The FRAC Act:

The Fracturing Responsibility and Awareness of Chemicals Act of 2011

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Table of Contents

Executive Summary 4

Introduction 5

The Growth of Natural Gas Supply in the US 5

Hydraulic Fracturing: Process Dynamics 7

Problems Associated with Hydraulic Fracturing 8

- Contamination of Drinking Water Sources 9
- Air Pollution 11
- Water Resource Depletion 12
- Geological Disturbances 12
- Uncertainties on the Level of Risk 12

The FRAC Act: A Step in the Right Direction? 13

- Legislative History 13
- The FRAC Act and its Components 13

How the FRAC Act Will Address Health Risks 14

- Regulatory Component 14
  - Authorization and Permitting Procedures 14
  - Monitoring Requirements 15
  - Pros and Cons of the Regulatory Component 16
- Disclosure Component of the FRAC Act 16
  - Material Safety and Data Sheets 16
  - Pros and Cons of the Disclosure Component 17

Conclusion 18

References 19

Appendix 22

Executive Summary

Hydraulic fracturing, commonly referred to as hydrofracking or fracking, is a technology used to stimulate production from unconventional oil and gas deposits, such as shale rock and coalbed formations. While the process has been used for several decades, in recent years, advancements in horizontal drilling technology have allowed for exploration and extraction of previously inaccessible reserves throughout the United States. The speed of the expansion, combined with its use in new geological settings has led to a number of citizen complaints about the potential contamination of drinking water sources and investigations into the practice, as well as calls for federal oversight.

In order to address some of these concerns, on March 15th 2011, Senator Robert Casey introduced the Fracturing Responsibility and Awareness of Chemicals Act (FRAC Act) to the Senate. The proposed legislation aims to reduce regulatory uncertainty surrounding the fluids used in the hydraulic fracturing process, which are currently not regulated under the Safe Drinking Water Act.

Historically, the underground injection of hydraulic fracturing fluids has not been regulated by the Environmental Protection Agency (EPA). A 2004 EPA report found no evidence of potential risks caused by the fluids. A year later, the Energy Policy Act of 2005 revised the Safe Drinking Water Act to deregulate the injection of fluids and propping agents as part of the Underground Injection Control process. Now with the depletion of conventional natural gas reserves and the growth of hydraulic fracturing from deep reservoirs, in 2011 Congress is considering bringing hydraulic fracturing back under the regulatory structure of the Environmental Protection Agency.

While the FRAC Act appears to be an appropriate response to concerns about hydraulic fracturing, a closer look at the Act reveals that, even with the authority conferred to the EPA and the revised definition of "underground injection," it does not thoroughly address the potential health hazards linked to hydraulic fracturing as well as other environmental concerns.

In this paper we will provide an in-depth analysis of the science behind hydraulic fracturing and this legislative proposal in order to gain understanding of the hydraulic fracturing process, its potential health risks, the solution proposed by the Act, and the controversies associated with it.

Introduction

Hydraulic fracturing, commonly referred to as hydrofracking or fracking, is a technology used to stimulate production from unconventional oil and gas deposits, such as shale rock and coalbed formations. While the process has been used for several decades, in recent years, advancements in horizontal drilling technology have allowed for exploration and extraction of previously inaccessible reserves throughout the United States. According to the industry, this could potentially meet increased energy demand and allow the United States to achieve energy independence.

The speed of the expansion, combined with its use in new geological settings has led to a number of citizen complaints about the potential contamination of drinking water sources and investigations into the practice, as well as calls for federal oversight. The FRAC Act, or Fracturing Responsibilities and Awareness of Chemicals Act of 2011, is an attempt to regulate the hydraulic fracturing process at a federal level.

The FRAC Act could provide the impetus for the industry to address the negative externalities resulting from the extraction process. However, the Act primarily focuses on drinking water contamination and does not address other possible environmental problems associated with hydraulic fracturing, like water depletion, geological disturbance and greenhouse gas emissions.

The Growth of Natural Gas Supply in the US

Increasing energy demand and the goal of American energy independence have made natural gas extraction a popular solution to energy concerns in the United States. In fact, over the next century, natural gas could provide the United States with a vast amount of domestically sourced energy. The availability of easy-to-access natural gas reserves has made hydraulic fracturing a rapidly growing form of natural gas extraction, as the method renders previously out-of-reach supplies accessible. Deep shale gas reservoirs are the most abundant and significant categories of those supplies. As illustrated in Figure 1, the US Energy Information Administration (EIA), reports that shale gas currently accounts for around 20% of US domestic production and estimates predict that it will grow to 45% by 2035 (EIA, 2011).

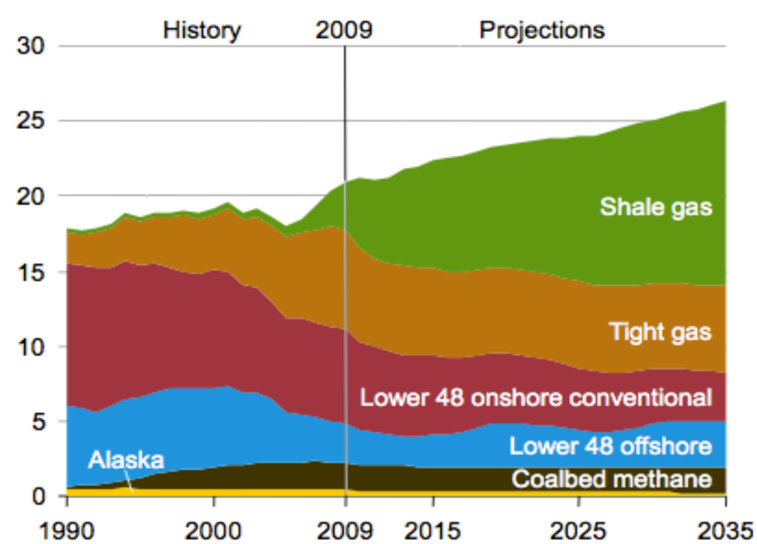

Figure 1: U.S. natural gas production, 1990-2035 (trillion cubic feet per year). Source: EIA 2011

While hydraulic fracturing has been used for several decades, new technologies such as horizontal drilling have opened up vast reserves of natural gas in the United States that would have otherwise been too expensive and difficult to extract. Industry argues that natural gas expansion may thus reduce dependence on foreign oil, create jobs, grow the economy, and help to reduce carbon emissions from the burning of fossil fuels. Figure 2 illustrates the major U.S. natural gas shale beds.

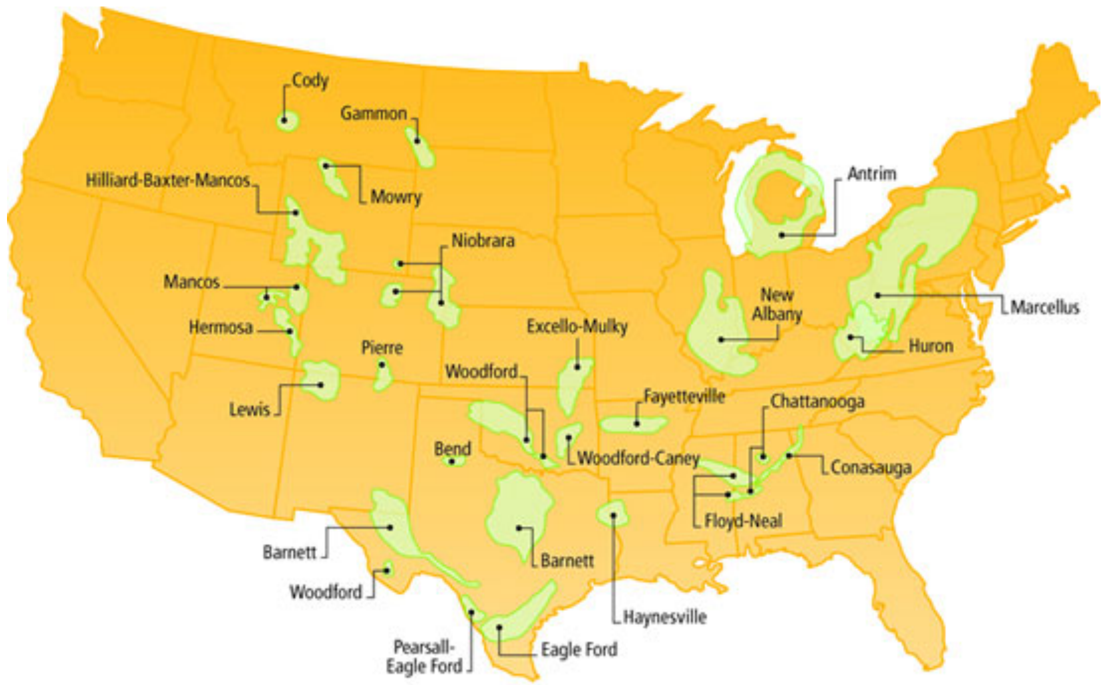

Figure 2: Modern Shale Gas Development in the United States. Source: US Department of Energy

Despite its economic potential, there are many concerns related to the environmental and human health effects of hydraulic fracturing. Many Americans have reported evidence of ecosystem and human health effects related to the process. However, these reports only constitute anecdotal evidence. A lack of official federal regulation and scientific consensus on the safety of hydraulic fracturing has led to further uncertainty and a proliferation of concerns about the effects of hydraulic fracturing on drinking water, human health, and local ecosystems.

In order to understand the sources of the problem, in the following pages we will analyze the technical aspects of hydraulic fracturing and the science of the controversies associated with the extraction process.

Hydraulic Fracturing: Process Dynamics

Natural gas exists in shale rock, a type of sedimentary rock formed over millions of years by the accumulation of sediments in slow moving bodies of water. The sediments trap decaying organic material, which is converted into hydrocarbons by the growing pressure caused by increased sediment loads (Sumi, 2008).

The process of shale gas extraction begins with the selection and preparation of an appropriate site (EPA, 2011). A borehole is then drilled into the targeted shale formation. Current practices in drilling for natural gas include drilling vertical, horizontal, and directional (S-shaped) wells (EPA, 2011). When the formation has been drilled, casing and cement are injected to protect the walls of the well (EPA, 2011). These perforations create the initial fractures in the shale that are then enlarged through hydraulic fracturing. The enlarged fractures allow gas to escape the rock formation and flow to the wellhead at the surface.

Large volumes of water are mixed with chemical additives and proppants, such as sand or ceramic materials. The fluid is blasted into the geological formations at high pressures to break apart the shale rock. The proppant holds the fractures open to allow the oil and gas to flow freely out of the formation and into a production well (Tiemann & Vann, 2011). This process is illustrated in Figure 3.

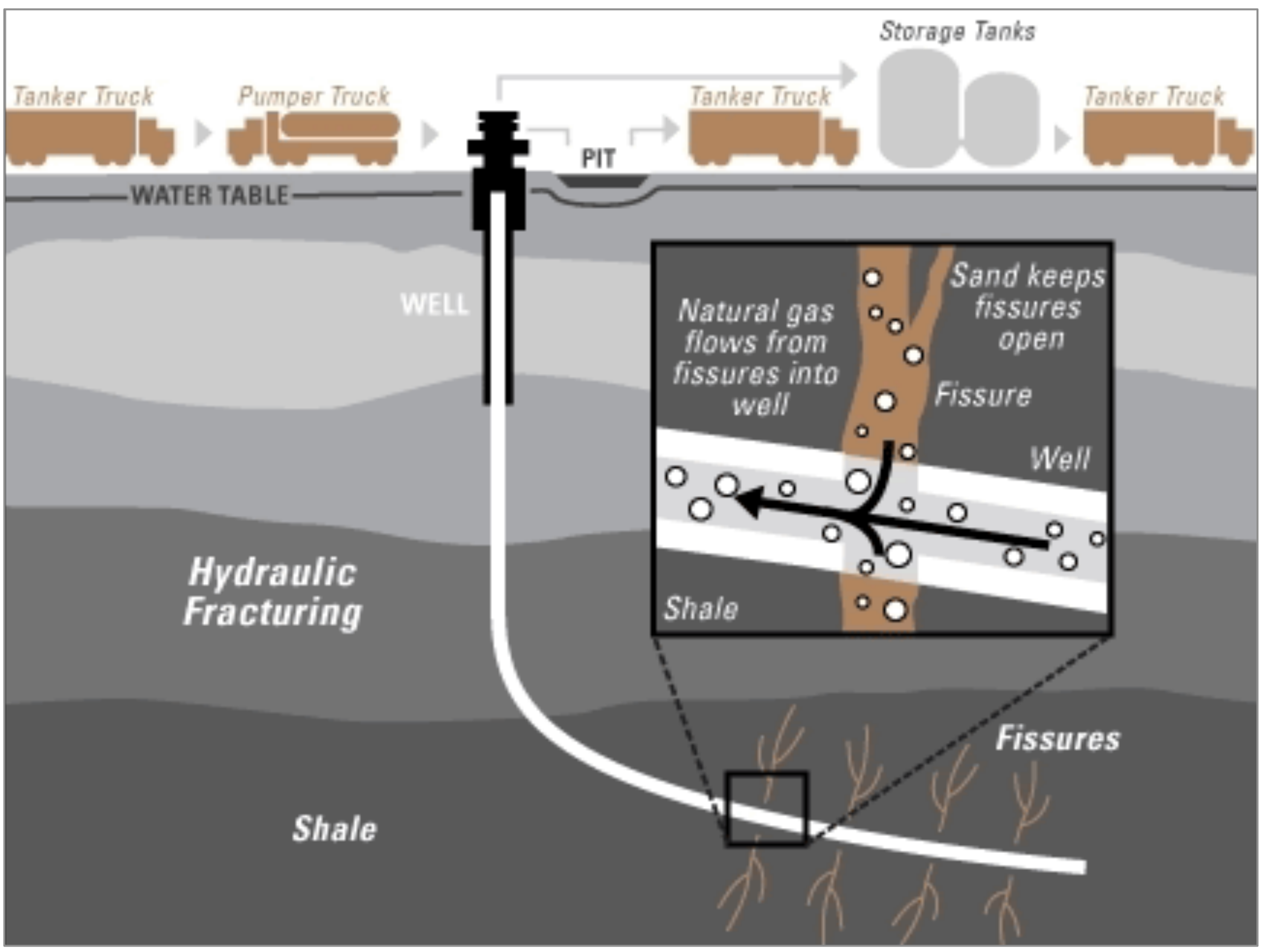

Figure 3: The hydraulic fracturing process. Source: The Southeast Texas Record

After the fracturing is completed, the pressure in the well bore drops and a portion of the injected fluid returns to the surface, along with naturally occurring substances released from the targeted formation. This waste fluid is called "flowback" (EPA, 2011). The hydraulic fracturing process also leaves behind a significant portion of the fracturing fluid in underground rock formations (EPA, 2011).

Scientists, environmentalists, and citizen watchdog groups are concerned that the fluids that remain underground as well as the flowback that returns to the surface could potentially contaminate drinking water sources. This is the main focus of this paper, and one that will be analyzed in the following pages.

Problems Associated with Hydraulic Fracturing

The uncertainty surrounding the unknown chemicals used in hydraulic fracturing as well as the harmful health effects of known chemicals in fracturing fluid are at the center of the hydraulic fracturing debate. In fact, natural gas operators are not required to fully disclose the nature of the chemical additives used in the hydraulic fracturing process neither to the government nor to the public.

An emerging body of anecdotal evidence suggests that these chemicals may pose serious human and environmental health problems. According to a recent study released by the House of Representatives Committee on Energy and Commerce (2011) in which natural gas producers were asked to voluntarily disclose the additives they had been using in hydraulic fracturing operations, 29 of the disclosed chemicals are known or possible human carcinogens that are regulated under the Safe Drinking Water Act for their risks to human health or are listed as hazardous air pollutants under the Clean Air Act. These 29 chemicals are components of more than 650 products used in hydraulic fracturing.

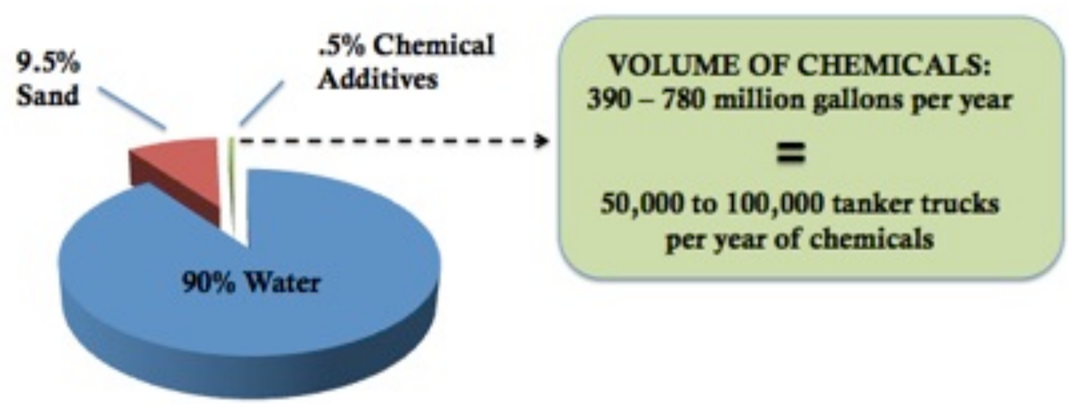

Figure 4: Fluid composition and total annual volume of chemicals used in hydraulic fracturing. Source: Energy in Depth.

These chemicals can have an array of negative human health effects. For example, aromatic hydrocarbons such as benzene are associated with blood disorders, petroleum distillates can negatively impact the central nervous system, and ethers can harm kidney function. Other compounds may have negative effects, but the lack of disclosure prevents scientists from painting a full picture of possible human health and ecological impacts of hydraulic fracturing chemicals (NYDEC, 2011).

Proponents of hydraulic fracturing insist that the mixture is a benign combination of around 10-15 chemicals per hydraulic fracturing job (API, 2010). The natural gas industry says that the voluntary reporting is sufficient as the chemicals make up a small fraction of the overall fracturing solution. They argue that certain chemicals must remain proprietary to ensure they maintain an economic advantage in the market. Opponents, however, assert that the additives contain dangerous carcinogens and pollutants. According to the Endocrine Disruption Exchange, a scientific group that studied and collected data on the potential health effects of chemicals used during natural gas operations, "product manufacturers should be required to divulge 100% of the chemicals used in their products in order to allow effective monitoring of air and water quality" (Colburn, 2010). Without full knowledge of the chemicals used, it is extremely difficult to determine what air and water quality tests to run.

The potential problems associated with the chemicals utilized in hydraulic fracturing as well as the process itself can be broadly classified into four main categories: drinking water contamination, air pollution, water depletion and geological disturbances.

Contamination of Drinking Water Sources

Although expanded use of hydraulic fracturing to develop unconventional natural gas resources has enabled the rapid expansion of gas production, concern has emerged regarding the potential impacts that this process may have on groundwater quality and public water supplies (Tiemann & Van, 2011).

One of the main concerns stems from the possibility that unrecovered fluids that remain underground once the fracturing operation is finished may migrate through the rocks and contaminate underground sources of drinking water.

Figure 5: Contaminated drinking water from a residential well in Hickory, Pennsylvania. Source: (NRDC, 2011)

Aquifers, which are underground pools of fresh water held by layers of porous rock, are considered important sources of drinking water, as much of the country's population relies on them. In fact, in the United States, 84 million people (nearly a third of the population) depend on aquifers for drinking water (Cohen, 2006).

Depending on the well depth of each fracturing operation, between 25% and 75% of the injected fracturing fluid returns to the surface. This fluid could potentially make its way into aquifers and surface water supplies through various means, including (DNYEC, 2011):

- Wellbore failure
- Movement of unrecovered fracturing fluid out of the subsurface through subterranean pathways such as a poorly constructed or improperly plugged wellbore
- Fractures created by the hydraulic fracturing process
- Natural faults and fractures
- Movement of fracturing fluids through the interconnected pore spaces in the rocks from the fracture zone to a well or aquifer.

However, because hydraulic fracturing generally takes place thousands of feet below most aquifers, both the industry and the EPA argue that with proper well construction there is a very low chance that hydraulic fracturing fluids could cause aquifer contamination (Urbina, 2011).

Figure 6: Hydraulic fracturing holding pond for flowback fluids. Source: J. Henry Fair

In addition to underground water contamination from unrecovered fluids, there are concerns about the threats that the resultant wastewater or flowback that returns to the surface may pose to human health. This wastewater contains not only the chemical additives originally injected with the fracturing fluid, but also corrosive salts and radioactive elements that occur naturally in shale rock and are dissolved into the fluid during the injection process. Radioactive elements can damage DNA, weaken immune systems, and cause anemia and cancer, among other issues (Illinois Department of Public Health, 2008).

The storage, treatment and disposal of this wastewater vary depending on state regulation. The recovered flowback is stored in holding ponds or pits (as illustrated in Figure 6) for a certain length of time before it is transported to wastewater treatment plants, injected deep underground for permanent storage, or released into waterways. All of these processes represent an opportunity for potential water supply contamination. For example, these substances may contaminate surface waterways through storm water runoff while being stored in holding ponds. What's more, water treatment plants may not be able to remove these substances prior to discharging the treated water into waterways (EPA, 2011). A *New York Times* investigation showed that most wastewater treatment plants are unable to effectively handle the elevated levels of radioactive elements in wastewater from hydraulic fracturing operations and that flowback received by treatment plants can be over 2000 times the EPA standard for radioactivity (Urbina, 2011).

The risk of chemical contamination also includes the possibility of methane gas seeping into groundwater. When hydraulic fracturing wells are not properly drilled, methane can seep and dissolve into water sources. Depending on the degree of the contamination, methane can cause water to ignite, potentially leading to explosions (Osborn, 2011). Methane is not regulated in drinking water sources because it does not alter its color, taste, or odor and is not known to affect water potability (Lustgarten, 2011).

A recent study from Duke University based on groundwater analyses of 60 private water wells within the Marcellus shale with active drilling and extraction revealed that methane concentrations were on average 17 times higher than in non-active areas, with some drinking-water wells having concentrations of methane well above the "immediate action" hazard level established by the EPA (Osborn, 2011). However, there was no other evidence of contamination from hydraulic fracturing fluids or saline produced waters.

Air Pollution

Air pollution is another major concern associated with hydraulic fracturing. Oil and natural gas production and processing account for nearly 40% of all US methane emissions, making this industry the nation's single largest source of methane emissions (EPA, 2011).

Figure 7: Methane plume. Source: Think Progress

There are concerns that, in the next two decades, shale gas recovered through hydraulic fracturing could produce even more greenhouse gases than the burning of coal (Howarth, et al., 2011). Conventional natural gas is widely believed to be a less detrimental form of non-renewable energy since its combustion produces fewer carbon dioxide emissions than coal (Howarth, et al., 2011). However, hydraulic fracturing results in the escape of "fugitive" methane during the drilling process – a fact that is often ignored when comparing the relative ills of natural gas and coal with regard to impacts on global climate change. Compared to coal, the footprint of shale gas may be at least 20% greater and could be more than twice that over a 20-year timespan (Howarth, et al., 2011). Methane gas emission from the hydraulic fracturing extraction process lowers the purported greenhouse-gas emission advantage that natural gas continues to boast over coal.

Water Resource Depletion

Each fracturing job requires upwards of 4 million gallons of water per operation (Lustgarten, 2009). The EPA estimates that around 35,000 wells are fractured each year across the US (EPA, 2011). This means that hydraulic fracturing companies use between 390 and 780 million gallons of water per year, which is roughly equal to the water demands of 1 to 2 cities the size of Chicago. This is particularly problematic in areas west of the Mississippi, where freshwater resources are scarce and drought is widespread (EPA, 2011).

Geological Disturbances

Water depletion can lead to land subsidence, which occurs when large amounts of ground water have been excessively withdrawn from an aquifer. The clay layers within the aquifer compact and settle, resulting in the lowering of the ground surface in the area from which the ground water is being pumped (USDI, 2000). Studies have shown that oil and gas production can lead to subsidence, through the removal of water, gas and oil from the ground, resulting in the compaction of dry porous rock formations (Gurevich and Chilingarian, 1992).

It is also thought that hydraulic fracturing could be the cause of minor seismic activity. In March 2011, Arkansas saw a period of increased earthquake activity in an area of the state where injection wells were present. After the Oil and Gas Commission shut down the wells, the Arkansas Geological Survey reported an immediate decrease in seismic activity; however, there are still uncertainties surrounding the cause of the activity (Eddington, 2011).

Uncertainties on the Level of Risk

Attempts to determine risks associated with hydraulic fracturing date back to 2004, when the EPA released a study that found no "confirmed evidence" of contamination and that injection "poses little or no threat" to underground sources of drinking water (EPA, 2004). An independent analysis of the 2004 study found that the EPA removed information from earlier drafts that suggested unregulated fracturing poses a threat to human health, and that the Agency did not include information that suggests fracturing fluids may pose a threat to drinking water long after drilling operations are completed (Sumi, 2005). In response to increasing public concern, Congress commissioned the EPA to conduct a new study to examine the relationship between hydraulic fracturing and drinking water resources, to be completed by 2014 (EPA, 2011).

The lack of overarching federal oversight has resulted in a patchwork of state regulations of varying stringencies, which may not be sufficient to address the issues associated with hydraulic fracturing as the process can produce effects across political boundaries. In addition, the lack of chemical disclosure requirements for natural gas operators further contributes to the many uncertainties associated with this procedure.

A key barrier to better understanding the risks that may be associated with hydraulic fracturing is the lack of scientific studies and baseline information to assess the practice and related complaints from the public. Such information gaps contribute to uncertainty surrounding the scope and structure of any potential legislative or regulatory framework for hydraulic fracturing activities (Tiemann & Vann, 2011). In the next section we will analyze the proposed piece of legislation that may begin to address these widespread concerns.

The FRAC Act: A Step in the Right Direction?

Legislative History

On March 15, 2011, Senator Robert Casey of Pennsylvania and seven co-sponsors introduced the Fracturing Responsibility and Awareness of Chemicals Act (FRAC Act), S. 587, to the 112th Congress. The general purpose of the proposed bill is to amend the Safe Drinking Water Act by repealing the current exemption for hydraulic fracturing as well as to facilitate the required disclosure of the chemical constituents of the fluid used during operation.

In order to understand how the FRAC Act would regulate hydraulic fracturing, it is important to first understand the existing regulatory framework the bill hinges upon. In 1974 Congress passed the Safe Drinking Water Act (SDWA) (Pub. L. No. 93-523), authorizing the Environmental Protection Agency to set standards for drinking water quality and oversee those who implement them: states, localities and suppliers (EPA, 2011). The SDWA required the establishment of the Underground Injection Control (UIC) program, a national regulatory program for the protection of underground sources of drinking water, including the oversight and limitation of underground injections that could affect aquifers (Tiemann & Vann, 2011).

The EPA did not initially regulate hydraulic fracturing under the SDWA. The discrepancy stemmed from the fact that UIC programs focused on “disposal” wells, meaning that the extractive process of hydraulic fracturing was not considered “underground injection” activity. In the mid-1990s, however, a lawsuit in Alabama over this language forced the EPA to reevaluate its oversight responsibility for hydraulic fracturing under the SDWA, ultimately making it subject to UIC regulations.

The issue of regulating hydraulic fracturing wells re-emerged with the Energy Policy Act of 2005 (Pub. L. No. 109-58). This Act amended the SDWA to exclude from the definition of “underground injection” those substances (other than diesel fuels) involved in hydraulic fracturing operations. In this way, the Act stripped the EPA of its authority to regulate hydraulic fracturing under the Safe Water Drinking Act. This exemption is referred to as the Halliburton Loophole, because former Vice President Dick Cheney, ex-chief executive of energy giant Halliburton, is associated with its creation.

To implement the UIC program as mandated by the provisions of the SDWA, EPA has established six distinct categories or "classes" of underground injection wells based on different types of substances injected. Class II wells are those involving the injection of fluids associated with oil and gas production, either for disposal or to access residual fuels through "Enhanced Recovery." If hydraulic fracturing comes under the purview of the UIC program with the existing class distinctions, a Congressional Research Service Report suggests that it is likely to fall into the Class II category, which would parallel its approach to regulating the injection of diesel for fracturing purposes (Tiemann & Vann, 2011).

The FRAC Act and its Components

The FRAC Act contains two amendments to the SDWA. First, the bill requires that substances involved in hydraulic fracturing should be included within the definition of an "underground injection" and thus, subject to regulation under the UIC program. Second, the bill mandates that companies involved in hydraulic fracturing disclose information regarding chemicals used in the process both before and after operations to the relevant Administrator—a state or federal regulator. The Administrator must then make this information available to the public, provided it is not considered "Confidential Business Information" or "proprietary information." In the event of a medical emergency, however, the Act requires companies to immediately disclose the specific identity of a proprietary chemical formula where such information would facilitate patient treatment, as determined by the Administrator or a medical professional.

Both the regulatory and the disclosure components of the FRAC Act each have a number of positive and negative aspects. An analysis of the degree to which these components will address the concerns associated with hydraulic fracturing will be presented in the next section.

How the FRAC Act Will Address Health Risks

Regulatory Component

The first provision of the FRAC Act will bring hydraulic fracturing under the authority of the EPA by amending the definition of "underground injection" under the Safe Drinking Water Act. Under the UIC program hydraulic fracturing operations will be subject to regulatory measures such as authorization, permitting and monitoring.

Authorization and Permitting Procedures

If hydraulic fracturing comes under the purview of the UIC program with the existing class distinctions, it is likely to fall under the Class II category as "Enhanced Recovery" (Tiemann & Vann, 2011). As such, it will be subject to a number of new regulatory measures and oversight from which it is currently exempt. In fact, all new Class II wells must apply to the relevant authority for a permit, a process that includes detailing potential effects of wells on their locations' hydrology and geologic formations.

The UIC Permit Application lays out the required contents of the application, including geological data on injection zones, information on wells and water sources in the area of drilling, data on the operating procedures (such as fluids and pressures), and well construction procedures.

Monitoring Requirements

Once a well receives Class II authorization under the UIC program and is constructed, subsequent regulatory measures are put in place by the UIC. These measures aim to ensure accountability and responsibility from the well operators and are outlined in greater detail in the EPA's Technical Program Overview for Underground Injection Control Regulation.

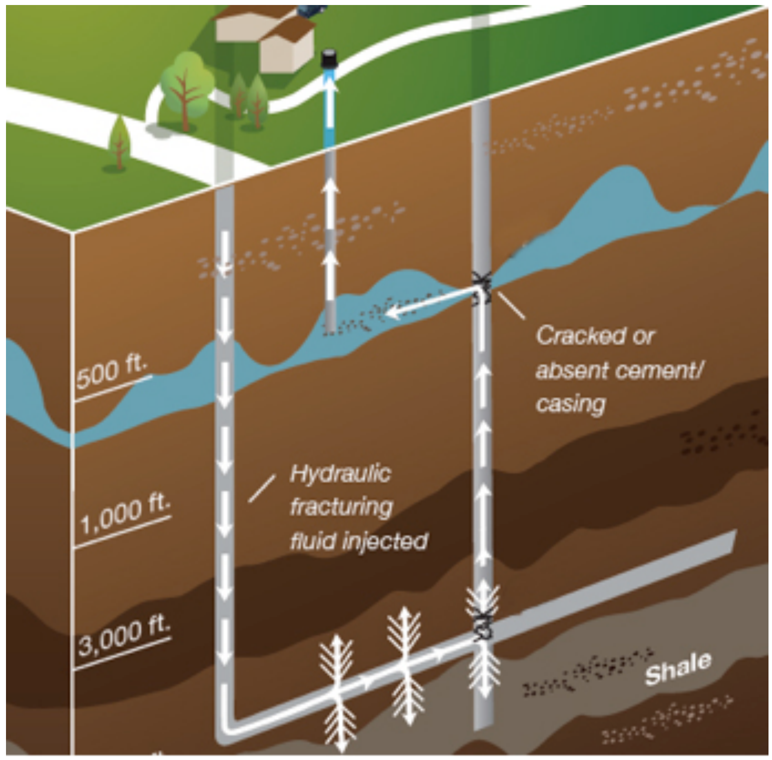

Figure 8: Schematic showing potential aquifer contamination as a result of a breach in a well's structure. Source: Desmogblog

Upon construction, in order for a well to begin operation, a Mechanical Integrity Test (MIT) is required. The EPA defines a well as having mechanical integrity if the well meets certain requirements for internal and external stability. Internal MITs ensure that the pressure of the injection fluid is at a safe level so as not to breach the well's structure, as illustrated in Figure 8, while external MITs verify that the well itself is constructed properly. The tests ensure that there is no significant leak in the casing or tubing of the well and that there is no movement of fluid into underground sources of drinking water from the wellbore (EPA, 2011e). Because hydraulic fracturing is exempt from the UIC program, operators are not required to submit the results of such scientific tests to any regulatory body (EPA, 2011).

The success of the regulatory component of the FRAC act must be broadly measured in terms of its compliance with the Underground Injection Control (UIC) program requirements. Given that the UIC program focuses on the authorization, monitoring and inspection of the construction and mechanical integrity of wells, measurable indicators would include:

- Number of wells authorized
- Number of successful mechanical integrity tests performed
- Number of cease to discharge permits issued
- Number of non-compliance civil penalties

The above indicators would facilitate the collection of data that could then be analyzed and used to further refine regulation.

Pros and Cons of the Regulatory Component

There are pros and cons to bringing hydraulic fracturing within the UIC structure. A positive outcome of regulation would be the immediate assurance of greater level of accountability for the practice, which would be subject to a number of new regulatory measures and oversight from which it is currently exempt.

One potential drawback of bringing hydraulic fracturing under the purview of the UIC program is that it may not sit cleanly within the present regulatory structure. It was suggested earlier that if the process were to fall within the *existing* class distinctions, it would be considered a Class II well due to its similarity to oil and gas production through "Enhanced Recovery" operations. It is possible, however, that the EPA would classify hydraulic fracturing within a different class, or develop an entirely new class of wells altogether (Tiemann & Vann, 2011). This implies the possibility that "the agency may need to develop an essentially new framework to address hydraulic fracturing of production wells" (Tiemann & Vann, 2001).

Another potential concern is that through its explicit reference to the SDWA and its focus on the underground injection of fluid, the FRAC Act hones in exclusively on the possible contamination of underground drinking water sources by chemical additives in hydraulic fracturing fluid. In doing so, the FRAC Act ignores other environmental risks posed by hydraulic fracturing, such as air pollution, water depletion and geological disturbances.

Disclosure Component of the FRAC Act

The second half of the FRAC Act is a chemical disclosure provision designed to inform both the public and the federal government of the chemicals used in hydraulic fracturing operations. The disclosure provision has several relevant implications for the scientific issues surrounding hydraulic fracturing. First, it will facilitate scientific inquiry into the potential link between hydraulic fracturing and contamination of underground sources of drinking water, as well as the potential human health impacts of the various chemical constituents. Second, it will facilitate the treatment of patients suffering from the effects of these chemicals, both in medical emergencies and in long-term, chronic health impact scenarios.

Material Safety and Data Sheets

The disclosure of chemicals under the FRAC Act would be conducted mainly through the release of Material Safety and Data Sheets (MSDS), which are chemical safety documents. The Occupational Health and Safety Administration (OSHA) currently requires that employers post the MSDS for the various chemicals used or stored in the workplace. OSHA set up guidelines for MSDS to include the following components, among others (OSHA, 2011):

- Toxicological information
- Ecological information
- Transport information

OSHA does not verify MSDS forms except in the case of an emergency (Colborn et al, 2010). An EPA requirement of full MSDS information would hopefully enable a more targeted and comprehensive exploration of the effects of hydraulic fracturing.

The success of the chemical disclosure component of the FRAC Act would be measured by the degree to which the information disclosed is used to mitigate harm to human health and the environment. Indicators will be derived from well permit applications, mechanical integrity tests and annual monitoring reports, as well as the amount and content of mandatory Material Safety Data Sheets (MSDS), as shown below:

- Percentage of chemicals classified as proprietary.
- Degree to which the information can be applied to medical treatment
- Number of scientific research studies resulting from information disclosed

The lack of transparency behind hydraulic fracturing and the chemical composition of fracturing fluid have made the scientific assessment of hydraulic fracturing difficult. As researchers and government officials have learned from voluntary submissions of chemical additives, there are hundreds of chemicals that can be used in hydraulic fracturing fluids. Testing for unknown chemicals is a time-consuming and expensive process. Disclosure would allow researchers and government officials to assess human health risks by providing two important components of the effects of hydraulic fracturing (EPA, 2011): the chemical fate and transport and the toxicity and human health effects of hydraulic fracturing chemicals.

Pros and Cons of the Disclosure Component

A potentially negative implication of the disclosure aspect of the FRAC Act is the level of ambiguity about the status of "Confidential Business Information". As it stands, the EPA is unable to disclose proprietary information to the public with the exception of two cases: the first of which relates to information "relevant to a proceeding" (Section 2.304(g)(1)); the second case allows disclosure to "any authorized representative of the United States" (Section 2.304(h)(1)).

Given past reports by the EPA that included confidential information, it is likely that the agency would simply not name or would redact the chemical being discussed. From a scientific perspective, this would hinder the ability for independent research into the potential impacts of the chemicals regarded as confidential business information.

Conclusion

Hydraulic fracturing has made it possible to access vast sources of domestic natural gas that could lead the United States to a future of fuel independence. However, many questions about the safety of this practice and its potential impacts on human health and the environment remain unanswered. There is no certainty about the negative human health impacts, only anecdotal evidence. The lack of transparency surrounding the types and volumes of chemicals used in hydraulic fracturing fluids and the lack of available data and scientific studies on the process only exacerbates the uncertainty (United States House, 2011).

The central concern echoed by multiple stakeholders is the lack of available data and scientific studies on hydraulic fracturing. The FRAC Act aims to begin the process of scientific investigation through the collection of information via a regulatory process and a disclosure requirement. However, the FRAC Act only addresses these two aspects, and only in conjunction with the protection of drinking water. It primarily aims to place the procedure under a regulatory structure that provides for permitting, monitoring and disclosure.

For this reason, the FRAC Act is a good first step, but it is by no means a comprehensive solution to the presented problems. It does not address many of the concerns or controversies highlighted throughout this paper such as water depletion, air pollution and geological disturbances.

Depending on the results of the EPA study, hydraulic fracturing practices could be determined to be the cause of significant threat to human health, or they could be ruled a non-threat. Before the EPA begins regulating potential threats to drinking water, there should be a definitive scientific consensus on the exact nature, extent, and level of all public and environmental threats. One thing is clear – we need more transparency, scientific inquiry, and a federal policy that reflects the findings of the scientific community and protects citizens in a uniform fashion from potentially harmful impacts of hydraulic fracturing.

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Figure 4: Fluid composition and total volume of chemicals used in hydraulic fracturing per year. Energy in Depth."A fluid situation: typical solution used in hydraulic fracturing". Retrieved from http://www.energyindepth.org/frac-fluid.pdf

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Figure 8: Schematic showing potential aquifer contamination as a result of a breach in a well's structure. "Hydraulic fracturing." DeSmogBlog | Clearing the PR Pollution that Clouds Climate Science. Aug. 2011 <http://www.desmogblog.com/directory/vocabulary/5137

Appendix

S.587 -- FRAC Act (Introduced in Senate - IS)

S 587 IS

112th CONGRESS

1st Session

S. 587

To amend the Safe Drinking Water Act to repeal a certain exemption for hydraulic fracturing, and for other purposes.

IN THE SENATE OF THE UNITED STATES

March 15, 2011

Mr. CASEY (for himself, Mr. SCHUMER, Mrs. FEINSTEIN, Mrs. GILLIBRAND, Mr. LAUTENBERG, Mr. WHITEHOUSE, Mr. SANDERS, and Mr. CARDIN) introduced the following bill; which was read twice and referred to the Committee on Environment and Public Works

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A BILL

To amend the Safe Drinking Water Act to repeal a certain exemption for hydraulic fracturing, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.

This Act may be cited as the `Fracturing Responsibility and Awareness of Chemicals Act' or the `FRAC Act'.

SEC. 2. REGULATION OF HYDRAULIC FRACTURING.

(a) Underground Injection- Section 1421(d) of the Safe Drinking Water Act (42 U.S.C. 300h(d)) is amended by striking paragraph (1) and inserting the following:

`(1) UNDERGROUND INJECTION-

`(A) IN GENERAL- The term `underground injection' means the subsurface emplacement of fluids by well injection.

`(B) INCLUSION- The term `underground injection' includes the underground injection of fluids or propping agents pursuant to hydraulic fracturing operations relating to oil or gas production activities.

`(C) EXCLUSION- The term `underground injection' does not include the underground injection of natural gas for the purpose of storage.'.

(b) Disclosure- Section 1421(b) of the Safe Drinking Water Act (42 U.S.C. 300h(b)) is amended by adding at the end the following:

`(4) DISCLOSURES OF CHEMICAL CONSTITUENTS-

`(A) IN GENERAL- A person conducting hydraulic fracturing operations shall disclose to the State (or to the Administrator, in any case in which the Administrator has primary enforcement responsibility in a State), by not later than such deadlines as shall be established by the State (or the Administrator)--

`(i) before the commencement of any hydraulic fracturing operations at any lease area or a portion of a lease area, a list of chemicals intended for use in any underground injection during the operations (including identification of the chemical constituents of mixtures, Chemical Abstracts Service numbers for each chemical and constituent, material safety data sheets when available, and the anticipated volume of each chemical to be used); and

`(ii) after the completion of hydraulic fracturing operations described in clause (i), the list of chemicals used in each underground injection during the operations (including identification of the chemical constituents of mixtures, Chemical Abstracts Service numbers for each chemical and constituent, material safety data sheets when available, and the volume of each chemical used).

`(B) PUBLIC AVAILABILITY- The State (or the Administrator, as applicable) shall make available to the public the information contained in each disclosure of chemical constituents under subparagraph (A), including by posting the information on an appropriate Internet website.

`(C) IMMEDIATE DISCLOSURE IN CASE OF MEDICAL EMERGENCY-

`(i) IN GENERAL- Subject to clause (ii), the regulations promulgated pursuant to subsection (a) shall require that, in any case in which the State (or the Administrator, as applicable) or an appropriate treating physician or nurse determines that a medical emergency exists and the proprietary chemical formula or specific chemical identity of a trade-secret chemical used in hydraulic fracturing is necessary for medical treatment, the applicable person using hydraulic fracturing shall, upon request, immediately disclose to the State (or the Administrator) or the treating physician or nurse the proprietary chemical formula or specific chemical identity of a trade-secret chemical, regardless of the existence of--

`(I) a written statement of need; or

`(II) a confidentiality agreement.

`(ii) REQUIREMENT- A person using hydraulic fracturing that makes a disclosure required under clause (i) may require the execution of a written statement of need and a confidentiality agreement as soon as practicable after the determination by the State (or the Administrator) or the treating physician or nurse under that clause.

`(D) NO PUBLIC DISCLOSURE REQUIRED- Nothing in subparagraph (A) or (B) authorizes a State (or the Administrator) to require the public disclosure of any proprietary chemical formula.'.