

# Natural Gas, Hydraulic Fracturing and Implications for Electric Utilities

## Introduction

The technological advances in the petroleum industry known as hydraulic fracturing (HF), used to release natural gas from shale rock formations, are producing abundant new supplies of natural gas. Hydraulic fracturing has to date been used in approximately 30,000 wells in the U.S., with some hydraulic fracturing techniques in use as early as the 1940s. However, more recent HF methods, combined with advances in multi-directional drilling, are now commonly used in the U.S. and Canada—including in non-shale formations – resulting in the new natural gas boom. The popular term used to describe these new technologies is “fracking.” Recently the term ‘fracking’ has stretched beyond the actual fracturing process (which is actually a short period in the drilling process) to refer to the entire natural gas production/extraction process in shale formations.<sup>1</sup>

The abundance of natural gas now available using HF has also brought some increased concerns about the safety and environmental consequences of the HF process itself.

This paper examines the current state of “fracking regulations” at the state and federal levels, the prospects for additional regulation, and the concerns of groups that are urging or opposing additional regulatory action. Hydraulic fracturing has become synonymous with the term “fracking.” (For purposes of this paper, hydraulic fracturing will be referred to as HF or fracking). While ‘fracking’ is oil industry jargon, it has increasingly taken on a negative meaning in popular usage.

An appendix with more detailed references is provided on page 11.

## Background to Understand Shale Gas in the U.S. Economy

The shale gas boom has added 2.8 million oil and gas (and related) jobs in the past couple of years. Estimates suggest that by 2035, another 1.4 million jobs will be added in the oil and gas sector. The National Association of Manufacturers (NAM) further estimates another one million manufacturing jobs will be created in the next few years using natural gas as a manufacturing feedstock. According to the Financial Times, “manufacturers have announced more than \$90 billion worth of investments in the U.S. to take advantage of its cheap, natural gas.”<sup>2</sup> “Petrochemical, fuel, fertilizer, and steel

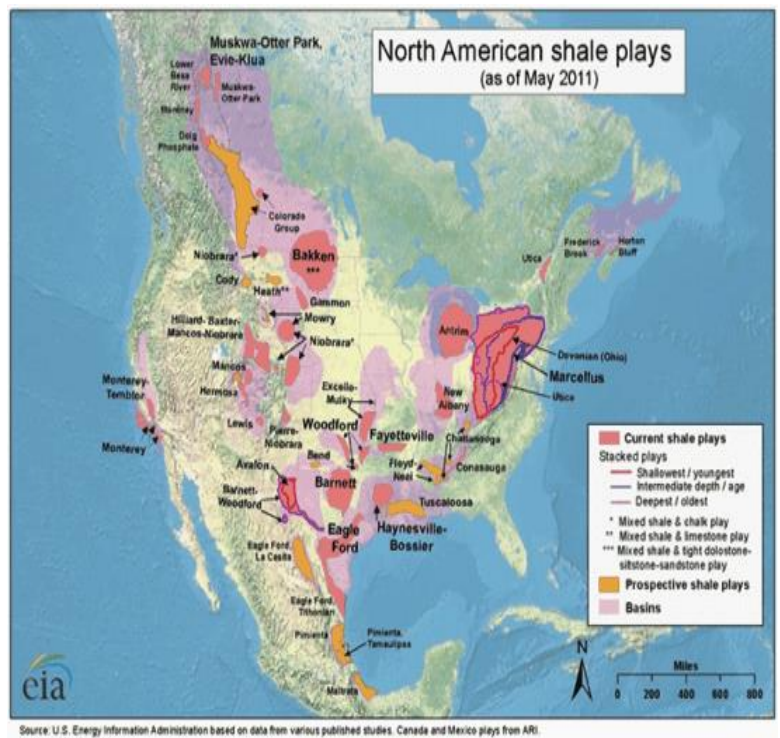


Figure 1, Source EIA

<sup>1</sup> “Fracking” or “hydraulic fracturing” is often used *incorrectly* to refer to the full spectrum of air pollution, water disposal, water movement, CO<sub>2</sub> or methane from the upstream industry, and water usage issues that are not precisely germane to hydraulic fracturing itself. This paper will attempt to distinguish between the environmental issues which are perhaps a consequence from natural gas drilling or production, but not directly from fracturing or ‘fracking’. In the popular media, the loose use of ‘fracking’ is often blurred and can confuse the public, rate payers, homeowners, and policy makers. Used broadly, it includes many other environmental issues beyond the fracturing of rocks under pressure to produce oil or gas.

<sup>2</sup> See U.S. Sees \$90bn Boost from Shale Gas Boom, Financial Time, available at <http://www.ft.com/intl/cms/s/0/4b3f6280-4609-11e2-ae8d-00144feabdc0.html#axzz2F2yNTOMI>.

companies are among those that have committed to or are considering making these multi-billion dollar investments because of their ability to source cheap energy and feedstocks.”<sup>3</sup>

Several large transportation companies have announced interest in the use of natural gas for rail, truck, and commercial fleet transportation. While natural gas supply estimates from the government and private parties vary, U.S. and Canadian shale resources have between 20 and 100 years of supply at current use. Additional shale formations have been found in Poland, China, Russia, England, and on small Mediterranean islands. Exploration continues to determine if shale deposits in Asia and the Middle East might be productive. Domestic and foreign shale gas will greatly expand U.S. natural gas supplies because existing domestic conventional gas supplies declined or were no longer economical. Additional U.S. exploration continues in the Utica (PA-NY) and Marble Falls (TX) formations to see if these less explored formations might also have shale gas.

### How HF Regulations Affect Natural Gas Availability, Supply, and the Price of Electricity

Shale gas might indeed be a “game changer” in international and U.S. energy markets, as many have suggested. The presumed large volume of shale gas suggests basic economics –more volume of shale gas worldwide could keep energy prices lower. It is not yet known if “dry” shale gas can be produced as economically, and it is well known that most of the production now is in the liquid “plays.” Additional federal and state environmental regulations, as well as new water management requirements to address concerns with HF, will add costs to shale gas production and the electricity generated from natural gas.

Drilling for shale gas in more densely populated or urban areas is typically less than 10 years old. The public’s anxiety is more pronounced in states with no oil and gas industry experience. But it is very clear that without the hydraulic fracturing and the directional drilling advances, these shale gas deposits would be inaccessible. **Hydraulic fracturing and other sophisticated new advancements are essential for getting natural gas from shale rock, as well as for extracting oil.**

### Exactly What Is HF?

After an oil or gas well is drilled, different techniques are used to release shale gas that are called “hydraulic fracturing.” Hydraulic fracturing opens the brittle rock and holds the rock formation open long enough to release and remove the natural gas or oil (or other hydrocarbons or chemicals that have a commercial value). The methods used to hold open the rock include using huge volumes of water in combination with sand or certain chemicals and surfactants (a sophisticated detergent), with extreme pressure. Which “recipe” of sand (sometimes altered to increase the blasting effect), water, and chemicals is used varies based upon each geologic formation and well. No two wells are exactly alike. Sometimes the chemical formula in the “fracking fluids” or “sand” is proprietary. Many states now require chemical disclosure to state agencies under new state regulations. Previously, environmental concerns focused on chemical disclosure. Recently these concerns are secondary to the other environmental and human health claims.

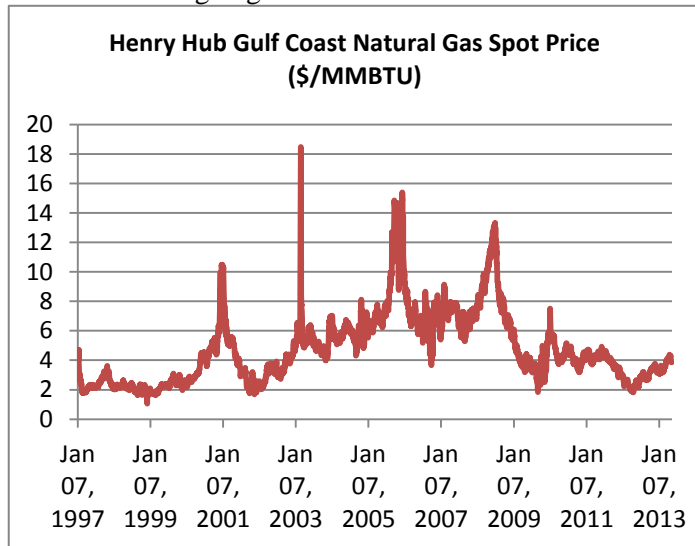


Figure 2  
Data Source: <http://www.eia.gov/dnav/ng/hist/rngwhhdd.htm>

### The Utility Sector’s Generation Transformation Necessitates Clarity and Certainty on HF for Gas Production

The electric utility sector’s increasing use of natural gas to generate electricity is transforming the industry. The electric sector needs to know that natural gas from shale deposits located throughout the nation will be accessible

and reliable. Uncertainty about the shale supply due to regulatory uncertainty on HF will not just affect the oil and gas

<sup>3</sup> Id

sector. Indecision could affect drilling investments, long-term contracts, and the price of natural gas for the consumer, and perhaps negatively impact reliability of the electric grid in certain areas.

Many factors, including price, have driven up the electric utility sector’s demand for natural gas from shale deposits. Natural gas prices have dropped from a volatile \$10-18 Mcf in the early to mid-2000s to an extreme drop to \$2.50 in May 2009, with a rebound to approximately \$4 Mcf today (See Figure 2). Some U.S. coal-fired power plants have switched to natural gas as a result of these cost factors in the last two years (See Figure 3 for EIA’s illustration showing the Appalachian coal and gas price convergence).

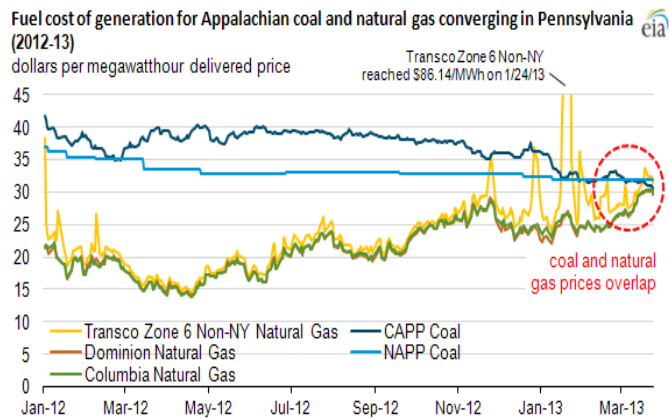


Figure 3, Source EIA

Environmental Protection Agency (EPA) regulations for the electric utility sector under the Clean Air Act are pushing greater usage of natural gas for electric generation. Several major EPA air pollution regulations are leading some owners of coal-fired power plants to mothball or officially retire plants. Others have decided to build new natural gas plants rather than burn gas at coal plants or retrofit coal plants to comply with these EPA regulations. The replacement of a coal plant with a new natural gas unit is often referred to as “scrape and rebuild.” In order for such a replacement to occur, natural gas pipeline and storage infrastructure needs to be available, as well as financing to invest in a combined cycle natural gas plant. Some older coal-fired plants might make very minor (and often uneconomic), but complex, engineering decisions to burn natural gas at existing (and often older) coal plants for a year or two. This “let’s-buy-time” strategy allows the utility

owners to decide later whether a full conversion to natural gas is wise, economical, or justifiable based upon industrial, commercial, and residential demand. The additional time also allows the utility to determine whether various retrofits on coal-fired generation should be made to meet new EPA regulations, but would not alter the deadline for compliance with the Mercury Air Toxics Standards (MATS) deadline of 2015. In some cases, the “let’s-buy-time” approach might mean buying electricity off the open market since the utility cannot install all the pollution controls by the EPA deadline.

Flat electricity demand due to the 2008 recession and resulting industrial downturn has made these decisions all the more difficult. The North American Electric Reliability Corporation (NERC) recently predicted that, based upon regional utility announcements, as much as 71 GW of coal-fired generation could retire by 2022. NERC believes that 90% of those retirements will take place by 2017. It also predicts that about 340 coal-fired power plants will undergo significant retrofits to comply with major EPA regulations and that those plants might have to be offline some length of time while retrofits are being made. More natural gas will likely be burned at combined and simple cycle plants during these retrofits. In addition, natural gas is increasingly used to back up variable renewable generation, which is becoming a larger percentage of generation in many states. As more variable resources, such as wind, are integrated into the grid, more natural gas will be used to “follow” wind and other variable sources whose output can vary by time of day and season. Increased attention is needed on the relationship between variable energy resources and natural gas usage.

Given current and proposed EPA regulations, it is virtually impossible to build a new coal plant, so most new plants are likely to be fueled by natural gas (probably combined cycle). While it is too soon to know exactly how much natural gas will be used by the electric utility sector between now and 2020, natural gas generation makes up 43% of the generation energy mix in 2013, with coal at 30%. APPA’s 2010 study on natural gas found that the utility sector will likely demand a significantly larger amount of natural gas annually because of the many EPA regulations impacting coal-fired generation. This estimate did not factor the additional demand for natural gas by industrial users or to back up renewables. Despite the current surplus in the natural gas market, the need for more gas by the electric and industrial sectors will further increase demand. While the Energy Information Administration (EIA) and National Petroleum Council’s prognostications about the availability of gas suggest that this increase in demand is supportable, the uncertainty surrounding environmental issues related to oil and gas production might shrink the availability of supply. Prolonged uncertainty about “fracking” in a region or state, such as New York or California, might also decrease investments in both oil/gas production and the building of new gas pipelines or storage reservoirs.

## **Current Regulations and Proposed Regulatory Options for HF**

The HF process is currently regulated by a variety of federal, state, county, and municipal laws and regulations, as well as by voluntary industry standards. At the federal level, it is sometimes incorrectly stated that fracking by the oil and gas sector is unregulated by EPA. While fracking fluids themselves are not regulated by EPA under the Safe Drinking Water Act (SDWA), due to a provision in the Energy Policy Act of 2005, the injection of water used to extract the oil and gas is regulated under the Underground Injection Control (UIC) Program for Class II wells in the SDWA. In a few states, the state agency has primacy to regulate, but in most cases, EPA has the authority. EPA's regulatory authority covers briny or salty water and production waters used to recover oil and gas. Currently, there are approximately 150,000 Class II wells and most are oil and gas disposal wells located far below drinking water resources. Roughly 30,000 of these are brine disposal wells. These wells can also be regulated by the state if the state chooses to do so.

EPA authority also covers naturally occurring radioactive materials (similar to that in coal) and certain agents used to hold the rock open in the production process. These regulations and related standards are referred to as "Section 1422 standards" of the SDWA.

Many environmental organizations believe current regulations insufficiently address HF. Many of these groups support additional regulatory action by EPA following the alleged drinking water contaminations in Pavilion, Wyoming, and Dimmit, Texas. The agency is still accepting comments on the Pavilion studies, the alleged first documented case of groundwater contamination in several decades. The oil and gas sector claims that EPA has used faulty and flawed test procedures in its investigation. Environmental organizations assert that the drinking water contamination was clearly caused by oil and gas drilling and HF. Industry representatives counter that in the Pavilion, Wyoming, case, there is no clear indication of drinking water contamination from fracking because the wells may have been old, improperly maintained, or not monitored. It is unclear how long EPA will need to review the more than two million comments expected on the Pavilion, Wyoming, drinking water claims. A final EPA decision on the many studies is not expected before 2014.

Some environmentalists have also asserted that there will be more ozone or smog nonattainment (noncompliance) areas of the country as a result of the shale boom. It is true that particulate matter (PM) and ozone emissions have increased in Wyoming as a result of the oil and gas boom. If there are new ozone, PM, or sulfur dioxide (SO<sub>2</sub>) nonattainment areas in these new oil and gas producing communities, EPA will regulate the oil and gas sector as contributors to ozone and PM (or perhaps SO<sub>2</sub>) and the states will have to address those pollutants in their State Implementation Plans (SIPs).

Typically state and local regulations dictate drilling based upon the depth of the reservoir and establish standards to protect local surface or subsurface water, wetlands, endangered or threatened species, and other localized concerns. The drilling of natural gas wells can also be regulated by counties, city ordinance, and sometimes even by neighborhood association bylaws. Additionally, odor and taste quality in drinking water are primarily regulated at the state and local levels, but EPA has some regulatory authority as well. EPA does not regulate private water wells for maintenance or monitoring. Local laws often restrict oil and gas drilling based on the time of day and address such matters as the setback to trees, homes, commercial buildings, hospitals, and surface water. They can also address issues such as whether roads may be used by drilling-related trucks during the night or during school hours, and whether such roads must be rebuilt or even removed after drilling ceases. Some environmentalists would like to see EPA regulate these many general oil and gas issues that are often loosely described by the term "fracking."

While the rare cases of methane in private drinking water wells gets the public's attention, other types of contamination in private wells unrelated to oil and gas production do not, such as fecal coliform bacteria, dead animals, or other pollutants. Most private drinking wells are rarely inspected after construction, though some localities do regulate private drinking wells to protect human health. However, most cities and counties do not regulate private drinking wells. Environmental organizations point to the fact that EPA does not regulate the HF process as a major weakness in how fracking is currently regulated and assert this lack of sufficient regulation poses risks to drinking water. Environmentalists and the oil/gas sector might find commonality in recognizing that private drinking water wells need better regulatory supervision.

Geology is very local. With the advantage of state geologists' reports, local officials have historically known more about subsurface and surface connectivity than regulators at the national level. Additionally, some HF best practices are set in contracts between the driller, landowner, and subsurface mineral rights owners based in part on the local geology. Environmentalists express concerns about water usage related to oil and gas production. In some cases, state regulatory agencies share this concern. In response to economics or local concerns about water usage, many natural gas producers are recycling the produced water from well to well.

Some environmental groups are calling for more EPA regulation of well casing, well construction, and closure standards, but this is an oilfield operations issue, not strictly an HF issue.

Much of the public concern revolves around drinking water protection and whether state regulations are adequate. Most state regulatory agencies, though, are not as concerned about drinking water contamination as they are about the volume of water used and what happens to the water after HF is completed. The production process to recover shale gas often uses anywhere from a million gallons of water to several million gallons per fracking event. Many wells require multiple uses of HF over the life of the well. States where HF takes place today typically have numerous regulations addressing environmental use, drilling proximity to other buildings, and other set back or safety requirements. Other states that are newer to oil and gas production are now establishing new environmental regulations, as well as setting up commercial arrangements for drilling and production.

According to a National Conference of State Legislatures (NCSL) report<sup>4</sup>, there are currently approximately 140 pending bills in state legislatures to address environmental concerns related to HF. Many bills focus on the chemicals and chemical disclosure of HF fluids. Some state bills would make clear determinations as to which level of government is most appropriate to regulate such environmental concerns: municipal, county, or state authorities. Many, but not all, deal with HF. Some state bills address commercial arrangements for drilling and leasing natural gas or establish state and county opportunities for tax revenue.

Some states and cities have placed a moratorium on HF in their communities indefinitely or pending final EPA studies (including the "Pavilion study" mentioned above) because of concerns about impacts to drinking water. Cities and states contemplating fracking or drilling moratoria include: Grand Rapids, MI; California; New York; and Ft. Collins, CO.

In April 2013, a petition with over 100,000 signatures was delivered to Governor Tom Corbett by PennEnvironment, an environmental group opposed to natural gas drilling in Pennsylvania. This Pennsylvania petition drive raised issues beyond those involved in the HF process itself and made claims about human health concerns in the general population, citing that "a number of illnesses have been reported in areas where HF occurs, including nosebleeds, headaches, skin irritation, fatigue, stomach pains, difficulty breathing, and more. While research projects are underway to investigate the health effects of fracking, a moratorium is a common-sense measure to prevent further illness." The petition also asserts that oil and gas companies have committed 4,363 environmental violations in "recent years."

## **Drought and Water Scarcity**

Even in states like Texas, where HF is established and accepted, serious concerns have emerged among ranchers that water used for HF might not be returned to reservoirs fast enough for ranchers' needs. Given recent droughts in some parts of the country, particularly the Southwest, large volumes of oil and gas production have intensified water supply concerns. While water use and drought is not precisely an HF issue, the question about what to do with the billions of gallons of water used in the HF process might necessitate that state agencies set requirements for "produced" water recycling by oil and gas producers. Some states might require desalinization to address droughts, but it is not clear who would pay for this expensive step.

CERES is an "investor advisory service" that was created in response to the Exxon Valdez oil spill in the 1980s. While it is an advisory service to Wall Street and private corporations, CERES usually takes rather strong environmental positions on a variety of EPA regulations. On May 2, 2013, CERES issued a report on the relationship between drinking water, drought, and oil and gas production (including specific concerns about HF). The report is based on well drilling and water

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<sup>4</sup> <http://www.ncsl.org/documents/energy/NaturalGasDevLeg313.pdf>

use data from FracFocus.org and water stress indicator maps developed by the World Resources Institute (WRI). The research shows that nearly 47 percent of the wells in those states were developed in water basins with high or extremely high water stress. The research was based on FracFocus data collected on 25,450 wells in operation from January 2011 through September 2012.

Ceres’ announcement asserted: “These findings highlight emerging tensions in many U.S. regions between growing hydraulic fracturing activity and localized water supply needs.”

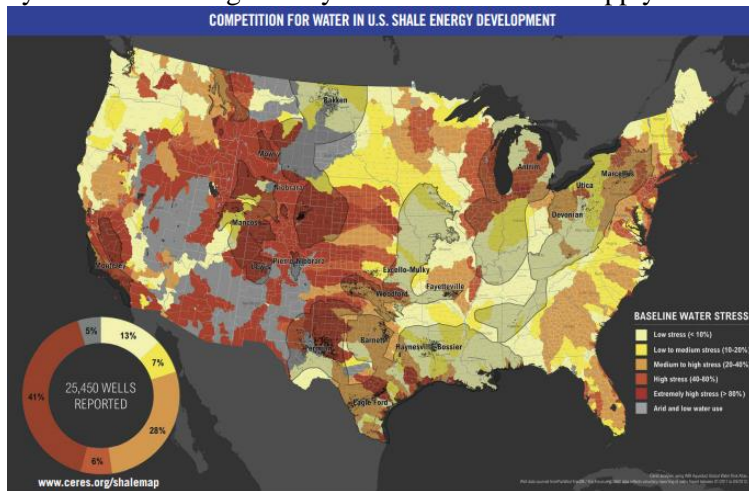


Figure 4, Source CERES

### Interest Groups Concerns and Policy/Regulatory Options

Due to increased concerns regarding the current level of HF regulation at the federal, state and local level, a number of interest groups are calling for additional scrutiny or regulation. For example, the American Water Works Association (AWWA), which represents a diverse national membership of private and public water utilities, has produced a paper<sup>5</sup> on HF and the broader oil and gas industry. AWWA would like to see a repeal of the exclusion language in the Energy Policy Act of 2005 that prevents EPA from regulating the chemicals used in “fracking fluids”. The association would also like to see continued scrutiny of the UIC program for Class 2 and Class 6 wells, as well as better financial

assurance requirements for the prevention of, and in response to, any possible drinking water contamination. Currently the UIC insurance and financial assurance requirements in SDWA only cover closure of oil or gas wells. AWWA is not seeking federal regulatory authority over specific drilling standards.

The AWWA paper concludes:

...oil and gas production, like any industrial activity, carries some risk. Although the risks associated with these activities are difficult to quantify, evidence points to the known risks being manageable through prudent regulations and industry best practices. It is also important to remember that oil and gas development also offers tangible and significant benefits to society, and its risks should be balanced against those benefits. ...Although some policy decisions will be made on the state or national level, ultimately, many critical decisions regarding the protection of particular watersheds and aquifers will be made locally, by regulators, oil and gas developers, and water utilities. In making these decisions, the protection of drinking water must be a paramount concern. ...energy production and safe water (can) coexist peacefully in the years ahead.

The American Gas Association (AGA) and American Petroleum Institute (API) have a number of joint technical papers addressing the adequacy of state primacy over groundwater and drinking water protection. They oppose any efforts that would have EPA water regulations supplant state authorities or state primacy. They do not oppose air pollution regulations by EPA to address ozone, particulate matter, and air toxics. Many oil and gas companies have accepted the need to disclose chemicals used in HF, although some confidentiality might be needed to protect patented techniques. Many of the state legislatures are focused on chemical disclosure and transparency in the use of HF.

As mentioned above, environmental advocates generally believe that state law is not adequate to protect drinking water and are pushing for EPA regulations, in addition to state and local laws. The exception is the recent action taken by the Environmental Defense Fund (EDF), that believes a collaborative industry-environmental, independent certification process can address air, water, and waste management at oil and gas production areas that protect public health. The chart below summarizes the wide views of the environmental and business groups:

<sup>5</sup> <http://www.awwa.org/Portals/0/files/legreg/documents/AWWAFrackingReport.pdf>

ENVIRONMENTAL OR INDUSTRY GROUP	AREAS OF CONCERN	MORE EPA REGS & OTHER AGENCIES?
American Water Works Association Association of Metropolitan Water Agencies National Association of Water Companies	<ul style="list-style-type: none"> <li>EPA should regulate under Safe Drinking Water Act addressing well construction &amp; operation, HF practices through the existing UIC program</li> <li>Congress should remove the EPCRA 2005 limitations on SDWA regulations on wells and HF.</li> <li>Congress should provide adequate EPA staff and research funding.</li> </ul>	<ul style="list-style-type: none"> <li>Use of existing SDWA authority and removal of EPCRA 2005 Section 322 loophole..</li> <li>Financial assurance under the UIC program for oil/gas companies.</li> <li>Disclosure to water utilities about fracking chemicals &amp; volume of water to be used.</li> </ul>
<b>Greenpeace</b> <b>(Environmental advocates)</b> <a href="http://www.greenpeace.org/usa/en/campaigns/global-warming-and-energy/The-Problem/fracking/">http://www.greenpeace.org/usa/en/campaigns/global-warming-and-energy/The-Problem/fracking/</a>	<ul style="list-style-type: none"> <li>Drinking water contamination from bad wells.</li> <li>Natural gas is not a solution to climate change problem.</li> <li>Waste management at drilling site.</li> <li>Possible surface waste to harm rivers &amp; streams.</li> </ul>	<b>Yes</b> <ul style="list-style-type: none"> <li>Concerns about methane from well burping and flaring, natural gas will increase CO<sub>2</sub> overall.</li> </ul>
<b>Sierra Club</b> <b>(Environmental advocates)</b> <a href="http://content.sierraclub.org/naturalgas/">http://content.sierraclub.org/naturalgas/</a>	<ul style="list-style-type: none"> <li>Drinking water contamination from bad wells.</li> <li>Natural gas is not a solution to climate change problem.</li> <li>“Beyond Gas” campaign is on website following the Beyond Coal campaign.</li> <li>Concerns about natural gas pipeline across areas with wetlands, endangered or threatened species, etc.</li> </ul>	<b>Yes.</b> <ul style="list-style-type: none"> <li>Seeking new Federal regulatory authorities not yet used in Safe Drinking Water Act, Clean Water Act as well as under Clean Air Act.</li> </ul>
<b>Riverkeepers of NY (and other states)</b> <b>(Environmental advocates )</b> <a href="http://www.riverkeeper.org/campaigns/safeguard/gas-drilling/">http://www.riverkeeper.org/campaigns/safeguard/gas-drilling/</a>	<ul style="list-style-type: none"> <li>Concerns about drinking water exposures since groundwater is only filtered for NYC.</li> <li>Claims of leukemia, spinal damage, nervous system disorders and risks for other cancers from benzene exposure from drilling for oil &amp; natural gas.</li> <li>Additional ozone/PM areas in NY state &amp; respiratory illnesses resulting from additional nonattainment areas.</li> </ul>	<b>Yes.</b> <ul style="list-style-type: none"> <li>Concerns about carcinogens &amp; radioactive substances in rock displaced from natural gas production.</li> <li>Seeking moratorium on drilling in NY state for natural gas using HF. Believe that moratorium should only be lifted when human health and environmental concerns can completely be eliminated including smog and PM issues.</li> </ul>
<b>FracTracker</b> <b>(Environmental advocates)</b> <a href="http://www.fractracker.org/">http://www.fractracker.org/</a>	<ul style="list-style-type: none"> <li>Same environmental concerns as others.</li> <li>Pipeline safety &amp; exposure concerns.</li> <li>There are more than 100 similar grassroots organizations in NY, PA, and CA with others emerging in OR, WA and even states with no probable shale gas deposits.</li> </ul>	<b>Yes.</b>
<b>Earth Justice</b> <b>(Environment advocates)</b> <a href="http://earthjustice.org/our_work/campaigns/fracking-gone-wrong-finding-a-better-way">http://earthjustice.org/our_work/campaigns/fracking-gone-wrong-finding-a-better-way</a>	Same as above	<b>Yes</b> <ul style="list-style-type: none"> <li>Additionally have interactive “Fraccidents” website map with alleged human health and animal reactions to natural gas production and HF.</li> <li>Website offers training techniques to oppose natural gas through municipal zoning laws.</li> </ul>

<p><b>Natural Resources Defense Council (NRDC)</b>  <b>(Environmental advocates)</b>  <a href="http://www.nrdc.org/energy/gasdrilling/">http://www.nrdc.org/energy/gasdrilling/</a></p>	<ul style="list-style-type: none"> <li>• No HF in sensitive lands &amp; critical watersheds. Methane at gas production &lt;1% of production to reduce CO<sub>2</sub>E.</li> </ul>	<p><b>Yes</b></p> <ul style="list-style-type: none"> <li>• NRDC has the most complete list.</li> <li>• Require “green completions” at well.</li> <li>• Mandate sound well drilling &amp; construction require strongest well siting, casing and cementing and other drilling best practices.</li> <li>• Protect landscape, air, and water by closing CWA and SDWA loopholes,</li> <li>• Toxic and hazardous waste management at drilling site or injection location.</li> <li>• Fund robust inspection &amp; enforcement</li> <li>• Full chemical disclosure</li> </ul>
<p><b>CERES (also shown as “ceres” on website)</b>  <b>(Environmental/Investor-Advocacy)</b>  <a href="http://www.ceres.org">http://www.ceres.org</a></p>	<ul style="list-style-type: none"> <li>• <i>May 2013 report titled “<a href="#">Hydraulic Fracturing &amp; Water Stress: Growing Competitive Pressures for Water</a>”</i> asserts water use issues in drought prone states where oil and gas production is expected.</li> </ul>	<p><b>Not yet clear</b></p> <ul style="list-style-type: none"> <li>• It is not clear if they are solely concerned about water adequacy or also about EPA regulations. CERES has taken definitive positions on other fossil fuel resources so continued monitoring of CERES position is wise.</li> </ul>
<p><b>American Petroleum Institute (Industry advocacy organization)</b>  <b>American Gas Association (advocacy)</b>  <b>American Natural Gas Alliance (ANGA)</b>  <b>API/AGA/ANGA joint positions (industry)</b></p>	<ul style="list-style-type: none"> <li>• Uncertainty on fracking leads to delays, cost overruns and uncertainty in investments.</li> <li>• Want states to remain primary authority for safe drinking water &amp; clean water act regulations and water use.</li> <li>• Oppose EPA taking on additional regulatory authority to delay natural gas production. Believe that the Pavilion, WY and Dimmit, Texas claims about drinking water contamination or PA faucet water catching on fire are due to poor private drinking well construction and lack of maintenance.</li> </ul>	<p><b>No</b></p> <ul style="list-style-type: none"> <li>• State primacy in water; EPA to regulate for ozone/smog &amp; PM</li> </ul>
<p><b>Resources for the Future (Think Tank)</b>  <a href="http://www.wri.org/publication/clearing-the-air">http://www.wri.org/publication/clearing-the-air</a>  <a href="http://rfflibrary.wordpress.com/2013/04/11/induced-seismicity-and-hydraulic-fracturing-for-the-recovery-of-hydrocarbons/">http://rfflibrary.wordpress.com/2013/04/11/induced-seismicity-and-hydraulic-fracturing-for-the-recovery-of-hydrocarbons/</a></p>	<ul style="list-style-type: none"> <li>• Note: organization has independent analysts with suggestions or analysis—no organizational opinion about legislation or regulations.</li> <li>• Overview on HF see <a href="http://insights.wri.org/news/2011/12/shale-gas-time-look-we-leap-any-further">http://insights.wri.org/news/2011/12/shale-gas-time-look-we-leap-any-further</a></li> <li>• Additional natural gas concerns: <a href="http://www.wri.org/publication/clearing-the-air">http://www.wri.org/publication/clearing-the-air</a></li> <li>• Concerns about life cycle of CO<sub>2</sub>E with lifecycle analysis—will CO<sub>2</sub> really reduce if US is more reliant upon domestic natural gas given methane leakage where CO<sub>2</sub> Equivalent with methane could be very high? This could mean more methane recovery control requirements at natural gas production, pipelines, booster compressors and other infrastructure locations.</li> <li>• Concerns about geologic seismicity and increasing water use.</li> </ul>	



<p><b>University of Texas Bureau of Economic Geology</b> studies on water use for natural gas <i>industry (study did use private industry funding)</i>  <a href="http://www.twdb.state.tx.us/waterplanning/rwp/planningdocu/2016/doc/current_docs/project_docs/201209FinalReport_O&amp;GWaterUse.pdf">http://www.twdb.state.tx.us/waterplanning/rwp/planningdocu/2016/doc/current_docs/project_docs/201209FinalReport_O&amp;GWaterUse.pdf</a></p>	<ul style="list-style-type: none"> <li>• This report (and predecessor) illustrate the large volumes of water to be used for natural gas production.</li> </ul>	
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### Likely or Feasible Action by EPA or States and Local Governments

Without further authorization by Congress, EPA cannot regulate the chemicals used in the fracking process. However, EPA could regulate indirectly through revisions to Effluent Guidelines Limitations (ELG) or through a lengthy process to change water quality standards for substances detected in streams that might also be found in fracking chemicals. Changing water quality standards can take several years. Moreover, changing water quality standards could also impact several types of electricity generation.

The potential regulatory paths EPA could undertake include the following:

- Mandate the reuse of water and require that produced waters be regulated to drinking water standards. This could have implications for coal-fired and oil-fired power plants. Typically EPA has deferred to the states on requiring multiple uses of water at power plants. Revising drinking water standards for one industry could set a precedent for many industries.
- Regulation for odor, smell, and taste quality in drinking water, although this is historically a local decision.
- Initiate other water usage regulations that address how production or fracking water is used, reused, and how it is disposed. It would likely take at least two years before the agency could initiate such regulatory steps with perhaps another four years before the issues are resolved. Further, EPA could address “like kind” hydrocarbon waste injections into oil and gas wells under the Resource Conservation and Recovery Act (RCRA).

The expansion of EPA authority in any of these areas has other implications for the electric utility sector’s own waste management and local water use. Any agency effort to regulate waste disposal of “like-kind wastes” and water use could impact natural gas and nuclear generation. A glance at the chart on pages 7-9 outlines what environmental advocates would seek in an EPA regulation. Some of these concerns address non-water issues, endangered species, and wetlands protection. The SDWA requires that companies drilling and injecting waste water or drilling properties in the UIC Class II wells provide financial assurance (through cash, property, other assets, insurance, or stock) that, should there be an environmental problem, the contamination would be cleaned up. It is unclear if EPA could require a larger financing or insurance assurance for drillers under the UIC Class II program.

Twenty-one state oil and gas production regulatory programs have been evaluated for adequacy by the State Review of Oil and Natural Gas Regulations (STRONGER). STRONGER’s review committee includes environmentalists and academics and former oil and gas experts. Their review of 21 state regulatory systems has shown that they competently regulate natural gas operations. A 2009 review of state oil and natural gas regulations conducted by the Ground Water Protection Council (which receives funding from both state regulatory agencies and the oil and gas sector) found that state regulation of oil and gas exploration and production activities is adequate to protect water resources.

Depending upon location, the water used for production may also be regulated for re-use, re-deployment elsewhere, for deep well injection locally, or for treatment at a local wastewater utility. In some cases, these local restrictions might currently be more stringent than what EPA might do.

### Other Federal Agency Views, Existing Authorities, and Actions, Plans, Etc.

Under existing authority, the Bureau of Land Management (BLM) reduced the available shale gas from the New York state portion of the giant Marcellus shale formation by 80 percent due to environmental concerns. In addition, BLM just issued an updated proposal for broad regulations and guidelines for natural gas extraction on federal lands, which primarily affects western states. The new proposal has been criticized by environmental groups as inadequate, and by some in industry as duplicative of existing requirements. Among other things, the proposed regulations would require additional disclosure of chemicals used in the extraction process. It also allows states to propose their own standards if

they can show those standards are as strong as the federal ones. It is unclear when BLM will finalize these regulations, but when they do it could have profound impacts on the amount of shale gas supply.

The U.S. Fish and Wildlife Service (FWS) may also curtail or limit natural gas if a threatened or endangered species is identified. In addition, the U.S. Geological Survey (USGS) will continue to advise state agencies with geologic faults as to risks associated with injection of fracking fluids. USGS and the oil and gas industry work to eliminate inadvertent seismicity in locations where seismic events are not normal. USGS recently reviewed seismic events in Ohio and Arkansas to determine if oil and gas production could be the cause. Other agencies, including the Federal Regulatory Energy Commission (FERC), may well look at National Environmental Policy Act (NEPA) review for possible impacts on threatened or endangered species in the vicinity of interstate natural gas pipelines. Further, EPA and other agencies might limit oil and gas production in locations that might send air pollution precursors (PM, NO<sub>x</sub>, or ozone) into U.S. National Parks, Class I areas, and protected historical areas.

## **Conclusion**

Shale gas has transformed the domestic energy outlook and should be a part of a diverse portfolio of electricity generation resources, including nuclear, coal, oil, hydro, and renewable sources such as solar, biomass, geothermal, and wind. Shale gas will reduce emissions of CO<sub>2</sub> from coal-fired power plants, as well as conventional pollutants, such as smog precursors at power plants. (It is possible that methane, CO<sub>2</sub> PM, and Volatile Organic Compounds (VOCs) emissions may increase from the oil and gas sector while declining from the power sector.) Natural gas development offers tremendous economic benefits, such as jobs, increased public and private sector revenues, and lower gas prices. As shale gas development has moved into more densely populated regions, however, public concern has increased about its potential effects on human health and the environment. State legislatures are exploring how to ensure that this important domestic resource is developed safely, while also taking advantage of its economic value to our economy and to our electric utility consumers.

HF is essential to all new shale gas production. HF can be effectively regulated by states to protect drinking water supplies, while still allowing for more stringent standards to be set by county or city governments. EPA has regulatory authority under the UIC program, but otherwise limited authority to regulate under SDWA. Historically, most state agencies have primacy for all water regulations, just as they have for the power sector's water use and for meeting local standards. For federal lands, BLM will continue to regulate, in conjunction with FWS and USGS, where relevant. It is impossible to know, at this time, whether EPA will take additional steps to regulate HF as a way to regulate drilling practices, propose well completion standards or set back standards, regulate the use and re-injection of produced waters, or establish national standards for taste or smell.

APPA's goal is to ensure that hydraulic fracturing results in economically affordable natural gas from shale formations for the electric utility sector and our customers. At the same time, environmental regulations should continue to protect drinking water and air quality. APPA believes that the current "cooperative federalism" is an effective system to regulate for the electric utility sector, the mining industry, and the oil and gas sector.

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May 22, 2013

## Helpful Links and Reference Materials

### U.S. Governmental Agency Information

#### EPA regulations

<http://www.epa.gov/airquality/oilandgas/>

<http://www.epa.gov/airtoxics/oilgas/oilgaspg.html>

<http://www.epa.gov/lawsregs/sectors/petroleum.html>

**Safe Drinking Water exemption on “fracking fluids” regulation under Energy Policy Act of 2005 (Section 322 of EPAAct2005)**

[http://www1.eere.energy.gov/femp/pdfs/epact\\_2005.pdf](http://www1.eere.energy.gov/femp/pdfs/epact_2005.pdf)

#### EPA information on HF and drinking water

<http://water.epa.gov/type/groundwater/uic/class2/hydraulicfracturing/hydraulic-fracturing.cfm>

#### EPA information & diagram on fracturing water

<http://www2.epa.gov/hfstudy/hydraulic-fracturing-water-cycle>

#### EPA Underground Injection Control program

<http://www.epa.gov/region9/water/groundwater/uic.html>

#### Well water information from EPA

<http://water.epa.gov/drink/info/well/faq.cfm>

**U. S. Geological Services’ webinars and electronic training on HF, seismic issues etc...**

<http://energy.usgs.gov/OilGas/UnconventionalOilGas/HydraulicFracturing.aspx>

### State/local regulatory or agency expertise

#### Environmental Council of the States (ECOS)

[http://www.ecos.org/section/committees/waste/ecos\\_iogcc\\_forum1](http://www.ecos.org/section/committees/waste/ecos_iogcc_forum1)

#### July 2013 meeting on HF and policy issues

<http://www.ecos.org/section/events/?id=4907>

#### American Water Works Association (AWWA)

<http://www.awwa.org/Portals/0/files/legreg/documents/AWWAFrackingReport.pdf>

**NCSL Paper on Natural Gas and Hydraulic Fracturing & NCSL 2013 map illustrating natural gas legislation pending in state legislatures**

<http://www.ncsl.org/documents/energy/NaturalGasDevLeg313.pdf>

**NCSL 2013 map illustrating natural gas legislation pending in state legislatures**

<http://www.ncsl.org/documents/energy/NaturalGasDevLeg313.pdf>

### Petroleum sector information

**FracFocus link to state regulations on fracking chemicals, chemical usage, and transparency**

<http://fracfocus.org/regulations-state> and webinar <http://www.teex.org/ev/flash/player.html>

**ANGA interactive state map with natural gas jobs, production and jobs**

<http://www.anga.us/why-natural-gas/jobs/natural-gas-in-my-state#>

<http://www.anga.us/why-natural-gas/jobs/us-natural-gas-benefits/state-by-state>

**American Petroleum Institute/American Gas Association Technical Papers on Shale Gas/Fracking Best Practices for HF In Communities**

[http://www.api.org/~media/Files/Policy/Exploration/Hydraulic\\_Fracturing\\_InfoSheet.pdf](http://www.api.org/~media/Files/Policy/Exploration/Hydraulic_Fracturing_InfoSheet.pdf)

<http://www.api.org/oil-and-natural-gas-overview/exploration-and-production/hydraulic-fracturing?page=2>

<http://www.api.org/oil-and-natural-gas-overview/exploration-and-production/hydraulic-fracturing>

### Environmental advocacy groups

**Sierra Club’s Beyond Gas and HF materials**

<http://content.sierraclub.org/naturalgas/>

**Environmental Defense Fund’s HF and natural gas areas of concern materials**

<http://www.edf.org/climate/what-is-fracking>

<http://www.edf.org/climate/five-areas-of-concern?path=hp&postion=1>

**Private-Public Collaborations on Groundwater Protection**

<http://www.strongerinc.org/> and guideline review details <http://67.20.79.30/sites/all/themes/stronger02/downloads/HF%20Guideline%20Web%20posting.pdf>

### Collaboration of environmentalists and natural gas producers

**Center for Sustainable Shale Development**

<http://www.sustainableshale.org/>

**Proposed Policy Standards From Center For Sustainable Shale Development**

<http://037186e.netsolhost.com/site/wp-content/uploads/2013/03/CSSD-Performance-Standards-3-13R.pdf>

### Other

**Unconfirmed Antifracking Resolutions in City Or County Governments (Pending Or Passed)**

[http://www.citizenscampaign.org/special\\_features/fracking/hydro-fracking-resolutions.asp](http://www.citizenscampaign.org/special_features/fracking/hydro-fracking-resolutions.asp)