Leading by Example: The Fracturing Responsibility and Awareness of Chemicals Act of 2011 as a Catalyst for International Drilling Reform

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I. INTRODUCTION

As nations around the world thirst for more nonrenewable resources to fuel their economies, they are faced with the reality that the world's remaining nonrenewable energy resources are both scarce and increasingly hard to acquire. A 'toe' is a unit of measurement equal to 1 ton (7.35 barrels) of oil.[1] A 2010 study by the German government projects that the Earth's reserves still hold approximately 406 billion toes of hydrocarbons that can be extracted with current technology and at a cost that is economically practical given current market prices.[2] To put this figure in context, the International Energy Agency ("IEA") calculated that the entire planet used approximately 8.353 billion toes of energy in 2009.[3] At 2009 consumption rates, 406 billion toes would serve the entire planet's energy needs for over forty-eight years.[4] Of those 406 billion toes of hydrocarbons, 335 billion toes are viscous hydrocarbons, capable of being pumped out of the earth using conventional drilling techniques.[5] The remaining 71 billion toes represent heavier, unconventional hydrocarbons like oil sand, extra heavy oil, and tight gas.[6] Unconventional hydrocarbons are not capable of flowing because they are trapped in hard, nonporous earth.[7] Therefore, unconventional hydrocarbons require more advanced drilling technologies both to reach the reserve and to pull the oil or gas to the surface.

As the world's conventional hydrocarbons are burned to extinction, the extraction of unconventional hydrocarbons is becoming increasingly profitable by way of the well-established practice of hydraulic fracturing.[8] "Fracking," as hydraulic fracturing is commonly known in

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1. FED. INST. FOR GEOSCIENCES & NATURAL RES., ANNUAL REPORT: RESERVES, RESOURCES AND AVAILABILITY OF ENERGY RESOURCES 81, 86 (2010), *available at* http://www.bgr.bund.de/EN/Themen/Energie/Downloads/annual_report_2010_en.pdf?__blob=publicationFile&v=3 [hereinafter FED. INST. FOR GEOSCIENCES & NATURAL RES. 2010 ANNUAL REPORT].

2. *Id.* at 12.

3. INT'L ENERGY AGENCY, KEY WORLD ENERGY STATISTICS 28, 64 (2011), *available at* http://www.iea.org/textbase/nppdf/free/2011/key_world_energy_stats.pdf.

4. Remaining reserves (406 billon toes), divided by 2009 global consumption (8.353 billion toes), equates to approximately 48.61 years of consumption.

5. FED. INST. FOR GEOSCIENCES & NATURAL RES. 2010 ANNUAL REPORT, *supra* note 1, at 12, 80.

6. *Id.* at 12.

7. Tomás Felipe Correa Gutiérrez, Nelson Osorio, & Dora Patricia Restrepo Restrepo, *Unconventional Natural Gas Reserviors*, Energética, Dec. 2008–July 2009, at 61, 62, *available at* http://redalyc.uaemex.mx/pdf/1470/147012859006.pdf.

8. 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, 115, 122 (2009).

the industry, is the process of pumping a primarily liquid cocktail down a well to break up very dense hydrocarbon-bearing geological formations so the trapped hydrocarbons can flow into the well.[9] Fracking has become more popular in recent years with advances in drilling technologies and the increasing worldwide demand for hydrocarbons.[10] This boom has brought fracking closer to populated areas and generated numerous questions concerning its effects on people and the environment.[11] Because fracking was removed from regulation under the Safe Drinking Water Act ("SDWA") by the United States Congress in 2005, many of these questions remain unanswered, and fracking continues nation-wide with scattered and inconsistent regulation at the state level.[12] However, both the House and Senate have offered to repeal the exemption for hydraulic fracturing in the SDWA and finally bring fracking back under federal regulation.[13] The Fracturing Responsibility and Awareness of Chemicals Act of 2011 ("FRAC Act") would establish the regulatory framework necessary to efficiently monitor the environmental impacts of fracking, facilitate the expansion of scientific inquiry into fracking's effects on humans, and bring greater transparency and accountability to the fracking industry in the United States.[14]

The potential impacts of passing the FRAC Act and forcing fracking back into the federal regulatory scheme go beyond the borders of the United States. With more experience developing unconventional hydrocarbons than any other nation, the United States is a coveted advisor for many countries looking to develop their tight oil and gas resources in a manner that is both efficient and sustainable.[15] The world's two most populous countries, China and India, are among the nations

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9. *Id.* at 117-21; *see* Emily Rand, CBS News, *EPA Subpoenas Halliburton Over "Fracking"* (Nov. 9, 2010), http://www.cbsnews.com/8301-31727_162-20022247-10391695.html.

10. *See* Joe Carroll, Bloomberg, *Fracking Market to Grow 19% to $37 Billon Worldwide in 2012* (Jan. 19, 2012), http://www.bloomberg.com/news/2012-01-19/frack-market-to-grow-19-in-2012-to-37-billion-correct-.html.

11. Rand, *supra* note 9.

12. Wiseman, *supra* note 8, at 145, 157.

13. H.R. 1084, 112th Cong. (introduced Mar. 15, 2011), *available at* http://www.govtrack.us/congress/bill.xpd?bill=h112-1084; S. 587, 112th Cong. (introduced Mar. 15, 2011), *available at* http://www.govtrack.us/congress/bill.xpd?bill=s112-587.

14. *See id.*

15. David L. Goldwyn, Special Envoy for International Energy Affairs, U.S. Dept. of State, Briefing on the Global Shale Gas Initiative Conference (Aug. 24, 2010) (transcript available at http://www.state.gov/s/ciea/rmk/146249.htm); *see* Carroll, *supra* note 10 (North America accounted for 87% of the fracking market in 2011).

that have come to the United States looking for help.[16] The importance of fracking regulation cannot be understated. Fracking catastrophes abroad could devastate densely populated regions, which would inevitably impact the United States because of the interconnected global economy. Now, with the global unconventional hydrocarbon boom in its infancy, the United States must act to prevent fracking from contaminating its domestic environment and to avoid an environmental catastrophe abroad that might cripple the U.S. economy. The FRAC Act establishes a regulatory foundation the United States can take to the international community to begin discussing the adoption of serious reforms in fracking regulation worldwide.

This Note begins by discussing the history and procedure of fracking. Part II focuses on the unintended side effects of fracking and the resulting personal and environmental injuries. Part III outlines the history of fracking regulation in the United States and its role in mitigating the consequences of fracking. This history moves chronologically from federal fracking regulation under the SDWA to the express removal of fracking from the SDWA and the creation of today's inconsistent and unchecked system of state control. Part III concludes by offering insight into the prospects of Congress bringing fracking back under federal regulatory control in the near future and by explaining why doing so is in the best interests of the United States. Part IV examines the global community and analyzes the state of fracking and the environment internationally by focusing on what is happening in China and India. Finally, this Note explains why fracking that results in environmental degradation in other nations is a threat to the United States' national interests, offering insight into how the United States may use its technological prowess and the regulatory foundation of the FRAC Act to spark change in less developed nations that are looking to fracking to solve their energy demands. This Note concludes that the United States should pass the FRAC Act to ensure safe and sustainable fracking practices domestically, and that the United States should use the FRAC Act as the foundation for better domestic regulation and building a cooperative international understanding of safe and sustainable fracking practices.

16. Sheila McNulty, Fin. Times, *China and India See What the US Doesn't – the Potential of Natural Gas* (Nov. 11, 2010), http://blogs.ft.com/energy-source/2010/11/11/china-india-see-natural-gas-potential-us-government-is-missing.

II. HYDRAULIC FRACTURING: HOW IT IS DONE AND ITS UNINTENDED CONSEQUENCES

A. Journey to the Center of the Earth

The oil and gas industry has come a long way since Edwin Drake first discovered oil in a field in Titusville, Pennsylvania in 1859.[17] In addition to conventional fluid oil reservoirs or gas pockets, geologists have located great reserves of oil and gas trapped thousands of feet below the Earth's surface in tight geological formations.[18] Traditional drilling techniques either cannot reach these deep reserves or cannot feasibly produce the hydrocarbons because traditional wells can only extract the unconventional hydrocarbons immediately surrounding the wellhead.[19] Commercial operators first developed the technique of hydraulic fracturing to exploit oil and gas trapped in tight, nonporous geological formations with widely dispersed oil or gas pockets in 1949.[20] Fracking allows oil and gas to permeate difficult geological features by injecting fluid cocktails into the well at high pressure, which induces the hydrocarbon-bearing rock formations to crack or expand existing fractures, giving the hydrocarbons a path to the wellhead.[21] Hydraulic fracturing is an expensive endeavor, requiring that the operator truly understand the geology of the rock formation and chemistry of the fluid being used.[22] However, fracking has become more economically viable as the industry's technology has improved and the value of oil and gas has increased, due to scarcity of conventional hydrocarbons.[23]

The exact consistency of the fluid cocktail used to fracture a formation depends on the specific geology and desired hydrocarbon, but the two primary ingredients are typically water and sand.[24] Sand is considered a "proppant," meant to hold open the fracture to maximize the

17. Wes Deweese, *Fracturing Misconceptions: A History of Effective State Regulation, Groundwater Protection, and the Ill-Conceived FRAC Act*, 6 OKLA. J. L. & TECH. 49, at *28 (2010).

18. *See id.* at 4; *see also* FED. INST. FOR GEOSCIENCES & NATURAL RES. 2010 ANNUAL REPORT, *supra* note 1, at 12.

19. *See* FED. INST. FOR GEOSCIENCES & NATURAL RES. 2010 ANNUAL REPORT, *supra* note 1, at 12, 79 (unconventional hydrocarbons need to be stimulated to be able to reach the wellhead).

20. Wiseman, *supra* note 8, at 122.

21. *Id.* at 118–19.

22. Deweese, *supra* note 17, at 3.

23. *Id.* at 4.

24. *Id.* at 18.

flow of hydrocarbons to the well.[25] Depending on the rock formation being fracked, additional chemicals are added either as proppants, to induce fracturing, to help push granulated substances into the fracture, or to help extract the fracturing fluid once the well has been exploited.[26] Once the well has been exploited, the fracking fluid either remains in the fractures or comes to the surface with the hydrocarbon, where it is either recycled onsite, trucked off for treatment, or filtered and disposed.[27]

Tight, hydrocarbon-bearing geologic formations come in many varieties, but two of the most discussed and exploited tight formations today are shale and coal beds. Shale is sedimentary rock that is "formed by the consolidation of clay, mud, or silt, has a finely stratified or laminated structure, and is composed of minerals essentially unaltered since deposition."[28] In an exploitable deposit of shale, also known as a resource play or shale play, oil or gas is trapped in pores separated by relatively impermeable layers of shale.[29] In exploitable coal beds, natural gas is similarly trapped in the bed in pores.[30] Fracturing these features connects the pores so operators can draw the trapped hydrocarbons to the wellhead and pump them to the surface.

In the United States, some of the largest and most talked about deposits of hydrocarbons are trapped in shale plays found along the Rocky Mountains, from Montana to the Western Slope of Colorado, and scattered in a broad swath of the United States from southwest Texas to the Adirondack Mountains in New York.[31] The Marcellus Shale, an underground layer of shale covering all of West Virginia and over half of Ohio, New York, and Pennsylvania, is estimated to contain up to 489 trillion cubic feet of natural gas.[32] To put this number in context, the U.S. Energy Information Administration projects that the nation will use approximately 68.9 billion cubic feet of natural gas per day in 2012.[33]

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25. Wiseman, *supra* note 8, at 118.

26. *Id.* at 118–19.

27. *Id.* at 120–21.

28. Merriam-Webster's Dictionary, *Shale*, http://east.merriam-webster.com/dictionary/shale (last visited Mar. 2, 2012).

29. Deweese, *supra* note 17, at 4; U.S. GEOLOGICAL SURVEY, NATIONAL ASSESSMENT OF OIL AND GAS FACT SHEET: COAL BED GAS RESOURCES OF THE ROCKY MOUNTAIN REGION, *available at* http://pubs.usgs.gov/fs/fs-158-02/FS-158-02.pdf.

30. U.S. GEOLOGICAL SURVEY, NATIONAL ASSESSMENT OF OIL AND GAS FACT SHEET: COAL BED GAS RESOURCES OF THE ROCKY MOUNTAIN REGION, *available at* http://pubs.usgs.gov/fs/fs-158-02/FS-158-02.pdf.

31. ENERGY INFO. ADMIN., LOWER 48 STATES SHALE PLAYS, *available at* http://www.eia.doe.gov/oil_gas/rpd/shale_gas.pdf.

32. New York Dep't. of Envtl. Conservation, *Marcellus Shale*, http://www.dec.ny.gov/energy/46288.html (last visited Mar. 2, 2012).

33. U.S. ENERGY ADMIN., SHORT-TERM ENERGY OUTLOOK: NATURAL GAS: U.S.

Besides satisfying the nation's thirst for natural gas, a May 2010 study by the University of Pennsylvania estimated that over $4.5 billion had already been spent developing the Marcellus Shale in Pennsylvania alone; generating $389 million in state local tax revenue and over 44,000 jobs.[34] Companies are already beginning to use fracking to unlock the Marcellus Shale and other major hydrocarbon plays across the nation.

B. When Fracking and People Collide

All across the United States, people are encountering unusual problems in and around their homes that were not present until hydraulic fracturing operations came to their neighborhoods. During fracking of natural gas deposits, gas has been known to "migrate" away from wells and up through bedrock fractures into permeable soil and aquifers, which eventually deposit the gas on the surface.[35] Methane, a colorless, odorless, and flammable gas, is the main constituent of natural gas.[36] In New Mexico's San Juan Basin, explosive levels of methane have been found in homes near a fracturing operation extracting methane from a coal bed deep underneath the earth's surface.[37] A Duke University study analyzed water from sixty-eight groundwater wells in five northeastern Pennsylvania and New York counties and found methane levels to be seventeen times higher on average in wells located within a kilometer of active fracking sites.[38] After touring a coal bed methane drilling operation in Colorado, the U.S. Environmental Protection Agency ("EPA") reported brown and dying trees and grass in areas with normal soil conditions prior to the commencement of drilling.[39] The

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NATURAL GAS CONSUMPTION (Mar. 6, 2012), *available at* http://www.eia.gov/forecasts/steo/report/natgas.cfm (last visited Mar. 18, 2012).

34. Clifford Krauss & Tom Zeller, Jr., N.Y. Times, *When a Rig Moves In Next Door* (Nov. 6, 2010), http://www.nytimes.com/2010/11/07/business/energy-environment/07frack.html?scp=1&sq=marcellus%20shale%20fracking&st=cse.

35. THE PITTSBURGH GEOLOGICAL SOC'Y, NATURAL GAS MIGRATION PROBLEMS IN WESTERN PENNSYLVANIA, *available at* http://www.pittsburghgeologicalsociety.org/naturalgas.pdf.

36. The Free Dictionary, *Methane* http://www.thefreedictionary.com/methane (last visited Mar. 2, 2012).

37. Wiseman, *supra* note 8, at 129–30.

38. Duke Univ. Nicholas Sch. of the Env't, *Methane Levels 17 Times Higher in Water Wells Near Hydrofracking Sites*, May 9, 2011, http://www.nicholas.duke.edu/hydrofracking/methane-levels-17-times-higher-in-water-wells-near-hydrofracking-sites (last visited May 28, 2012); *see* Dina Cappiello, MSNBC, *Methane in Water Near Gas Drilling Sites Study Finds* (May 9, 2011), http://www.msnbc.msn.com/id/42964307/ns/us_news-environment/t/methane-water-near-gas-drilling-sites-study-finds/#.T1pJPIFQ5Ao.

39. Wiseman, *supra* note 8, at 130.

documentary *Gasland* tells the stories of homeowners, living in the vicinity of methane producing coal bed fracking operations on Colorado's Eastern Plains, who took lighters to their kitchen faucets, sparking spectacular fires even as water continued to flow from the tap.[40] In pursuit of natural gas, fracking operations leave some of their prized hydrocarbons in the trees, homes, and drinking water of their neighbors, damaging the environment and endangering human health.

Improperly managed fracking operations also result in surface pollution. On September 16, 2009, failed pipe connections caused two chemical spills at a hydraulic fracturing operation in Dimock, Pennsylvania, 150 miles northwest of New York City, sending approximately 8,000 gallons of fracturing fluid into a nearby creek.[41] That fluid contained the chemical LGC-35 CBM, a hazardous and potentially carcinogenic liquid gel concentrate.[42] While the Pennsylvania Department of Environmental Protection ("PA DEP") found no evidence of well or groundwater contamination,[43] private tests discovered fracking chemicals including ethylene glycol, propylene glycol, and toluene in the town's water supply.[44] But this incident is only a whisper of what could happen if a neighborhood or watershed was exposed to more dangerous or concentrated fracking chemicals.

Fracking chemicals have been linked to serious health problems in humans that come into contact with them. The PA DEP has compiled and published a list of the more than eighty chemicals being used in fracking operations throughout the state.[45] Among those chemicals are compounds "associated with neurological problems, cancer and other serious health effects."[46] In August 2008, an energy services employee in Colorado went to a hospital complaining of nausea and headaches

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40. Andrew Maykuth, *'Gasland' Documentary Fuels Debate Over Natural Gas Extraction*, PHILA. INQUIRER, June 23, 2010, at A01, *available at* http://articles.philly.com/2010-06-23/news/24961785_1_natural-gas-marcellus-shale-gas-drilling.

41. Deweese, *supra* note 17, at 7.

42. *Id.*; HALLIBURTON, LGC-35 CBM MATERIAL SAFETY DATA SHEET (2008), *available at* http://newyork.sierraclub.org/fingerlakes/MSDS/LGC-35%20CBM%20MSDS.pdf.

43. Deweese, *supra* note 17, at 7.

44. The Herald-Dispatch, *Toxic Fracking Chemicals Found in Pennsylvania Drinking Water* (Sept. 16, 2010), http://www.herald-dispatch.com/news/briefs/x1988164152/Toxic-fracking-chemicals-found-in-Pennsylvania-drinking-water.

45. Marc Levy, The Huffington Post, *Pennsylvania Fracking Fluid Found to Contain Neurologically Harmful Chemicals* (June 28, 2010), *available at* http://www.huffingtonpost.com/2010/06/28/pennsylvania-fracking-flu_n_628373.html.

46. *Id.*

allegedly resulting from exposure to fracking fluids.[47] The emergency nurse who treated the man later complained of similar symptoms, which lead to vomiting and yellowing skin.[48] She was diagnosed with chemical poisoning, but the specific chemicals could not be identified because the fracking fluid's safety data failed to disclose several proprietary compounds.[49] Reading, hearing, or experiencing stories like these raises an important question: how are fracking operations regulated in the United States to ensure that exploiting America's energy resources does not come at the expense of the environment and human health?

III. FRACKING IN AMERICA: REGULATION, DEREGULATION, AND THE PROSPECT OF RENEWED REGULATION

A. Regulation of Hydraulic Fracturing Prior to 2005

The primary avenue to address the safety of hydraulic fracturing prior to 2005 was the Safe Drinking Water Act ("SDWA"), which proved relatively successful. Congress passed the SDWA in 1974 to regulate the nation's drinking water supply in order to protect public health.[50] Part C of the SDWA covers the protection of underground drinking water sources.[51] To prevent contamination of underground drinking water sources, Part C requires the EPA to establish and publish regulations that set minimum requirements and restrictions for underground injections nationwide.[52] For a state to obtain regulatory and enforcement responsibility within their borders from the EPA, it must submit an Underground Injection Control ("UIC") proposal to the EPA that meets the EPA's minimum requirements.[53] The EPA has the right to take responsibility back from a state if it determines, by rule, that the state UIC program no longer satisfies the SDWA.[54] In *Legal*

47. Jim Moscou, Newsweek, *A Toxic Spew?: Officials Worry About Impact of 'Fracking' of Oil and Gas* (Aug. 19, 2008), *available at* http://www.newsweek.com/2008/08/19/a-toxic-spew.html.

48. *Id.*

49. *Id.*

50. *See* Safe Drinking Water Act, 42 U.S.C. § 300F–300J-26 (2006); Envtl. Prot. Agency, *Safe Drinking Water Act (SWDA)*, http://water.epa.gov/lawsregs/rulesregs/sdwa/index.cfm (last visited Mar. 2, 2012).

51. 42 U.S.C. §§ 300h–300h-8.

52. *Id.* § 300h.

53. *Id.* § 300h-1.

54. *Id.*

Environmental Assistance Fund v. EPA, a landmark case in hydraulic fracturing and the field of environmental law generally,[55] the Eleventh Circuit held that the SDWA requires hydraulic fracturing to be regulated under state UIC programs.[56] This decision led Alabama to add fracking to its UIC.[57] In response, the EPA began a study to determine whether fracking in coal bed methane reservoirs should be regulated under the SDWA.[58] When it finished in June 2004, the EPA found that fracking coal bed methane reservoirs poses "minimal threat" to underground sources of drinking water.[59] Just over a year later, as environmental groups and even EPA scientists were contesting the methodology of the study and impartiality of the panel that conducted it, Congress put an end to the debate by expressly excluding fracking from the SDWA.[60]

B. Regulation of Hydraulic Fracturing Since 2005

1. The Energy Policy Act of 2005

Less than three weeks after he took office in 2001, President George W. Bush created the National Energy Policy Development Group to develop energy policy aimed at reducing American dependence on foreign energy and appointed Vice President Dick Cheney as its chair.[61] For seven years prior to becoming vice president, Cheney was chairman and chief executive officer of Halliburton, one of the world's largest oil field services companies.[62] Unsurprisingly, the findings of this group were heavily influenced by the concerns of the oil and gas industry.[63]

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55. Legal Envtl. Assistance Found. v. EPA, 276 F.3d 1253, 1263 (11th Cir. 2001).

56. *Id.*

57. Wiseman, *supra* note 8, at 144.

58. *Id.*

59. ENVTL. PROT. AGENCY, EVALUATION OF IMPACTS TO UNDERGROUND SOURCES OF DRINKING WATER BY HYDRAULIC FRACTURING OF COALBED METHANE RESERVOIRS (2004), *available at* http://www.epa.gov/ogwdw/uic/pdfs/cbmstudy_attach_uic_final_fact_sheet.pdf.

60. Wiseman, *supra* note 8, at 145; Union of Concerned Scientists, *EPA Findings on Hydraulic Fracturing deemed "Unsupportable"*, http://www.ucsusa.org/scientific_integrity/abuses_of_science/oil-extraction.html (last visited Mar. 2, 2012).

61. Eric Dannenmaier, *Executive Exclusion and the Cloistering of the Cheney Energy Task Force*, 16 N.Y.U. ENVTL. L.J. 329, 331 (2008).

62. Richard Bruce Cheney, *Biographical Directory of the U.S. Congress*, http://bioguide.congress.gov/scripts/biodisplay.pl?index=C000344 (last visited Mar. 2, 2012); Halliburton, *Corporate Profile*, http://www.halliburton.com/AboutUs/default.aspx?navid=966&pageid=2458 (last visited Mar. 2, 2012).

63. Dannenmaier, *supra* note 61, at 331.

The Energy Policy Act of 2005, in turn, was substantially influenced by the findings of the Cheney group and as a result, enacted sweeping policy changes that deregulated much of the oil and gas industry.[64]

Section 300h(d)(2) of the SDWA states that:

> [u]nderground injection endangers drinking water sources if such injection may result in the presence in underground water which supplies or can reasonably be expected to supply any public water system of any contaminant, and if the presence of such contaminant may result in such system's not complying with any national primary drinking water regulation or may otherwise adversely affect the health of persons.[65]

Prior to 2005, this section applied to hydraulic fracturing fluids and bestowed upon the EPA a duty to ensure that the fluids used in fracking projects did not endanger drinking water supplies.[66] The Energy Policy Act of 2005 expressly exempted hydraulic fracturing fluids, other than diesel, from Part C of the SDWA.[67] Where the EPA previously had the authority under the SDWA to remove state regulatory powers and regulate fracking itself when it felt a state's UIC was not meeting the SDWA's requirements, the Energy Policy Act of 2005 made it clear that the EPA could not invalidate a state's UIC for failing to regulate fracking. This had the practical effect of taking the regulation of fracking out of federal hands and placing it entirely with state governments.[68]

2. Inconsistent and Deficient State Regulation Since the Energy Policy Act of 2005

The biggest problem with state regulation of hydraulic fracturing under the Energy Policy Act of 2005 is that it varies widely among states in the absence of a federal law requiring specific minimums. Colorado, for example, has one of the nation's better regulatory schemes, requiring drillers, including those who conduct fracking, to apply for and obtain a permit from the director of the state's Oil and Gas Conservation Commission ("COGCC").[69] The permit application must include, among other things, where the well is to be drilled and the location of water

64. *Id.* at 331–32.

65. 42 U.S.C. § 300h(d)(2).

66. *See* Natural Res. Def. Council, Inc. v. EPA, 907 F.2d 1146, 1157 (D.C. Cir. 1990).

67. Energy Policy Act of 2005, Pub. L. No. 109-58, § 322, 119 Stat. 594, 694 (2005).

68. Wiseman, *supra* note 8, at 145.

69. COLO. CODE REGS. § 404-1:303(d)(3)(c) (2010).

sources within 400 feet of the wellhead.[70] If the COGCC Director believes that the well is an imminent threat to "public health, safety, and welfare, including the environment," then he may withhold the permit.[71] Pennsylvania and New York have similar requirements and, like Colorado, are considered to be some of the nation's strictest fracking regulators.[72]

In contrast, Oklahoma has one of the nation's weakest fracking regulatory schemes. To be clear, Oklahoma is not entirely silent when it comes to regulating fracking. Oklahoma requires wells to be cased and cemented to the greater of ninety feet below the surface or fifty feet below the base of treatable water, and pressure tested to make sure they are sealed once exhausted.[73] While ensuring the integrity of the well through the water supply is important, Oklahoma fails to address the integrity of the casing beyond that shallow depth, which could be a mere fifty feet from treatable water.[74] In Texas, fracking regulations also address well integrity, but, as in Oklahoma, fail to address what is happening to the greater environment as a result of the fracking process.[75] What is happening in the well is certainly important and vital to preventing environmental degradation. However, a UIC is not truly effective until it also addresses what is happening in the earth outside the well bore.

Almost six years after fracking was expressly removed from the SDWA, the United States has evolved into a patchwork of regulations. Even in states with relatively strong regulatory schemes, existing regulatory frameworks are failing to prevent and redress harm to people and the environment. The aftermath of the Energy Policy Act of 2005 demonstrates that states are unable to handle the job of regulating fracking on their own. It is time for the federal government to re-establish its authority to regulate fracking operations and to re-enter the business of regulating fracking operations that affect public health.

C. The Prospects of Future Federal Fracking Regulation

1. The CWA

The Clean Water Act ("CWA") is a possible federal statutory tool for preventative regulation of potentially hazardous fracking operations

70. *Id.*
71. *Id.* § 404-1:303(m)(1).
72. *See* Deweese, *supra* note 17, at 24–26, 28–29.
73. *Id.* at 27–28.
74. *See id.*
75. *See generally id.* at 29–30.

and for remedying fracking related damages once they occur.[76] However, the practical reality is that the CWA is ineffective with respect to regulating hydraulic fracturing. The CWA established effluent limitations and standards governing the discharge of pollutants into the waters of the United States.[77] To implement these standards, the CWA requires point sources that discharge into the waters of the United States to obtain a permit pursuant to the National Pollutant Discharge Elimination System ("NPDES").[78] Permits are issued by the EPA or by states or tribes with a qualified water program.[79] The CWA has been successful at regulating the surface activities of hydraulic fracturing operations, but has not been and should not be the vehicle for policing underground operations.[80] Past cases suggest that drillers will not be compelled to get NPDES permits for underground injection until a solid causal connection can be made between fracking fluid injection and injuries to people and property.[81] Without a stronger regulatory scheme, drillers will hide behind causation and engage in drawn out legal battles over their responsibility. Underground injection requires a regulatory regime that polices drillers before any fracking fluids are deposited into the ground, not only after irreparable damage has been done to the environment. It would take a serious overhaul of the CWA to make it the proper vessel for fracking regulation.

2. Congressional Studies

Congress has demonstrated an interest in researching and reporting on hydraulic fracturing, which suggests that legislation on the matter may be forthcoming. A recent probe by the House Energy and Commerce Committee found that fracking companies have injected at least 32 million gallons of diesel fuel, which was not exempted from the SDWA by the Energy Policy Act of 2005, in nineteen states between 2005 and 2009.[82] This contradicts the long-standing industry claim that

76. Clean Water Act, 33 U.S.C. §§ 1251-87 (2006).

77. Ann Wooster, *Actions brought under Federal Water Pollution Control Act Amendments of 1972 (CWA) (33 U.S.C.A. §§ 1251 et seq.)—Supreme Court cases*, 163 A.L.R. Fed. 531 § 2(a) (2000).

78. *Id.*

79. *See* 40 C.F.R. §§ 123.1-.64- (2012).

80. *See* Office of Pub. Affairs, Dep't. of Justice, *Texas Natural Gas and Oil Drilling Contractor Pleads Guilty to Negligent Violation of Clean Water Act in Oklahoma* (2011), http://www.justice.gov/opa/pr/2011/October/11-enrd-1342.html (last visited Mar. 2, 2012).

81. *See* Deweese, *supra* note 17, at 7.

82. David O. Williams, Real Aspen, *House Probe: Fracking Companies Injected 32 million gallons of diesel fuel into ground*, 2011, http://www.realaspen.com/article/449/House-probe-Fracking-companies-injected-32-

diesel is no longer used in the fracking process.[83] In addition to demonstrating congressional interest in fracking, the Energy and Commerce Committee's study provides House members who are skeptical of federal regulation of fracking with evidence supporting the call to amend the SDWA and bring hydraulic fracturing back under federal regulation.

On October 29, 2009, Congress asked the EPA in the Interior and Environment Appropriations Bill to revisit the impact of hydraulic fracturing on the environment and safe drinking water.[84] In response, the EPA initiated the Hydraulic Fracturing Study, to be completed by the end of 2012.[85] As Representative Diana DeGette of Colorado, a co-sponsor of the FRAC Act has noted, this study is an important step toward ensuring safe drinking water in America.[86] The EPA's research will shed light on the true effects that fracking has on the environment. However, because of the Energy Policy Act of 2005, this study will not change the status of fracking regulation at the federal level. Only Congress can bring fracking operations back under federal regulation and ensure that all fracking operations in the United States meet nationally recognized minimum standards. The EPA's study is an important step toward bringing fracking back under federal regulation, but it will take more than research to remedy the effects of the Energy Policy Act of 2005.

3. The Fracturing Responsibility and Awareness of Chemicals Act of 2011

The FRAC Act would bring fracking back under the purview of the

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million-gallons-of-diesel-fuel-into-ground (last visited Mar. 2, 2012); Mike Soraghan, N.Y. Times, *Fracking Companies Injected 32M Gallons of Diesel, House Probe Finds* (Jan. 31, 2011), http://www.nytimes.com/gwire/2011/01/31/31greenwire-fracking-companies-injected-32m-gallons-of-die-24135.html.

83. *Id.*

84. H.R. 2996, 111th Cong. (2010) (enacted), *available at* http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=111_cong_bills&docid=f:h2996enr.txt.pdf; Abrahm Lustgarten & Sabrina Shankman, Propublica, *Congress Tells EPA to Study Hydraulic Fracturing* (Nov. 10, 2009), http://www.propublica.org/article/congress-tells-epa-to-study-hydraulic-fracturing-hinchey-1110.

85. U.S. Envtl. Prot. Agency, *Hydraulic Fracturing*, http://water.epa.gov/type/groundwater/uic/class2/hydraulicfracturing/index.cfm (last visited Mar. 2, 2012)*;* U.S. Envtl. Prot. Agency, *EPA's Study of Hydraulic Fracturing and Its Potential Impact on Drinking Water Resources*, http://www.epa.gov/hfstudy/index.html (last visited Mar. 2, 2012).

86. David O. Williams, Colo. Indep., *EPA to study hydraulic fracturing, but calls for FRAC Act to continue*, (Mar. 18, 2010), http://coloradoindependent.com/49367/epa-to-study-hydraulic-fracturing-but-calls-for-frac-act-continue.

EPA, force fracking operations to be more transparent and compel fracking operators to cooperate with medical officials in the event of an emergency. Beyond reinstating the ambiguous pre-2005 language of Section 1421(d) of the SDWA, the FRAC Act expressly includes "fluids or propping agents pursuant to hydraulic fracturing operations related to oil, gas, or geothermal production activities" in the definition of underground injections to be included in state UIC program regulations.[87] The FRAC Act will still allow a state to regulate drilling within its borders, but will also ensure that fracking operations nationwide are subject to scrutiny if a state's UIC fails to adequately protect the public.[88]

While environmentalists applaud these measures, oil and gas companies are complaining that the FRAC Act will hurt their business. Some in the oil and gas industry believe that the FRAC Act should be rejected for failing to adequately protect the proprietary formulas that companies use in the fracking process.[89] However, proprietary information is protected under the FRAC Act. Both the House and Senate versions of the FRAC Act require fracking operators to disclose to the relevant SDWA enforcement authority (either the state or EPA) the "chemical constituents" used in their fracking operation, but explicitly maintain that the company does not have to disclose the quantities of each constituent, its "proprietary chemical formulas."[90] The EPA or state UIC administrator is then required to make the identity of the chemicals used available to the public.[91] The FRAC Act would serve the important interest of public disclosure about the chemicals being pumped into the ground beneath their communities, but has been written such that adequate safeguards exist to protect the legitimate concern of industry confidentiality.

The FRAC Act would also force operators to disclose, under optional confidentiality agreements, their proprietary formulas if a state, EPA administrator, or health care official deems it necessary for medical treatment in the event of an emergency.[92] Some in the oil and gas industry believe that confidentiality agreements will be insufficient and that time may not provide for a confidentiality agreement to be signed

87. H.R. 1084, 112th Cong. § 2(a); *see* S. 587, 112th Cong. § 2(a).

88. *See* 40 C.F.R. § 145.1 (permitting states to apply to run state UIC program); *see also* 40 C.F.R. § 145.33
(criteria for the EPA to withdraw state programs; assuming control).

89. Deweese, *supra* note 17, at 11.

90. H.R. 1084, 112th Cong. § 2(b); *see* S. 587, 112th Cong. § 2(b).

91. *Id.*

92. H.R. 1084, 112th Cong. § 2(b)(iii).

before the information would need to be disclosed.[93] However, nothing forecloses a company's ability to bring suit against anyone who might abuse this provision. Oil and gas employees, medical professionals, and the public at large deserve access to the best medical care available when needed. Requiring companies to tell medical professionals the levels of chemicals people have been exposed to gives health care providers a clearer picture of the problem they are charged with treating. The FRAC Act adequately balances the proprietary interests of the oil and gas industry against the dangers to public health that fracking chemicals pose.

The American public is already starting to send signals to Congress indicating that fracking is dangerous business, that it is causing serious consequences to the environment, and is rife with trans-boundary and public health issues that call for federal regulation. The cities of Pittsburgh and Buffalo have banned hydraulic fracturing amid concerns that the practice contaminates drinking water.[94] Placing fracking regulation back under the primary authority of the federal government does not weaken state's rights; it merely strengthens the system of regulatory checks on industry and provides greater access to information in the interest of public health. The FRAC Act is the best opportunity to restructure fracking regulation, close loopholes in state regulatory schemes that appeared after fracking was federally deregulated in 2005, and afford greater protection to public health than what is currently being offered through state regulation.

IV. THE START OF SOMETHING BIGGER: THE FRAC ACT AS A CATALYST FOR INTERNATIONAL COOPERATION

In the United States, public perception and political pressure often focus on energy availability and independence while obscuring the issue of safe drinking water. Worldwide oil production peaked in 1970.[95] "By 1975 . . . the oil embargo imposed against the United States by certain foreign countries had placed national political attention on the economic

93. Deweese, *supra* note 17, at 13–14.

94. Daniel Trotta, Reuters, *City of Buffalo Bans Hydraulic Fracturing* (Feb. 8, 2011), http://www.reuters.com/article/2011/02/08/us-energy-natgas-buffalo-idUSTRE7176BZ20110208.

95. U. S. GOV'T ACCOUNTABILITY OFFICE, CRUDE OIL: UNCERTAINTY ABOUT FUTURE OIL SUPPLY MAKES IT IMPORTANT TO DEVELOP A STRATEGY FOR ADDRESSING A PEAK AND DECLINE IN OIL PRODUCTION 7 (2007), *available at* http://www.gao.gov/new.items/d07283.pdf.

and national security problems connected with relying on foreign energy sources, and resulted in the first comprehensive federal energy conservation policy."[96] Since then, energy and dependence on foreign oil and natural gas has remained a serious concern in the United States.

However, in many other parts of the world, energy dependence is taking a back seat to water security and policy.[97] In *Aqua Shock – The Water Crisis in America*, author Susan Marks points out that 1.1 billion people in the world do not have access to safe drinking water and 2.5 billion cannot access proper water sanitation services.[98] A United Nations ("UN") Educational Scientific and Cultural Organization report projects that freshwater scarcity affects approximately seventy-five percent of the global population.[99] Since 1900, the world's population has doubled, but the demand for water has increased a staggering six-fold.[100] UN estimates project that the world will add 57 million people every year for the first half of the twenty-first century, bringing the world population to 8.9 billion in 2050.[101] More people coupled with higher demand generated by rising standards of living in the developing world means that an already stretched necessity is on pace to become even more scarce in the foreseeable future.[102] The current scarcity of safe drinking water worldwide, coupled with the alarming projections for the future, illustrates why countries need to pay close attention to and start remedying the causes of freshwater shortages and water pollution.

Fixing the shortage of fresh drinking water, however, cannot come unless nations address the sources of their water shortages and contamination. Many nations see hydraulic fracturing as the solution to their energy demands and independence.[103] However, these same nations

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96. Alexandra B. Klass, *State Standards for Nationwide Products Revisited: Federalism, Green Building Codes, and Appliance Efficiency Standards*, 34 HARV. ENVTL. L. REV. 335, 347 (2010).

97. World Water Org., *China*, *available at* http://www.theworldwater.org/world_water.php?id=china (last visited Mar. 2, 2012).

98. Todd Likman et al., *Book Notes*, 13 U. DENV. WATER L. REV. 405, 432 (Spring 2010).

99. *Id.*

100. Arizona Water Res., Univ. of Arizona *Global Water Shortage Looms In New Century* (1999), *available at* http://ag.arizona.edu/AZWATER/awr/dec99/Feature2.htm (last visited Mar. 2, 2012).

101. U.N. DEP'T OF INT'L ECON. & SOC. AFFAIRS, WORLD POPULATION TO 2300 4 (2004), *available at* http://www.un.org/esa/population/publications/longrange2/WorldPop2300final.pdf.

102. Arizona Water Res., *supra* note 102.

103. David Winning, Wall St. J., *China Considers Shale-Gas Potential* (June 28, 2010), http://online.wsj.com/article/SB10001424052748703615104575328200873180036.html.

are moving forward with large-scale fracking projects while considerable debate still exists over fracking's effects on the environment and water quality.[104] Moreover, many of these countries do not even come close to the basic regulatory system established in the United States, making them especially susceptible to incurring water or greater environmental damage without the prospect of recourse against the fracking industry.[105] The following sections focus specifically on two of the larger developing countries experimenting with fracking, China and India, and illustrate how the consequences of fracking may affect the world's two most populous nations.

A. China

China has already identified vast unconventional hydrocarbon reserves and has begun using hydraulic fracturing to extract them. By early 2009, over thirty large and medium low-permeability (tight) gas reserves had been identified in China, "accounting for more than half the total proved natural gas reserves in China."[106] While these discoveries are good for China's movement toward resource independence, their development could pose a significant environmental threat, especially in an already polluted environment.[107] Eighty percent of the major rivers in China are too polluted to support fish and an estimated 500 million people in China do not have access to clean drinking water.[108] With millions already struggling for access to clean drinking water, a lack of proper fracking regulation and enforcement in China could lead to millions more being affected by water contamination.

For a good example of the severity of the current situation, one should look to what is happening in and around the hydrocarbon reserves just west of China's capital, Beijing. The greater Beijing area is home to just under 20 million people.[109] The city is heavily dependent on

104. Ben Schiller, Yale Env. 360, *'Fracking' Comes to Europe, Sparking Rising Controversy* (Feb. 28, 2011), http://e360.yale.edu/feature/fracking_comes_to_europe_sparking_rising_controversy/2374//.

105. *See* Sonja Schiller, *Avoiding the Problem of the Commons in a Communist Society: The Role of Water Rights in the Enforcement of Environmental Law in China*, 29 WASH. U. J.L. & POL'Y 349, 349–54 (2009).

106. Lou Dongkun & Dai Youjin, *China's Low-Permeability Gas Resources Await Development*, 1/5/09 OIL & GAS. J. 37.

107. Sonya Schiller, *supra* note 107, at 350–52.

108. *Id.* at 350–51.

109. Meng Jing, China Daily, *Beijing's Population Surges Near 20 million* (July 23, 2010), http://www.chinadaily.com.cn/china/2010-07/23/content_11038489.htm (last visited Mar. 2, 2012).

groundwater to supply its citizens with drinking water, but its groundwater and local reservoirs are drying up at an alarming rate.[110] As Beijing exhausts the water that is left in its immediate vicinity, the government is looking to import water from far outside the city to fuel its demand and growth.[111] Projects are already underway to bring water 800 miles from the Yangtze River. The Sulige field, China's largest natural gas reserve, consisting primarily of tight gas reserves, is in the Ordos Basin, approximately 450 miles west of the center of Beijing, and is already producing over 10 billion cubic meters of natural gas a year.[112] Every water system in the Ordos Basin is part of the Yellow River system.[113] Even though the Yellow River is already too polluted to be used for drinking water, the Chinese government's western water diversion project plans to bring water all the way from the Tibetan plateau into the Yellow River.[114] As the Chinese government looks to serve the water needs of Beijing and the other 440 million people in northern China, it grows increasingly closer to the effects of underground injection into the Sulige field.[115] The effects on drinking water that have been associated with hydraulic fracturing in rural America would be exponentially greater in a country as densely populated as China. The scale of the impact requires careful regulation to ensure that an already stretched and contaminated water supply is not permanently handicapped.

B. India

Like China, India is looking to unconventional hydrocarbons, especially those trapped in shale deposits, for an answer to its growing energy needs.[116] Preliminary estimates show that India's shale gas

110. Edward Wong, N.Y. Times, *Plan for China's Water Crisis Spurs Concern* (June 1, 2011), http://www.nytimes.com/2011/06/02/world/asia/02water.html?pagewanted=all.

111. *Id.*; Li Jing, China Daily, *Project to Increase Beijing's Water Supply* (Aug. 9, 2004), http://www.chinadaily.com.cn/english/doc/2004-08/19/content_366665.htm.

112. Energy-Pedia News, *China: PetroChina's 2010 Gas Output in Sulige to top 10 bcm* (May 28, 2010), http://www.energy-pedia.com/article.aspx?articleid=140526 (last visited Mar. 2, 2012).

113. CHINA NAT'L PETROLEUM CO., ORDOS BASIN 4, *available at* http://www.cnpc.com.cn/resource/english/images1/pdf/Brochure/Ordos%20Basin.pdf.

114. Wong, *supra* note 112.

115. *See id*; *see* China Nat'l Petroleum Corp., *Efficient Development of Sulige Tight Sandstone Gas Field*, http://www.cnpc.com.cn/en/press/Features/Efficient_development_of_Sulige_tight_sandstone_gas_field.htm (last visited Mar. 2, 2012).

116. R. Suryamurthy, The Telegraph, *Shale Gas Mission to US* (July 5, 2010),

resources exceed its remaining traditional gas resources.[117] While the existence of these reserves has been known for some time, the technology to develop them has only come about recently and has yet to be fully utilized in India.[118] Like American companies and the Marcellus Shale, companies in India are also testing fracking as an option for exploiting resources trapped in tight geological formations.[119] Indian officials acknowledge that exploration laws in the country will have to change because licensing in India does not currently cover the exploitation of unconventional resources like shale gas.[120] Not only is India in need of hydraulic fracturing technology, but also a regulatory system to deal with it.

As India moves toward developing its shale gas resources, it is simultaneously dealing with one of the world's greatest water crises. Author Philippe Cullet points out in his book, *Water Law, Poverty, and Development: Water Sector Reforms in India*, that while eighty-six percent of the country has proper access to water, only thirty-three percent has access to adequate sanitation to ensure the water is safe to drink.[121] Beyond issues of water quality, India also faces quantity concerns because projections show that without serious governmental intervention, demand for water in India is expected to exceed its supply of potable freshwater by forty percent as early as 2030.[122] These alarming statistics paint a dire picture for water issues in India even before hydraulic fracturing enters the conversation.

To illustrate the human cost that unsafe fracking might have in India, it is helpful to use the city of Ahmedabad as a case study. Ahmedabad is approximately sixty miles inland from the Arabian Sea and 350 miles due north of India's largest city, Mumbai, which had an estimated population in 2010 of over 20 million.[123] Ahmedabad's population in 2010 was estimated to be just over 5.7 million people.[124]

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http://www.telegraphindia.com/1100706/jsp/business/story_12650352.jsp.

117. *Id.*

118. *Id.*

119. European Formation Damage Conference, Schevenigen, The Netherlands, May 30–June 1, 2007; Josef Shaoul et al., *Massive Hydraulic Fracturing Unlocks Deep Tight Gas Reserves in India*, *available at* http://www.onepetro.org/mslib/servlet/onepetropreview?id=SPE-107337-MS&soc=SPE.

120. Suryamurthy, *supra* note 118.

121. Geoffrey Frazier et al., *Book Notes*, 13 U. DENV. WATER L. REV. 405, 427.

122. Anjli Raval, Financial Times, *WEF India: Thirst for Water* (Nov. 15, 2010), http://blogs.ft.com/beyond-brics/2010/11/15/wef-india-thirst-for-water/.

123. UNITED NATIONS, WORLD URBANIZATION PROSPECTS: THE 2009 REVISION POPULATION DATABASE (2009), *available at* http://esa.un.org/wup2009/unup/p2k0data.asp.

124. *Id.*

While only India's seventh largest city, Ahmedabad is, as recently noted by Forbes Magazine, one of the world's fastest growing cities, with an expected population of over 7.5 million by 2025.[125] Ahmedabad sits in the Indian state of Gurajat on top of one of the most promising shale gas reserves in India, the Cambay Basin.[126] The Cambay is a tight gas reservoir that is estimated to hold approximately 248 billion cubic feet of natural gas.[127] Since the reserve holds tight gas, conventional commercial drilling has been unable to exploit this resource.[128] However, fracking technology borrowed from shale gas developers in the United States has made this previously unbreakable reserve exploitable for commercial production.[129] The millions of people living in the vicinity of this reserve are already at risk, given India's significant water problems. Hydraulic fracturing, which is currently unregulated in India, poses an additional serious threat to the health of these inhabitants.

C. What Environmental Degradation in Nations like China and India Means to the United States

Before moving into how the United States can prevent environmental degradation abroad, it is necessary to first explain why the United States has a vested interest in avoiding environmental destruction thousands of miles from its borders. Over the last twenty-five years, the United States has become dependent on foreign economies. In 1985, the United States imported approximately $6 million more worth of goods from China than it exported to the Chinese.[130] In 2010, the United States' trade deficit with China was approximately $273 billion.[131] Over the same twenty-five year span, the U.S. trade deficit with India grew by approximately $9.56 billion.[132] The products imported are vital to the U.S. economy. In 2005 alone, the United States imported $174 billion

125. *Id.*; *see* Joel Kotkin, Forbes, *The World's Fastest-Growing Cities* (Oct. 7, 2010), http://www.forbes.com/2010/10/07/cities-china-chicago-opinions-columnists-joel-kotkin.html.

126. *See* Suvrat Kher, *Fossils in Amber from Eocene Cambay Basin India* 2 (2010), http://suvratk.blogspot.com/2010/10/fossils-in-amber-from-eocene-cambay.html (last visited Mar. 2, 2012).

127. The Hindu, *Oilex Strikes Big Gas Reserves South of Ahmedabad* (Nov. 11, 2010) http://www.thehindu.com/business/Industry/article879973.ece.

128. *Id.*

129. *Id.*

130. U.S. Census Bureau, *Trade in Goods with China*, *available at* http://www.census.gov/foreign-trade/balance/c5700.html (accessed Feb. 2, 2011).

131. *Id.*

132. U.S. Census Bureau, *Trade in Goods with India*, http://www.census.gov/foreign-trade/balance/c5330.html (accessed Feb. 2, 2011).

worth of electrical machinery, $33 billion worth of plastics, $26 billion worth of iron and steel, and $8 billion worth of grain, seeds, and fruit from China.[133] The United States depends on the developing world to manufacture the goods it needs to function as a service economy and economic power.

Environmental degradation in foreign nations can hurt the quality and quantity of products produced, which in turn would harm the United States' ability to deliver high-quality products to American consumers. The most obvious example of harm coming to the United States as a result of fracking in China is crop destruction. In 2007 alone, the United States imported over 2 million metric tons of agricultural and seafood products from China, totaling $4.9 billion dollars.[134] Growing grains, seeds, and fruits viable for sale to the American market is nearly impossible when irrigation water is polluted with methane and fracking chemicals. Over 350,000 metric tons of fish and related products were sent from China to the United States in 2007.[135] Fish farmed in water polluted with carcinogenic chemicals and diesel fuel is an unattractive sale in the United States. Without China's supply of goods, prices would rise in the United States, negatively affecting consumers, which in turn would negatively affect the economy as a whole.

Environmental degradation also has an effect on the availability of the workforce to produce the goods Americans and their economy depend on. Consuming water and food contaminated with diesel fuel can damage the linings of the esophagus, intestines, mouth, stomach, and throat, and may cause serious damage if diesel fuel enters the lungs.[136] Without healthy and productive people to operate the massive manufacturing sectors in China and India, the United States would lose the lifeblood of goods on which it has become so dependent. As the United States has grown more dependent on other nations for the products that drive its economy, the United States has also become interested in the health and viability of the foreign nationals that are manufacturing goods. A healthy environment means a healthy workforce, which in turn means that the United States gets the products it needs. Environments contaminated by hydraulic fracturing pose a threat to the economic interests of the United States.

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133. CONG. RESEARCH SERV., CHINA'S TRADE WITH THE UNITED STATES AND THE WORLD 11 (2007), *available at* http://www.fas.org/sgp/crs/row/RL31403.pdf.

134. CONG. RESEARCH SERV., FOOD AND AGRICULTURAL IMPORTS FROM CHINA 5 (2008), *available at* http://www.fas.org/sgp/crs/row/RL34080.pdf.

135. *Id.* at 6.

136. U.S. Nat'l Library of Medicine, *Diesel Oil*, http://www.nlm.nih.gov/medlineplus/ency/article/002753.htm (last visited Mar. 2, 2012).

D. International Cooperation

Cooperation between the United States and its trade partners, to ensure that the world's unconventional hydrocarbon resources are efficiently and safely produced, is already underway, but has yet to offer any solid promise of true reform and protection. China hopes to push its domestic shale gas production from its current output, which is negligible, to 15-30 billion cubic meters by 2020.[137] However, China has been unable to develop its estimated 26 trillion cubic meters of shale gas because it lacks the technology to reach the reserves.[138] On November 17, 2009, President Barack Obama signed the U.S.-China Shale Gas Resource Initiative ("the Chinese Initiative"), offering cooperation between the two countries with the goal of efficiently and safely developing China's shale gas resources.[139] The Chinese Initiative is aimed at lending American expertise in the area of shale gas development, to help China efficiently develop its shale gas resources with minimal environmental impact.[140]

In India, officials have also reached out to the United States for help with developing their shale resources. Almost one year after signing the Chinese Initiative, President Obama signed a Memorandum of Understanding ("MOU") with the Indian government on energy development, including the development of shale resources.[141] The MOU calls for cooperation in the pursuit of clean energy, but its shale gas language focuses on resource assessment and personnel training, while remaining silent on the "clean" part.[142] It is clear that India needs foreign help to develop its tight gas resources,[143] however, the United States should make sustainability a priority before helping India develop these reserves. The United States is giving India the technology and knowledge to drill in tight geologic formations before India has

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137. Winning, *supra* note 105.

138. *Id.*

139. THE WHITE HOUSE: OFFICE OF PRESS SECRETARY, FACT SHEET: U.S.-CHINA SHALE GAS RESOURCE INITIATIVE (2010), *available at* http://www.america.gov/st/texttrans-english/2009/November/20091117145333xjsnommis0.4233515.html.

140. *Id.*

141. McNulty, *supra* note 16.

142. Patricia Zengerle & Alister Bull, Reuters, *India and U.S. to Cooperate on Clean Energy, Shale Gas*, (Nov. 8, 2010), http://www.reuters.com/article/idUSTRE6A712N20101108.

143. *See* Shubi Arora, Bar & Bench, *Shale Gas: An Essential Part of India's Plan for Energy Independence* (Nov. 17, 2010), http://www.barandbench.com/brief/3/1113/shale-gas-an-essential-part-of-indias-plan-for-energy-independence-.

established even basic licensing procedures for operators to become unconventional drillers, let alone enacted environmental regulations to protect its people from the environmental effects of fracking.[144] India has already identified substantial reserves in its northeastern states and is looking to adopt and implement a royalty and leasing system based on the United States' model as early as 2013.[145] As India grows closer to exploitation of its unconventional hydrocarbons without substantive environmental regulation in place, the opportunity to establish meaningful fracking regulation slips further and further away.

E. Toward International Reform

To understand how the FRAC Act can spark an international agreement for global cooperation on regulating and reducing fracking's impacts, it is useful to draw analogies between fracking and the Montreal Protocol.[146] The Montreal Protocol, which went into effect in 1989, was developed to protect the ozone layer from further degradation, primarily as a result of the release of chlorofluorocarbons ("CFCs").[147] The first hints that CFCs were damaging the environment came from a 1974 paper that argued that CFCs release chlorine atoms as they migrate through the upper atmosphere, which destroy the ozone layer.[148] Even as scientific evidence that CFCs were damaging the ozone layer mounted and the public awakened to the issue, industry representatives denied that CFCs were harmful and argued that regulation was unnecessary without more concrete evidence on the connection between CFCs and the environment.[149] Eventually, multi-nation talks, spearheaded by the United States and culminating in Montreal in September of 1987, resulted in an international agreement to both freeze the use of CFCs in

144. *See* Suryamurthy, *supra* note 118.

145. Gireesh Chandra Prasad, *Royalty Regime to be Adopted for Shale Gas Operators*, FIN. EXPRESS, Aug. 6, 2010, 2010 WLNR 15633641; World Oil Online, *India Delays Shale Gas Auction to 2013* (Feb. 14, 2012), http://www.worldoil.com/India_delays_shale_gas_auction_to_2013.html (last visited Mar. 2, 2012); Rakesh Sharma, Wall St. J., *India Official: Expect Shale Gas Block Auction by End 2013* (Dec. 21, 2011), http://online.wsj.com/article/SB10001424052970204464404577111683701766096.html.

146. *See* ROBERT V. PERCIVAL ET AL., ENVIRONMENTAL REGULATION: LAW, SCIENCE, & POLICY 1050–1055 (2006).

147. T. Rick Irvin et al., *Kyoto Comes to Georgia: How International Environmental Initiatives Foster Sustainable Commerce In Small Town America*, 36 GA. J. INT'L & COMP. L. 559, 566 (2008).

148. Cass R. Sunstein, *Of Montreal and Kyoto: A Tale of Two Protocols*, 31 HARV. ENVTL. L. REV. 1, 10 (2007).

149. *Id.* at 10–11.

new commercial products and cut their use by fifty percent over the following decade.[150] The industry responded to the Montreal Protocol not by stalling or trying to circumvent the restrictions, but by recognizing the new market for CFC alternatives and beginning to develop substitutes.[151] The industry's cooperation in reducing CFC emissions made the impact of the Montreal Protocol much greater than if it had simply resulted in an international agreement.[152]

In addition to the work done through the Montreal Protocol, the reduction of CFCs was also due in part to the fact that the CFC industry's cost-benefit analysis began to favor the change.[153] Science showed the industry that the risk of serious and expensive remediation was not worth the monetary benefits of continuing to produce CFCs.[154] This financial calculation induced the industry to develop new technology to replace CFCs, which was to the benefit of all parties involved; the ozone was protected, while the producers of products that formerly used CFCs retained marketable products.[155]

Much like the former CFC producers, today's oil and gas interests are arguing that the science on fracking is wrong, and, moreover, that the necessity of these fuels requires fracking since no reasonable substitutes are available.[156] However, these arguments are without merit. As the unbiased science proving the ill effects of fracking mounts and the public awakens to the dangers of fracking, the industry is likely to take a serious look at the costs and benefits of spearheading their own preventative measures.[157] In fact, the fracking industry is already starting to hint that they are seeing the cost-benefit analyses favoring prevention and

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150. *Id.* at 16.

151. *Id.* at 21.

152. *Id.* at 22–23.

153. *Id*. at 15.

154. *Id.*

155. PERCIVAL ET AL., *supra* note 148, at 1053.

156. Alex Cameron, News On 6, *Oklahoma Oil and Gas Execs Concerned About EPA's 'Fracking' Study*(2011), http://www.newson6.com/Global/story.asp?S=14266933 (last visited Mar. 2, 2012); *see* Steve Hargreaves, CNN, *Billions of Barrels of Untapped U.S. Oil* (Mar. 9, 2011), http://money.cnn.com/2011/03/04/news/economy/oil_shale_bakken/index.htm (last visited Mar. 9, 2011).

157. *See* Ian Urbina, N.Y. Times, *Regulation Lax as Gas Wells' Tainted Water Hits Rivers* (Feb. 26, 2011), http://www.nytimes.com/2011/02/27/us/27gas.html?_r=1&src=me&ref=homepage; *see also* Anne C. Mulkern, N.Y. Times, *Natural Gas Companies Send Workers to Hill to Make Case for Fracking* (Mar. 8, 2011), http://www.nytimes.com/gwire/2011/03/08/08greenwire-natural-gas-companies-send-workers-to-hill-to-83229.html.

regulation. Halliburton, originally opposed to disclosing the chemicals they use in fracking, has consented to releasing the constituents of their fracking fluids.[158] The experience of CFCs suggests that greater international cooperation is likely as more of the industry moves to voluntary regulation.

As for the future prospects of remedying the fracking problem, the fracking industry is less of an environmental problem compared to what CFCs were pre-Montreal. Unlike with CFCs, fracking damage has been localized so far, and has not caused extensive damage to humans and the environment.[159] Further, many countries are only beginning to experiment with fracking, which leaves time to implement preventative measures before the extent of the damage grows.[160] Having most nations enter the discussion at the same stage of development leaves every nation ready for fracking regulation and limits the need for differentiating responsibilities between the developed and underdeveloped nations.[161] Like with CFCs, the United States is in a prime position to lead the international community in the quest for safer fracking practices. The United States should start with the FRAC Act's stronger regulatory foundation and build on its lessons. Then, it should use the subsequent experience to work with the industry and global community to develop an agreement regulating fracking before the localized environmental degradation that has been documented takes place on an inconceivable scale in cities like Ahmedabad, Yulin, Mumbai, and Beijing.

Given the substance of its current agreements, the United States has a responsibility to China and India to impart the importance of extensive investigation of proposed fracking operations to ensure sustainable growth. It is part of America's pledge to China to work with the Chinese to efficiently and effectively develop China's shale gas resources.[162] However, development should not come at the expense of China's environmental sustainability.[163] The lessons of the FRAC Act can be taken to countries like China to teach foreign oil and gas developers how

158. Matthew Daly, The Huffington Post, *EPA: Halliburton Issued Subpoena For Refusing To Disclose Hydraulic Fracturing, 'Fracking,' Chemical Ingredients* (Nov. 9, 2010), http://www.huffingtonpost.com/2010/11/09/epa-halliburton-subpoenae_n_781045.html (last visited Mar. 7, 2011); Mike Soraghan, N.Y. Times, *Halliburton Announces Ecofriendly Fracking Fluid, More Disclosure* (Nov. 15, 2010), http://www.nytimes.com/gwire/2010/11/15/15greenwire-halliburton-announces-ecofriendly-fracking-flu-80875.html.

159. *See* Sunstein, *supra* note 150, at 14; *see also* Urbina, *supra* note 159.

160. Schiller, *supra* note 106; Winning, *supra* note 105.

161. *Id.*; PERCIVAL ET AL., *supra* note 148, at 1053–54.

162. FACT SHEET: U.S.-CHINA SHALE GAS RESOURCE INITIATIVE, *supra* note 141.

163. *Id.*

to balance the important concerns of efficient and sustainable development. The FRAC Act is crucial to international hydraulic fracturing reform and must not be undervalued as the tool that can lead to the end of unsafe fracking worldwide.

V. CONCLUSION

As the global leader in fracking technology, the United States has the ability to advocate effectively for safe fracking worldwide. Giving countries like China and India the technology to drill unconventional oil and gas reserves, without also advocating for better regulation of fracking, is an irresponsible policy and is inconsistent with the goals of America's global clean energy, shale development, and fracking initiatives. While the United States certainly does not have the authority to force any country to strictly regulate hydraulic fracturing, it can lead by example and demonstrate that strict, well enforced, and nationally consistent regulation can foster the exploitation of tight oil and gas formations in a way that is both economically and environmentally sound.

In the end, fracking will not have to disappear in order to fix the problem. However, the world's current fracking regulations do not adequately protect against environmental degradation. Pollution can be mitigated, if not eliminated altogether, through better regulation. People around the world can sleep better knowing that the international community is working to ensure that their natural resources are being used in a manner that is both efficient and environmentally friendly.

The world is looking to the United States for guidance on shale development and regulation. By adopting the FRAC Act, Congress is taking a big step in support of America's commitment to efficient and sustainable development of unconventional oil and gas resources at home and abroad. By recognizing the dangers posed and addressing them early, hydraulic fracturing has the potential to become one of the unique examples of when the planet came together to do something great for all mankind. Domestically, the FRAC Act will protect the nation's drinking water supply. The lessons from the FRAC Act will guide the international community to conduct fracking responsibly and will also protect the United States' interests by ensuring that foreign environmental degradation does not have a negative impact on the U.S. economy. The FRAC Act is the tool with which the United States can lead the international community to develop an international fracking agreement, which the entire world has an interest in developing.