

**HYDRAULIC FRACTURING IN THE UNITED STATES
AND THE EUROPEAN UNION: RETHINKING
REGULATION TO ENSURE THE PROTECTION OF
WATER RESOURCES**

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INTRODUCTION

In a world increasingly concerned about available sources of energy, scientific innovations have opened the door to new methods of obtaining natural gas and oil. One such method, known as hydraulic fracturing, functions as a double-edge sword because it permits energy companies to obtain previously unreachable sources of energy, but poses significant environmental risks.¹

The Energy Information Administration states that the United States possesses sufficient natural gas to supply the country with energy for 110 years.² The significance of this resource cannot be understated given the risks associated with burning coal³ and generating nuclear energy.⁴ For example, reports indicate that hydraulic fracturing may account for up to 70 percent of natural gas development in the future.⁵ Similarly, hydraulic fracturing has the potential to provide tremendous economic benefits, with manufacturers estimating that the industry will employ 1 million workers by 2025.⁶ In 2010 alone, development of shale resources supported 600,000 jobs.⁷ For these reasons, hydraulic fractur-

¹ STEFAN LECHTENBÖHMER ET. AL., *IMPACTS OF SHALE GAS AND SHALE OIL EXTRACTION ON THE ENVIRONMENT AND ON HUMAN HEALTH* 48 (2011).

² Jim Efstathiou Jr. & Katarzyna Klimasinska, *U.S. to Slash Marcellus Shale Gas Estimate 80%*, BLOOMBERG (Aug. 23, 2011), <http://www.bloomberg.com/news/2011-08-23/u-s-to-slash-marcellus-shale-gas-estimate-80-.html>.

³ NATURAL RESOURCES DEF. COUNCIL, *CLIMATE CHANGE, WATER, AND RISK: CURRENT WATER DEMANDS ARE NOT SUSTAINABLE* (2012).

⁴ Hiroko Tabuchi, *Study Shows Worse Picture of Meltdown in Japan*, N.Y. TIMES (Nov. 30, 2011), <http://www.nytimes.com/2011/12/01/world/asia/meltdown-in-japan-may-have-been-worse-than-thought.html>. An example of nuclear power's risks can be seen by the recent tragedy at the Fukushima Daiichi plant.

⁵ AM. PETROLEUM INST., *Shale Energy: 10 Points Everyone Should Know* 1 (2012), available at <http://www.api.org/policy-and-issues/policy-items/hf/10-facts-everyone-should-know-about-shale-energy.aspx>.

⁶ *Id.*

⁷ *Id.*

ing appears to be an inevitable and vital aspect of the United States' energy policy.⁸

Despite the numerous benefits that hydraulic fracturing can provide, the process poses multiple concerns to both the quality of freshwater and human health. Many of the chemicals used in hydraulic fracturing processes are classified as toxic, suspected carcinogens or mutagenic.⁹ For instance, fourteen oil and gas companies in the United States used more than 2,500 hydraulic fracturing products between 2005 and 2009, which contained 750 different chemicals.¹⁰ Faced with these environmental concerns, many countries and the international community have recognized the need to develop a framework that directly addresses the issue, weighs the costs and benefits, and implements a comprehensive regulatory program for controlling the use of hydraulic fracturing.

In the United States, the federal government's current policy concerning hydraulic fracturing could pose water regulation and health concerns. This is the case because hydraulic fracturing is exempt from the statutory framework established under the Safe Drinking Water Act ("SWDA").¹¹ The SWDA directly prohibits state restrictions on "any underground injection for the secondary or tertiary recovery of oil or natural gas."¹² Considering that the SWDA is the "main federal law that ensures the quality of Americans' drinking water,"¹³ this regulatory gap has critical implications for hydraulic fracturing regulation in the United States. In addition to this exception on hydraulic fracturing, the SWDA only requires the Environmental Protection Agency ("EPA") to create a national standard when a contaminant may have an adverse effect on the health of persons and there is a substantial likelihood that it will occur in public water systems.¹⁴ Additionally, the EPA decides if regulating the contaminant presents a "meaningful opportunity for health risk reduction."¹⁵

⁸ See generally *id.*

⁹ LECHTENBÖHMER ET AL., *supra* note 1, at 32.

¹⁰ *Id.* at 60.

¹¹ Angela Cupas, *The Not-So-Safe Drinking Water Act: Why We Must Regulate Hydraulic Fracturing at the Federal Level*, 33 WM. & MARY ENVTL. L. & POL'Y REV. 605, 606 (2009).

¹² *Id.* at 607.

¹³ Safe Water Drinking Act, 42 U.S.C. §300f (2012), available at <http://water.epa.gov/lawsregs/rulesregs/sdwa/index.cfm>.

¹⁴ Cupas, *supra* note 11, at 609.

¹⁵ *Id.*

In 2004, when the EPA reviewed state reports on the impact of hydraulic fracturing on water quality, the agency concluded that there was no conclusive evidence to claim that fracturing causes water degradation.¹⁶ Despite this claim, many complaints counter the EPA's 2004 conclusion and argue that the agency's ruling was both biased and inaccurate.¹⁷ In sum, the United States does not appear to be taking an acceptable approach to a potentially serious threat to water quality. Both statutory loopholes and the EPA's expansive discretion undermine effective regulation of hydraulic fracturing.¹⁸

The United States is not alone in failing to create a regulatory system that weighs the costs and benefits associated with hydraulic fracturing. The European Union ("EU") does not have a comprehensive directive concerning hydraulic fracturing either.¹⁹ However, the EU has issued a tremendous number of directives that are applicable to hydraulic fracturing and may help guide the regulatory framework within the Member States.²⁰ For instance, there are several directives directly related to mining and six directives directly related to water quality.²¹

In an era that must address new sources of energy, hydraulic fracturing allows nations to access a vast amount of otherwise unreachable resources. Despite the benefits to the international energy supply, hydraulic fracturing poses a complex and potentially serious risk to water supplies. Neither the EU nor the United States has a comprehensive regulatory framework tailored to address these concerns. This note will compare the regulatory mechanisms of the United States and EU related to hydraulic fracturing and suggest specific policy improvements. Additionally, this note will argue that hydraulic fracturing should be regulated by the federal government in the United States and directly by the EU. Moreover, a comprehensive regulatory framework must be developed that takes a cautious approach to allowing fracturing activities. Part I of the note will illustrate the risks that hydraulic fracturing poses to water resources. Part II will discuss hydraulic fracturing regulation in the United States. Part III will describe Europe's approach to regulating fracturing. Part IV will compare the United States and Europe's regulatory framework for addressing hydraulic fracturing and suggest what the two

¹⁶ *Id.* at 608.

¹⁷ *Id.* at 607—08.

¹⁸ *Id.* at 611.

¹⁹ LECHTENBÖHMER ET AL, *supra* note 1, at 48.

²⁰ *Id.*

²¹ *Id.* at 49, 55.

governing bodies can learn from one another. Lastly, Part V will summarize the regulatory framework in the United States and EU and suggest specific policy improvements going forward.

I. HYDRAULIC FRACTURING POSES ENVIRONMENTAL RISKS TO DRINKING WATER SUPPLIES

In order to understand the risks associated with hydraulic fracturing, a brief review of hydraulic fracturing processes is crucial. Hydraulic fracturing occurs when pressured fluids are injected into geologic formations in order to extract underground energy resources.²² Since the pressure exceeds the rock strength, fractures in the underground rock are opened or enlarged.²³ Once the formation is fractured, a “propping agent,” like ceramic beads or sand, is pumped into the fractures to keep them from closing.²⁴ This process allows natural gas to be extracted from the underground rock formations.²⁵ Due to the injection of highly pressured fluids into underground formations and the fact that the fracturing fluids return to the surface, the EPA has acknowledged that “potential risks to surface and underground sources of drinking water might occur at various points in the hydraulic fracturing process.”²⁶

Despite the potential benefits to a nation’s energy supply, hydraulic fracturing poses numerous risks to surface and drinking waters. One significant problem stems from the amount of water pumped in for use in the hydraulic fracturing process, with the biggest threat to drinking water arising from the process known as “flowback.”²⁷ Flowback occurs when very large amounts of water come to the surface during the drilling process.²⁸ One well site can produce up to a million gallons of water laced with radioactive elements, such as radium.²⁹ Despite the dangers of flowback, Congress has exempted flowback fluids from the Resource Conservation and Recovery Act (“RCRA”), unless there is an accidental

²² EPA, HYDRAULIC FRACTURING RESEARCH STUDY 1 (2010), www.epa.gov/safewater/uic/pdfs/hfresearchstudyfs.pdf.

²³ *Id.*

²⁴ *Id.*

²⁵ *Id.*

²⁶ *Id.* at 1—2.

²⁷ *The Debate on Fracturing*, N.Y. TIMES (Aug. 20, 2011), <http://www.nytimes.com/2011/08/21/opinion/sunday/the-debate-on-fracturing.html>.

²⁸ *Id.*

²⁹ *Id.*

leak.³⁰ This exemption helps contribute to the hands-off approach taken by the federal government because the RCRA “gives EPA the authority to control hazardous waste from ‘cradle-to-grave.’”³¹ As a result, toxic flowback fluids are generally unregulated by the federal government, leaving the responsibility to the states.³²

In terms of water quantity, the amount of water needed is quite significant because fracturing fluids can be up to 99 percent water.³³ In a coalbed formation, fracturing one well may require between 50,000 to 350,000 gallons of water.³⁴ In a horizontal well shale formation, one well could require between two to five million gallons of water.³⁵ This water is acquired from groundwater and surface waters from areas near the wells.³⁶ Some of the water used in the hydraulic fracturing process can be returned to the water sources.³⁷ Between 15 to 80 percent of the water used can be recovered depending on the specific site.³⁸ Due to the nature of hydraulic fracturing processes, both water quality and quantity risks arise.

The EPA admits that many recent reports suggest potential impacts to drinking water.³⁹ In a recently released draft report concerning hydraulic fracturing in Wyoming, the EPA tested the area of Pavillon, Wyoming, because complaints indicated that well water near hydraulic fracturing sites had an objectionable taste and odor problems.⁴⁰ The goal of the study was to determine the presence, not the extent, of ground water contamination.⁴¹ After conducting a total of four sampling events,⁴² the EPA detected high concentrations of xylenes, benzene, gasoline range organics, diethylene glycol, triethylene glycol, tert-butyl-alcohol,

³⁰ AM. PETROLEUM INST., WATER MANAGEMENT ASSOCIATED WITH HYDRAULIC FRACTURING 18 (2010), available at www.shalegas.energy.gov/resources/HF2_e1.pdf.

³¹ EPA, Summary of the Resource Conservation and Recovery Act, <http://www.epa.gov/lawsregs/laws/rcra.html>.

³² AM. PETROLEUM INST., *supra* note 30.

³³ EPA, *supra* note 17, at 2.

³⁴ *Id.*

³⁵ *Id.*

³⁶ *Id.*

³⁷ *Id.*

³⁸ *Id.*

³⁹ *Id.*

⁴⁰ DOMINIC C. DIGIULIO ET AL., DRAFT - INVESTIGATING GROUND WATER CONTAMINATION NEAR PAVILLION, WYOMING, U.S. ENVTL. PROT. AGENCY, xi (Dec. 8, 2011), http://www.epa.gov/region8/superfund/wy/pavillion/EPA_ReportOnPavillion_Dec-8-2011.pdf.

⁴¹ *Id.*

⁴² *Id.*

toluene, ethylbenzene, and trimethylbenzenes diesel range organics and hydrocarbons in ground water samples from shallow monitoring wells.⁴³ The study analyzed alternative explanations that could account for the detection of these chemicals in the tested waters.⁴⁴ However, the study concluded “the data indicates likely impact to ground water that can be explained by hydraulic fracturing.”⁴⁵ After accounting for numerous alternative explanations, the study stated that there was “compelling evidence” to attribute the contamination to fracturing.⁴⁶ This study provided significant evidence to show that hydraulic fracturing poses serious risks to groundwater and the health of humans and wildlife. In addition to the suspected groundwater contamination in Pavillion, Wyoming, there are numerous other reports and incidences of suspected contamination as a result of hydraulic fracturing.⁴⁷ Likewise, a study conducted in New York and Pennsylvania concluded that shale-gas extraction is associated with methane gas contamination in drinking water.⁴⁸ As a result, this data illustrates that hydraulic fracturing poses at least some risk to drinking and surface waters.⁴⁹

II. HYDRAULIC FRACTURING REGULATION IN THE UNITED STATES

This note will first explain the current regulatory framework of hydraulic fracturing in the United States in order to establish a comparison with the EU. The regulatory mechanisms present in the United States

⁴³ *Id.*

⁴⁴ *Id.* at xiii.

⁴⁵ *Id.*

⁴⁶ *Id.* at 33.

⁴⁷ Amy Mall, *Incidents Where Hydraulic Fracturing is a Suspected Cause of Drinking Water Contamination*, NATURAL RESOURCES DEFENSE COUNCIL (Dec. 19, 2011), http://switchboard.nrdc.org/blogs/amall/incidents_where_hydraulic_frac.html. Reports describe contaminated water as smelling bad, turning yellow and being filled with silt. Another report states that the water turned muddy and was filled with particles that looked like pieces of leather. Other water sources have been described as turning gray and cloudy and having a noxious odor. A New York report describes the water as “foamy, chocolate-brown.” There are numerous other similar reports, occurring in many states. The states include Arkansas, Colorado, New Mexico, New York, North Dakota, Ohio, Pennsylvania, Texas, West Virginia and Wyoming.

⁴⁸ STEPHEN G. OSBORN ET. AL., METHANE CONTAMINATION OF DRINKING WATER ACCOMPANYING GAS-WELL DRILLING AND HYDRAULIC FRACTURING, PROCEEDINGS OF THE NAT'L ACADEMY OF SCIENCES OF THE USA (August 31, 2012), available at <http://www.pnas.org/content/early/2011/05/02/1100682108.full.pdf+html?sid=bde16321-e169-437d-a59c-798e7f65c479>.

⁴⁹ *Id.*

will be analyzed from both a federal and state level. Since this note is limited to the relationship between fracturing and water quality, the numerous other environmental and non-environmental risks from hydraulic fracturing will not be explored.⁵⁰

A. THE SAFE DRINKING WATER ACT AND THE EPA'S TIMID IMPLEMENTATION

At the federal level, the SDWA provides a potentially viable mechanism for regulating hydraulic fracturing with respect to water quality. Unfortunately, the SWDA also contains numerous loopholes that allow the EPA to avoid regulating fracturing activities.⁵¹ The first concern stems from EPA's broad discretion, defined as "sole discretion," in determining the types of contamination-reducing technologies that are "feasible."⁵² To determine the scope of the permitted regulations, the EPA generally balances the costs that would occur by obtaining a particular contaminant level and compares it with the benefits to public health.⁵³ Some experts contend that the EPA has not fully complied with its responsibility due to political pressure.⁵⁴ In part, this concern is related to the EPA's interpretation of section 300g of the SWDA.⁵⁵ An issue arises because section 300g permits the use of "accepted methods," which could be argued as a vague or weak standard.⁵⁶

A second issue concerns the EPA's approach toward conducting research on the risks of hydraulic fracturing. The SDWA requires that the EPA use the best available, peer-reviewed science or data collected by accepted methods when analyzing the risks to drinking water.⁵⁷ This language is problematic because it assumes that "accepted" methods are

⁵⁰ See generally Emily C. Powers, *Fracking and Federalism: Support for an Adaptive Approach That Avoids the Tragedy of the Regulatory Commons*, 19 J.L. & POL'Y 913, 924–26 (2011). Non-water based environmental concerns include: toxic air emissions from gas leaks, erosion from pipeline sitting and construction, destruction of habitats and landscapes, chemical fires, gas explosions, disposal of radioactive elements and even triggering earthquakes. Non-environmental concerns include diminishing property values, ongoing noise pollution, persistent vibrations, land use changes, influxes of temporary workers, and local issues stemming from significant new sources of wealth and revenue. See generally *id.*

⁵¹ Cupas, *supra* note 11, at 611.

⁵² *Id.*

⁵³ *Id.*

⁵⁴ *Id.*

⁵⁵ *Id.* at 612.

⁵⁶ *Id.*

⁵⁷ *Id.*

comparable to peer-reviewed data.⁵⁸ As a result, critics assert that section 300g of the SDWA allows the EPA to engage in a “circular process of assessment” when evaluating the risks to a water source because the EPA can declare that data is acceptable, and then later use the data for its analysis.⁵⁹ It is important to understand this process because the EPA relied on its broad discretion in choosing what data to use when it created its 2004 report on the environmental impact of fracturing.⁶⁰ Some critics contend that as long as the agency uses “buzz words,” it will have the statutory authority to create a report that appears to be factual and legitimate.⁶¹ This presents a concern because the EPA’s discretion allows it to pick and choose “facts” without further inquiry into the thoroughness of its investigation by the statutory authorities.⁶² Therefore, in order to understand the regulatory mechanisms for regulating hydraulic fracturing that the United States employs, it is essential to be aware of the background related to agency law and statutory interpretation.

In 2005, Congress officially removed the EPA’s ability to regulate fracturing under the SDWA in the Energy Policy Act of 2005.⁶³ The amendment specifically exempts regulation of underground injections related to hydraulic fracturing.⁶⁴ This decision is significant because the amendment by Congress specifically prevents the EPA from regulating water pollution as a result of hydraulic fracturing. There are multiple reasons to argue that it is unwise to exempt hydraulic fracturing regulation from the SDWA. First, underground sources of drinking water should be viewed as a national concern.⁶⁵ Since water quality remains essential to health, safety and the country’s quality of life, this assumption appears to be a safe one.⁶⁶ However, state regulations often only address local sources of water and generally deal with landowner wells, regional lakes, aquifers, and streams.⁶⁷ Second, contaminants released underground do

⁵⁸ *Id.* at 612—13.

⁵⁹ *Id.*

⁶⁰ *Id.*

⁶¹ *Id.* at 612.

⁶² *Id.* at 613.

⁶³ *Id.* at 616. □

⁶⁴ *Id.*

⁶⁵ Hannah Wiseman, *Untested Waters: The Rise of Hydraulic Fracturing in Oil and Gas Production and the Need to Revisit Regulation*, 20 *FORDHAM ENVTL. L. REV.* 115, 185 (2009).

⁶⁶ See Lawrence Ng, *A Drastic Approach to Controlling Groundwater Pollution*, 98 *YALE L.J.* 773, 776 (1989). The Office of Technology Assessment estimates that there are over 200 contaminants in the nation’s ground water.

⁶⁷ Wiseman, *supra* note 52, at 185.

not necessarily remain in the same location as where they are originally injected.⁶⁸ This is because fracturing can cause or change the length of fractures, which can result in contaminants crossing state lines.⁶⁹ Moreover, understanding the particular extent and scope of contamination presents a difficult challenge for scientists, and thus local policymakers.⁷⁰ Third, fracturing fluids can remain underground for several decades.⁷¹ As a result, a decision to conduct hydraulic fracturing in a particular area may have important implications for future generations. In sum, these issues reveal that preventing the EPA from regulating hydraulic fracturing through the SWDA presents a significant national concern.

Considering the goals of the SWDA, one could easily question the legitimacy of exempting hydraulic fracturing from its regulatory oversight. In general, under the Act, the EPA should publish a maximum contaminant level goal and create national regulations if “the contaminant may have an adverse effect on the health of persons” and “the contaminant is known to occur or there is a substantial likelihood that the contaminant will occur in public water systems with a frequency and at levels of public health concern.”⁷² However, as previously discussed, this judgment is within the EPA’s discretion.⁷³ For these reasons, there appears to be a discrepancy between the general goals of the SWDA and the EPA’s decision in regard to fracturing regulations.⁷⁴

Given the risk that hydraulic fracturing poses to the nation’s waters, hydraulic fracturing should be regulated at the federal level. However, reputable scientific and legal experts disagree with this policy judgment, and support the regulation of the industry through state law.⁷⁵ This argument begins with the assumption that hydraulic fracturing does not pose significant environmental risks.⁷⁶ It further contends that the

⁶⁸ *Id.*

⁶⁹ *Id.*

⁷⁰ *Id.* Scientists must drill thousands of samples or make a complex model to begin to predict where a contaminant will go.

⁷¹ *Id.* at 185—86.

⁷² 42 U.S.C. 300g-1(4)(B)(1)(A) (2011).

⁷³ *Id.*

⁷⁴ For a lengthy discussion concerning the perceived flaws in EPA’s report concerning hydraulic fracturing, *See* LISA SUMI, OIL AND GAS ACCOUNTABILITY PROJECT, OUR DRINKING WATER AT RISK - WHAT EPA AND THE OIL AND GAS INDUSTRY DON’T WANT US TO KNOW ABOUT HYDRAULIC FRACTURING (2005).

⁷⁵ Wes Deweese, *Fracturing Misconceptions: A History of Effective State Regulation, Groundwater Protection, And The Ill-Conceived Frac Act*, 6 OKLA. J. L. & TECH. 49, 1 (2010).

⁷⁶ *Id.*

federal government's involvement will result in costly regulatory obstacles which function to hinder the ability of the United States to tap its natural gas sources.⁷⁷ This camp argues that state regulation has a sixty-year history of effective regulation.⁷⁸ Lastly, proponents of state regulations believe that the federal government could not create an effective one-size-fits-all approach due to the geological and economic concerns unique to each region.⁷⁹

Despite these issues, regulating fracturing exclusively through state control presents many concerns.⁸⁰ The SWDA was originally designed to target the problems that hydraulic fracturing presents, such as inconsistent and varying levels of state regulation concerning an issue of national concern.⁸¹ Furthermore, since the SWDA only seeks to "prevent underground injections which endangers drinking water sources," the regulations would not be too burdensome if fracturing is indeed safe for drinking water.⁸² Moreover, state regulations may not adequately address interstate pollution issues.⁸³ Although the proponents of state-based fracturing laws should be given attention, federal law could provide a valuable framework for addressing the risk of groundwater contamination from hydraulic fracturing.⁸⁴

B. INDIVIDUAL STATES AND THE REGULATION OF HYDRAULIC FRACTURING

As a result of the SWDA amendments, hydraulic fracturing remains largely a function of state government regulation. In general, state powers allow sovereigns to regulate activities that impact natural resources and human health.⁸⁵ Because Congress decided to exempt fracturing from federal law, states with significant gas resources are forced to balance potentially large economic benefits with possible harm to the environment and human health.⁸⁶

⁷⁷ *Id.*

⁷⁸ *Id.* at 31.

⁷⁹ *Id.*

⁸⁰ Wiseman, *supra* note 65, at 185.

⁸¹ *Id.* at 185—86.

⁸² *Id.* at 187.

⁸³ *Id.* at 193.

⁸⁴ *Id.* at 185—86.

⁸⁵ Powers, *supra* note 50, at 941.

⁸⁶ *Id.* at 914.

States must consider the benefit of intrastate energy sources, especially during a time when the nation seeks to find alternative sources of fuel.⁸⁷ Moreover, states have an obligation to take specific positions on sustainable development, which poses a challenge because this process is a function of political, economic, and social forces.⁸⁸ By definition, sustainable development seeks to balance the interests of humans and the environment while considering current and future generations and the optimization of natural resources.⁸⁹ State laws regulating fracturing can be potentially problematic because states sometimes rely on each other's research when tailoring their regulations.⁹⁰

Crafting state regulations can be challenging because hydraulic fracturing could actually present more danger to water sources than some of the data indicates,⁹¹ and thus governments should not rely on the same information.⁹² This is partially the case because the SWDA does not define or qualify the meaning of "best available" or "accepted" methods when reviewing its regulations.⁹³ For example, the EPA's 2004 study on hydraulic fracturing reveals that if a state uses buzz words like "state agency report," the administration will "blindly accept" any "fact" without questioning the inquiry or accuracy of the source.⁹⁴ Critics contend that the EPA is failing to reasonably investigate methods of prevention and overall public policies concerning the benefits and negatives of implementing a national regulatory system to respond to complaints of contamination in underground aquifers.⁹⁵

Even at the state level, the varying levels of hydraulic fracturing regulations indicate the need for a uniform standard. Some states have basic regulations that only address fracturing indirectly, while other states have comprehensive requirements that cover nearly every aspect of the process.⁹⁶ Only a few states have specific laws related to groundwater withdrawal and the disposal issues related to fracturing.⁹⁷ At a minimum,

⁸⁷ *Id.* at 923.

⁸⁸ Allan Ingelson, *Sustainable Development and the Regulation of the Coal Bed Methane Industry in the United States*, 20 J. NAT. RESOURCES & ENVTL. L. 51, 60 (2006).

⁸⁹ *Id.*

⁹⁰ Cupas, *supra* note 7, at 615.

⁹¹ *Id.* at 607.

⁹² *Id.* at 615.

⁹³ *Id.* at 612.

⁹⁴ *Id.* at 613.

⁹⁵ *Id.* at 606.

⁹⁶ Wiseman, *supra* note 65, at 167.

⁹⁷ *Id.*

most states collect data on the fracturing fluids used at each specific formation.⁹⁸ However, only a few states allow public participation related to permit decisions, even though the effects can greatly impact local populations.⁹⁹ A brief review of specific state regulations will show the wide range of fracturing regulations.

Pennsylvania is an example of a state that has relatively strong fracturing regulations.¹⁰⁰ The fracturing controls are exclusively a part of the oil and gas regulations, but fracturing regulations and best management practices exist in order to reduce environmental impacts.¹⁰¹ Additionally, specific regulations were created to account for drilling in the Marcellus Shale.¹⁰² The Pennsylvania Department of Environmental Protection can deny a permit if any environmental regulation, rule, or statute would be violated.¹⁰³ Pennsylvania also has extensive regulations for disposing of waste, listing fracturing fluids, and reporting pollution incidents.¹⁰⁴ Moreover, Pennsylvania provides guidance on treating and discharging waste fluids in order to help companies comply with state and local laws.¹⁰⁵ When an operator drills a well, it must install the casing string with equipment that can handle the pressure and tension of the fracturing process.¹⁰⁶ The overall goal of these regulations is to control the conditions of the well, prevent pollution to water sources, and stop the migration of gas and other fluids into coal seams.¹⁰⁷ Overall, Pennsylvania's regulatory framework represents a well-structured, fairly comprehensive regulatory approach that accounts for specific conditions (such as the Marcellus Shale) in its jurisdiction.

In contrast to Pennsylvania's fairly comprehensive regulatory mechanisms, Texas does not have formal regulations for hydraulic fracturing.¹⁰⁸ However, the Railroad Commission of Texas ("RRC") regulates natural gas production and exploration.¹⁰⁹ Yet, the RCC does not re-

⁹⁸ *Id.*

⁹⁹ *Id.*

¹⁰⁰ *Id.* at 163.

¹⁰¹ *Id.*

¹⁰² *Id.*

¹⁰³ *Id.*

¹⁰⁴ *Id.* at 164.

¹⁰⁵ *Id.*

¹⁰⁶ Deweese, *supra* note 75, at 28.

¹⁰⁷ *Id.* at 28–29.

¹⁰⁸ Terry W. Roberson, *The State of Texas Versus the EPA Regulation of Hydraulic Fracturing*, 48-APR Hous. Law. 24, 25 (2011), available at <http://www.thehoustonlawyer.com/marapr11.htm>.

¹⁰⁹ *Id.*

quire a special permit for hydraulic fracturing.¹¹⁰ The Texas Supreme Court has ruled that neither the RCC nor the legislature has chosen to regulate hydraulic fracturing.¹¹¹ Quite significantly, Texas does not require an environmental assessment for proposed drilling activities.¹¹² However, operators must submit a “location map” and they cannot “cause” or “allow” the pollution of subsurface or surface water.¹¹³ Operators are permitted to dispose of the waste in a pit if a commission determines that it will not result in the pollution of water.¹¹⁴ Moreover, offsite disposal requires a permit to transport the wastes.¹¹⁵ Despite these shortcomings, Texas has become one of the first states to pass legislation that requires operators to disclose the chemicals used when conducting hydraulic fracturing processes.¹¹⁶ Even though the disclosure of fracking chemicals is a step in the right direction, Texas law reveals that states pick and choose the areas of regulation on which they want to focus. Such inconsistencies in state law, in addition to several critical federal exemptions, contribute to “the public outcry for more stringent regulation.”¹¹⁷

New York has also crafted a regulatory approach to manage hydraulic fracturing. Article 23 of the New York Environmental Conservation Law establishes jurisdiction to regulate gas and oil extraction through its Division of Mineral Resources.¹¹⁸ The regulatory plan focuses on land use controls, which are implemented mainly through reporting requirements and permitting.¹¹⁹ Due to the unique environmental impact of high-volume hydraulic fracturing, New York supplemented the Generic Environmental Impact Statement requirements with a Supplemental Generic Environmental Impact Statement (“SGEIS”).¹²⁰ Additionally, New York allows municipalities some ability to govern local activities; however, Article 23 supersedes all local laws and ordinances if neces-

¹¹⁰ *Id.*

¹¹¹ Wiseman, *supra* note 65, at 116.

¹¹² *Id.* at 157.

¹¹³ *Id.* at 158.

¹¹⁴ *Id.*

¹¹⁵ *Id.*

¹¹⁶ Rebecca Jo Reser & David T. Ritter, *State and Federal Legislation and Regulation of Hydraulic Fracturing*, 57 THE ADVOC. 31, 33 (2011).

¹¹⁷ *Id.* at 31.

¹¹⁸ Powers, *supra* note 38, at 941—42.

¹¹⁹ *Id.* at 942.

¹²⁰ *Id.*

sary.¹²¹ Moreover, local governments are expected to provide emergency response services and look into water quality concerns.¹²² Local authorities are responsible for sanitation and waste disposal.¹²³ Overall, New York has taken a prominent role in the regulation of hydraulic fracturing.

Despite New York's attempt to create a comprehensive regulatory system to manage hydraulic fracturing, the laws have resulted in numerous weaknesses.¹²⁴ Most importantly, New York's regulations may not meet some of the baseline standards established by the EPA.¹²⁵ For example, hydraulic fracturing fluids tested during the flowback phase have been tainted with toxic chemicals that would exceed the standards established under the SWDA.¹²⁶ Second, New York's decision to assign waste disposal, road regulation, emergency response, and public health concerns to local governments increases the likelihood of serious concerns due to an inadequate level of resources available to respond to these responsibilities.¹²⁷ Importantly, the regulatory approach is dependent upon voluntary action by the hydraulic fracturing companies in order to comply with the regulations as established.¹²⁸ As a result, local governments hope that energy companies will provide the necessary infrastructure, such as roads, and support emergency response efforts.¹²⁹ This presents a particularly problematic issue because the industry is biased in favor of its interests and has a strong incentive to frame the perceived risks in a positive manner.¹³⁰ Third, New York officials fear that low enforcement and staffing concerns will lead to noncompliance.¹³¹ Even if an issue is detected, it appears that local governments do not have sufficient power to actually adhere to and enforce the laws and regulations.¹³² New York's regulatory plan poses complex challenges to the effective regulation of hydraulic fracturing by compelling local governments to enforce regulations that they are not adequately equipped to handle. Overall, hydraulic fracturing is further hindered by ineffective and undermanned

¹²¹ *Id.* at 945.

¹²² *Id.* at 946.

¹²³ *Id.*

¹²⁴ *Id.* at 954.

¹²⁵ *Id.*

¹²⁶ *Id.* at 954—55.

¹²⁷ *Id.* at 955.

¹²⁸ *Id.* at 955—56.

¹²⁹ *Id.*

¹³⁰ *Id.* at 956.

¹³¹ *Id.* 956—57.

¹³² *Id.*

state regulations.¹³³ The approaches of Pennsylvania, Texas, and New York demonstrate the varying levels of state regulations, and the challenges they present related to fracturing.

III. HYDRAULIC FRACTURING REGULATION IN THE EUROPEAN UNION

Compared to the United States, the regulation of hydraulic fracturing in Europe has been characterized as in its “infancy.”¹³⁴ This is because the United States has drilled more than 50,000 wells in the past forty years, compared to the relatively recent activity in Europe.¹³⁵ As a general matter, mining law remains largely the responsibility of the Member States.¹³⁶ In terms of EU directives, four are specifically related to mining activities, ten additional directives are relevant for mining activities, and approximately forty are related to shale gas and tight oil concerns.¹³⁷ However, the EU’s regulation of hydraulic fracturing has failed to establish a comprehensive mining framework capable of handling all of the challenges unique to fracturing.¹³⁸ Although there are a vast number of EU directives related to environmental concerns,¹³⁹ there are seven directives that are directly relevant for the extraction of shale gas. By definition, shale gas consists of geological hydrocarbons that are created from marine sediments.¹⁴⁰ Shale gas differs from conventional sources of energy because it is stored in rocks with tiny fractures and pore spaces and dispersed over a very large area.¹⁴¹ From a regulatory perspective, the directives that relate to shale gas include the (1) Water Framework Directive, (2) Groundwater Directive, (3) REACH, (4) Natura2000, (5) Environmental Impact Assessment, (6) Waste Frame-

¹³³ Susan L. Sakmar, *The Global Shale Gas Initiative: Will the United States Be the Role Model for the Development of Shale Gas Around the World?*, 33 HOUS. J. INT’L L. 369, 416 (2011). For example, a report issued from the Pennsylvania Land Trust Association states that Pennsylvania drillers have been cited for violations 1435 times since 2008. Quite significantly, 952 violations are related to environmental issues. These statistics further indicate that the current hydraulic fracturing regulatory schemes fail to adequately protect water quality and public health.

¹³⁴ LECHTENBÖHMER ET AL., *supra* note 1, at 1.

¹³⁵ *Id.*

¹³⁶ *Id.* at 48.

¹³⁷ *Id.*

¹³⁸ *Id.*

¹³⁹ *Id.* at 54.

¹⁴⁰ *Id.* at 12.

¹⁴¹ *Id.* at 13.

work Directive, and (7) Noise Directive.¹⁴² Since these directives are not geared specifically toward hydraulic fracturing, the regulatory framework contains numerous gaps.¹⁴³ Notably, the threshold for conducting Environmental Impact Assessments is set significantly above the potential industrial activities of hydraulic fracturing.¹⁴⁴ As a result, the Environmental Impact Assessment threshold must be lowered to account for the specific dangers of fracturing.¹⁴⁵ Second, the Water Framework Directive does not cover hydraulic fracturing's potential impact on surface waters.¹⁴⁶ Third, the Life Cycle Analysis does not have a comprehensive cost-benefit analysis for fracturing activities.¹⁴⁷ This tool would help EU nations make responsible decisions that analyze the benefits and dangers of fracturing, while giving the public vital information.¹⁴⁸ Fourth, the directives have not addressed whether there should be a complete ban on using toxic chemicals in injection sites.¹⁴⁹ Fifth, the EU does not mandate that statistics be gathered about the amount of injected quantities of fracturing fluids and the number of projects.¹⁵⁰ Additionally, all of the chemicals used are not necessarily disclosed publicly and there are not enough restrictions on the number of different chemicals allowed.¹⁵¹ Sixth, public participation and a Life Cycle Analysis should be mandatory at the regional level in order to ensure that communities can both participate in the decision-making process as well as prevent specific communities from being subject to unfair risks.¹⁵² Seventh, if a project permit is granted, surface water flow monitoring should be mandatory.¹⁵³ Eighth, statistics on accidents and complaints should be taken and reviewed by an independent authority separate from the EU.¹⁵⁴ And most importantly, a comprehensive regulatory directive should be developed to account for all of the issues and gaps related to hydraulic fracturing.¹⁵⁵

¹⁴² *Id.* at 54.

¹⁴³ *Id.* at 61—63.

¹⁴⁴ *Id.* at 9.

¹⁴⁵ *Id.*

¹⁴⁶ *Id.*

¹⁴⁷ *Id.*

¹⁴⁸ *Id.*

¹⁴⁹ *Id.*

¹⁵⁰ *Id.*

¹⁵¹ *Id.*

¹⁵² *Id.*

¹⁵³ *Id.*

¹⁵⁴ *Id.*

¹⁵⁵ *Id.*

In response to a lack of a comprehensive regulatory framework, the specific response of different European countries has varied.¹⁵⁶ For example, France became the first country to ban hydraulic fracturing for extracting natural gas or oil.¹⁵⁷ The French government banned the practice based on its concerns about environmental damage.¹⁵⁸ This decision is particularly relevant given hydraulic fracturing's potential boost to France's energy supply. The current regulatory framework under the European Union provides some guidance in regard to hydraulic fracturing, but fails to adequately address the issue. As a result, Member States are left with many tough decisions concerning the proper scope of regulation in the EU.

A. THE EUROPEAN UNION'S CURRENT DIRECTIVES INDIRECTLY IMPACT FRACTURING REGULATIONS

The Water Framework Directive relates to hydraulic fracturing because it mandates that all EU water obtain a "good" status by 2015.¹⁵⁹ Notably, the directive states that there should be "no deterioration" in groundwater quality.¹⁶⁰ The directives also mandate "the least possible changes to good groundwater status, given impacts that could not have reasonably been avoided due to the nature of the human activity or pollution."¹⁶¹ There are numerous other directives that are also applicable to fracturing.¹⁶² For instance, the Groundwater Directive attempts to reduce or limit the amount of groundwater pollution by 2015.¹⁶³ The directive would require shale gas firms to consent to mandatory environmental testing and set controls for the levels of chemicals allowed in drinking

¹⁵⁶ *Fracking Heaven: Other Europeans Fear Fracking. Poland is Steaming Ahead*, ECONOMIST (June 23, 2011), available at <http://www.economist.com/node/18867861>. Poland plans on drilling 120 test wells to obtain possibly trillions of cubic meters of gas. Currently, 95% of Poland's energy comes from coal.

¹⁵⁷ Tara Patel, *France Vote Outlaws 'Fracking' Shale for Natural Gas, Oil Extraction*, BLOOMBERG (July 1, 2011), available at <http://www.bloomberg.com/news/2011-07-01/france-vote-outlaws-fracking-shale-for-natural-gas-oil-extraction.html>.

¹⁵⁸ *Id.*

¹⁵⁹ William Wilson, *Environmental Regulation Crucial to Shale Gas in EU*, PETROLEUM ECONOMIST, July 1, 2011, available at <http://www.petroleum-economist.com/Article/2857826/Environmental-regulation-crucial-to-shale-gas-in-EU.html>.

¹⁶⁰ *Id.*

¹⁶¹ *Id.*

¹⁶² *Id.*

¹⁶³ *Id.*

water supplies.¹⁶⁴ Next, the Reach Chemicals Regulation controls what chemicals are permitted on the market.¹⁶⁵ This directive can impact the types of chemicals used in the hydraulic fracturing fluid.¹⁶⁶ Furthermore, the Waste Framework Directive could be applied to large disposals of contaminated water.¹⁶⁷ Given the number and scope of the EU's environmental directives, there are certainly significant environmental regulations in effect that can be applied to hydraulic fracturing.¹⁶⁸ Despite the merits of this argument, it is important to note that the directives that apply to hydraulic fracturing contain profound gaps and do not account for the specific complexities of hydraulic fracturing processes.¹⁶⁹

B. DISCREPANT REPORTS UNDERMINE COMPREHENSIVE HYDRAULIC FRACTURING REGULATION IN EUROPE

An important issue in the hydraulic fracturing debate stems from critical differences among experts concerning the adequacy of the current fracturing regulations.¹⁷⁰ A study submitted to the European Commission in 2011 proposed that a new comprehensive directive be created to account for all phases of the fracturing process, including exploration.¹⁷¹ However, a report created by the law firm Philippe & Partners concluded that there were no significant gaps in the current legislative framework in Europe related to the exploration of shale gas.¹⁷² Furthermore, the report stated that water quality is regulated under the Water Framework Directive and Mining Waste Directive during the exploration phase of hydraulic fracturing.¹⁷³ The report issued by the law firm of Philippe & Partners only addresses the exploration of shale gas.¹⁷⁴ In contrast, the 2011 report to the European Commission stated that the Water Directive

¹⁶⁴ *Id.*

¹⁶⁵ *Id.*

¹⁶⁶ *Id.*

¹⁶⁷ *Id.*

¹⁶⁸ *Id.*

¹⁶⁹ See generally LECHTENBÖHMER ET AL., *supra* note 1

¹⁷⁰ *Shale Gas in Europe at the Crossroads: Are Existing Laws Sufficient?*, ENERGY & ENVTL.MGMT. (Jan. 30, 2012), www.eaem.co.uk/news/shale-gas-europe-crossroads-are-existing-laws-sufficient.

¹⁷¹ *Id.*

¹⁷² LAW FIRM OF PHILIPPE & PARTNERS, FINAL REPORT ON UNCONVENTIONAL GAS IN EUROPE 101 (2011).

¹⁷³ *Id.* at 101.

¹⁷⁴ *Id.* at 101.

should be reevaluated with a “special focus” on fracturing activities in order to address the potential impacts to surface water.¹⁷⁵ Such reports present Member States with conflicting information and increase the challenge to regulators in determining the proper scope of regulations in Europe. In order to address fracturing regulations appropriately, nations must be able to rely on comprehensive scientific reports, not reports that choose only one aspect of the fracturing process—which in this case is the exploration of shale gas—and declare that the regulatory system is sufficient for that issue.¹⁷⁶ This is because hydraulic fracturing poses a risk to surface waters beyond the exploration process.¹⁷⁷ Thus, an analysis of the sufficiency of the current regulatory framework in Europe should consider every step in the fracturing process, as opposed to an analysis of a single step.¹⁷⁸

C. EUROPEAN UNION MEMBER STATES AND INDIVIDUAL RESPONSES TO HYDRAULIC FRACTURING

The debate about the sufficiency of the current regulatory framework in Europe continues to create a rift among experts, as Member States have taken vastly different approaches toward the regulation of fracturing.¹⁷⁹ As previously discussed, France voted to outlaw the hydraulic fracturing of shale and natural gases, becoming the first nation to ban the process in response to environmental concerns.¹⁸⁰ The law allows the government to revoke the permits of companies who plan to use fracturing processes and authorizes fines and prison sentences.¹⁸¹ Moreover, the government must pass a new law to permit future research of hydraulic fracturing.¹⁸²

In a bold move, President Nicholas Sarkozy stated that France will continue to uphold the fracturing ban until there is proof that the

¹⁷⁵ LECHTENBÖHMER ET AL., *supra* note 1, at 79.

¹⁷⁶ *See generally* LAW FIRM OF PHILIPPE & PARTNERS, *supra* note 158. The scope of the report’s conclusions are relevant for understanding regulations about hydraulic fracking *exploration* in Europe, but do not account for every phase of the fracking process, such as production. While this report presents critical information to Member States, it is limited by the extent of its findings.

¹⁷⁷ *See generally* LECHTENBÖHMER ET AL., *supra* note 1

¹⁷⁸ *Id.* at 48.

¹⁷⁹ Patel, *supra* note 157.

¹⁸⁰ *Id.*

¹⁸¹ *Id.*

¹⁸² *Id.*

process will not harm the environment or “massacre” the landscape.¹⁸³ Sarkozy further stated that the “development of hydrocarbon resources underground is a strategy for our country but not at any price . . . this won’t be done until it has been shown that technologies used for development respect the environment, the complex nature of soil and water networks.”¹⁸⁴ This decision is particularly relevant in light of the fact that France’s shale gas reserves have been described as “potentially some of the most promising in Europe.”¹⁸⁵ Yet, despite the potential economic benefits from shale gas, the French government responded to nationwide protests about hydraulic fracturing’s risk to groundwater supplies by enacting a complete ban.¹⁸⁶

In a similar fashion, Bulgaria banned hydraulic fracturing during January of 2012.¹⁸⁷ Lawmakers spoke in a clear voice when they voted in favor of the ban by a count of 166 to 6.¹⁸⁸ A report issued by the Energy & Gas Ministry stated that Bulgaria could possess between 300 billion to 1 trillion cubic meters of shale gas.¹⁸⁹ The amount of potential shale gas in Bulgaria represents a significant quantity, especially when considered in light of the fact that Bulgaria only needs approximately four billion cubic meters of gas each year.¹⁹⁰

The consequences of such a ban have not gone unchallenged within Bulgaria’s government. For instance, Ivan Kostov, the leader of the Democrats for Strong Bulgaria party, stated that the ban will “seriously impair” Bulgaria’s efforts to gain energy independence from Russia.¹⁹¹ Furthermore, the U.S. Ambassador to Bulgaria, James Warlick, stated that Chevron alone could provide millions in investment to Bulgaria and create jobs.¹⁹² Despite these benefits, the government responded

¹⁸³ Tara Patel, *France to Keep Fracking Ban to Protect Environment, Sarkozy Says*, BLOOMBERG (Oct. 4, 2011), <http://www.businessweek.com/news/2011-10-04/france-to-keep-fracking-ban-to-protect-environment-sarkozy-says.html>.

¹⁸⁴ *Id.*

¹⁸⁵ Geraldine Amiel, *France Cancels Shale-Gas Permits Over Fracking Impasse*, WALL ST. J., Oct. 4, 2011, <http://online.wsj.com/article/SB10001424052970204612504576608983814069012.html>.

¹⁸⁶ *Id.*

¹⁸⁷ Elizabeth Konstantinova & Joe Carroll, *Bulgaria Bans Gas Fracking, Thwarting Chevron Drilling Plan*, BLOOMBERG (Jan. 18, 2012), <http://www.bloomberg.com/news/2012-01-18/bulgaria-votes-to-ban-gas-fracking-thwarting-chevron-1-.html>.

¹⁸⁸ *Id.*

¹⁸⁹ *Id.*

¹⁹⁰ *Id.*

¹⁹¹ *Id.*

¹⁹² *Id.*

to the protestors who marched in Sofia, fearing that fracturing would pollute the water and contaminate the soil in Bulgaria's most fertile region.¹⁹³ Similar to France, the ban is for an indefinite period of time and covers the entire nation.¹⁹⁴

Unlike France and Bulgaria, Poland is aggressively pursuing shale gas reserves through hydraulic fracturing.¹⁹⁵ In January of 2012, the Polish Treasury Minister, Mikolaj Budzanowski, reported that Polish companies with fracturing permits must intensify drilling in order to begin production by 2014 or 2015.¹⁹⁶ Poland's decision to expand shale gas fracturing is motivated by several factors. First, Poland might have the largest shale gas reserves in Europe, estimated at 5.3 trillion cubic meters.¹⁹⁷ Second, Poland currently depends on Russian Gazprom for approximately two-thirds of its annual gas consumption.¹⁹⁸ And third, the energy obtained from Poland's shale gas reserves could be as much as 50 percent less expensive than its current rates.¹⁹⁹ In response to these factors, Poland chose to encourage hydraulic fracturing, but to regulate companies through a permit system.²⁰⁰ Polish Treasury Minister, Mikolaj Budanowski, stated that each company with a permit is attempting to drill twelve wells and conduct twelve hydraulic fracturing operations each year.²⁰¹ Due to the experience of North American firms, Poland hired companies such as ExxonMobil and ConocoPhillips.²⁰² Poland's desire to commence fracking activities is evidenced by the fact that it has issued exploration licenses to over twenty firms and has commenced test wells.²⁰³ Despite Poland's enthusiasm for fracking, to date the exploration phase has not gone as well as had hoped.²⁰⁴ Problems have included a

¹⁹³ *Id.*

¹⁹⁴ *Id.*

¹⁹⁵ John C.K. Daly, *Poland Gives Green Light to Massive Fracking Efforts*, OILPRICE, Feb. 2, 2012, <http://www.minyanville.com/businessmarkets/articles/fracking-hydraulic-fracturing-natural-gas-energy/2/2/2012/id/39195>.

¹⁹⁶ *Id.*

¹⁹⁷ *Id.*

¹⁹⁸ *Id.*

¹⁹⁹ *Id.*

²⁰⁰ *Id.*

²⁰¹ *Id.*

²⁰² *ECONOMIST*, *supra* note 156.

²⁰³ *Shale Gas in Europe and America: Fracking Here, Fracking There*, *ECONOMIST* (Nov. 26, 2011), available at <http://www.economist.com/node/21540256>.

²⁰⁴ Trefis Team, *Exxon's Polish Fracking Plans Hit Air Pocket*, *FORBES* (Feb. 3, 2012), <http://www.forbes.com/sites/greatspeculations/2012/02/03/exxons-polish-fracking-plans-hit-air-pocket/>.

lack of equipment, rigs and insufficient water supplies.²⁰⁵ When analyzing Poland's regulatory plan, it is important to note the nation's troubled relationship with Russia may account for its quick and assertive response to hydraulic fracturing efforts.²⁰⁶

IV. A COMPARISON OF EUROPEAN UNION AND UNITED STATES HYDRAULIC FRACTURING REGULATIONS

Neither the United States nor the EU has a comprehensive regulatory framework for mining activities.²⁰⁷ The lack of such a regulatory system represents a significant issue because the goals of a comprehensive regulatory framework are to promote a profitable energy sector, maintain a reliable energy supply, and protect the environment and health of citizens.²⁰⁸ As a result of the lack of a comprehensive regulatory framework in the EU, mining law is generally the responsibility of the Member States.²⁰⁹ This situation presents a potential problem, as EU nations often base their fracturing regulations on their historical situation.²¹⁰ While all parties agree that current EU regulations cover some aspects of fracturing, this fact does not necessarily alleviate the need for a more comprehensive regulation that focuses on the unconventional risks associated with it.²¹¹ Despite their water quality concerns, Member States often prioritize mining rights over citizens' rights.²¹² Of additional concern, local governments often have difficulty influencing the location of project sites because such locations are generally based on national and state decisions.²¹³

Moreover, the EU's regulatory mechanisms only require an environmental impact assessment when the production rate of the well is over 500 m³ each day.²¹⁴ Some experts maintain that this level is far too high and poses risks to the environment.²¹⁵ A compelling argument can be made to change the EU regulations to mandate an environmental impact

²⁰⁵ *Id.*

²⁰⁶ The Economist, *supra* note 203.

²⁰⁷ LECHTENBÖHMER ET AL., *supra* note 1, at 48.

²⁰⁸ *Id.*

²⁰⁹ *Id.*

²¹⁰ *Id.*

²¹¹ *Id.* at 54.

²¹² *Id.* at 77.

²¹³ *Id.*

²¹⁴ *Id.* at 78.

²¹⁵ *Id.*

assessment for each well, including significant public participation.²¹⁶ Furthermore, the monitoring of surface water flows should be a mandatory aspect of hydraulic fracturing, but this is currently not the case under the EU directives.²¹⁷ Due to the complexity and risks associated with hydraulic fracturing, developing a comprehensive framework to regulate all aspects of the process merits serious merit and attention.²¹⁸

A. THE UNITED STATES HAS THE OPPORTUNITY TO LEARN FROM THE EUROPEAN UNION'S APPROACH TO HYDRAULIC FRACTURING

The United States has the opportunity to learn from the EU's approach toward hydraulic fracturing regulations. For instance, an individual state could decide to completely ban the practice of hydraulic fracturing, as was the case with France and Bulgaria.²¹⁹ Such a decision could reasonably be based on public health concerns, potential environmental damage, and significant risks to water resources.²²⁰ Of course, a complete ban would eliminate the possibility of reaping the potential benefits of hydraulic fracturing, including affordable energy, reduced carbon emissions, and energy independence.²²¹ However, as at least one commentator has stated: "It is virtually unthinkable that the United States and most other countries could turn their back on fracking now (parts of Europe may be an exception)."²²² With respect to the United States, this point of view was illustrated when President Obama stated during his 2012 State of the Union speech: "We have a supply of natural gas that can last America nearly 100 years, and my administration will take every possible action to safely develop this energy."²²³

²¹⁶ *Id.*

²¹⁷ *Id.* at 79.

²¹⁸ *Id.*

²¹⁹ Kate Fried, *New Report: Fracking Could Cause a New Global Water Crisis*, NORTHCENTRALPA.COM (Mar. 7, 2012), http://www.northcentralpa.com/feeditem/2012-03-07_new-report-fracking-could-cause-new-global-water-crisis.

²²⁰ *Id.*

²²¹ John Kemp, *Fracking Safely and Responsibly*, REUTERS (Mar. 13, 2012), <http://www.reuters.com/article/2012/03/13/column-fracking-politics-idUSL5E8EDAQ620120313>.

²²² *Id.*

²²³ Neela Banerjee, *Obama Talks Up Natural Gas Development in State of the Union Speech*, L.A. TIMES (Jan. 24, 2012), <http://articles.latimes.com/2012/jan/24/news/la-pn-obama-talks-up-natural-gas-development-in-state-of-the-union-speech-20120124>.

Beyond a complete ban of hydraulic fracturing, the EU's regulatory framework provides useful information for the United States to consider. Under EU law, Environmental Impact Assessments can be required if the activity reaches the necessary threshold to trigger the analysis.²²⁴ In Europe, that threshold is set substantially above the realities of natural gas and tight oil extraction activities.²²⁵ Furthermore, experts recommend that the EU Environmental Impact Assessment threshold be lowered significantly.²²⁶ The United States could avoid this problem by requiring an environmental assessment for all proposed drilling operations, like New York and Pennsylvania require.²²⁷

Moreover, in Europe, the directives that apply to hydraulic fracturing do not necessarily cover numerous "unconventional risks."²²⁸ Such risks include the vast quantity of chemicals used, the types of chemicals, the flowback of contaminated water, the number of drilling sites, fracturing infrastructure, and the amount of water needed to drill a well.²²⁹ These risks are relevant because the existing regulatory framework is not necessarily in a position to handle these issues appropriately.²³⁰ Similarly, it is potentially problematic to rely on a regulatory scheme that was designed without considering the unique nature of hydraulic fracturing.²³¹ For instance, the Water Framework Directive began to take effect in 2000, but since hydraulic fracturing was not a main issue at this time, the risks of fracturing were not taken into account.²³²

Despite the potential issues inherent in its regulatory gaps, the United States created an intentional gap under the SWDA when Congress decided to exempt hydraulic fracturing from its jurisdiction.²³³ Hence, the United States could work toward eliminating regulatory gaps by regulating fracturing under the SWDA.²³⁴ While the EU is facing regulatory gaps due to not considering the issue of hydraulic fracturing at

²²⁴ LECHTENBÖHMER ET AL., *supra* note 1, at 48.

²²⁵ *Id.*

²²⁶ *Id.*

²²⁷ Wiseman, *supra* note 65, at 157.

²²⁸ LECHTENBÖHMER ET AL., *supra* note 1, at 54.

²²⁹ *Id.*

²³⁰ *Id.*

²³¹ *Id.* at 62.

²³² *Id.*

²³³ Cupas, *supra* note 11, at 606.

²³⁴ *Id.* at 629.

the time that directives were created,²³⁵ the United States is hampering the effectiveness of relevant laws due to intentional loopholes.²³⁶

B. THE EUROPEAN UNION HAS THE OPPORTUNITY TO LEARN FROM HYDRAULIC FRACTURING REGULATIONS IN THE UNITED STATES

Although hydraulic fracturing regulations in the United States contain significant flaws,²³⁷ the EU has the opportunity to analyze both the positive and negative aspects of the United States' regulations. The individual U.S. states have implemented a wide variety of fracturing regulations, ranging from no specific fracturing regulations, like in Texas, to relatively comprehensive regulatory approaches, such as in New York and Pennsylvania.²³⁸ Hence, the EU and member states should take the opportunity to learn from the United States regarding the spectrum of hydraulic fracturing regulations that are in place.

The United States, through the Department of State ("DOS"), established the Global Shale Gas Initiative ("GSGI") to help other countries develop unconventional gas resources economically and safely.²³⁹ With respect to the EU, the GSGI agreed to a partnership with Poland.²⁴⁰ The goals of the GSGI include providing technical and regulatory assistance, in addition to providing environmental and economic support.²⁴¹ Moreover, the GSGI provides a framework that tailors its assistance to the specific circumstances of each nation.²⁴² This program provides potential benefits to EU nations because governments are often unsure about how to develop shale gas in an environmentally and economically sound manner.²⁴³ However, some critics wonder whether the United

²³⁵ LECHTENBÖHMER ET AL., *supra* note 1, at 62.

²³⁶ Cupas, *supra* note 11, at 606.

²³⁷ Wiseman, *supra* note 65, at 193–94.

²³⁸ *Id.* at 116.

²³⁹ David L. Goldwyn, Special Envoy of Int'l Energy Affairs, Briefing on the Global Shale Gas Initiative Conference (Aug. 24, 2010), in U.S. DEP'T ST., Nov. 11, 2012, available at <http://www.state.gov/s/ciea/rmk/146249.htm>.

²⁴⁰ Press Release, White House Office of the Press Secretary, Fact Sheet: U.S.-Poland Cooperation on Clean Energy (May 28, 2011), <http://www.whitehouse.gov/the-press-office/2011/05/28/fact-sheet-us-poland-cooperation-clean-energy>.

²⁴¹ Goldwyn, *supra* note 239.

²⁴² Fact Sheet, U.S. Dep't of State, Unconventional Gas Technical Engagement Program (Nov. 11, 2012), <http://www.state.gov/s/ciea/utep/>.

²⁴³ Goldwyn, *supra* note 239.

States can provide an effective regulatory model for other countries, especially when these countries have less advanced laws concerning fracturing.²⁴⁴ A cynic could question the utility of the GSGI considering the United States has been experiencing environmental and safety issues.²⁴⁵ Despite these potential limitations, it is safe to say that the United States has significant experience studying and regulating hydraulic fracturing²⁴⁶ and could provide useful information to EU nations.

Next, EU nations could look at specific United States state laws in order to help develop their regulatory framework. For example, Pennsylvania provides a potential source of information for EU nations because its regulatory structure has been described as “relatively strong.”²⁴⁷ For instance, as discussed above, operators must obtain a permit that adheres to all environmental laws and regulations.²⁴⁸ Moreover, in some cases, operators are responsible for water pollution damages.²⁴⁹ Pennsylvania has also established disposal requirements for waste from fracturing activities.²⁵⁰ Notably, operators must provide a list of the chemicals used during hydraulic fracturing processes.²⁵¹ Likewise, the EU could follow the example of some U.S. states that have allowed for public participation concerning a state’s decision to grant a hydraulic fracturing permit.²⁵² In sum, U.S. states have implemented a multitude of hydraulic fracturing regulations that could be used as a model for the EU.²⁵³

Additionally, the EU could follow future regulations in the United States concerning safety certifications.²⁵⁴ Companies will soon be required to certify that they are not threatening local water supplies when engaging in hydraulic fracturing.²⁵⁵ This certification will increase the authority of the federal government through an inspection process.²⁵⁶ In par-

²⁴⁴ Sakmar, *supra* note 133, at 398.

²⁴⁵ *Id.*

²⁴⁶ *See generally* Sakmar, *supra* note 133.

²⁴⁷ Wiseman, *supra* note 65, at 163.

²⁴⁸ *Id.*

²⁴⁹ *Id.*

²⁵⁰ *Id.* at 164.

²⁵¹ *Id.*

²⁵² *Id.* at 167.

²⁵³ *Id.*

²⁵⁴ Katarzyna Klimasinska, *Fracking Rules to Include Safety Certification, Salazar Says*, BLOOMBERG (Feb. 29, 2012), <http://www.bloomberg.com/news/2012-02-29/fracking-rules-to-include-safety-certification-salazar-says.html>.

²⁵⁵ *Id.*

²⁵⁶ *Id.*

ticular, the inspections will focus on high-risk issues, such as adequate cementing during fracturing processes.²⁵⁷ The safety certification and inspections provide the type of regulatory approaches that the EU could choose to adopt.²⁵⁸

CONCLUSION

Hydraulic fracturing regulation should be based on a rational framework that relies on facts.²⁵⁹ Yet, the EU²⁶⁰ and the United States²⁶¹ do not have a comprehensive regulatory approach to account for the unique nature of hydraulic fracturing. Despite the risks that hydraulic fracturing poses to water supplies,²⁶² proponents argue that fracturing remains critical to the energy policy of the United States.²⁶³ However, the United States chose to significantly reduce federal involvement in fracturing regulation when Congress passed the Energy Policy Act of 2005, which specifically exempted “underground injections” from the SWDA.²⁶⁴ Due to the decisions of Congress, the individual states have become the main regulators of hydraulic fracturing.²⁶⁵ Unfortunately, critics believe that certain states are failing to adequately protect water sources, which poses a federal issue.²⁶⁶ Moreover, regulations vary considerably from state to state which raises concerns²⁶⁷ given the EPA’s acknowledgement of the potential risks to underground and surface water sources.²⁶⁸ Since water sources are of national concern, it is fair to argue that the federal government should regulate hydraulic fracturing.²⁶⁹

In comparison, the EU’s regulatory framework concerning hydraulic fracturing remains significantly behind that of the United

²⁵⁷ *Id.*

²⁵⁸ *Id.*

²⁵⁹ CHARLES G. GROAT & THOMAS W. GRIMSHAW, FACT BASED REGULATION FOR ENVIRONMENTAL PROTECTION SHALE GAS DEVELOPMENT 12 (Energy Institute 2012), available at http://energy.utexas.edu/images/ei_shale_gas_regulation120215.pdf.

²⁶⁰ LECHTENBÖHMER ET AL., *supra* note 1, at 9.

²⁶¹ Wiseman, *supra* note 65, at 142.

²⁶² U.S. ENVTL. PROT. AGENCY, *supra* note 39, at 2.

²⁶³ Deweese, *supra* note 75, at 1.

²⁶⁴ Rebecca J. Reser & David T. Ritter, *State and Federal Legislation and Regulation of Hydraulic Fracturing*, 57 THE ADVOCATE 31, 32 (2011).

²⁶⁵ Wiseman, *supra* note 65, at 167.

²⁶⁶ *Id.*

²⁶⁷ *Id.*

²⁶⁸ U.S. ENVTL. PROT. AGENCY, *supra* note 39, at 2.

²⁶⁹ Wiseman, *supra* note 35, at 185.

States.²⁷⁰ Since the EU does not have a directive tailored for hydraulic fracturing, Member States often rely on regulations that do not necessarily account for present-day factors.²⁷¹ Frequently, the rights of mining corporations are protected less than citizens' rights, and local jurisdictions find it difficult to influence the commencement of a project.²⁷² In some cases, such as in France, nations have chosen to forfeit the potential benefits of hydraulic fracturing by completely banning the process.²⁷³ In contrast, Poland plans to aggressively pursue fracturing projects.²⁷⁴ Although there are directives that apply to hydraulic fracturing,²⁷⁵ they are not tailored to address the complexities of the process.²⁷⁶ As a result, a valid argument can be made that the EU should regulate specific aspects of fracturing.²⁷⁷

In terms of future outlook, there are specific policies that the United States²⁷⁸ and EU²⁷⁹ could choose to adopt or improve. First, the United States could pass the Fracturing Responsibility and Awareness of Chemicals Act of 2011 ("FRAC Act"), which would overturn the SWDA's exemption on hydraulic fracturing and would mandate that companies reveal the chemicals present in their fracturing fluids.²⁸⁰ Moreover, the EPA would be required to create reporting, inspection, and monitoring requirements on fracturing projects.²⁸¹ Quite significantly, companies intending to utilize fracturing techniques would be required to obtain a permit, which would mandate that underground fluid injections not pose a threat to drinking water sources.²⁸² Although some critics of the FRAC Act contend that the regulations will cost federal and state governments significant tax revenue and will result in overregula-

²⁷⁰ LECHTENBÖHMER ET AL., *supra* note 1, at 79.

²⁷¹ *Id.* at 48.

²⁷² *Id.* at 77.

²⁷³ Patel, *supra* note 157.

²⁷⁴ Daly, *supra* note 195.

²⁷⁵ Wilson, *supra* note 159.

²⁷⁶ *See generally* LECHTENBÖHMER ET AL., *supra* note 1.

²⁷⁷ *Id.* at 77.

²⁷⁸ *See generally* Wiseman, *supra* note 65; *See generally* Cupas, *supra* note 11.

²⁷⁹ *See generally* LECHTENBÖHMER ET AL., *supra* note 1.

²⁸⁰ Rebecca J. Reser & David T. Ritter, *supra* note 264, at 33. In response to this proposal, companies are concerned that the disclosure of fracturing fluids would undermine their trade secrets.

²⁸¹ *Id.*

²⁸² *Id.*

tion,²⁸³ the potential risks to water sources²⁸⁴ merit a reevaluation of the existing regulatory framework.²⁸⁵

Second, a mandatory environmental impact assessment should be required for new projects in order to analyze the costs and benefits of the specific proposal.²⁸⁶ A mandatory environmental impact assessment would address the EU's current framework that only requires such assessments when the production of the well reaches a very high and unrealistic rate.²⁸⁷ Moreover, governments could choose to make public participation a required component of the environmental impact assessment.²⁸⁸ Third, U.S. states (and the EU's Member States) should have a role in regulating hydraulic fracturing because oil and gas reserves vary from location to location.²⁸⁹ However, regulating fracturing at the federal and EU levels would provide additional safeguards for water sources.²⁹⁰ Fourth, the international community should work together, such as through the GSIG, to develop expertise and share research and work on the nuanced and technical aspects of fracturing.²⁹¹ Lastly, jurisdictions, such as France,²⁹² should have the ability to completely ban the process of fracturing if they decide that the risks are too great.

Overall, hydraulic fracturing has the potential to lead to the "golden age of gas."²⁹³ Nonetheless, shale gas resources must be developed carefully in order to protect the environment and human health.²⁹⁴ Since the EU²⁹⁵ and United States²⁹⁶ do not have comprehensive regulatory frameworks for handling the unique aspects of fracturing, one could reasonably question the legitimacy of the current patchwork of regula-

²⁸³ Deweese, *supra* note 75, at 22. Estimates state that the FRAC act will cost states \$505 million and the federal government \$1.2 billion in income taxes.

²⁸⁴ U.S. ENVTL. PROT. AGENCY, *supra* note 39, at 2.

²⁸⁵ See generally Wiseman, *supra* note 65.

²⁸⁶ LECHTENBÖHMER ET AL., *supra* note 1, at 77.

²⁸⁷ *Id.* at 77–78.

²⁸⁸ *Id.* at 77.

²⁸⁹ Matt Willie, *Hydraulic Fracturing and "Spotty" Regulation: Why the Federal Government Should Let States Control Unconventional Onshore Drilling*, 2011 B.Y.U.L. REV. 1743, 1746 (2011). However, Matt Willie advocates for a state-based regulatory approach.

²⁹⁰ See generally Cupas, *supra* note 11.

²⁹¹ U.S. DEP'T OF STATE, *supra* note 239.

²⁹² Patel, *supra* note 157.

²⁹³ Martin Wolf, *Fracking Could Lead to Golden Age of Gas*, IRISH TIMES (Feb. 22, 2012), <http://www.irishtimes.com/newspaper/finance/2012/0222/1224312169239.html>.

²⁹⁴ CHARLES G. GROAT & THOMAS W. GRIMSHAW, *supra* note 259, at 12.

²⁹⁵ LECHTENBÖHMER ET AL., *supra* note 1, at 9.

²⁹⁶ Wiseman, *supra* note 65, at 142.

tions and approaches.²⁹⁷ However, since fracturing appears to be an inevitable and critical activity in some jurisdictions,²⁹⁸ regulators must consider the shortcomings of current environmental laws, weigh the costs and benefits, and work aggressively to develop a framework that addresses the intricacies of the process.²⁹⁹

²⁹⁷ See generally Wiseman, *supra* note 65.

²⁹⁸ Banerjee, *supra* note 223.

²⁹⁹ See generally LECHTENBÖHMER ET AL., *supra* note 1.