water with ozone and granulated carbon to remove 120 regulated and nonregulated contaminants. Since the mix of hundreds of fracking chemicals, including known carcinogens, is proprietary, we can expect that some would enter our water supply if fracking were allowed in the George Washington National Forest. (The Southern Environmental Law Center)

“…The U.S. Forest Service…is considering allowing George Washington to become the first national forest to permit high-volume hydraulic fracturing, or fracking. The million-acre forest sits on the eastern edge of the Marcellus shale formation, whose vast deposits of natural gas have touched off a drilling bonanza in Pennsylvania and West Virginia. Fracking currently is permitted on only two Forest Service preserves, both in the West: Dakota Prairie National Grasslands in North Dakota and Pawnee National Grassland in Colorado.” Sarah Francisco, an attorney with the Southern Environmental Law Center (SELC), (as cited in the January 22, 2014, Los Angeles Times) cautions that before fracking in the GW Forest is approved, several questions need to be considered:

- Would the gas companies compete with municipalities for the forest’s water?
- How would the highly contaminated water be disposed of, since local treatment plants could not handle it?
- Would methane from wells migrate into the water?
- Would accidental spills of chemicals or wastewater taint the watershed?

SELC supports cleaner alternative energy sources such as natural gas that will help move our region away from coal but strongly objects to the destructive ways natural gas is now being extracted—and to the lack of environmental oversight. Its highest priority in Virginia is to keep fracking out of the George Washington National Forest, more than
half of which overlies the Marcellus Shale formation. SELC is working intensely to convince the U.S. Forest Service to stick with its proposal to ban horizontal drilling on any land leased for oil or gas production in the national forest, which would provide a significant check on high-volume fracking. It also insists that drinking water supply watersheds be made off-limits to all forms of drilling. However, companies are expressing interest in the Marcellus Shale area in Rockingham County as well as in the Taylorsville Basin Shale area through Caroline, King George, Westmoreland, Kind and Queen, King William counties.

**Arguments for and against hydraulic fracturing**

**Pro:**
1. Natural gas produced by fracking has an environmental advantage over coal mining. Shale gas emits half the carbon dioxide per unit of energy as does coal. Coal burning emits metals such as mercury into the atmosphere that settle back into our land and waters. The oil and gas industry argues that natural gas is a cleaner fuel than coal so fracking would result in a reduction of greenhouse gas emissions.
2. Short-run economic interests support fracking saying that natural gas is leading to lower energy prices, greater energy independence, and more jobs with higher salaries. 3. States where fracking takes place have seen an increase in tax revenue.
4. Fracking increases the energy security of the U.S. and improves the abilities to generate electricity, heat homes and power vehicles for generations to come.
5. The U.S. Geological Survey is studying the source and composition of current and future water produced as a result of fracking.

**Con:**
1. Chemical contamination of ground water and local drinking water sources can occur by way of leaks, spills, erosion, and runoff from drilling operations. Companies have been granted special exemptions from existing federal environmental laws (i.e., Clean Air Act, Clean Water Act, Safe Drinking Water Act) and are not required to disclose some of the chemicals they use.
2. Air pollution results from emissions from drilling rigs, storage tanks, compressor stations, and truck traffic, contributing to harmful ozone levels and human health problems.
3. Wells, roads, and pipelines can displace wildlife and harm habitats.
4. Methane emissions from production sites and pipelines contribute to climate change.
5. Concerns about earthquakes possibly resulting from the injecting of wastewater from drilling, creating fluid pressure below the surface are being substantiated by the US Geological Survey.

**Outlook**

“The International Energy Agency suggests that for oil and gas producers to make peace with adversaries and move forward, they should take common-sense steps: improve transparency about the chemicals they use; engage communities better; monitor wells more effectively; toughen rules on well design and surface spills; manage water supplies carefully; and reduce methane emissions. The IEA reckons that implementing such
measures would add just 7 percent to total well costs, and would go a long way toward pacifying critics.” The industry is still in its “adolescence.”

The U.S. Geological Survey states that “The accurate and unbiased scientific data provided by ‘federal agencies’ are crucial to the Federal and State resource managers to meet the challenge of balancing America’s needs for unconventional resources and a clean and healthy environment.” Currently, government studies are being developed to identify the impact of fracking in the environment more definitively. As yet, we have no national standards in place; instead the affected states have differing requirements for fracking operations. Nationally, environmental laws are being administered through the Environmental Protection Agency, Department of Interior, the Bureau of Land Management, and the U.S. Forest Service.

Hydraulic fracturing presents opportunities and challenges to our area and to our country. Legislative oversight both at federal and state levels must be developed. We must be cognizant of the potential impacts on public health and the environment. But the economics of the process also can positively influence our domestic economy and our international standing. Further understanding of the pros and cons of fracking is critical and localities must weigh its costs and benefits. The development of cleaner, sustainable energy sources is also critical.

Summary of Fairfax unit discussions

With almost complete unanimity, the units concluded that the ban on fracking in the George Washington National Forest should be continued. The risks are too great to our area’s environment. The potential damage to our watershed could be irreversible. Possible destruction of the forest and animal habitat is not acceptable.

Despite the fact that fracking has been occurring for several decades now, members concluded that greater transparency about the processes involved is critical and that more effective government regulation is necessary. Legislation from the states and localities has been the primary source of regulations, but there is a lack of uniformity in oversight. Since this process will not go away, public understanding of fracking and its consequences can contribute to better regulations. As the unit discussions concluded, further examination of other means of energy production must also proceed.

Update

On November 18, The Washington Post reported that “The U.S. Forest Service has backed off a proposal to ban fracking in the George Washington National Forest… an about-face from a preliminary proposal released three years ago that would have prohibited fracking… Oil and natural gas companies already lease about 10,000 acres within the forest and own the underground mineral rights for an additional 167,000 acres… That land will remain open for extraction. The new policy, which is expected to take effect early next year, caps the amount of land available for drilling at about 16 percent of the forest.” Since hydraulic fracturing will be restricted now and in the future
in the GW National Forest, environmental groups have praised the U.S. Forest Service for its decision that no additional land will be leased for oil and gas drilling. The new policy is expected to take effect early next year.

**Footnotes**


3. U.S. Energy Information Administration, Monthly Energy Review, Table 1.3 (May 2014), preliminary 2013 data


15. Sarah Francisco, an attorney with the Southern Environmental Law Center, (as cited in the January 22, 2014, Los Angeles Times, by Neela Banerjee)


17. EnergyFromShale.org as cited in “What is Fracking by Marc Lallanilla, July 17, 2013 at www.livescience.com

And http://earthquake.usgs.gov/research/induced/

19. From Chapter 7 (The Future of Fracking) in Hydrofracking by Alex Prud’homme, Oxford University Press, 2014


**Shale Gas Formations in the United States**

![Shale Gas Formations Map](http://www.ehelpfultips.com/list_of_shale_gas_formations_in.htm)


http://www.ehelpfultips.com/list_of_shale_gas_formations_in.htm

**Update on “Fracking “ Developments**

By Elizabeth Lonoff

- Forest Service OKs Fracking in Forest Near Nation's Capital: Analysts say the decision has more to do with avoiding precedent than extracting oil and gas,

• Maryland fracking rules proposed, but Hogan gets final say,
  http://www.baltimoresun.com/features/green/blog/bal-maryland-fracking-rules-proposed-
  20141212-story.html

• Citing Health Risks, Cuomo Bans Fracking in New York State,
  http://www.nytimes.com/2014/12/18/nyregion/cuomo-to-ban-fracking-in-new-york-state-
  citing-health-risks.html

• Virginia has an informative site on Fracking, including:
  http://www.dmme.virginia.gov/dgo/HydraulicFracturing.shtml#FracingVA.

• According to SourceWatch,
  http://www.sourcewatch.org/index.php/Virginia_and_fracking:

"It's been reported [by WTOP, 12/5/14] that 'geologists say the Taylorsville Basin, which
stretches from east of Richmond up through Prince George's County (Maryland), could hold up to
1 trillion cubic feet of natural gas. A Dallas energy company plans to tap into that basin by
drilling on tens of thousands of leased acres south and east of Fredericksburg. And some local
officials have expressed concerns about some of the chemicals used in fracking being injected
into an area near the Chesapeake Bay.'"

[SourceWatch is a special project of the Center for Media and Democracy, which claims to be
non-partisan - "a boutique investigative research and reporting group with a demonstrated
capacity to break major news stories and highlight the work of advocates. Located in Madison,
Wisconsin, it is a national, non-profit watchdog organization, founded in 1993. CMD's niche is
investigating and exposing the undue influence of corporations and front groups on public policy,
including PR campaigns, lobbying, and electioneering. CMD's original reporting helps educate
the public and aids grassroots action about policies affecting people?s lives?their rights and the
health of our democracy."}