

WHAT THE FRACK SHALE WE DO? A PROPOSED ENVIRONMENTAL REGULATORY SCHEME FOR HYDRAULIC FRACTURING

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I. INTRODUCTION: A MODERN-DAY GOLD RUSH

Over lunch at a Colorado Oil and Gas Association conference in August 2011, Halliburton Company Chief Executive Officer Dave Lesar offered a glass of Halliburton's new hydraulic fracturing fluid to a colleague.¹ The executive took a swig of CleanStim,² a trial fluid that Halliburton's website cautions should not be considered edible.³ Oil and gas industry insiders lauded the demonstration as proof that such companies are taking public concerns over the content of the fluid to heart.⁴ Fracking critics and other environmentalists called it a "stunt [that] is very much indicative of the problem the industry has in assuring the public that they are in fact taking public concerns seriously."⁵

However, perhaps the industry is taking public concerns *too* seriously. Three months after the conference in Colorado, an Anadarko Petroleum representative spoke on the topic of "Understanding How Unconventional Oil & Gas Operators are Developing a Comprehensive Media Relations Strategy to Engage Stakeholders and Educate the Public" at an industry

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¹ Catherine Tsai, *Halliburton Executive Drinks Fracking Fluid at Conference*, HUFFINGTON POST (Aug. 22, 2011, 7:36 PM), http://www.huffingtonpost.com/2011/08/22/halliburton-executive-drinks-fracking-fluid_n_933621.html.

² *Id.*

³ *CleanStim® Hydraulic Fracturing Fluid System*, HALLIBURTON, <http://www.halliburton.com/ps/default.aspx?pageid=4184&navid=93&AdType=JPTCSTC>.

⁴ Tsai, *supra* note 1.

⁵ *Id.* As Mark Brownstein, Chief Counsel of the Energy Program at Environmental Defense Fund, noted upon viewing the demonstration, "[Q]uite honestly, a homeowner in Pennsylvania doesn't have the option of having an underling drink his water. He has to do it himself." *Id.*

get-together in Houston.⁶ He offered some advice to others concerned about mounting public pressures: “Download the U.S. Army-slash-Marine Corps Counterinsurgency Manual, because we are dealing with an insurgency.”⁷ “There’s a lot of good lessons in there and coming from a military background, I found the insight in that extremely remarkable,” he continued.⁸ Another company’s representative, addressing stakeholder concerns about fracking, noted that “[w]e have several former [psychological operations] folks that work for us . . . because they’re very comfortable in dealing with localized issues and local governments.”⁹ Even if this militaristic attitude is overblown,¹⁰ it raises important questions: What is so controversial about fracking, and why are certain stakeholders outraged about the environmental impact of the process?

Hydraulic fracturing, or “fracking,”¹¹ is a well treatment designed to increase the productivity of a well.¹² Though fracking has been used since at least 1947,¹³ it has only recently contended for Oscars.¹⁴ Disposal of

⁶ Eamon Javers, *Oil Executive: Military-Style ‘Psy Ops’ Experience Applied*, CNBC (Nov. 8, 2011, 1:35 PM), <http://www.cnn.com/id/45208498>.

⁷ *Id.*

⁸ *Id.*

⁹ *Id.*

¹⁰ *Id.* An industry spokesperson dismissed the “insurgency” comment as a joke: “There are no black helicopters here. No one’s rappelling down from a helicopter at three a.m. looking through people’s trash. We go to township meetings, and we hear what people have to say.” *Id.*

¹¹ Hannah Wiseman, *Risk and Response in Fracturing Policy*, 84 U. COLO. L. REV. (forthcoming 2013) (also known as “hydrofracking” and may be spelled “(hydro)fracing” or “(hydro)fracking”).

¹² *Evaluation of Impacts to Underground Sources of Drinking Water by Hydraulic Fracturing of Coalbed Methane Reservoirs*, Appendix A: Department of Energy – Hydraulic Fracturing White Paper (EPA 816-R-04-003, June 2004), http://www.epa.gov/ogwdw/uic/pdfs/cbmstudy_attach_uic_append_a_doe_whitepaper.pdf. Part II offers a much more in-depth explanation of the fracking process.

¹³ *Id.*

¹⁴ *GasLand*, a 2010 film directed by Josh Fox, was nominated in the “Documentary Feature” category in 2011. Charles Riley, ‘*GasLand*’ Oscar Nod Draws Industry Ire, CNNMONEY (Feb. 27, 2011, 9:06 AM), http://money.cnn.com/2011/01/26/news/companies/gasland_movie/index.htm. The film includes vivid images of families living near fracked wells able to light their tap water on fire. Terri Finch Hamilton, *Can You Light Your Tap Water on Fire? Award-Winning Documentary ‘Gasland’ in Town*, MLIVE (Mar. 21, 2011, 1:38 PM), http://www.mlive.com/entertainment/grand-rapids/index.ssf/2011/03/can_you_light_your_tap_water_o.html.

fracking fluid may result in earthquakes,¹⁵ and environmentalists contend that escaped or spilled fracking fluid pollutes groundwater and monstrous drilling rigs pollute the air.¹⁶ Yet, fracking is no longer subject to federal regulation.¹⁷

In the last several years, oil and gas companies have sent landmen to purchase billions of dollars of leaseholds in the oil- and gas-rich shale regions of the United States.¹⁸ Industry and government sources cite such development as an important step in America's energy future.¹⁹ As President Obama noted in a recent speech concerning America's energy security and the prospect of enhanced natural gas production, "Recent innovations have given us the opportunity to tap large reserves—perhaps a century's worth of reserves, a hundred years worth of reserves—in the shale under our feet."²⁰

¹⁵ In 1967, the largest and most well-known United States earthquake caused by human activity, measuring a magnitude of 5.5, resulted from fluid injection at the Rocky Mountain Arsenal near Denver, Colorado. CRAIG NICHOLSON & ROBERT L. WESSON, U.S. GEOLOGICAL SURVEY BULLETIN 1951: EARTHQUAKE HAZARD ASSOCIATED WITH DEEP WELL INJECTION—A REPORT TO THE U.S. ENVIRONMENTAL PROTECTION AGENCY 1 (1990), <http://pubs.usgs.gov/bul/1951/report.pdf>. See also *FAQs—Earthquakes, Faults, Plate Tectonics, Earth Structure*, UNITED STATES GEOLOGICAL SURVEY, <http://www.usgs.gov/faq/index.php?action=artikel&cat=116&id=1653&artlang=en> (last updated Oct. 5, 2012); Mark Fischetti, *Ohio Earthquake Likely Caused by Fracking Wastewater*, SCI. AM. (Jan. 4, 2012), available at <http://www.scientificamerican.com/article.cfm?id=ohio-earthquake-likely-caused-by-fracking> (attributing the cause of two rare earthquakes in northeast Ohio, one measuring 4.0 on the Richter scale, to the injection of fracking wastewater).

¹⁶ See discussion *infra* Part II.C.

¹⁷ See discussion *infra* Part III.C.

¹⁸ For example, by July 2011, Chesapeake Energy estimated that it had spent between \$1.5 billion and \$2 billion to acquire the rights to 1.25 million acres in Ohio. Spencer Hunt, *Drillers Snapping Up Lease Rights in Ohio*, COLUMBUS DISPATCH, Sept. 26, 2011, at A5. Hess Corporation paid more than \$1.3 billion in September 2011 to lease more than 180,000 acres in eastern Ohio. *Id.*

¹⁹ See, e.g., Barack Obama, President of the United States of America, Remarks by the President in State of the Union Address (Jan. 24, 2012), available at <http://www.whitehouse.gov/the-press-office/2012/01/24/remarks-president-state-union-address>; Jack Williams, President of XTO Energy, Speech at the Shale Gas Insight 2012 Conference and Exhibition (Sept. 20, 2012).

²⁰ Barack Obama, President of the United States of America, Remarks by the President on America's Energy Security at Georgetown University (Mar. 30, 2011), available at <http://www.whitehouse.gov/the-press-office/2011/03/30/remarks-president-americas->

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In Ohio, hardly the center of the national shale gas boom, state geologists estimate that if just 5% of the natural gas contained in the Utica Shale is extracted, it will provide enough natural gas to fulfill Ohio's needs for twenty-one years.²¹ Similar and even more extraordinary estimates abound, and states are eager to get in on the economic benefits of oil and gas exploration to help get their fiscal houses in order.²² Gas and oil company representatives continue to flood local libraries to examine land records, and landowners tell tales of seemingly exorbitant lease and bonus payments.²³

This Comment first provides the reader with a background in hydraulic fracturing, the shale boom, and the environmental considerations that play into any discussion of potential regulation.²⁴ Second, this Comment examines the existing regulatory framework at the federal level, reflecting on common law rules, efforts at industry self-regulation, and existing and proposed federal statutes designed to address the environmental impacts of fracking.²⁵ Third, this Comment touches on the states at the forefront of fracking regulation, cites mounting litigation challenging fracking bans at the local level, and briefly surveys other nations that are reconsidering their own regulatory systems given fracking concerns.²⁶ Finally, by synthesizing the foregoing regulatory strategies, this Comment arrives at a regulatory framework that supports a national call for energy independence while addressing health and environmental concerns.²⁷

This Comment does not purport to give more than cursory treatment to the property and mineral rights aspects of shale development, nor does it

energy-security. However, Obama followed his endorsement with a warning: "But just as is true in terms of us extracting oil from the ground, we've got to make sure that we're extracting natural gas safely, without polluting our water supply." *Id.*

²¹ Spencer Hunt, 'Fracking' Future, COLUMBUS DISPATCH, Sept. 25, 2011, at A8.

²² A July 2011 study from Penn State University estimated that natural gas production in the Marcellus region of Pennsylvania added \$11.2 billion in economic value and supported 140,000 jobs during 2010. The study predicted that those figures will grow to \$20.2 billion and 256,000 jobs by 2020. TIMOTHY J. CONSIDINE ET AL., PA. STATE UNIV., THE PENNSYLVANIA MARCELLUS NATURAL GAS INDUSTRY: STATUS, ECONOMIC IMPACTS, AND FUTURE POTENTIAL 31 (July 20, 2011), <http://www.eidmarcellus.org/wp-content/uploads/2011/07/Final-2011-PA-Marcellus-Economic-Impacts.pdf>.

²³ Hunt, *supra* note 18, at A5.

²⁴ See discussion *infra* Part II.

²⁵ See discussion *infra* Part III.A–C.

²⁶ See discussion *infra* Part III.D–F.

²⁷ See discussion *infra* Part V.

address landowner concerns about lease negotiations and arrangements. Such topics are beyond the scope of this Comment.

Considering the rapidly developing regulatory climate and the newsworthiness of the fracking debate, this Comment merely intends to suggest what an omnibus federal regulatory scheme might look like. Several important studies are currently in the works,²⁸ and much more research is necessary before the legislative and administrative gears are greased.²⁹ However, unconventional gas developers who acknowledge fracking's risks and can better anticipate forthcoming developments stand to benefit greatly from an early proactive outlook.

Given the pending shale boom and recent evidence that fracking poses risks to groundwater and air, federal regulation is necessary to preempt haphazard state and local regulations and shrink the "Halliburton loophole."³⁰ Requiring disclosure and regulation of fracking fluid, and greater federal regulation of the fracking process in general, should have a limited effect on the oil and gas industry, while assuaging health and environmental concerns. Ultimately, a balanced regulatory solution may postpone today's need for a heavily subsidized alternative energy sector, providing the "ideal bridge . . . until renewable sources like wind and solar mature."³¹

²⁸ Of particular importance is EPA's initial report on its fracking study, which is scheduled for release in late 2012. Part III.C.8 explains the scope of this study.

²⁹ See *CDC Scientist: Tests Needed on Gas Drilling Impact*, WALL ST. J. (Jan. 4, 2012, 4:28 PM), <http://online.wsj.com/article/AP8338b702930849f49d22a5d96b7d1b2d.html>.

³⁰ Editorial, *The Halliburton Loophole*, N.Y. TIMES, Nov. 3, 2009, at A28 (referring to § 322 of the Energy Policy Act of 2005, a provision that stripped the Environmental Protection Agency of its authority to regulate hydraulic fracturing).

³¹ David Brooks, *Shale Gas Revolution*, N.Y. TIMES, Nov. 4, 2011, at A31. See also Amy Myers Jaffe, *How Shale Gas Is Going to Rock the World*, WALL ST. J., May 10, 2010, at R1 ("Since there's no longer an urgent need to make [alternative fuels] competitive *immediately* through subsidies, since we can use natural gas now, we can pour that money into R&D—so renewables will be ready to compete without lots of help when shale supplies run low, decades from now.").

II. DON'T DRINK THE WATER: FRACKING SEEPS INTO THE TWENTY-FIRST CENTURY

A. Fracking Since the 1940s

Fracking has come a long way since the first well was “fracked”³² in the 1940s.³³ Technological innovation has benefitted the oil and gas industry, much like it has other sectors,³⁴ but the basic premise remains the same.³⁵ Adjacent wells are drilled several feet apart into the center of a shale formation in which natural gas is trapped.³⁶ The drills run straight down for a mile or more then gradually turn horizontally, boring through the shale for another mile or two.³⁷ This horizontal drilling technique makes it possible to exploit shale formations around the country, as a single vertical well would not reach enough of the trapped gas to make the process economically feasible.³⁸ Throughout this initial drilling process, which normally takes about a month, layers of steel casing and cement are put in to insulate the well bore, separating it from underground aquifers that are often the sources of drinking water.³⁹

Next, the drilling rig is moved away from the well bore, and the well completion process starts.⁴⁰ Fracking is the first step of well completion.⁴¹ A perforating gun is fed into the horizontal portion of the well, and small charges are detonated inside that puncture tiny holes in the production casing.⁴² Then, a long steel tube is fed down the well bore and into the

³² The process may also be called a “frack job” or “frac job.”

³³ Leonard S. Rubin, *Frack to the Future: Considering a Strict Liability Standard for Hydraulic Fracturing Activities*, 3 GEO. WASH. J. ENERGY & ENVTL. L. 117, 119 (2012).

³⁴ See Karen Moreau, *How Fracking Works*, N.Y. POST (Sept. 27, 2011, 10:47 PM), http://www.nypost.com/p/news/opinion/opedcolumnists/how_fracking_works_cKSUVaVvWedFdqfvNQ2q7H.

³⁵ Succinctly, fracking “injects large amounts of water, under high pressure, combined with sand and small amounts of chemicals, into the shale formation. This fragments underground rock, creating pathways for otherwise trapped natural gas (and oil) to find a route and flow through to the well.” DANIEL YERGIN, *THE QUEST: ENERGY, SECURITY, AND THE REMAKING OF THE MODERN WORLD* 327 (2011).

³⁶ Moreau, *supra* note 34.

³⁷ *Id.*

³⁸ *Id.*

³⁹ *Id.*

⁴⁰ *Id.*

⁴¹ *Id.*

⁴² *Id.*

horizontal portion of the production casing.⁴³ Water, sand, and chemical additives are mixed at the surface to make fracking fluid, and huge pumps force the fluid down the steel tube and through the tiny holes.⁴⁴ The tremendous force at which the fluid is pumped is designed to create fractures in the underground shale, allowing natural gas to escape to the well and flow to the surface to be captured.⁴⁵ The sand props open the cracks and the chemicals serve a variety of functions.⁴⁶

After fracking, the well regurgitates some of the fracking fluid; the rest stays underground.⁴⁷ The used fluid is often reused in another frack job or in another well, though spent fluid may also be injected into underground disposal wells or trucked from the well site, to be cleaned at wastewater treatment facilities, and then discharged.⁴⁸ At this point, the well is “pumped back” until gas begins flowing.⁴⁹ Finally, the well is capped until pipelines are constructed to connect the well to the local natural gas transmission system.⁵⁰

Over a million wells have been fracked in the United States.⁵¹ However, two key differences between the process of the mid-twentieth century and the process of today bear mention. These differences alarm landowners, regulators, and environmentalists alike.⁵² First, as hinted at before, the shale boom has spurred an unprecedented investment in these regions, resulting in the drilling of many new wells.⁵³ Second, in the most desirable shale formations, such as the Marcellus, the rock is very deep, requiring deeper wells, and in turn, larger drilling rigs and more fracking

⁴³ *Id.*

⁴⁴ *Id.*

⁴⁵ *Id.*

⁴⁶ *Id.*

⁴⁷ Wenonah Hauter, *Memo to Fracking Apologists: You're Hurting Renewables (and You're Greenwashing, Too)*, HUFFPOST GREEN (Sept. 18, 2012), http://www.huffingtonpost.com/wenonah-hauter/memo-to-fracking-apologists_b_1890889.html; *Hydraulic Fracturing Background Information*, EPA, http://water.epa.gov/type/groundwater/uic/class2/hydraulicfracturing/wells_hydrowhat.cfm (last visited Oct. 6, 2012).

⁴⁸ Moreau, *supra* note 34; *Hydraulic Fracturing Background Information*, *supra* note 47.

⁴⁹ Moreau, *supra* note 34.

⁵⁰ *Id.*

⁵¹ YERGIN, *supra* note 35, at 330.

⁵² *See* Wiseman, *supra* note 11, at 9.

⁵³ *Id.*

fluid.⁵⁴ Though the fluid is primarily sand and water,⁵⁵ the chemical additives included can be toxic.⁵⁶

Each rock formation requires a different mix of fluids specifically designed to perform best given the geologic conditions.⁵⁷ A typical treatment will use three to twelve chemicals (among hundreds used less often), each designed to serve a purpose in addition to reducing friction.⁵⁸ For example, a treatment might include “biocides to prevent microorganism growth and to reduce biofouling of the fractures; oxygen scavengers and other stabilizers to prevent corrosion of metal pipes; and acids that are used to remove drilling mud damage within the near-wellbore area.”⁵⁹

Given their minimal concentrations and highly engineered purposes, these additives may seem innocuous. Companies—and even the federal government—routinely cite common or household uses of the most common additives as examples of their harmless everyday use.⁶⁰ For example, diluted hydrochloric acid, designed to help dissolve minerals and initiate cracks in the rock, is also used in swimming pools.⁶¹ Ethylene glycol, used to prevent deposits in the well pipe, is the primary component of automotive antifreeze and is found in antiperspirant and hair coloring.⁶² These reassurances, however, do not tell the whole story. First, an ordinary person is not likely to ingest what is found under a sink, in a car’s engine, or in a pool. Second, while the *concentration* of any single chemical is minimal, that chemical may be present in substantial quantities by *volume* given the millions of gallons of fluid used in the average well.⁶³

⁵⁴ GROUND WATER PROTECTION COUNCIL & ALL CONSULTING, MODERN SHALE GAS DEVELOPMENT IN THE UNITED STATES: A PRIMER 21, 64 (April 2009) [hereinafter MODERN SHALE GAS DEVELOPMENT], http://fossil.energy.gov/programs/oilgas/publications/naturalgas_general/Shale_Gas_Primer_2009.pdf.

⁵⁵ Most frack jobs use a fluid comprised of 98% to 99.5% water. *Id.* at 61.

⁵⁶ These chemical additives are called “slickwater” because they reduce friction, allowing fluids to be pumped at a higher rate and reduced pressure than if water alone were used. *Id.*

⁵⁷ *Id.* at 62.

⁵⁸ *Id.* at 61.

⁵⁹ *Id.*

⁶⁰ *Id.* at 63.

⁶¹ *Id.*

⁶² *Id.*

⁶³ *See id.* at 64. For example, take a frack job in which five million gallons of fluid is used, and in which a variety of toxic chemical constituents comprise just one-tenth of one
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A congressional investigation revealed that from 2005 to 2009, fourteen of the nation's largest oil and gas companies injected 866 million gallons⁶⁴ of additives—excluding water—into wells as part of fracking operations.⁶⁵ The report also noted that over 650 of these fluids “contained chemicals that are known or possible human carcinogens, regulated under the Safe Drinking Water Act, or are listed as hazardous air pollutants.”⁶⁶ Furthermore, during the same five-year period, companies injected 11.4 million gallons of fluids containing toxic or carcinogenic chemicals, notably benzene, toluene, xylene, and ethylbenzene.⁶⁷ The study followed only months after another investigation by congressional Democrats revealed that a dozen companies injected 32.2 million gallons of fluids containing diesel during the same period, in possible violation of the Safe Drinking Water Act.⁶⁸

While the use of diesel fuel in fracking may be illegal⁶⁹—or at least ill-advised and bad for public relations—large quantities of other chemicals are legally injected deep into the earth every day in fracking operations.⁷⁰ The risk of groundwater pollution is present,⁷¹ but groundwater pollution is only one concern. New studies also indicate that fugitive methane leaking from numerous wells may be contributing to climate change,⁷² among other issues implicating both water and air pollution. The oil and gas

percent of that fluid. That means 5,000 gallons of toxic chemicals are being injected into the well. If the well needs to be fracked multiple times, that only adds to the volume.

⁶⁴ To put this number in perspective, a Michigan study compared a typical fracking treatment using five million gallons of water to the volume of water typically used by eight to ten acres of corn during a growing season. MICH. DEP'T OF ENVTL. QUALITY, HYDRAULIC FRACTURING OF NATURAL GAS WELLS IN MICHIGAN (May 31, 2011), http://www.michigan.gov/documents/deq/Hydrofrac-2010-08-13_331787_7.pdf.

⁶⁵ Ian Urbina, *Chemicals Were Injected Into Wells, Report Says*, N.Y. TIMES, April 17, 2011, at A16.

⁶⁶ *Id.*

⁶⁷ *Id.*

⁶⁸ *Id.*

⁶⁹ In May 2012, EPA published draft guidance for permitting fracking activities using diesel fuels under the Safe Drinking Water Act's Underground Injection Control Program. EPA, PERMITTING GUIDANCE FOR OIL AND GAS HYDRAULIC FRACTURING ACTIVITIES USING DIESEL FUELS – DRAFT: UNDERGROUND INJECTION CONTROL PROGRAM GUIDANCE #84, at 1 (May 2012), <http://water.epa.gov/type/groundwater/uic/class2/hydraulicfracturing/upload/hfdieselfuelsguidance508.pdf>.

⁷⁰ MODERN SHALE GAS DEVELOPMENT, *supra* note 54, at 61.

⁷¹ *Id.* at 62.

⁷² See discussion *infra* Part II.C.

industry, however, appears to hold the trump card in the fracking debate, arguing that the “shale gale” represents an opportunity to bridge the energy gap to renewables,⁷³ and that federal regulation should subsist in favor of already-adequate state regulation, no matter the environmental costs.⁷⁴

B. *The Shale Gale*

Shale gas is a relatively recent energy panacea. Barely a decade ago, shale gas accounted for just 1% of domestic natural gas supply.⁷⁵ By 2011, it comprised one-quarter of the supply.⁷⁶ Though constantly revised, mostly downward, estimates have ranged as high as 1,000 trillion cubic feet of recoverable shale gas in North America alone.⁷⁷ That would be enough natural gas to supply America’s energy needs—all of it—for the next forty-five years.⁷⁸ Some commentators have termed this the shale gale,⁷⁹ and there is no shortage of like superlatives in the literature. In his book, *The Quest*, Daniel Yergin calls it “the most significant innovation in energy so far since the start of the twenty-first century.”⁸⁰ Perhaps energy expert Amy Myers Jaffe captured the hype best when she published a 2010 piece in the *Wall Street Journal* titled, *How Shale Gas Is Going to Rock the World*.⁸¹

The government, too, seems to approve. President Obama championed the shale gas revolution in his 2012 State of the Union address.⁸² Shale gas development was also featured prominently in the 2011 Year-End Report of the President’s Council on Jobs and Competitiveness.⁸³ There is no doubt that the shale gale is more than an over-hyped, feel-good response to

⁷³ See discussion *infra* Part II.B.

⁷⁴ See discussion *infra* Part III.D.

⁷⁵ YERGIN, *supra* note 35, at 329.

⁷⁶ *Id.*

⁷⁷ Jaffe, *supra* note 31.

⁷⁸ *Id.*

⁷⁹ YERGIN, *supra* note 35, at 329.

⁸⁰ *Id.* at 330.

⁸¹ Jaffe, *supra* note 31.

⁸² Obama, *supra* note 19. In part, the President proclaimed that “[w]e 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. Experts believe this will support more than 600,000 jobs by the end of the decade.” *Id.*

⁸³ PRESIDENT’S COUNCIL ON JOBS & COMPETITIVENESS, ROAD MAP TO RENEWAL 28–31 (2011 YEAR-END REPORT) [hereinafter ROAD MAP TO RENEWAL], http://files.jobs-council.com/files/2012/01/Jobscouncil_2011YearEndReport1.pdf.

a global downturn, but the environment gets barely a passing mention in the sources previously.⁸⁴ Yet, hydraulic fracturing—the technology primarily responsible for the shale boom—has inspired a populist call for regulation.⁸⁵ There is little doubt that the concerns are legitimate.⁸⁶

C. Environmental Concerns

1. Water Pollution: Use Ventilation When Showering?

Until recently, the oil and gas industry's primary response to allegations of groundwater pollution was that a link between fracking and pollution has never been proven.⁸⁷ On December 8, 2011, after a three-year investigation into groundwater pollution near Pavillion, Wyoming, EPA released its draft findings for public comment and independent scientific review.⁸⁸ The findings led to local concerns about the odor and taste of drinking water and preliminary studies recommending that affected well owners take precautionary steps, including using “ventilation when showering.”⁸⁹ EPA responded by drilling two deep monitoring wells to sample water in an underground aquifer that is the source for many drinking water wells in the area.⁹⁰

The study indicated that “when considered together with other lines of evidence, the data indicates likely impact to ground water that can be

⁸⁴ See generally YERGIN, *supra* note 35; ROAD MAP TO RENEWAL, *supra* note 83, at 28–31; Jaffe, *supra* note 31; Obama, *supra* note 19.

⁸⁵ *Americans Call for More Fracking Regulation*, DAILYFINANCE (Mar. 19, 2012, 8:20 AM), <http://www.dailyfinance.com/rtn/pr/americans-call-for-more-fracking-regulation/rfid542799430>.

⁸⁶ See discussion *infra* Part II.C.

⁸⁷ See Seamus McGraw, *Is Fracking Safe? The Top 10 Controversial Claims About Natural Gas Drilling*, POPULAR MECHANICS, <http://www.popularmechanics.com/science/energy/coal-oil-gas/top-10-myths-about-natural-gas-drilling-6386593#slide-4>. Senator James Inhofe claimed in an April 2011 radio interview, “[There’s] never been one case—documented case—of groundwater contamination in the history of the thousands and thousands of hydraulic fracturing [wells].” *Id.*

⁸⁸ Press Release, EPA, EPA Releases Draft Findings of Pavillion, Wyoming Ground Water Investigation for Public Comment and Independent Scientific Review (Dec. 8, 2011) [hereinafter Pavillion Press Release], available at <http://yosemite.epa.gov/opa/admpress.nsf/0/EF35BD26A80D6CE3852579600065C94E>.

⁸⁹ *Id.*; Kirk Johnson, *E.P.A. Links Tainted Water in Wyoming to Hydraulic Fracturing for Natural Gas*, N.Y. TIMES, Dec. 9, 2011, at A23.

⁹⁰ Pavillion Press Release, *supra* note 88; Johnson, *supra* note 89.

explained by hydraulic fracturing.”⁹¹ Samples taken from the monitoring wells indicated the presence of “synthetic chemicals, like glycols and alcohols consistent with gas production and hydraulic fracturing fluids, benzene concentrations well above Safe Drinking Water Act standards and high methane levels.”⁹² The study noted that “data suggest that enhanced migration of gas has occurred within ground water at depths used for domestic water supply”⁹³

These findings made news, but EPA qualified its analysis with some interesting caveats. First, the study differentiated the conditions at the Pavillion field, where Encana’s⁹⁴ wells are quite shallow, from the deep drilling conditions in other areas of the country, which meant that natural gas could potentially seep upward into aquifers.⁹⁵ It also noted that the oldest Pavillion wells were drilled forty or more years ago, and harmful chemicals legally used then may still be present.⁹⁶

Natural gas proponents quickly responded to the draft study. Encana issued a strongly worded press release, saying, “[M]any of the EPA’s findings from its recent deep monitoring wells, including those related to any potential connection between hydraulic fracturing and Pavillion groundwater quality, are conjecture, not factual and only serve to trigger undue alarm.”⁹⁷ An Encana spokesperson said, “What we have here is not a conclusion, but a probability—and based on the facts, not a good probability.”⁹⁸ The spokesperson contended that hydraulic fracturing should actually reduce the likelihood of gas seepage into drinking water

⁹¹ EPA, DRAFT: INVESTIGATION OF GROUND WATER POLLUTION NEAR PAVILLION, WYOMING, at xiii (Dec. 2011) [hereinafter PAVILLION INVESTIGATION], http://www.epa.gov/region8/superfund/wy/pavillion/EPA_ReportOnPavillion_Dec-8-2011.pdf.

⁹² Pavillion Press Release, *supra* note 88.

⁹³ PAVILLION INVESTIGATION, *supra* note 91, at xiii.

⁹⁴ Encana Oil & Gas (USA) has owned the Pavillion field since 2004, and has drilled approximately 169 wells there. See Johnson, *supra* note 89.

⁹⁵ *Id.*

⁹⁶ *Id.*

⁹⁷ Press Release, Encana, Why Encana Refutes U.S. EPA Pavillion Groundwater Report (Dec. 12, 2011) [hereinafter Encana Press Release], [http://investor.shareholder.com/common/download/download.cfm?CompanyID=AMDA-I95FU&FileID=527868&FileKey=c8b25a58-46a9-4f9f-bc5e-2fa101a93d39&FileKey=c8b25a58-46a9-4f9f-bc5e-2fa101a93d39&FileName=ECA_News_2011_12_12_General_Releases.pdf](http://investor.shareholder.com/common/download/download.cfm?CompanyID=AMDA-I95FU&FileID=527868&FileKey=c8b25a58-46a9-4f9f-bc5e-2fa101a93d39&FileName=ECA_News_2011_12_12_General_Releases.pdf).

⁹⁸ Johnson, *supra* note 89.

wells due to the decrease in pressure in the underlying rock.⁹⁹ He also noted that finding methane and benzene in the deep test wells, drilled hundreds of feet below a typical drinking water well, is expected in a gas-rich field.¹⁰⁰ “Encana didn’t put those there, nature did,” he said.¹⁰¹ Encana also expressed particular disappointment that the draft study was not subjected to peer review by qualified third parties before release.¹⁰²

The governor of Wyoming, Matt Mead, issued a statement calling the study “scientifically questionable” and asking for more testing.¹⁰³ The *Wall Street Journal* followed with an editorial allegedly “breaking down the facts in that Wyoming drinking water study.”¹⁰⁴ After highlighting some methodological concerns with the study, the article resorted to name-calling: “[T]he EPA’s credibility is also open to review. The agency is dominated by anticarbon true believers, and the Obama Administration has waged a campaign to raise the price and limit the production of fossil fuels.”¹⁰⁵

These draft findings will no doubt come under increased scrutiny as time goes on. The industry sees discrediting the findings as a primary goal given EPA’s scheduled release of an interim report about the implications of hydraulic fracturing on drinking water resources.¹⁰⁶

2. Air Pollution

Air pollution from oil and gas operations has not been the center of attention of the fracking controversy, though increasing attention has resulted from extraordinarily high ozone levels in rural areas as of late.¹⁰⁷ In the Upper Green River Basin of Wyoming, one of the top gas-producing areas in the United States, temperature inversions in the winter trap gas industry emissions near the ground result in smog that can pose health

⁹⁹ *Id.*

¹⁰⁰ *Id.*

¹⁰¹ *Id.*

¹⁰² Encana Press Release, *supra* note 97.

¹⁰³ Johnson, *supra* note 89.

¹⁰⁴ Editorial, *The EPA’s Fracking Scare*, WALL ST. J., Dec. 19, 2011, at A16.

¹⁰⁵ *Id.*

¹⁰⁶ See discussion *infra* Part III.C.8.

¹⁰⁷ See Mead Gruver, *Wyoming’s Natural Gas Boom Comes with Smog Attached*, MSNBC (Mar. 9, 2011, 12:54 PM), <http://www.msnbc.msn.com/id/41971686>.

risks.¹⁰⁸ On multiple occasions in March 2011, ozone levels in the basin exceeded levels reached in Los Angeles during all of 2010.¹⁰⁹

Fugitive methane is another concern with fracking and with natural gas in general.¹¹⁰ Methane is the primary constituent of natural gas, and is a potent greenhouse gas.¹¹¹ A 2011 study by Cornell University scientists called into question the viability of shale gas as a “bridge fuel,” instead propounding that escaped methane stands to do more environmental harm than might otherwise result from the continued use of conventional fossil fuels such as coal and oil.¹¹² The study warned that:

3.6% to 7.9% of the methane from shale-gas production escapes to the atmosphere in venting and leaks over the life-time of a well. These methane emissions are at least 30% more than and perhaps more than twice as great as those from conventional gas. The higher emissions from shale gas occur at the time wells are hydraulically fractured—as methane escapes from flow-back return fluids—and during drill out following the fracturing . . . Compared to coal, the footprint of shale gas is at least 20% greater and perhaps more than twice as great on the 20-year horizon and is comparable when compared over 100 years.¹¹³

The study’s statistical suspicions have since been empirically confirmed by the Chesapeake Bay Foundation, which used infrared cameras to film air pollution at fifteen hydraulic fracturing sites in Pennsylvania, Maryland, and West Virginia.¹¹⁴ Video evidence showed emissions at eleven of the sites.¹¹⁵ Given these concerns, further examination will certainly shed more light on the delicate balance between the promise of a cleaner-

¹⁰⁸ *Id.*

¹⁰⁹ *Id.*

¹¹⁰ See Robert W. Howarth et al., *Methane and the Greenhouse-Gas Footprint of Natural Gas from Shale Formations*, 106 CLIMATIC CHANGE LETTERS 679 (2011), <http://www.springerlink.com/content/e384226wr4160653/fulltext.pdf>.

¹¹¹ *Id.* at 680.

¹¹² *Id.* at 679.

¹¹³ *Id.*

¹¹⁴ Associated Press, *Bay Foundation Links Fracking, Air Pollution*, MD. DAILY REC., Nov. 30, 2011, available at <http://thedailyrecord.com/2011/11/30/bay-foundation-infrared-video-shows-gas-drilling-pollution>.

¹¹⁵ *Id.*

burning fuel and the environmental complications associated with harvesting it.

3. Major Accidents

While the initial Pavillion report, conclusive or not, can hardly be cited as evidence of a fracking accident, the risks associated with the entire process are not limited to the pollution of water deep underground. The process itself is riddled with opportunities for accidents. The various chemicals used in the fluid must be trucked to the site, stored separately, mixed with water, and finally injected, at several-thousand PSI, into the well.¹¹⁶ Thereafter, the well “regurgitates” a certain percentage of the fluid, which must be captured¹¹⁷ and reinjected as part of another frack job, injected into a permitted disposal well, or treated at a wastewater treatment plant.¹¹⁸

In early April 2011, Chesapeake Energy began the process of completing a well in Pennsylvania, which involved fracking the well once drilling is completed to stimulate the production of natural gas.¹¹⁹ In the middle of the night, a steel coupling located above the ground failed, resulting in the release of thousands of gallons of fracking fluid.¹²⁰ Some of the fluid ended up in a tributary of a popular trout-fishing stream, and seven families were temporarily evacuated from the area.¹²¹ The company was unable to estimate how much fluid was released, though subsequent testing suggests that no lasting harm came to the area’s fish and

¹¹⁶ See *supra* Part II.A. for a discussion of this process.

¹¹⁷ See *supra* Part II.A. In the Marcellus, for example, approximately 9%–35% of the fluid must be captured, meaning that up to two million gallons of flowback water might be held on the surface until disposal. About one-half percent (by weight) of this flowback water is some form of chemical—toxic or not. Hannah Wiseman, *Regulatory Adaptation in Fractured Appalachia*, 21 VILL. ENVTL. L.J. 229, 260–61 (2010).

¹¹⁸ See *supra* Part II.A. In at least a few states, however, operators may even dispose of flowback water by spreading it on the land surface, a technique called land application. See Wiseman, *supra* note 11.

¹¹⁹ Edward McAllister, *Driller Halts Pennsylvania Fracking After Blowout*, REUTERS (Apr. 21, 2011, 2:43 PM), <http://www.reuters.com/article/2011/04/21/us-chesapeake-blowout-idUSTRE73K5OH20110421>.

¹²⁰ Seamus McGraw, *Pennsylvania Fracking Accident: What Went Wrong*, POPULAR MECHANICS (Apr. 21, 2011, 1:00 PM), <http://www.popularmechanics.com/science/energy/coal-oil-gas/pennsylvania-fracking-accident-what-went-wrong-5598621>.

¹²¹ *Id.*

vegetation.¹²² Chesapeake immediately suspended well completion operations in Pennsylvania.¹²³

Not surprisingly, fracking's proponents minimized the event, which was billed in some circles as "the most serious fracking accident in the history of Marcellus Shale development."¹²⁴ In fact, Senator Jim Inhofe announced that the blowout "ha[d] nothing to do with hydraulic fracturing."¹²⁵ After all, this spill occurred above ground, he noted.¹²⁶ Instead, he lauded fracking as a method of boosting American energy supplies, and reiterated that no groundwater pollution had yet been traced to fracking in his home state of Oklahoma, one of the first states in which the process was widely used.¹²⁷ Unfortunately, though, Senator Inhofe's former argument is merely a justification for shale gas development in general, while the latter "no proof" argument is questionable in the least. However, Inhofe's mindset is a common one among fracking's advocates.¹²⁸

*D. In Defense of Fracking*¹²⁹

Fracking's proponents defend the practice on a number of grounds independent of its status as savior of America's glut for carbon-rich foreign oil.¹³⁰ The most common refrain is that fracking is a decades-old technology that has been proven a million times over, without a confirmed incident of contamination of underground drinking water.¹³¹ The merits of the Pavillion study notwithstanding, this defense of "I didn't do it" ignores not only changes in the fracking process and the scope of the shale boom, but also air pollution and climate change concerns as well.

¹²² *Id.*

¹²³ McAllister, *supra* note 119.

¹²⁴ McGraw, *supra* note 120.

¹²⁵ McAllister, *supra* note 119.

¹²⁶ *Id.*

¹²⁷ *Id.*

¹²⁸ See Jeffrey C. King et al., *Factual Causation: The Missing Link in Hydraulic Fracture—Groundwater Contamination Litigation*, 22 DUKE ENVTL. L. & POL'Y F. 341, 360 (2012).

¹²⁹ Rather than rebut each argument in this Part, these myths are addressed throughout the Article. This Part is merely intended as a handy summary of portions of the preceding materials.

¹³⁰ King, *supra* note 128, at 353.

¹³¹ *Id.*

A second argument is a scientific one: Wells are fracked thousands of feet below the water table; thus, it is physically impossible for fracking fluid to make its way toward the surface and into underground aquifers.¹³² Implicit in this argument is the assumption that the drilling process is already well-regulated, thereby ensuring the integrity of the well bore.

The final argument is that states are in a better position to regulate shale development than the federal government—and states already do a fine job.¹³³ In other words, a “one-size-fits-all” federal approach is both practically infeasible and implicates principles of federalism. Despite these arguments in favor of fracking, the search for a truly adequate regulatory framework is substantively important because the common law effectively shields polluters from meaningful regulation.¹³⁴

III. THE EXISTING REGULATORY FRAMEWORK

A. *Common Law Inadequacies*

The advent of modern-day fracking and horizontal drilling processes has not been kind to plaintiffs alleging environmental damage. Common law causes of action—notably nuisance and trespass¹³⁵—are not up to the task. As Professor Wiseman notes, “[F]racking has come before courts in only a limited number of cases, typically presenting ownership, pooling, and trespass questions as well as related damages issues. No state cases appear to have directly addressed claims of environmental damage caused by fracking.”¹³⁶

The problem with these common law causes of action is one of causation.¹³⁷ Provided a well is properly cased so that it does not leak, fracking fluid is typically injected thousands of feet below the surface of

¹³² *Id.* at 350.

¹³³ Jennifer A. Dlouhy, *Energy Execs: States Should Regulate Fracturing*, HOUSTON CHRON. (June 1, 2011), <http://www.chron.com/business/energy/article/Energy-execs-States-should-regulate-fracturing-1689187.php>.

¹³⁴ See 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, 146 (2009).

¹³⁵ *Id.* at 156.

¹³⁶ *Id.* at 146.

¹³⁷ *Id.* at 156. See also King, *supra* note 128, at 345. Further, because fracking and associated drilling activities are not considered “ultrahazardous” or “abnormally or inherently dangerous” activities in many states, plaintiffs cannot proceed on a theory of strict liability. *Williams v. Amoco Prod. Co.*, 734 P.2d 1113, 1123 (Kan. 1987).

the earth—significantly below aquifers and drinking water wells.¹³⁸ The fluid left behind in the rock formations may spend decades underground before leeching into a well and finally giving the landowner a cause of action for trespass.¹³⁹ By then, though, intervening and superseding causes will abound, leaving a plaintiff an insurmountable task—identifying the particular exploration company that fracked the well, along with the myriad manufacturers of the particular chemicals that comprised the fluid.¹⁴⁰ Nuisance law does not fare much better, as the same latency period may well give courts trouble.¹⁴¹

For example, in a toxic tort action brought by a Colorado family alleging “health injuries” stemming from the operation of three nearby natural gas wells in Silt, Colorado, the court dismissed the plaintiffs’ suit.¹⁴² The court held that the plaintiffs failed to make a prima facie showing of causation and exposure to air and water contaminated with “hazardous gases, chemicals, and industrial wastes.”¹⁴³ There, the court adopted an unusual case management order, putting the initial burden of production on the plaintiffs to make threshold showings in the form of “data and expert opinions in order to establish their claims” before permitting discovery to proceed.¹⁴⁴ The court required expert opinion and supporting data showing, among other things, the identity, concentration, timing, duration, and location of any exposure, as well as general and specific causation.¹⁴⁵

In adopting this order, the court relied on findings by the Colorado Oil and Gas Conservation Commission that the family’s well had not been contaminated; sworn testimony that the companies conducted operations in compliance with all “applicable laws and regulations designed to protect human health and the environment”; and empirical evidence that the facilities’ air emission control equipment and prevailing winds “ma[d]e it unlikely that [p]laintiffs or their property were exposed to harmful levels of

¹³⁸ See King, *supra* note 128, at 350.

¹³⁹ Wiseman, *supra* note 134, at 156.

¹⁴⁰ *Id.* at 185 (noting that pollutants may migrate underground and across state lines).

¹⁴¹ *Id.* There are, of course, obvious causes of action sounding in trespass or nuisance that state courts can hear, concerning aboveground spills and leaks, for example. *Id.*

¹⁴² Strudley v. Antero Res. Corp., 2011-CV-2218, slip op. at 7 (Denver Cnty. Dist. Ct. May 9, 2012), <http://www.shb.com/newsletters/ECU/Etc/StrudleyvAnteroResourceCorp.pdf>.

¹⁴³ *Id.*

¹⁴⁴ *Id.* at 2.

¹⁴⁵ *Id.* at 3.

chemicals from [d]efendants' activities."¹⁴⁶ With this order, the court undoubtedly avoided a lengthy and expensive discovery process amid some vague claims, though a similar threshold-showing requirement would certainly place an onerous burden on those with claims that are more legitimate.

These common law inadequacies should give stakeholders and regulators pause. Disregarding the viability of a trespass or nuisance action for a moment, one may not even *exist* for decades. Tort litigation works *ex-post*, providing equitable remedies or damages only after an injury occurs and a cause has been identified.¹⁴⁷ Regulation works *ex-ante*, which is why it can do a better job of addressing harms that do not become manifest until many years later—it prevents the harms in the first place.¹⁴⁸ At the very least, an enhanced regulatory framework could give a landowner the tools to make a case in state court in the distant future, if not create alternative causes of action to be brought immediately in federal court under existing environmental statutes.

B. Efforts at Industry Self-Regulation: Voluntary Disclosure

In April 2011, the Ground Water Protection Council and the Interstate Oil and Gas Compact Commission went live with FracFocus, the “hydraulic fracturing chemical registry” website.¹⁴⁹ Oil and natural gas producers can voluntarily upload information about the chemicals used in wells fracked after January 1, 2011, or since the date the producer registered to participate.¹⁵⁰ Visitors can then search for wells by geographic location, well number, or operator to see a list of chemicals used.¹⁵¹ As of April 2012, the database included over fifteen thousand wells fracked by more than 231 companies.¹⁵²

¹⁴⁶ *Id.* at 2.

¹⁴⁷ Charles D. Kolstad et al., *Ex Post Liability for Harm vs. Ex Ante Safety Regulation: Substitutes or Complements?*, 80 AM. ECON. REV. 888, 888 (1990).

¹⁴⁸ *Id.*

¹⁴⁹ *About Us*, FRACFOCUS CHEMICAL DISCLOSURE REGISTRY, <http://www.fracfocus.org/welcome>.

¹⁵⁰ *Id.*

¹⁵¹ *Find a Well*, FRACFOCUS CHEMICAL DISCLOSURE REGISTRY, <http://www.hydraulicfracturingdisclosure.org/fracfocusfind/>.

¹⁵² *About Us*, *supra* note 149.

While the website is noteworthy and represents an important step toward proper groundwater protection, it is not without its weaknesses.¹⁵³ First, the chemical ingredients listed on the website come from the fluid's Material Safety Data Sheet (MSDS).¹⁵⁴ One analysis of 980 oil and gas products revealed that the MSDS for more than 40% of them reported less than 1% of the total composition of the chemical.¹⁵⁵ Only 14% included information on 95% or more of the total composition of the chemical.¹⁵⁶

Second, pursuant to the trade secret provisions of the Occupational Safety and Health Standards for toxic and hazardous substances,¹⁵⁷ companies are not required to disclose any chemical they deem to be a trade secret or a proprietary product.¹⁵⁸ Thus, the "companies . . . decide for themselves what they want to keep secret."¹⁵⁹ Finally, by using the FracFocus website, companies are required to disclose the chemicals used only after fracking takes place.¹⁶⁰ Disclosing the chemicals anticipated to be used before fracking occurs (even though chemicals may be changed before and during the process) spurs landowners to obtain a baseline water sample to ensure that none of the chemicals likely to be used are already present in their water supply.¹⁶¹

All things considered, FracFocus is an imperfect site, and one that will certainly evolve. However, the industry's claims that voluntary disclosure is a substitute for hard-nosed mandatory disclosure laws cannot withstand

¹⁵³ See Amy Mall, *Why Voluntary Disclosure of Hydraulic Fracturing Is Insufficient*, SWITCHBOARD: NAT. RESOURCES DEF. COUNCIL STAFF BLOG (May 18, 2011), http://switchboard.nrdc.org/blogs/amall/why_voluntary_disclosure_of_hy.html.

¹⁵⁴ *Frequently Asked Questions*, FRACFOCUS CHEMICAL DISCLOSURE REGISTRY, <http://www.fracfocus.org/faq>. Materials Safety Data Sheets are required by the Occupational Safety and Health Administration to be sent by chemical manufacturers to the purchasers of their chemicals. See 29 C.F.R. § 1910.1200 (2011).

¹⁵⁵ Theo Colburn et al., *Natural Gas Operations from a Public Health Perspective*, 17 HUM. & ECOLOGICAL RISK ASSESSMENT: AN INT'L J. 1039, 1045 (2011).

¹⁵⁶ *Id.*

¹⁵⁷ 29 C.F.R. § 1910.1200(i) (2011). The first element of the regulation is simply that "[t]he claim that the information withheld is a trade secret can be supported." *Id.*

¹⁵⁸ Mall, *supra* note 153.

¹⁵⁹ *Id.*

¹⁶⁰ *Id.*

¹⁶¹ *Id.*

scrutiny.¹⁶² A federal disclosure requirement would plug at least some of the holes that the traditional federal environmental laws leave open.

C. Regulation (or Lack Thereof) at the Federal Level

1. The Clean Air Act

Section 112 of the Clean Air Act addresses emissions of various hazardous air pollutants, such as those that might come from oil and gas drilling operations.¹⁶³ The 1990 Amendments to section 112 define “major sources” as:

[A]ny stationary source or group of stationary sources located within a contiguous area and under common control that emits or has the potential to emit . . . in the aggregate, 10 tons per year or more of any hazardous air pollutant or 25 tons per year or more of any combination of hazardous air pollutants.¹⁶⁴

For these major sources, EPA is required to promulgate regulations mandating “the maximum degree of reduction in emissions of the hazardous air pollutants,”¹⁶⁵ often called MACT (maximum achievable control technology) standards, the most potent technology-based requirement available.¹⁶⁶ The aggregation principle is important, because it would theoretically subject all emitting sources—rigs, compressors, generators, and trucks—at a given well site to aggregation, placing many drilling operations under EPA’s direct control via the Clean Air Act.

However, section 112 goes on to provide that “in the case of any oil or gas exploration or production well (with its associated equipment), such emissions shall not be aggregated for any purpose under this section.”¹⁶⁷ Thus, in barely two-dozen words buried deep within the statute, Congress

¹⁶² See *id.* (stating that the public need for full disclosure of fracking chemicals is not satisfied by voluntary disclosure on FracFocus).

¹⁶³ 42 U.S.C. § 7412 (2006).

¹⁶⁴ *Id.* § 7412(a)(1).

¹⁶⁵ *Id.* § 7412(d)(2).

¹⁶⁶ Paul R. Portney, *Policy Watch: Economics and the Clean Air Act*, 4 J. ECON. PERSP. 173, 178 (1990).

¹⁶⁷ 42 U.S.C. § 7412(n)(4)(A).

exempted a substantial portion¹⁶⁸ of the oil and gas industry from the hazardous air pollution regulations of the Clean Air Act.¹⁶⁹

In April 2012, however, EPA issued final rules, effective October 15, 2012, designed to reduce air pollution from the oil and natural gas industry, including the first federal air standards for natural gas wells that are hydraulically fractured.¹⁷⁰ These regulations are expected to reduce the amount of volatile organic compounds emitted from new hydraulically fractured wells by 95% each year by requiring the industry to implement “green completions.”¹⁷¹ In a green completion, equipment separates the gas and liquid hydrocarbons from the flowback and stores it so that it can be treated and used or sold, thereby avoiding its escape into the atmosphere.¹⁷² The rules also yield substantial reductions in methane emissions; EPA estimates the value of the climate co-benefits, including avoided health impacts and crop damage, due to methane reduction in the oil and gas sector at \$440 million annually by 2015.¹⁷³ These rules mark an important step in regulating air pollutants from the oil and gas industry, and it will be intriguing to see how the industry responds to their implementation.

2. *The Clean Water Act*

Interestingly, the Clean Water Act (CWA),¹⁷⁴ which regulates discharges into the country’s navigable waterways,¹⁷⁵ has always been ill-suited to regulate hydraulic fracturing. Much of the concern associated with fracking concerns groundwater contamination, not discharges at the

¹⁶⁸ Perhaps the well alone, if large enough, could be a “major” for the purposes of the section, although aggregation would no doubt bring many more sites under the auspices of section 112.

¹⁶⁹ 42 U.S.C. § 7412(n)(4)(A). The following subsection exempts oil and gas production wells from “area source” regulations—less stringent regulations requiring the use of generally available control technologies. *Id.* § 7412(n)(4)(B).

¹⁷⁰ Oil and Natural Gas Sector: New Source Performance Standards and National Emission Standards for Hazardous Air Pollutants Reviews, 77 Fed. Reg. 49,490 (Aug. 16, 2012) (to be codified at 40 C.F.R. pts. 60, 63).

¹⁷¹ EPA, OVERVIEW OF FINAL AMENDMENTS TO AIR REGULATIONS FOR THE OIL AND NATURAL GAS INDUSTRY 1 (Aug. 2012) [hereinafter OVERVIEW OF FINAL AMENDMENTS], <http://epa.gov/airquality/oilandgas/pdfs/20120417fs.pdf>.

¹⁷² *Id.*

¹⁷³ *Id.* at 3.

¹⁷⁴ 33 U.S.C. §§ 1251–1387 (2006).

¹⁷⁵ *Id.* § 1251(a)(1).

surface level.¹⁷⁶ Oil and gas production activities have been exempted from the stormwater runoff provisions of the CWA since 1987,¹⁷⁷ and the Energy Policy Act of 2005 amended the CWA to exempt oil and gas field construction activities as well.¹⁷⁸

Where the CWA can step in, though, is in regulating spent fracking fluid, called “flowback” or fracking wastewater.¹⁷⁹ Every other year, the CWA requires EPA to publish an Effluent Guidelines Program Plan.¹⁸⁰ “Effluent guidelines are national regulations that control the discharge of pollutants from industry to surface waters and to publicly owned treatment works (POTWs).”¹⁸¹ EPA has already issued effluent guidelines for fifty-seven industries, and its final 2010 Plan includes the Shale Gas Extraction industry for the first time.¹⁸² Many commentators anticipated the adoption of these rules after concern was expressed about the salinity and potential radioactivity of flowback being processed at wastewater treatment plants and then discharged into rivers.¹⁸³ As the former secretary of Pennsylvania’s Department of Conservation and Natural Resources noted, “In shifting away from coal and toward natural gas, we’re trying for cleaner air, but we’re producing massive amounts of toxic wastewater with salts and naturally occurring radioactive materials, and it’s not clear we have a plan for properly handling this waste.”¹⁸⁴

Pursuant to this Plan, EPA will begin collecting data from shale gas developers in anticipation of proposing rules by 2014.¹⁸⁵ The rules will

¹⁷⁶ See PAVILLION INVESTIGATION, *supra* note 91, at xi.

¹⁷⁷ Water Quality Act of 1987 § 401, 33 U.S.C. § 1342(l)(2) (2006).

¹⁷⁸ Energy Policy Act of 2005 § 323, 33 U.S.C. § 1362(24) (2006) (adding oil and gas field construction activities to the definition of “oil and gas exploration and production”). “Oil and gas exploration and production” are activities that are exempted from permit requirements. Water Quality Act of 1987 § 401, 33 U.S.C. § 1342(l)(2).

¹⁷⁹ OVERVIEW OF FINAL AMENDMENTS, *supra* note 171, at 3 (“During a stage of well completion known as ‘flowback,’ fracturing fluids, water and reservoir gas come to the surface at high velocity and volume.”).

¹⁸⁰ 33 U.S.C. § 1314(m) (2006).

¹⁸¹ EPA, EPA-820-F-11-0005, FINAL 2010 EFFLUENT GUIDELINES PROGRAM PLAN (Oct. 2011), <http://water.epa.gov/lawsregs/lawsguidance/cwa/304m/upload/factsheet2011.pdf>.

¹⁸² *Id.*

¹⁸³ See Ian Urbina, *Regulation Lax as Gas Wells’ Tainted Water Hits Rivers*, N.Y. TIMES, Feb. 27, 2011, at 1.

¹⁸⁴ *Id.*

¹⁸⁵ EPA Announces Schedule to Develop Natural Gas Wastewater Standards/Announcement is Part of Administration’s Priority to Ensure Natural Gas Development Continues Safely and Responsibly, EPA (Oct. 20, 2011), (continued)

impose pretreatment standards for wastewater from shale gas operations.¹⁸⁶ Proponents of the rules see them as another safeguard against drinking water pollution and insurance against a literal flood of disposed fracking fluid passing through ill-equipped treatment plants.¹⁸⁷ However, because the effluent limits have to match what is economically feasible for the industry, oil and gas companies will no doubt push back with data of their own to counter EPA's proposed rules.¹⁸⁸

3. *The Safe Drinking Water Act*

Perhaps the most notorious fracking exemption was added to the Safe Drinking Water Act (SDWA) in 2005.¹⁸⁹ The SDWA has always prohibited "underground injection," defined as the "subsurface emplacement of fluids by well injection,"¹⁹⁰ that is not authorized by a permit under an approved Underground Injection Control (UIC) program, which EPA can administer itself or delegate to the states.¹⁹¹ A permit applicant must show that the underground injection will not endanger drinking water resources and the UIC program must require inspection, monitoring, recordkeeping, and reporting requirements for those who employ underground injection.¹⁹²

In 1994, the Legal Environmental Assistance Foundation (LEAF) petitioned EPA to withdraw its approval of Alabama's UIC program because Alabama did not regulate hydraulic fracturing.¹⁹³ Despite LEAF's argument of plain meaning—that the term underground injection virtually spelled out the definition of hydraulic fracturing—EPA denied the petition, reasoning that the "principal function" of hydraulic fracturing is other than

<http://yosemite.epa.gov/opa/admpress.nsf/d0cf6618525a9efb85257359003fb69d/91e7fad4b114c4a8525792f00542001!OpenDocument>.

¹⁸⁶ *Id.*

¹⁸⁷ *See id.* The EPA is gathering information "[t]o ensure that these wastewaters receive proper treatment and can be properly handled by treatment plants." *Id.*

¹⁸⁸ *Id.* ("EPA will consider standards based on demonstrated, economically achievable technologies . . .").

¹⁸⁹ 42 U.S.C. § 300h(d)(1)(B)(ii) (2006) (the Halliburton loophole).

¹⁹⁰ *Id.* § 300h(d)(1).

¹⁹¹ *Id.* § 300h(b)(1)(A).

¹⁹² *Id.* § 300h(b)(1)(A)–(C).

¹⁹³ *See* Legal Envtl. Assistance Found. v. EPA, 118 F.3d 1467, 1471 (11th Cir. 1997). Here, hydraulic fracturing enabled recovery of methane from coal beds rather than shale gas extraction, but the principle is the same. *Id.*

the underground emplacement of fluids.¹⁹⁴ LEAF appealed the decision to the Eleventh Circuit, which overturned EPA's decision.¹⁹⁵

The decision narrowly bound only Alabama's UIC program,¹⁹⁶ but it spelled trouble for the nascent shale gas industry, which would come to depend on fracking as the principal means of well stimulation.¹⁹⁷ As a result, EPA began a study to evaluate the dangers of hydraulic fracturing, and concluded in 2004 that the "injection of hydraulic fracturing fluids into coalbed methane wells poses little or no threat to [underground sources of drinking water] and does not justify additional study at this time."¹⁹⁸

A year later, as if to finally put to rest the criticisms of the EPA study and preempt any further judicial or executive authority over the matter, the Energy Policy Act of 2005 included the "Halliburton loophole,"¹⁹⁹ amending the SDWA to exempt from federal regulation "the underground injection of fluids or propping agents (other than diesel fuels) pursuant to hydraulic fracturing operations related to oil, gas, or geothermal production activities."²⁰⁰ Thus, the most obvious and appropriate piece of environmental legislation regulating the safety of drinking water became powerless to address fracking's role in the shale gale.

¹⁹⁴ *Id.*

¹⁹⁵ *Id.* at 1469, 1478. The Eleventh Circuit reasoned:

Nothing in the statutory definition [of "underground injection"] suggests that EPA has the authority to exclude from the reach of the regulations an activity (i.e., hydraulic fracturing) which unquestionably falls within the plain meaning of the definition, on the basis that the well that is used to achieve that activity is also used—even primarily used—for another activity (i.e., methane gas production) that does not constitute underground injection.

Id. at 1475.

¹⁹⁶ *See id.* at 1478 (the LEAF petition concerned only Alabama's program).

¹⁹⁷ Scott R. Kurkoski, *The Marcellus Shale: A Game Changer for the New York Economy?*, 84 N.Y. ST. B. ASS'N J. 11, 13 (2012) (noting that the court's decision adversely affected hydraulic fracturing programs by causing uncertainty on how such programs were to proceed).

¹⁹⁸ EPA, EPA-816-R-04-003, EVALUATION OF IMPACTS TO UNDERGROUND SOURCES OF DRINKING WATER BY HYDRAULIC FRACTURING OF COALBED METHANE RESERVOIRS 7-5 (June 2004), <http://nepis.epa.gov/Adobe/PDF/P100A99N.PDF>.

¹⁹⁹ Colloquially named because former Halliburton Chief Executive and then-Vice President Dick Cheney urged the energy bill through Congress. Editorial, *The Halliburton Loophole*, N.Y. TIMES, Nov. 3, 2009, at A28.

²⁰⁰ 42 U.S.C. § 300h(d)(1)(B)(ii) (2006).

4. *Other Federal Environmental Laws*²⁰¹

a. *The Resource Conservation and Recovery Act*

The Resource Conservation and Recovery Act (RCRA)²⁰² of 1976 includes a comprehensive “cradle-to-grave” hazardous waste management program in Subtitle C of the Act.²⁰³ RCRA’s role in regulating fracking would concern primarily the disposal of spent fluid.²⁰⁴ However, the statute provides that “drilling fluids, produced waters, and other wastes associated with the exploration, development, or production of crude oil or natural gas or geothermal energy shall be subject only to existing State or Federal regulatory programs in lieu of [Subtitle C]”²⁰⁵ The breadth of this exemption is substantial.²⁰⁶

Interestingly, Congress anticipated the dangers associated with this exemption, specifying that such “[s]tate or [f]ederal programs should include . . . at least . . . [a] chemical and physical analysis of a produced water and a composition of a drilling fluid suspected to contain a

²⁰¹ This section includes only those statutes that seemingly apply to fracking, or rather, exempt it from regulation. For example, the Comprehensive Environmental Response, Compensation, and Liability Act, which creates liability for the “release” of a “hazardous substance,” exempts “natural gas, natural gas liquids, liquefied natural gas, or synthetic gas usable for fuel (or mixtures of natural gas and such synthetic gas)” from its definition of hazardous substances, but makes no mention, even indirectly, of exempting fracking fluid or wastewater from natural gas development. 42 U.S.C. § 9601(14) (2006).

²⁰² *Id.* §§ 6901–6992k.

²⁰³ *Id.* §§ 6921–6939e.

²⁰⁴ *See id.* § 6921(b)(2)(A).

²⁰⁵ *Id.*

²⁰⁶ *See* Clarification of the Regulatory Determination for Wastes from the Exploration, Development and Production of Crude Oil, Natural Gas and Geothermal Energy, 58 Fed. Reg. 15,284, 15,285 (Mar. 22, 1993) (to be codified at 40 C.F.R. pt. 261). The regulation states:

A simple rule of thumb for determining the scope of the exemption is whether the waste in question has come from down-hole (i.e., brought to the surface during oil and gas [exploration and production] operations) or has otherwise been generated by contact with the oil and gas production stream during the removal of produced water or other contaminants from the product (e.g., waste demulsifiers, spent iron sponge). If the answer to either question is yes, the waste is most likely considered exempt.

Id.

hazardous material, with such information to be acquired prior to closure and to be placed on the public record.”²⁰⁷ In other words, Congress deferred to the states and other federal programs, but offered some guidance as to the scope of those programs. It seems that Congress anticipated full disclosure of the makeup of fluids—at least before disposal in injection wells.

b. The National Environmental Policy Act

The National Environmental Policy Act (NEPA),²⁰⁸ one of the first environmental statutes, requires the government to study the effects of major federal actions significantly affecting the quality of the human environment.²⁰⁹ In theory, this process would cover oil and gas drilling and fracking on federal lands, but for a “rebuttable presumption” that several oil and gas-related activities²¹⁰ are to be given a “categorical exclusion.”²¹¹ The process under a categorical exclusion is substantially less comprehensive than the traditional methods and does not allow for any public comment.²¹²

Traditionally, upon a showing of “extraordinary circumstances,” a categorical exclusion can be overcome.²¹³ However, the “rebuttable presumption” language added to NEPA by the Energy Policy Act of 2005 occurs nowhere else in either statute, and nothing in section 390 of the Energy Policy Act refers to “extraordinary circumstances.” The George W. Bush administration appeared to construe the statutorily created categorical exclusion as distinct from the administratively created categorical exclusions, leaving it a mystery as to how the presumption might actually be rebutted.²¹⁴ On the other hand, the Obama administration seemed to have taken the opposite approach, applying the factors for extraordinary circumstances to allow for a rebuttal of even the statutory exclusion.²¹⁵ However, a federal judge later invalidated this

²⁰⁷ 42 U.S.C. § 6921(b)(2)(A).

²⁰⁸ *Id.* §§ 4321–4370f.

²⁰⁹ *Id.* § 4332(C).

²¹⁰ *Id.* § 15942(a)–(b).

²¹¹ *Id.* § 15942(a).

²¹² *See* 40 C.F.R. § 1508.4 (2011).

²¹³ *See* 43 C.F.R. §§ 46.205(c), 46.215 (2011).

²¹⁴ *See* Phil Taylor, *DOJ Is Urged to Seek Stay of Wyoming Ruling on NEPA Waivers for Oil and Gas Projects*, N.Y. TIMES (Sept. 9, 2011), <http://www.nytimes.com/gwire/2011/09/09/09greenwire-doj-is-urged-to-seek-stay-of-wyo-ruling-on-nep-72459.html>.

²¹⁵ *Id.*

approach, enjoining Bureau of Land Management instructions designed to limit the use of the categorical exclusion for oil- and gas-related activities.²¹⁶

There is no question that federal oversight of natural gas exploration under NEPA is now uncertain, and might be greatly improved by removing the categorical exclusion. Still, however, NEPA only applies to major *federal* actions,²¹⁷ so it is not the ideal statute for regulating the vast majority of fracking operations.

c. The Toxics Release Inventory of the Emergency Planning and Community Right-to-Know Act

Section 313 of the Emergency Planning and Community Right-to-Know Act²¹⁸ created the Toxic Release Inventory (TRI), which requires facilities covered by certain Standard Industrial Classification (SIC) codes to give EPA detailed information about their releases of toxic chemicals.²¹⁹ The SIC codes covered include the entire manufacturing sector, plus metal mining, coal mining, electric utilities, petroleum bulk terminals, chemical wholesalers, RCRA commercial hazardous waste treatment, and solvent recovery.²²⁰ Facilities within these SIC codes are required to report only if they have ten or more full-time employees,²²¹ and manufacture or process over 25,000 pounds of listed TRI chemicals, or use more than 10,000 pounds of any listed chemical.²²² Upon reporting, the EPA and various other groups compile and sort the data, which is then made available as an informational tool to the public.²²³

²¹⁶ *W. Energy Alliance v. Salazar*, No. 10–CV–237F, 2011 WL 3738240, at *1 (D. Wyo. Aug. 12, 2011). The court enjoined the instructions for failure to comply with the notice-and-comment provisions of the Administrative Procedure Act, but did not reach the merits. *Id.* at *7.

²¹⁷ COUNCIL ON ENVTL. QUALITY, A CITIZEN’S GUIDE TO THE NEPA: HAVING YOUR VOICE HEARD 1 (2007), http://ceq.hss.doe.gov/nepa/Citizens_Guide_Dec07.pdf.

²¹⁸ 42 U.S.C. § 11001–11050 (2006).

²¹⁹ *Id.* § 11023.

²²⁰ *Id.* § 11023(b)(1)(A); *Industrial Sectors Covered by Scorecard*, SCORECARD: THE POLLUTION INFO. SITE, http://scorecard.goodguide.com/chemical-profiles/def/ind_rel.html (last visited Oct. 13, 2012).

²²¹ 42 U.S.C. § 11023(b)(1)(A).

²²² *Id.* § 11023(f).

²²³ *See Toxics Release Inventory (TRI) Program*, EPA, <http://www.epa.gov/tri/> (last visited Oct. 13, 2012).

Generally, given their substantial size, oil and gas extractors would be required to report toxic releases, but SIC code 13, covering oil and gas extraction, is conspicuously absent from the TRI requirements.²²⁴ Thus, no matter how much benzene, a listed chemical,²²⁵ is used to fracture a well, it will never show up on a TRI report, nor will other harmful chemicals commonly used in fracking fluid.

d. The Toxic Substances Control Act

Congress passed the Toxic Substances Control Act (TSCA)²²⁶ in 1976 to regulate the “manufacture, processing, distribution in commerce, use, or disposal of a chemical substance or mixture, or . . . any combination of such activities, [that] presents or will present an unreasonable risk of injury to health or the environment.”²²⁷ Until recently, TSCA’s reach concerning the regulation of natural gas development was uncertain, due to its myriad exemptions.²²⁸

In August 2011, searching for a nontraditional avenue for the regulation of fracking and seeking to spur disclosure of the chemicals used in the process, the environmental law firm Earthjustice and various other signatory organizations submitted a thirty-page petition to EPA.²²⁹ The petition asked “that EPA adopt a rule under TSCA section 4, requiring that manufacturers and processors of [exploration and production] [c]hemicals conduct toxicity testing of all [exploration and production] [c]hemicals and identify all chemical substances and mixtures tested.”²³⁰ Earthjustice also sought “promulgation of a rule under TSCA section 8, requiring maintenance and submission of various records related to [exploration and

²²⁴ See 42 U.S.C. § 11023(b)(1)(A).

²²⁵ EPA, EPA-550-B-10-001, CONSOLIDATED LIST OF CHEMICALS SUBJECT TO THE EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW ACT (EPCRA), COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION AND LIABILITY ACT (CERCLA) AND SECTION 112(R) OF THE CLEAN AIR ACT 3 (July 2011), http://www.epa.gov/tri/trichemicals/reg_requirements/list_of_lists_revised_7_26_2011.pdf.

²²⁶ 15 U.S.C. § 2601–2692.

²²⁷ *Id.* § 2605(a).

²²⁸ *The Toxic Substances Control Act: Exclusions and Exemptions*, KELLER & HECKMAN LAW LLP PUBLICATIONS (2004), <http://www.khlaw.com/showpublication.aspx?Show=1138>.

²²⁹ Petition from Earthjustice, to Lisa P. Jackson, Administrator, EPA (Aug. 4, 2011), http://www.epa.gov/oppt/chemtest/pubs/Section_21_Petition_on_Oil_Gas_Drilling_and_Fracking_Chemicals8.4.2011.pdf.

²³⁰ *Id.* at 1.

production] [c]hemicals,²³¹ calling in records of allegations of significant adverse reactions to [exploration and production] [c]hemicals,²³² and requiring submission of all existing health and safety studies related to [exploration and production] [c]hemicals.”²³³

In November 2011, EPA denied the section 4 request, but granted in part the section 8 request.²³⁴ EPA granted the section 8(a) and section 8(d) requests, but limited the scope to chemicals used in hydraulic fracturing rather than the exploration and production sector as a whole.²³⁵ EPA specified that its “expectation is that the TSCA proposal would focus on providing aggregate pictures of the substances and mixtures used in hydraulic fracturing. This would not duplicate, but instead complement, the well-by-well disclosure programs of states.”²³⁶

EPA’s favorable response to Earthjustice’s petition, in tandem with the earlier adoption of new source performance standards and national effluent guidelines, represents an important challenge to the states’ regulatory authority over the oil and gas sector. The fact that the TSCA is a nontraditional statute by which to regulate fracking is both encouraging and disheartening. It is encouraging because EPA has implicitly suggested that it has an interest in working with environmental groups to develop such an approach. However, that EPA is doing so also indicates that

²³¹ TSCA section 8(a) requires manufacturers and processors of chemical substances to maintain and submit records concerning a host of information about those chemicals, including chemical identity and molecular structure, amount used, and data concerning environmental and health effects resulting from those chemicals. 15 U.S.C. § 2607(a)(1)–(2).

²³² TSCA section 8(c) requires manufacturers, processors, and distributors of chemical substances to maintain “records of consumer allegations of personal injury or harm to health, reports of occupational disease or injury, and reports or complaints of injury to the environment submitted to the manufacturer, processor, or distributor in commerce from any source” for at least five years. *Id.* § 2607(c).

²³³ Petition from Earthjustice, *supra* note 229, at 1. TSCA section 8(d) requires manufacturers, processors, and distributors of chemical substances to submit to EPA “lists of health and safety studies (A) conducted or initiated by or for such person with respect to such substance or mixture at any time, (B) known to such person, or (C) reasonably ascertainable by such person” 15 U.S.C. § 2607(d)(1).

²³⁴ Letter from Stephen A. Owens, Assistant Adm’r, EPA, to Deborah Goldberg, Earthjustice (Nov. 23, 2011), http://www.epa.gov/oppt/chemtest/pubs/EPA_Letter_to_Earthjustice_on_TSCA_Petition.pdf.

²³⁵ *Id.*

²³⁶ *Id.*

regulation under the Safe Drinking Water Act may be off the table for the foreseeable future.

5. *The Endangered Species Act*

The Endangered Species Act (ESA)²³⁷ of 1973 is designed to protect species from extinction “as a consequence of economic growth and development untempered by adequate concern and conservation.”²³⁸ Of late, the Fish and Wildlife Service (FWS), one of the agencies responsible for listing species,²³⁹ has come under fire for its tardiness in making listing decisions for candidate species. In 2011, Wild Earth Guardians²⁴⁰ and the Center for Biological Diversity²⁴¹ entered into a settlement decree with the FWS requiring listing decisions for over 250 candidate species by 2016. Many of these species inhabit the rivers flowing through the eastern United States,²⁴² and thus stand to be adversely impacted by pollution from oil and gas development in these resource-laden regions.

As the FWS makes listing determinations, it has shown an increasing willingness to cite such oil and gas development as a potential threat to candidate species. In its listing proposal for the diamond darter, a small river fish known to exist only in the Elk River in West Virginia,²⁴³ the FWS noted the recent acceleration in fracking activity in Kanawha County, through which the river runs.²⁴⁴ Kanawha County contained fifteen gas wells in March 2011, but by January 2012, there were 188 completed

²³⁷ 16 U.S.C. § 1531–1544.

²³⁸ *Id.* § 1531(a)(1).

²³⁹ U.S. FISH & WILDLIFE SERV., LISTING A SPECIES AS THREATENED OR ENDANGERED: SECTION 4 OF THE ENDANGERED SPECIES ACT (June 2011), <http://www.fws.gov/endangered/esa-library/pdf/listing.pdf>.

²⁴⁰ Stipulated Settlement Agreement at 6, *WildEarth Guardians v. Salazar* (D.D.C. May 10, 2011) (No. 10-377), http://www.fws.gov/endangered/improving_ESA/exh_1_re_joint_motion_filed.pdf.

²⁴¹ Stipulated Settlement Agreement at 4–5, *Ctr. for Biological Diversity v. Salazar*, (D.D.C. July 12, 2011) (No. 10-377), http://www.fws.gov/endangered/improving_ESA/218963-v1-hhy_071211_exh_1_re_cbd.pdf.

²⁴² Review of Native Species That Are Candidates for Listing as Endangered or Threatened, 75 Fed. Reg. 69,222, 69,284–91 (Nov. 10, 2010) (to be codified at 50 CFR pt. 17) (presenting a table of species that will be systematically addressed by FWS through the working plan developed through agreements with WildEarth Guardians and the Center for Biological Diversity).

²⁴³ Endangered Status for the Diamond Darter and Designation of Critical Habitat, 77 Fed. Reg. 43,906, 43,906 (July 26, 2012) (to be codified at 50 C.F.R. pt. 17).

²⁴⁴ *Id.* at 43,914.

Marcellus Shale gas wells and another twenty-seven wells that had been permitted.²⁴⁵ The FWS also noted the potential threats to the diamond darter:

Although limited data are available to quantify potential impacts, development of oil and gas resources can increase sedimentation rates in the stream and degrade habitat and water quality in a manner similar to that described for coal mining. Oil and gas wells can specifically cause elevated chloride levels through discharge of brine and runoff from materials used at the site, and the erosion of roads associated with these wells can contributed large amounts of sediment to the streams.²⁴⁶

The FWS also cited concerns about water withdrawals from the river, and the potential for spills of fracking wastewater due to overflow, ruptured pipes, and containment pond breaches.²⁴⁷

The ESA prohibits “takes”²⁴⁸ of endangered species, construed broadly as any type of “harm,”²⁴⁹ including “significant habitat modification or degradation . . .”²⁵⁰ Section 10(a) of the Act authorizes incidental take permits,²⁵¹ provided the applicant has implemented an acceptable habitat conservation plan.²⁵² In other words, oil and gas developers may have to negotiate voluntary conservation plans with the FWS for listed species or risk criminal and civil penalties, including private citizen-suits to enjoin allegedly illegal activity.²⁵³ While the ESA seems to be an odd source of fracking regulation, the FWS has rightfully expressed its concerns and given the oil and gas industry time to respond.

²⁴⁵ *Id.*

²⁴⁶ *Id.* at 43,913.

²⁴⁷ *Id.* at 43,914.

²⁴⁸ 16 U.S.C. § 1538(a)(1)(B) (2006).

²⁴⁹ *Id.* § 1532(19).

²⁵⁰ 50 C.F.R. § 17.3 (2011).

²⁵¹ 16 U.S.C. § 1539(a)(1)(B).

²⁵² *Id.* § 1539(a)(2)(A).

²⁵³ *Id.* § 1540(g)(1).

6. *The FRAC Act: Removing the Halliburton Loophole*

Two similar bills, one each in the House and Senate, represent the most substantial interjection yet by the federal government into the fracking conundrum. On March 15, 2011, Colorado Representative Diane DeGette, along with sixty-three cosponsors, introduced the Fracturing Responsibility and Awareness of Chemicals (FRAC) Act of 2011.²⁵⁴ Pennsylvania Senator Bob Casey and ten cosponsors introduced a similar bill the same day.²⁵⁵ The official title of the Senate bill as introduced—“A bill to amend the Safe Drinking Water Act to repeal a *certain* exemption for hydraulic fracturing, and for other purposes”²⁵⁶—left little doubt that the bill was directed at the Halliburton loophole.

Each bill has two significant provisions: first, to repeal the exemption for hydraulic fracturing in the Safe Drinking Water Act, and second, to require disclosure of all chemicals intended for use and actually used in the fracking process.²⁵⁷ Each provision is controversial,²⁵⁸ which is likely why no major action has been taken on either bill.

7. *The BREATHE Act: Attending to Air Pollution Concerns*

On the heels of the introduction of the FRAC Act, Colorado Representative Jared Polis introduced the Bringing Reductions to Energy’s Airborne Toxic Health Effects (BREATHE) Act.²⁵⁹ Responding to concerns that fracking results in air pollution that ought to be regulated, the

²⁵⁴ Fracturing Responsibility and Awareness of Chemicals Act of 2011, H.R. 1084, 112th Cong. (2011) (subsequently referred to the Subcomm. on the Env’t and the Econ.).

²⁵⁵ FRAC Act, S. 587, 112th Cong. (2011) (subsequently referred to the Subcomm. on the Env’t and Pub. Works).

²⁵⁶ *Id.* (emphasis added).

²⁵⁷ H.R. 1084 § 2; S. 587 § 2. Each bill exempts proprietary chemicals from disclosure, except in cases of medical emergency where the disclosure of a chemical formula is necessary to treatment. H.R. 1084 § 2(b); S. 587 § 2(b). Upon disclosure of a proprietary formula, a company may ask for a statement of need and a confidentiality agreement. H.R. 1084 § 2(b); S. 587 § 2(b).

²⁵⁸ See David O. Williams, *DeGette, Polis Once Again Introduce FRAC Act to Bring Federal Oversight to Gas Fracking*, COLORADO INDEP. (Mar. 15, 2011, 5:47 PM), <http://coloradoindependent.com/79273/degette-polis-once-again-introduce-frac-act-to-bring-federal-oversight-to-gas-fracking>.

²⁵⁹ Bringing Reductions to Energy’s Airborne Toxic Health Effects Act, H.R. 1204, 112th Cong. (2011) (subsequently referred to the Senate Health, Educ., Labor, and Pensions Comm.).

bill addresses two industry exemptions in the Clean Air Act.²⁶⁰ First, the BREATHE Act adds hydrogen sulfide to the list of hazardous air pollutants in the Clean Air Act.²⁶¹ Second, it closes the National Emissions Standards for Hazardous Air Pollutants exemption, in turn allowing for aggregation of emissions from oil and gas development sources so that the oil and gas industry may be required to use the maximum achievable control technology in its operations.²⁶² Like the FRAC Act, the BREATHE Act is currently sitting in committee, and may well be subject to intense industry pressure.²⁶³

8. EPA's Fracking Study

Before any further action is taken on the FRAC Act, and before any truly substantive federal regulations are enacted, lawmakers will most certainly pay close attention to EPA's *Plan to Study the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources*.²⁶⁴ In response to public concern, Congress directed EPA to commission a study "designed to assess the potential impacts of hydraulic fracturing on drinking water resources and to identify the driving factors that affect the severity and frequency of any impacts."²⁶⁵ The plan includes five fundamental research questions, all concerned with the potential contamination of drinking water.²⁶⁶ Interim results are expected to be released for public comment

²⁶⁰ *Id.*

²⁶¹ *Id.* § 1(a). Hydrogen sulfide was inadvertently listed as a hazardous air pollutant in the Clean Air Act, apparently due to clerical error. It was subsequently delisted in 1991. However, new studies demonstrate that the gas, which smells like rotten eggs and is found in substantial concentrations in the earth's crust, and thus in oil and gas located there, may be harmful to humans given prolonged exposure. See, e.g., Ilan Brat, *A Gas Under Pressure*, WALL ST. J., Dec. 11, 2007, at B1.

²⁶² H.R. 1204 § 1(b). Representative Polis emphasized the importance of aggregation by analogizing to automobiles. He noted, "Surely we wouldn't assume that as long as one car meets emissions standards, 20,000 cars wouldn't affect air quality." Press Release, On the Heels of FRAC Act and Air Quality Concerns, Polis, Hinchey, and Holt Introduce BREATHE Act to Close Drilling Industry Exemptions in Clean Air Act (Mar. 17, 2011), available at <http://polis.house.gov/News/DocumentSingle.aspx?DocumentID=229905>.

²⁶³ H.R. 1204, GOVTRACK, <http://www.govtrack.us/congress/bills/112/hr1204> (last visited Oct. 14, 2012).

²⁶⁴ EPA, EPA-600-R11-122, PLAN TO STUDY THE POTENTIAL IMPACTS OF HYDRAULIC FRACTURING ON DRINKING WATER RESOURCES (Nov. 2011) [hereinafter PLAN], http://www.epa.gov/hfstudy/HF_Study_Plan_110211_FINAL_508.pdf.

²⁶⁵ *Id.* at viii.

²⁶⁶ *Id.* at ix.

sometime in 2012, with an additional report scheduled for publication in 2014.²⁶⁷ EPA has identified retrospective case studies where drinking water contamination is suspected, and prospective case studies where stakeholders have indicated concern for future contamination.²⁶⁸ The case studies span all major shale plays in the United States.²⁶⁹

Meaningful participation in the public process is vital to the success of any eventual regulatory scheme. The natural gas industry has expressed concern about the feasibility of federal oversight in general, and about the broad scope of this study.²⁷⁰ However, EPA commissioned the study rather early in the fracking controversy, and missed important potential research areas, including “air impacts, ecological effects, seismic risks, public safety, and occupational risks” which though beyond the scope of the current study, “should be examined in the future.”²⁷¹ While the study will likely result in important research concerning drinking water contamination, EPA should be mindful of dragging its feet on other areas of potential regulation, particularly effects on air quality and climate change.

D. Regulation at the State Level

Fracking’s proponents stress that the states have always had authority over their own oil and gas sectors, and imply that the states themselves do an adequate job of regulation.²⁷² After all, each state can theoretically tailor regulations to its geological conditions and local circumstances.²⁷³ The realities of state regulatory oversight in an era of tight state budgets largely suggest otherwise, though.²⁷⁴ However, where states are addressing environmental concerns with a heavier hand—particularly with respect to

²⁶⁷ *Id.* at x.

²⁶⁸ *Id.* at ix–x.

²⁶⁹ *Id.* at 58, 62, 66.

²⁷⁰ See, e.g., Abrahm Lustgarten, *Broad Scope of EPA’s Fracturing Study Raises Ire of Gas Industry*, PROPUBLICA (Apr. 7, 2010 7:09 AM), <http://www.propublica.org/article/broad-scope-of-epas-fracturing-study-raises-ire-of-gas-industry>.

²⁷¹ PLAN, *supra* note 264, at xi.

²⁷² See Dlouhy, *supra* note 133.

²⁷³ *Id.*

²⁷⁴ See Hannah Wiseman, *Fracturing Regulation Applied*, 22 DUKE ENVTL. L. & POL’Y F. 361, 371–77 (2012) (“Some state agencies tasked with executing environmental regulations—often in addition to ensuring oil and gas conservation and protecting mineral rights—have been overwhelmed by the pace and volume of new development.”).

fluid disclosure requirements²⁷⁵—the federal government may have something to learn.

That fracking regulation varies significantly from state to state is an understatement. At one extreme is New York, which passed a temporary moratorium on fracking in late 2010.²⁷⁶ That moratorium technically expired in 2011, but a de facto moratorium continues as the state's Department of Environmental Conservation reviews the more than 61,000 public comments made to its proposed regulations.²⁷⁷ Before the final regulations are issued, drilling is unlikely to take place, and the New York State Assembly may vote to extend the moratorium until EPA releases its interim findings in 2012.²⁷⁸

In other states, though, less comprehensive ad hoc legislation continues to arise as new concerns come to light. Pending and withdrawn legislation in dozens of states includes provisions related to fluid monitoring and disclosure of chemical additives in fracking fluid, fluid disposal and testing, well regulation and inspection, air quality, etc.²⁷⁹ New Jersey and Pennsylvania adopted resolutions urging enactment of the FRAC Act, while Kansas and North Dakota adopted resolutions asking Congress to protect states' rights and explicitly delegate responsibility for regulating fracking to the states.²⁸⁰

It is one thing for a state legislature to respond to perceived environmental threats and weaknesses in a regulatory regime by enacting a law, but quite another thing for an already-stressed state agency to enforce new regulations covering an increasing variety and number of wells. A 2009 study solicited data concerning the number of new wells drilled and the number of enforcement personnel from all thirty-two oil and gas

²⁷⁵ Jacquelyn Pless, *Fracking Update: What States Are Doing to Ensure Safe Natural Gas Extraction*, NAT'L CONF. STATE LEGISLATURES, <http://www.ncsl.org/issues-research/energyhome/fracking-update-what-states-are-doing.aspx> (last updated July 2011).

²⁷⁶ Mireya Navarro, *N.Y. Assembly Approves Fracking Moratorium*, N.Y. TIMES (Nov. 30, 2011, 12:25 PM), <http://green.blogs.nytimes.com/2010/11/30/n-y-assembly-approves-fracking-moratorium>.

²⁷⁷ Associated Press, *'Fracking' Regs Need Work, Official Says*, MIDDLETOWN TIMES HERALD-RECORD (Feb. 8, 2012, 2:00 AM), <http://www.recordonline.com/apps/pbcs.dll/article?AID=/20120208/NEWS/202080346>.

²⁷⁸ *Id.*

²⁷⁹ See Pless, *supra* note 275.

²⁸⁰ *Id.*

producing states.²⁸¹ In the twenty-two states that provided the most complete data, on average the number of new wells drilled increased by 42% from 2004 to 2008, while the number of enforcement personnel increased by only 9%.²⁸² Five of those states actually increased their enforcement actions despite a decreasing staff-to-well ratio, but other states struggled to keep up.²⁸³ For example, as of 2009, West Virginia employed seventeen inspectors to monitor the state's 55,222 wells.²⁸⁴ To pay a single visit to each well once per year, each inspector would have to inspect nine wells daily, every day of the year.²⁸⁵ To add new regulations to an inspector's already-full plate seems unfathomable. Fortunately, some states—notably Texas and Colorado—are taking a proactive approach that may inform a comprehensive federal regulatory regime.

In May 2011, the Texas legislature directed the Texas Railroad Commission, the state's oil and gas overseer, to establish a disclosure process for fracking chemicals.²⁸⁶ As of February 1, 2012, drilling permits issued to new wells will subject the wells to mandatory chemical disclosure requirements.²⁸⁷ Drillers will also be required to disclose the amount of water used to frack new wells.²⁸⁸ Colorado adopted even tougher rules after days of negotiations among stakeholders and a helping hand from Governor John Hickenlooper.²⁸⁹ There, within sixty days of the fracking job, drilling companies will be required to file a list of all the chemical constituents in fracking fluid, as well as the concentrations

²⁸¹ See Jeff Larson, *How Big is the Gas Drilling Regulatory Staff in Your State?*, PROPUBLICA, <http://projects.propublica.org/gas-drilling-regulatory-staffing/> (last visited Oct. 14, 2012); Abrahm Lustgarten, *State Oil and Gas Regulators Are Spread Too Thin to Do Their Jobs*, PROPUBLICA (Dec. 30, 2009, 1:38 PM), <http://www.propublica.org/article/state-oil-and-gas-regulators-are-spread-too-thin-to-do-their-jobs-1230>.

²⁸² Larson, *supra* note 281.

²⁸³ Lustgarten, *supra* note 281.

²⁸⁴ *Id.*

²⁸⁵ *Id.*

²⁸⁶ David Wethe, *Texas, Colorado Drillers Must Disclose Fracking Chemicals*, BLOOMBERG (Dec. 13, 2011, 4:51 PM), <http://www.bloomberg.com/news/2011-12-13/texas-drillers-to-disclose-chemicals-used-in-fracturing-1-.html>.

²⁸⁷ Kate Galbraith, *Texas Fracking Disclosures to Include Water Totals*, TEXAS TRIB. (Jan. 16, 2012), <http://www.texastribune.org/texas-environmental-news/water-supply/fracking-disclosure-texas-includes-water-volumes>.

²⁸⁸ *Id.* This is of particular interest given the recent drought in Texas.

²⁸⁹ Mark Jaffe, *Colorado Approval of Fracking Fluids' Full Disclosure Came After Long Negotiations and Nudge from Governor*, DENVER POST (Dec. 14, 2011, 1:00 AM), http://www.denverpost.com/business/ci_19542430.

used.²⁹⁰ The lists will be available on the FracFocus website, but the Colorado Oil and Gas Conservation Commission has pledged to include the information in a more search-friendly format on its own website if FracFocus does not improve its searching features.²⁹¹

Trade secret protection for proprietary chemicals was a sticking point in the negotiations, but both sides compromised by finding an innovative solution: requiring a company to attest, under penalty of perjury, that a chemical is proprietary.²⁹² Even if the chemical is proprietary, its family and its concentration still must be included.²⁹³ Finally, the rule requires companies to send literature on fracking to nearby property owners, including information on baseline well-water testing.²⁹⁴

Colorado's disclosure rule is the "most comprehensive in the country,"²⁹⁵ and some hope "the Colorado rule can serve as the model for states across the nation."²⁹⁶ It might also make a good model for a federal disclosure requirement. For one, the perjury penalty gives the trade secret exemption teeth. If a company has something to hide, it must either change the chemical makeup of its fracking fluid, or risk harsh legal penalties.²⁹⁷ If there is nothing to hide, though, the rule does not overburden drillers.²⁹⁸ What this amounts to for environmentalists and landowners, of course, is peace of mind.

E. Regulation at the Local Level: Home Rule and Preemption

Municipalities that wish to regulate oil and gas operations tend to cite to their home-rule authority.²⁹⁹ A home-rule charter is essentially a local constitution, adopted pursuant to state constitutional provisions, governing

²⁹⁰ *Id.*

²⁹¹ *Id.*; Wethe, *supra* note 286.

²⁹² Jaffe, *supra* note 289.

²⁹³ *Id.*

²⁹⁴ *Id.*

²⁹⁵ *Id.*

²⁹⁶ Wethe, *supra* note 286 (quoting Matt Watson, a senior energy policy manager at the Environmental Defense Fund in Washington D.C.).

²⁹⁷ *See* Jaffe, *supra* note 289.

²⁹⁸ One Halliburton executive noted that "under these rules reverse engineering won't be possible." *Id.*

²⁹⁹ *N.E. Natural Energy, LLC v. City of Morgantown*, No. 11-C-411, slip op. at 7 (W. Va. Cir. Ct. Aug. 12, 2011), *available at* http://www.frackinginsider.com/Tucker_Marcellus_Order.pdf.

local affairs.³⁰⁰ Because the charter is authorized by the state's constitution it is also limited by the state's constitution, and this burden can be substantial:

As a general rule, home-rule bodies may not enact ordinances conflicting with general state laws. Accordingly, a charter municipality does not have the power to enforce ordinances that conflict with state law Any doubt about the extent to which a power attempted to be exercised under the home-rule provisions of a state constitution may affect the operation of a state statute is to be resolved against the ordinance and in favor of the statute.³⁰¹

In sum, basic principles of federalism suggest that state laws preempt local ordinances, and this has been the rule expressed by the courts that have addressed zoning ordinances.³⁰²

For example, in the first decision to strike down a municipal ordinance banning fracking, a West Virginia court examined a Morgantown city ordinance prohibiting “[d]rilling a well for the purpose of extracting or storing oil or gas using horizontal drilling with fracturing or fracking methods within the limits of the City of Morgantown or within one mile of the corporate limits of the City of Morgantown.”³⁰³ Northeast Natural Energy (Northeast), having already obtained state permits and agreed to environmental safeguards beyond what the state required, brought suit, seeking declaratory and injunctive relief.³⁰⁴ Northeast contended that the West Virginia Department of Environmental Protection's (WVDEP) regulations preempted the local ordinance and precluded its enforcement,³⁰⁵ but the City maintained that its home rule charter gave it the authority to regulate nuisances within and nearby the city.³⁰⁶

³⁰⁰ 56 AM. JR. 2D *Municipal Corporations, Counties, and Other Political Subdivisions* § 110 (2010).

³⁰¹ *Id.* § 112.

³⁰² *See, e.g.*, N.E. Natural Energy, LLC v. City of Morgantown, No. 11-C-411, slip op. at 7 (W. Va. Cir. Ct. Aug. 12, 2011), *available at* http://www.frackinginsider.com/Tucker_Marcellus_Order.pdf.

³⁰³ *Id.* at 3–4.

³⁰⁴ *Id.* at 2.

³⁰⁵ *Id.* at 5.

³⁰⁶ *Id.* at 7–8.

Prior to a final hearing, the parties requested to submit briefs on preemption.³⁰⁷ Shortly thereafter, the court granted summary judgment to Northeast, holding that given WVDEP's exclusive control over oil and gas development and production, there is "no exception or latitude to permit the City of Morgantown to impose a complete ban on fracking or to regulate oil and gas development and production."³⁰⁸ Interestingly, the court was "mindful" of environmental concerns, but noted that the state was already addressing them.³⁰⁹

The legal issue in this case was an easy one, and the holding will no doubt be replicated in pending litigation throughout the country.³¹⁰ Fortunately, though, local regulation of shale gas development is far from ideal.³¹¹ Ad hoc regulation of this sort burdens the industry with

³⁰⁷ *Id.* at 2.

³⁰⁸ *Id.* at 9–10.

³⁰⁹ *Id.*

³¹⁰ However, in February 2012, two lower courts in New York upheld municipal bans on fracking enacted by the towns of Middlefield and Dryden despite quite clear preemption language drafted by the New York legislature. Maura Stephens, *Fracking Bans that Can Stand*, YES! (Feb. 29, 2012), <http://www.yesmagazine.org/planet/banning-fracking-in-new-york2014for-go>. Both rulings have been appealed, in part because of the curious rationales offered. Chris Dolmetsch & Jim Efstathiou Jr., *New York Drilling Ban Rulings Being Appealed, Lawyers Say*, BLOOMBERG BUSINESSWEEK (Mar. 30, 2012), <http://www.businessweek.com/news/2012-03-30/anschutz-files-appeal-notice-in-fracking-case-lawyer-says>. For example, the *Anschutz* court cited—while attempting to distinguish—a Pennsylvania Supreme Court decision that affirmed the majority rule that state legislative action preempts local bans. *Anschutz Exploration Corp. v. Town of Dryden*, 940 N.Y.S.2d 458, 473 (N.Y. Sup. Ct. 2012). The Pennsylvania Supreme Court stated in that case that "once the state has acted . . . the township is foreclosed from exercising [its] police power [T]he comprehensive nature of the statutory scheme regulating oil and gas well operations reflects a need for uniformity so that the purposes of the legislature can be accomplished." *Range Resources—Appalachia, LLC v. Salem Twp.*, 964 A.2d 869, 871–72 (Pa. 2009).

Furthermore, at least one state legislator in New York wants to pass home rule bills removing specific grants of authority over oil and gas drilling to the state. In theory, this would allow more substantial local regulation. See Mary Esch, *N.Y. Gas Drilling Opponents Aim for Local-Based Bans*, POCONO REC. (Jan. 3, 2012), <http://www.pocconorecord.com/apps/pbcs.dll/article?AID=/20120103/NEWS90/201030309/-1/rss01>.

³¹¹ See Freeman Klopott & Jim Efstathiou Jr., *New York Fracking Advocates Say Local Bans Are 'Kiss of Death,'* BLOOMBERG (Jan. 17, 2012, 12:00 AM),
(continued)

unnecessary litigation costs, and impedes progress at the state and federal level to address environmental issues.

F. Regulation at the International Level

The United States is not the only nation torn between the energy potential locked within shale miles underground and the environmental risks associated with unlocking and developing that potential.³¹² As the French Environment Minister Nathalie Kosciusko-Morizet said before the French parliament voted on a fracking ban, “We are at the end of a legislative marathon that stirred emotion from lawmakers and the public.”³¹³ The next day, June 30, 2011, a partisan vote made France the first country to enact a complete ban on fracking.³¹⁴ According to the bill, exploration companies with existing permits were given two months to decide whether to use hydraulic fracturing; if they chose to frack, their permits would be revoked.³¹⁵

France has since maintained that it will not lift the ban “until it has been shown that technologies used for development respect the environment, the complex nature of soil and water networks.”³¹⁶ Other nations may well await the legal fallout in France before addressing their own regulatory schemes, as companies will certainly challenge the revocation of their permits.³¹⁷ If so, outcomes in France, in tandem with mounting legal challenges in the United States, will likely influence exploration elsewhere.³¹⁸

<http://www.bloomberg.com/news/2012-01-17/new-york-fracking-advocates-say-local-bans-are-kiss-of-death-.html>.

³¹² See, e.g., Tara Patel, *France Vote Outlaws ‘Fracking’ Shale for Natural Gas, Oil Extraction*, BLOOMBERG (July 1, 2011, 6:22 AM), <http://www.bloomberg.com/news/2011-07-01/france-vote-outlaws-fracking-shale-for-natural-gas-oil-extraction.html>.

³¹³ *Id.*

³¹⁴ *Id.*

³¹⁵ *Id.*

³¹⁶ Tara Patel, *France to Keep Fracking Ban to Protect Environment, Sarkozy Says*, BUSINESS WEEK (Oct. 4, 2011), <http://www.businessweek.com/news/2011-10-04/france-to-keep-fracking-ban-to-protect-environment-sarkozy-says.html>.

³¹⁷ Patel, *supra* note 312.

³¹⁸ Total SA, Europe’s third-largest oil company, and one faced with a permit revocation in France, plans to develop unconventional gas in Algeria, Argentina, Australia, Canada, China, Denmark, and Poland as well. Patel, *supra* note 316.

IV. THE FUTURE OF FRACKING

A. *Don't Use the Water: Propane-Based Fracking "Leaves the 'Nasties' in the Ground, Where They Belong"*

Technology-forcing regulation spurred automobile manufacturers, despite industry inertia, to develop the catalytic converter in the 1970s.³¹⁹ Today, information disclosure requirements and right-to-know laws place information in the hands of stakeholders, including citizens and environmental groups, enabling them to put public pressure on polluters to become greener.³²⁰ Though technology-forcing laws—fracking bans—have not been enacted widely, and voluntary disclosure of fracking chemicals is only a step down the road to mandatory disclosure laws, the oil and gas industry is already starting to innovate.³²¹

Since 2008, a small Canadian energy company, GasFrac, based in Calgary, Alberta, has been perfecting a waterless method called liquefied propane gas (LPG) fracturing, or “gas fracking.”³²² This method substitutes gelled propane gas for water, and like water, the gel carries proppant.³²³ While it may seem odd to inject *propane* gas into shale to capture *natural* gas, this innovative method has several important advantages. First, because of the enormous pressure and heat, the liquefied gas reverts to vapor underground and returns up the well to the surface for collection.³²⁴ Second, any drilling chemicals and radioactive material

³¹⁹ ROBERT V. PERCIVAL ET AL., ENVIRONMENTAL REGULATION: LAW, SCIENCE, AND POLICY 565–66 (5th ed. 2006).

³²⁰ See Cary Coglianese & Jennifer Nash, *The Promise and Performance of Management-Based Strategies*, in LEVERAGING THE PRIVATE SECTOR: MANAGEMENT-BASED STRATEGIES FOR IMPROVING ENVIRONMENTAL PERFORMANCE 250 (Cary Coglianese & Jennifer Nash eds., 2006) (discussing how empowered stakeholders can pressure the firms' decision makers).

³²¹ See Andrew C. Revkin, *A Fracking Method with Fewer Water Woes*, N.Y. TIMES (Nov. 8, 2011, 1:53 PM), <http://dotearth.blogs.nytimes.com/2011/11/08/a-fracking-method-with-fewer-water-woes> (“This is how the world works, for better and worse. Energy needs and economic forces drive innovation, both in using energy more thriftily and finding new sources. Environmental issues arise. Pressure builds for change. Regulations and rules evolve. Industry resists. Lawsuits and environmental campaigns ensue. Innovations occur. And the human enterprise, often in herky-jerky fashion, moves forward.”).

³²² Brian Nearing & Anthony Brino, *Cutting Waste in Gas Drilling*, ALBANY TIMES-UNION (Nov. 7, 2011, 9:00 AM), <http://www.timesunion.com/local/article/Cutting-waste-in-gas-drilling-2254667.php>.

³²³ *Id.*

³²⁴ *Id.*

naturally found underground stay there.³²⁵ As GasFrac's Chief Technology Officer says, "We leave the nasties in the ground, where they belong."³²⁶

The import of this innovation is two-fold. For one, gas fracking eliminates the need to transport and treat millions of gallons of produced wastewater, an extraordinary expense and nuisance associated with traditional fracking.³²⁷ It can also be more efficient, as "[a]ll the propane leaves the fractured rocks, unlike water, part of which remains behind and can be absorbed into rock to partially block the pathways for gas to escape."³²⁸

Only a few years in the making, gas fracking faces a number of hurdles. First, it is unproven. While nearly one thousand wells—mostly in Canada, and a handful in the United States—have used the technique since 2008, only two case studies have been done.³²⁹ Compared to sixty-plus years of experience³³⁰ and one million test runs³³¹ with traditional fracking methods, such a brief record is not likely to inspire a "conservative industry" to spend millions to make changes to a process that it contends works.³³²

Second, propane itself is more costly than water, notwithstanding the added expense of protecting against its explosive nature.³³³ Moreover, the technology is proprietary to GasFrac, and the company is waiting on a United States patent before entering the domestic market on a larger scale.³³⁴ Until then, GasFrac's trade secrets may be at risk, and GasFrac is not yet large enough to make its method available more widely.³³⁵ The

³²⁵ *Id.*

³²⁶ *Id.*

³²⁷ *Id.*

³²⁸ *Id.*

³²⁹ *Id.*

³³⁰ *Id.*

³³¹ THE ENERGY INST., FACT-BASED REGULATION FOR ENVIRONMENTAL PROTECTION IN SHALE GAS DEVELOPMENT 7 (2012), http://energy.utexas.edu/images/ei_shale_gas_regulation120215.pdf.

³³² Nearing & Brino, *supra* note 322.

³³³ *Id.* In January 2011, three Husky Energy workers suffered non-life-threatening burns after a flash fire at an LPG gas well being drilled in Alberta, Canada. GasFrac responded by increasing the number of propane sensors from three to twenty, and adding an infrared video monitor that allows crews to see gas leaks. *Id.*

³³⁴ *Id.*

³³⁵ *Id.*

company “envisions forming ‘strategic alliances’ with larger, unidentified drilling companies to make its process more available.”³³⁶

Finally, the infrastructure to handle the propane is vital to the success of the technology.³³⁷ Companies using gas fracking will need a large supply of propane, and “sufficient infrastructure . . . in place to allow the propane to be captured and reused.”³³⁸ These are all formidable obstacles, suggesting that gas fracking is no cure-all, but rather a longer-term solution that will take time to mature. Theoretically, it reduces the risk of groundwater pollution, but leaves the problem of air pollution unsolved, because it still involves large drilling operations emitting burnt fossil fuels.

B. Protecting the “Social License to Operate”: Risk Disclosure and Best Management Practices

As the promise of an energy independent America continues to clash with the prospect of fracking’s detrimental environmental impact, investors in the large public oil and gas developers will likely put more and more pressure on management to disclose risks and adopt best practices. At the request of energy companies, as fracking expanded, the Interfaith Center on Corporate Responsibility³³⁹ and the Investor Environmental Health Network³⁴⁰ teamed up with investors to develop management goals for natural gas operations.³⁴¹ A guide for companies was published in late 2011 after eighteen months of input.³⁴²

According to the guide, transparency is paramount:

Companies must be publicly transparent about managing their environmental footprint and social impacts, and engage with key community stakeholders to earn and

³³⁶ *Id.*

³³⁷ *Id.*

³³⁸ *Id.*

³³⁹ “ICCR is the pioneer coalition of active shareholders who view the management of their investments as a catalyst for change.” It has 300 member organizations with over \$100 billion in assets. INTERFAITH CTR. ON CORPORATE RESPONSIBILITY AND INVESTOR ENVTL. HEALTH NETWORK, EXTRACTING THE FACTS: AN INVESTOR GUIDE TO DISCLOSING RISKS FROM HYDRAULIC FRACTURING OPERATIONS (2011), <http://www.iccr.org/issues/subpages/ExtractingTheFacts121311LR.pdf>.

³⁴⁰ IEHN is a “collaborative partnership of investment managers and advisors concerned about the impact of corporate practices on environmental health, including the public health risks associated with corporate toxic chemical policies.” *Id.*

³⁴¹ *Id.*

³⁴² *Id.*

maintain their social license to operate. Transparency requires full disclosure of steps being taken to minimize risks, acknowledgement of challenges and failures, and clearly defined steps to continually improve operations.³⁴³

With these ideas in mind, the guide lists twelve core management goals for natural gas operations.³⁴⁴ This comprehensive list is governed by the principle of “comply or explain.”³⁴⁵ Many of the goals and their associated best management practices can be universally implemented, but “[w]here ‘one size does not fit all’, [sic] variances from the preferred norm should be explained.”³⁴⁶

Any federal regulatory scheme should be mindful of industry best practices, and seek to adopt regulations that complement and aid the adoption of such practices. However, if a universal solution is not optimal, built-in exemptions and exceptions should be carefully drafted so as not to swallow the rules themselves. In other words, the governing principle, at least where federal regulation is concerned, should be “comply, *or in extraordinary situations*, explain.”

C. Subsidizing a Solution

On December 20, 2011, the Research Partnership to Secure Energy for America (RPSEA) announced a request for proposals, funded to the tune of \$35 million, for both research and development projects and demonstration projects as part of its Unconventional Onshore Program.³⁴⁷ RPSEA is a nonprofit corporation that “currently consists of over 100 consortium members representing virtually all sectors of the natural gas and oil supply technology value chain.”³⁴⁸

The statement of program opportunity underscores the lack of incentives afforded the industry thus far, noting that a “basic principle of the program is to fund research, development and demonstration activities

³⁴³ *Id.* at 3.

³⁴⁴ *Id.* at 4–5.

³⁴⁵ *Id.* at 5.

³⁴⁶ *Id.*

³⁴⁷ RESEARCH P'SHIP TO SECURE ENERGY FOR AM., REQUEST FOR PROPOSAL (RFP2011UN001), UNCONVENTIONAL ONSHORE PROGRAM 5 (Dec. 20, 2011) [hereinafter RFP], http://www.rpsea.org/attachments/contentmanagers/43/RFP-DOC-RFP2011UN001_Final-12-20-11_P.pdf.

³⁴⁸ *Frequently Asked Questions*, RES. PARTNERSHIP TO SECURE ENERGY FOR AM., <http://www.rpsea.org/faqs> (last visited Jan. 31, 2013).

that would not be undertaken by industry in the absence of public funding.”³⁴⁹ Thus, the solicitation is “directed toward developing technology to address the concerns associated with shale gas development” and includes four specific topics to which proposals should be addressed.³⁵⁰ How far \$35 million goes toward assuaging environmental concerns remains to be seen, but the four topics illustrate the perceived environmental threat from fracking fluid, suggesting that a proper regulatory scheme should address fluid use and disposal in fracking operations.

D. A Good Fracking Fit: Bridging the Gap to Renewables

Fracking proponents see unconventional natural gas as the ideal bridge fuel until renewables like wind and solar become more practicable.³⁵¹ Two significant recent events both raised alarm concerning the world’s two largest sources of energy and underscored that need for affordable renewables.

In March 2011, a devastating earthquake and tsunami caused a meltdown at Japan’s Fukushima Daiichi nuclear power plant, leading to the largest radiation leak since the Chernobyl disaster of 1986.³⁵² Shortly thereafter, Japan, a nation with a burgeoning nuclear energy program set to meet half of Japan’s energy needs by 2030, issued a wholesale change in strategy, instead supporting a populist movement to become a nuclear-free nation.³⁵³ In a press conference, the Japanese Premier said: “By reducing reliance on nuclear power gradually, we will aim to become a society which can exist without nuclear power.”³⁵⁴ On the other side of the Pacific, the United States is reassessing its own future as a nuclear nation. One recent report suggests that the “regulatory fallout from the Fukushima power plant disaster . . . will short-circuit the U.S. nuclear renaissance of new power plant construction.”³⁵⁵ Despite the environmental dangers

³⁴⁹ RFP, *supra* note 347, at 1.

³⁵⁰ *Id.* at 2–3.

³⁵¹ See Brooks, *supra* note 31; Jaffe, *supra* note 31.

³⁵² Harumi Ozawa, *Japan PM Urges Nuclear-Free Future*, AFP (July 13, 2011), <http://www.google.com/hostednews/afp/article/ALeqM5jubRrCrEFfab89trVKbwqsp8LjUA?docId=CNG.ad3a22e0abc4c1fa82f883f49efc2c9b.451>.

³⁵³ *Id.*

³⁵⁴ *Id.*

³⁵⁵ See Ronald D. White, *Report: U.S. Nuclear Renaissance Unlikely After Fukushima*, L.A. TIMES MONEY & COMPANY BLOG (Dec. 28, 2011, 2:37 PM), http://latimesblogs.latimes.com/money_co/2011/12/a-new-study-released-today-said-that-

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associated with fracking, fears concerning resource extraction still pale in comparison to vivid images of atomic energy mishaps. Thus, an American nuclear renaissance will likely be postponed, and substitute energy sources may be poised to step up to the plate.

The second indirect benefactor to hydraulic fracturing came in the form of new air pollution regulations, known as the Mercury and Air Toxics Standards or MATS, which apply primarily to the most traditional source of electricity in the world, coal-fired power plants.³⁵⁶ The final standards, passed in late 2011 after twenty years in the making, sharply limit emissions of mercury and other toxins from the nation's power plants.³⁵⁷ EPA estimates the new rule will affect approximately 1,100 existing coal-fired units at 600 power plants around the nation, at a cost of approximately \$9.6 billion annually.³⁵⁸ Affected utilities threatened to challenge the rule, citing prohibitive costs, closed power plants, lost jobs, and potential outages.³⁵⁹ An industry spokesperson claimed "this rule is the most expensive air rule that E.P.A. has ever proposed in terms of direct costs It is certainly the most extensive intervention into the power market and job market that E.P.A. has ever attempted to implement."³⁶⁰

Given this new rule and its associated costs, operators of coal-fired plants may transition some resources away from coal-burning plants and toward unconventional natural gas development. This would be a boon to the natural gas industry, but it would truly add value only if the increased

theregulatory-fallout-from-the-fukushima-power-plantdisaster-in-japan-last-marchwill-pro.html (referencing MARK COOPER, NUCLEAR SAFETY AND NUCLEAR ECONOMICS: HISTORICALLY, ACCIDENTS DIM THE PROSPECTS FOR NUCLEAR REACTOR CONSTRUCTION; FUKUSHIMA WILL HAVE A MAJOR IMPACT 14, <http://www.markcooperresearch.com/Nuclear-Safety-and-Nuclear-Economics-Post-Fukushima.pdf>).

³⁵⁶ *Mercury and Air Toxics Standards (MATS) for Power Plants: Basic Information*, EPA, <http://www.epa.gov/mats/basic.html>.

³⁵⁷ National Emission Standards for Hazardous Air Pollutants from Coal- and Oil-Fired Electric Utility Steam Generating Unites and Standards of Performance for Fossil-Fuel-Fired Electric Utility, Industrial-Commercial-Institutional, and Small Industrial-Commercial Institutional Steam Generating Units, 77 Fed. Reg. 9,304 (Feb. 16, 2012) (to be codified at 40 C.F.R. pts. 60 and 63).

³⁵⁸ Fact Sheet, U.S. Environmental Protection Agency, Mercury and Air Toxics Standards for Power Plants, <http://www.epa.gov/mats/pdfs/20111221MATSummaryfs.pdf>.

³⁵⁹ John M. Broder, *E.P.A. Sets Poison Standards for Power Plants*, N.Y. TIMES, Dec. 22, 2011, at A26.

³⁶⁰ *Id.*

attention and investment is accompanied by a real interest in environmental responsibility.

V. CONCLUSION: ENHANCING THE FEDERAL REGULATORY SCHEME

It seems that the two most important takeaways from the fracking conundrum as it stands now are simple. First, water and air pollution are likely resulting from the oil and gas development process, if not from fracking itself. Second, if this is not the case, and the process is in fact perfectly safe, then the oil and gas industry has nothing to hide. Minimal, even barebones, federal regulation can level the playing field across the country by preempting a hodgepodge of haphazard state regulations.³⁶¹ Realistically, however, passage of the FRAC Act or similar legislation is improbable and may actually do more harm than good. There are simply not enough votes to repeal the Halliburton loophole, and doing so would result in chaos. Thus, stakeholders will have to reach a compromise on some difficult issues. Thankfully, despite rhetoric to the contrary, there is considerable middle ground between the “drill, baby, drill!” camp and those crying “ban fracking now!”

At least one article has proposed a model of modified cooperative federalism to find such middle ground.³⁶² Such a relationship would be “one in which the federal government agency produces a simple, final scientific answer to calm individual fears of new technology but leaves regulation to local governments.”³⁶³ Because air and water are migratory resources, however, the states cannot adequately regulate them,³⁶⁴ so such a model should “provide a flexible, national minimum standard that leaves room for state variation.”³⁶⁵

³⁶¹ See Exec. Order No. 13,605, 77 Fed. Reg. 23,107 (Apr. 13, 2012). The order created an Interagency Working Group to Support Safe and Responsible Development of Unconventional Domestic Natural Gas Resources. *Id.* The order noted that “[w]hile natural gas production is carried out by private firms, and States are the primary regulators of onshore oil and gas activities, the Federal Government has an important role to play by . . . setting sensible, cost-effective public health and environmental standards to implement Federal law and augment State safeguards” *Id.*

³⁶² Gianna Cricco-Lizza, Comment, *Hydraulic Fracturing and Cooperative Federalism: Injecting Reality into Policy Formation*, 42 SETON HALL L. REV. 703, 704 (2012).

³⁶³ *Id.*

³⁶⁴ *Id.* at 730.

³⁶⁵ *Id.* at 738.

A federal regulatory model would also avoid a race to the bottom, a phenomenon in which states competing to attract shale oil and gas development continue to adopt increasingly inadequate regulations to bring more operators in, to the detriment of the environment.³⁶⁶ Further, state and local governments may lack the resources to protect against the risks, and state bodies are more vulnerable to industry capture given “revolving-door connections to state regulators.”³⁶⁷ As Professor Wiseman writes, “In light of the current absence of federal regulation of several stages of the fracking process, states and the federal government must reevaluate the assumption that individual state regulations consistently and adequately fill each and every federal gap.”³⁶⁸

A comprehensive regulatory regime—a federal “floor”—should include three basic features: (1) mandatory disclosure rules for fracking fluid with more limited trade secret protections; (2) required methane emissions monitoring at drilling sites; and (3) enhanced wastewater treatment guidelines for spent fracking fluid. Such a framework addresses the most pressing water and air pollution concerns, obviating the need for narrow or otherwise ill-suited environmental statutes to serve as gap fillers.

A. *Fracking Chemical Disclosure*

Groundwater pollution from fracking is by far the most common and longstanding concern among the public.³⁶⁹ Thus, a mandatory disclosure rule should be the cornerstone of any piece of federal legislation. Professor Wiseman has identified a number of important benefits of such legislation, including improving citizen participation in policy discussions and agency monitoring, helping to verify or negate contamination claims and assist medical professionals, and benefitting cleanup efforts.³⁷⁰ Perhaps most importantly, “the publicization of information could spur fracturing companies to seek out safer chemicals if any raised red flags.”³⁷¹

³⁶⁶ See Wiseman, *supra* note 11 (“Indeed, some states appear to have avoided certain regulation expressly to attract industry—with Pennsylvania, for example, initially opposing a severance tax on gas and citing concerns about its effects on the rate of well development.”).

³⁶⁷ *Id.*

³⁶⁸ Wiseman, *supra* note 117, at 235.

³⁶⁹ Hannah Wiseman, *Trade Secrets, Disclosure, and Dissent in a Fracturing Energy Revolution*, 111 COLUM. L. REV. SIDEBAR 1, 8 (2011), http://www.columbialawreview.org/wp-content/uploads/2011/01/1_Wiseman.pdf.

³⁷⁰ *Id.* at 10.

³⁷¹ *Id.*

Additionally, “with full and accurate information about the fluids, individuals could ask a local lab or scientist to explain the hazards of the chemicals rather than having to guess.”³⁷²

Such a law might resemble the new Colorado rule, requiring all companies engaged in fracking to list and make available on the internet the chemicals anticipated to be used in each frack job.³⁷³ The website should be user friendly, with full-featured searching capabilities, and it should be housed and maintained on EPA servers. Companies should also be required to mail this list to homeowners, complete with information about baseline water testing.³⁷⁴ If the individual chemicals used or their concentrations are altered at any point during the fracking process, a new list should be issued and provided.

Importantly, the trade secret exemption should be narrowed in scope, so that it functions not only as a shield from disclosure, but as a sword as well.³⁷⁵ As with Colorado’s rule, the exemption should be backed by a penalty of perjury and tied to civil damages in an amount necessary to provide an effective level of deterrence.

B. Methane Emissions Monitoring

Only time will tell if fugitive methane leaking from large drilling operations presents the risk that a handful of scientists contend. Nevertheless, methane emissions monitoring is a win-win for the industry and for environmentalists. Leaks at a drilling site amount to inefficiencies, and one recent study found that a Colorado gas field leaks roughly 4% of its gross annual production into the atmosphere.³⁷⁶ This represents profits literally evaporating into the air, and the cost of complying with a federal mandate to reduce methane emissions may be cheap to come by, because

³⁷² Wiseman, *supra* note 117, at 283.

³⁷³ See discussion *supra* Part III.D.

³⁷⁴ This information should be provided well in advance of any fracking so homeowners may decide whether to have their wells tested.

³⁷⁵ See Wiseman, *supra* note 369, at 2 (“Unless Congress or state legislatures partially remove trade secret protections from fracking fluids, communities experiencing the brunt of the energy boom may have inadequate tools to evaluate and address the potential impacts of this development.”).

³⁷⁶ Pete Spotts, *Fracking Study Sends Alert About Leakage of Potent Greenhouse Gas*, CHRISTIAN SCI. MONITOR (Feb. 13, 2012, 7:24 PM), <http://www.csmonitor.com/USA/2012/0213/Fracking-study-sends-alert-about-leakage-of-potent-greenhouse-gas>.

leak-tight couplings, compressors, and pumps are inexpensive.³⁷⁷ Compliance may pay for itself.

For residents residing near gas wells that are being fracked, less methane means less of its cohorts: compounds that contribute to smog and carcinogenic compounds.³⁷⁸ Combine this with a reduced potential for devastating climate change, and methane emissions monitoring may help address largely ignored air pollution concerns.

C. Wastewater Treatment Guidelines

EPA's promise to propose effluent guidelines for flowback from fracking operations is among the most controversial and monumental tasks it will undertake in its regulatory efforts. For one, those standards will not be implemented until 2014, meaning, "[T]here is a risk that wastewater treatment plants operating under old Clean Water Act permits will accept and inadequately treat millions of gallons of flowback water before discharging it into surface waters."³⁷⁹

Further, because any proposed standards must account for feasibility, the industry has a powerful economic tool at its disposal: a quickly-increased supply of natural gas has reduced the industry's profit margins, making such environmentally friendly measures arguably less feasible to undertake.³⁸⁰ It would be both a shame and an irony if fracking wastewater regulation suffered precisely because the shale boom has reduced natural gas prices. EPA will need to stand firm against industry cost data, and be willing to craft other statutory provisions to reach fracking wastewater.

Additionally, legislators might consider phasing in wastewater recycling mandates—closed-loop systems—whereby the industry is required to recycle a certain percentage of fracking wastewater. Many

³⁷⁷ See SUSAN HARVEY ET AL., NAT'L RESOURCES DEF. COUNCIL, LEAKING PROFITS: HOW THE OIL AND GAS INDUSTRY CAN REDUCE POLLUTION, CONSERVE RESOURCES, AND MAKE MONEY BY PREVENTING METHANE WASTE 18 (2012), <http://www.nrdc.org/energy/files/Leaking-Profits-Report.pdf>.

³⁷⁸ Spotts, *supra* note 376.

³⁷⁹ Wiseman, *supra* note 11.

³⁸⁰ See Bridget DiCosmo, *EPA Sees Technology Limits in Plan to Set Water Standards for Gas Drilling*, INSIDE EPA, Oct. 21, 2011, <http://www.insideepa.com/201110212379937/EPA-Daily-News/Daily-News/epa-sees-technology-limits-in-plan-to-set-water-standards-for-gas-drilling/menu-id-95.html>.

companies are already doing this,³⁸¹ but federal guidelines would speed that process along and avoid an already-overburdened disposal system in some areas.

D. A Renewed Future

The natural gas in shale formations has been trapped there for millions of years, and it is not likely to disappear any time soon. The rush to tap this resource can be explained by any number of factors: a lagging economy, a desire for increased energy independence, lax federal and state regulations, and so on. Whatever the explanation for the shale gale, it is irresponsible to drill and frack at breakneck speed while comprehensive studies designed to shed more light on the environmental consequences of the process are in the works. A sensible regulatory framework can insure against environmental deterioration and degradation in the meantime, yet remain flexible for the future. That future will be all the more remarkable when, fifty or more years from now, the planet is powered by renewable sources of energy made possible because cleaner-burning natural gas was developed smartly in more desperate times.

³⁸¹ See Terry W. Roberson, *Environmental Concerns of Hydraulically Fracturing a Natural Gas Well*, 32 UTAH ENVTL. L. REV. 67, 125–26 (2012) (discussing those operators with recycling programs in place).