HYDRAULIC FRACTURING AND COOPERATIVE FEDERALISM: INJECTING REALITY INTO POLICY FORMATION

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I. INTRODUCTION

Energy independence and the importance of domestic sources of energy are pressing concerns in today's global political environment.[1] Shale gas development increasingly relies on hydraulic fracturing to stimulate production as domestic natural gas resources are depleted.[2] Hydraulic fracturing is a method of increasing the volume of coal-bed methane gas extracted from high-density sources.[3] Environmental organizations have raised serious concerns regarding states' diverse regulatory schemes and whether the federal government should provide uniform standards.[4] The Environmental Protec-

[*] J.D., May 2012, Seton Hall University School of Law; B.A., 2008, Columbia University. I want to express deep gratitude to Professor Marc Poirier for his excellent guidance and breadth of knowledge regarding all aspects of environmental law, to Brigitte Radigan for her supervision and valuable editing, and to my family, Evan Haggerty, and my friends for their comments and assistance.

[1] *See* INTERSTATE OIL & GAS COMPACT COMM'N, RESOLUTION 09.102: SUPPORTING HYDROCARBON EXPLORATION AND DEVELOPMENT IN THE COASTAL PLAIN OF ANWR AS PART OF THE NATIONAL ENERGY POLICY (2009) (noting that importing sixty percent of oil that the United States needs costs more than $400 billion every year, without considering the costs of providing military protection to that oil supply).

[2] *See* INTERSTATE OIL & GAS COMPACT COMM'N, RESOLUTION 09.106: SUPPORTING CONTINUED ENVIRONMENTALLY RESPONSIBLE DEVELOPMENT OF SHALE GAS IN THE UNITED STATES (2009) (noting that "domestic production of natural gas is expected to increase as a share of U.S. supply from 84 percent in 2007 to 97 percent in 2030," with shale gas formations gaining prominence as the fastest growing source within the same timeframe); ANDREW BRADFORD, BENTEK ENERGY, MARCELLUS SHALE & IMPLICATIONS FOR THE NORTHEAST 13 (2010) (indicating that Pennsylvania's active rig count—including directional, vertical, and horizontal wells—increased from forty in April 2009 to 115 in April 2010), *available at* http://www.narucmeetings.org/Presentations/BENTEK_Market_Update__MACRUC_100629.pdf.

[3] ENVTL. PROT. AGENCY, OPPORTUNITY FOR STAKEHOLDER INPUT ON EPA'S HYDRAULIC FRACTURING RESEARCH STUDY: STUDY DESIGN 1 (2010), *available at* http://www.epa.gov/safewater/uic/pdfs/hydrofrac_landscapemodel.pdf.

[4] *See infra* notes 39–46 and accompanying text.

tion Agency's (EPA) future role in regulation of this process is unclear.

This Comment argues that a model of modified cooperative federalism should be applied to the controversy surrounding the EPA's regulation of hydraulic fracturing. A relationship of this nature—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—will provide more comprehensive, protective, and accountable regulation of the industry, while preserving some balance between the competing environmental and industrial interests. Part II discusses background information regarding the mechanical process of hydraulic fracturing. Part III focuses on already implemented state solutions in addition to issues arising in states overlaying the Marcellus Shale. Part III also briefly identifies which federal statutes regulate parts of the hydraulic fracturing process and which gaps the Fracturing Responsibility and Awareness of Chemicals Act ("FRAC Act") is intended to fill. Part III additionally surveys science and policy related to the EPA's regulation of this area, particularly the precautionary principle, and analyzes a previous study of hydraulic fracturing. Part IV presents the concept of cooperative federalism and an illustration of how lack of designated authority has resulted in a catastrophic breakdown where federal and state powers overlap. Part V analyzes how to apply cooperative federalism to the controversy surrounding the EPA's regulation of hydraulic fracturing. Finally, Part VI summarizes the reasons why such a model should prevail in a situation where competing, highly valued interests must be balanced.

II. BACKGROUND

A. Geology of the Marcellus Shale

For the past sixty years,[5] commercial use of hydraulic fracturing has helped exploration and development companies access uncon-

[5] "The first commercial application of hydraulic fracturing as a well treatment technology designed to stimulate the production of oil or gas likely occurred in either the Hugoton field of Kansas in 1946 or near Duncan Oklahoma in 1949." GROUND WATER PROT. COUNCIL & U.S. DEP'T OF ENERGY, STATE OIL AND NATURAL GAS REGULATIONS DESIGNED TO PROTECT WATER RESOURCES 21 (2009), *available at* http://www.gwpc.org/elibrary/documents/general/State%20Oil%20and%20Gas%20Regulations%20Designed%20to%20Protect%20Water%20Resources.pdf.

ventional[6] sources of methane gas and has stimulated production in subsiding wells.[7] Recent utilization of the procedure has increased access to methane gas in shale plays, which are discoveries of gas or oil within geological formations of sufficient size to be worth subsequent exploration and development.[8] In Texas, development of the Barnett Shale began in Fort Worth during the 1980s.[9] Subsequent exploration has drawn industry attention to the natural resources waiting 4,000 feet under the earth's surface in the Marcellus Shale.[10] This shale play stretches from New York to Virginia.[11]

The Marcellus Shale consists of Middle Devonian-age black, low-density, organically rich shale[12] with an average depth to its top ranging from a mile in southwestern Pennsylvania[13] to 6,000 feet in south-

[6] "[U]nconventional . . . , for the non-specialist, means that it is challenging to lift this oil [or gas] out of the ground." Dave Cohen, *An Unconventional Play in the Bakken*, ENERGY BULL. (Apr. 16, 2008, 7:00 AM), http://www.energybulletin.net/print/42850.

[7] *See* STUART KEMP, HALLIBURTON ENERGY SERVS., INC., COMMENTS OF HALLIBURTON ENERGY SERVICES, INC. 6–7 (2010); *see also* JOSEPH H. FRANTZ, JR. & VALERIE JOCHEN, SCHLUMBERGER MKTG. COMMC'NS, SHALE GAS 4 (2005), *available at* http://large.stanford.edu/courses/2010/ph240/alnoaimi2/docs/shale_gas_solution_05of299.pdf.

> Early low-permeability horizontal wells were considered failures because they did not naturally produce at commercial rates. The explosive growth of horizontal wells in shales is due to improvements in completion technologies. Multistage stimulation treatments are now performed on these wells to place hydraulic fractures around the borehole. The ability to economically perforate, stimulate, and isolate multiple points along the lateral has made these wells commercial successes.

Id.

[8] Nolan Hart, *What Is a Shale Gas Play?*, EAGLE FORD SHALE BLOG (Mar. 3, 2010, 9:47 AM), http://eaglefordshaleblog.com/2010/03/03/what-is-a-shale-gas-play/.

[9] J. DANIEL ARTHUR ET AL., ALL CONSULTING, LLC, EVALUATING THE ENVIRONMENTAL IMPLICATIONS OF HYDRAULIC FRACTURING IN SHALE GAS RESERVES 2 (2008), *available at* http://www.all-llc.com/publicdownloads/ArthurHydrFracPaperFINAL.pdf.

[10] *Id.* at 5 Exhibit 3; *see also* TIMOTHY CONSIDINE ET AL., PA. STATE UNIV., AN EMERGING GIANT: PROSPECTS & ECONOMIC IMPACTS OF DEVELOPING THE MARCELLUS SHALE NATURAL GAS PLAY 6 (2009) (noting that the average depth of shale gas in the Marcellus Shale is one mile), *available at* http://alleghenyconference.org/PDFs/PELMisc/PSUStudyMarcellusShale072409.PDF.

[11] CONSIDINE, *supra* note 10, at 2.

[12] *Id.* at 4.

[13] *Id.* at 6.

eastern New York and 1,000 feet in the middle of New York.[14] With thickness of fifty feet to 200 feet, the shale "covers an area of 95,000 square miles."[15] While the shale has a lower gas content than some other domestic plays,[16] the estimated basin area is more than double the size of the next largest[17] in New Albany (43,500 square miles),[18] and almost ten times the size of the other five domestic plays: Barnett (5000 square miles),[19] Fayetteville (9000 square miles),[20] Haynesville (9000 square miles),[21] Woodford (11,000 square miles),[22] and Antrim (12,000 square miles).[23] In summary, the Marcellus Shale represents a conveniently placed, extensive source of natural gas.

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[14] N.Y. STATE DEP'T OF ENVTL. CONSERVATION, DRAFT SUPPLEMENTAL GENERIC ENVIRONMENTAL IMPACT STATEMENT ON THE OIL, GAS, AND SOLUTION MINING REGULATORY PROGRAM 4-19 (2009), *available at* ftp://ftp.dec.state.ny.us/dmn/download/OGdSGEISFull.pdf.

[15] U.S. DEP'T OF ENERGY, MODERN SHALE GAS DEVELOPMENT IN THE UNITED STATES: A PRIMER 21 (2009), *available at* http://www.netl.doe.gov/technologies/oil-gas/publications/epreports/shale_gas_primer_2009.pdf.

[16] ARTHUR, *supra* note 9, at 5 Exhibit 3.

> As recently as 2002 the United States Geological Survey in its "Assessment of Undiscovered Oil and Gas Resources of the Appalachian Basin Province," calculated that the Marcellus Shale contained an estimated undiscovered resource of about 1.9 trillion cubic feet (TCF) of gas. Just five years later, Engelder (2009) estimates 2,445 trillion cubic feet of reserves in place with recoverable reserves amounting to 489 trillion cubic feet.

CONSIDINE, *supra* note 10, at 4.

[17] ARTHUR, *supra* note 9, at 2 Exhibit 1 (delineating on a map where shales exist: "Gas Shale Basins of the United States with Estimated Gas Reserves"); *id.* at 5 Exhibit 3 (comparing various measurements of size and quality of reserves: "Comparison of Data for the Gas Shales in the United States"); *id.* at 6 Exhibit 4 (matching period, shale formation, and location: "Stratigraphy of the U.S. Gas Shales"). The Marcellus Shale extends for 95,000 square miles, while the next largest shale is merely 43,500 square miles. *Id.* at 5 Exhibit 3.

[18] *Id.* at 5 Exhibit 3. The New Albany Shale is located under Illinois and Indiana and the northwestern border of Kentucky, *id.* at 6 Exhibit 4, holding an estimated 19.2 Tcf (trillion cubic feet) in gas reserves, *id.* at 2 Exhibit 1.

[19] *Id.* at 5 Exhibit 3. The Barnett Shale is located beneath Texas, *id.* at 6 Exhibit 4, holding estimated reserves of 44 Tcf, *id.* at 5 Exhibit 3 .

[20] *Id.* at 5 Exhibit 3. The Fayetteville Shale is under Arkansas, *id.* at 6 Exhibit 4, holding estimated reserves of 42 Tcf, *id.* at 5 Exhibit 3.

[21] *Id.* at 5 Exhibit 3. The Haynesville/Bossier Shale is under Texas and Louisiana, *id.* at 6 Exhibit 4, and holds reserves of approximately 264 Tcf *id.* at 5 Exhibit 3.

[22] *Id.* at 5 Exhibit 3. The Woodford Shale is in both Texas and Oklahoma, *id.* at 6 Exhibit 4, with reserves of 11 Tcf, *id.* at 5 Exhibit 3.

[23] ARTHUR, *supra* note 9, at 5 Exhibit 3. Antrim, beneath Michigan, *id.* at 6 Exhibit 4, holds reserves between 35 and 76 Tcf, *id.* at 5 Exhibit 3.

B. Political and Economic Background to the Marcellus Shale's Development

Development of the Marcellus Shale presents the opportunity to create jobs,[24] encourage reliance on domestic natural resources,[25] and smoothly assist the transition from fossil fuels to greener sources of energy.[26] Natural gas extraction is important because of the potential to use natural gas as a "bridge fuel"[27] that will encourage the transition from traditional sources of energy to more renewable, greener sources.[28] Shale gas is projected to amount to fifty percent of the U.S. natural gas supply by 2035, up from twenty percent today and one percent in 2000.[29]

Market forces impacting natural gas production in the Marcellus Shale operate at local, state, national, and global levels.[30] Additionally, coal-fired electric power presents powerful competition in the

[24] CONSIDINE, *supra* note 10, at 17–18. The study estimates that total spending by Marcellus Shale producers was $3.09 billion in 2008, $66 million of which on payroll alone. *Id.* at 21–22.

[25] *Id.* at 10, 32–33. "[W]ithin a 200-mile radius of the Marcellus, there is an existing and potential market of over 18 BCF per day." *Id.* at 10.

[26] James M. Tour et al., *Green Carbon as a Bridge to Renewable Energy*, 9 NATURE MATERIALS 871, 871 (Oct. 22, 2010) ("The typical value of greenhouse gas emission for natural gas is about *half that of coal*, or half as much CO_2 per kilowatt hour. Moreover, there is enough recoverable natural gas in shale deposits (shale gas) to meet the world's energy needs for the next 60 years." (emphasis added) (citations omitted)); INTERSTATE OIL & GAS COMPACT COMM'N, RESOLUTION 09.106: SUPPORTING CONTINUED ENVIRONMENTALLY RESPONSIBLE DEVELOPMENT OF SHALE GAS IN THE UNITED STATES (2009). "[D]omestic production of natural gas is expected to increase as a share of U.S. supply from 84 percent in 2007 to 97 percent in 2030" and natural gas currently comprises twenty-three percent of the United States' energy supply. *Id.*

[27] *See* Tour et al., *supra* note 26, at 871. The article identifies the three elements most abundant on Earth with "the capacity to store and produce enough energy to power our civilization": carbon, non-fissile uranium-238, and hydrogen. *Id.* at 872. Because the current infrastructure is geared to carbon, however, the authors suggest that a green carbon movement towards a hydrogen-based future would best serve long-term national energy needs. *Id.* at 874.

[28] *Id.*; *see also* INTERSTATE OIL & GAS COMPACT COMM'N, RESOLUTION 09.101: URGING THE U.S. GOVERNMENT TO RECOGNIZE THE IMPORTANCE OF OIL & GAS RESEARCH AND TO ADEQUATELY FUND OIL & GAS RESEARCH INITIATIVES (2009) (proposing that repeal of the Energy Policy Act of 2005 would result in a substantial reduction of funding necessary to ensure that "American consumers have clean, reliable, and affordable supplies of oil and natural gas").

[29] IHS CAMBRIDGE ENERGY RESEARCH ASSOCS., FUELING NORTH AMERICA'S ENERGY FUTURE: THE UNCONVENTIONAL NATURAL GAS REVOLUTION & THE CARBON AGENDA, at ES-1 (2010), *available at* http://www2.cera.com/docs/Executive_Summary.pdf.

[30] CONSIDINE, *supra* note 10, at 7 fig.2. Natural gas prices are still recovering from the summer of 2008. *Id.*

market, with natural gas only recently gaining an edge through lower capital costs and strategic environmental considerations.[31] Widespread use of hydraulic fracturing has led to a surge in interest in shales across the United States.[32] The Marcellus Shale is uniquely situated as compared to other sources of natural gas due to its proximity to major cities on the eastern seaboard.[33] Pennsylvania and five surrounding states engage in "current natural gas consumption [of] 9.5 BCF [billion cubic feet] per day."[34]

Additionally, this particular market relies on a similar level of electric power derived from coal combustion, which yields a potential market of at least eighteen BCF of natural gas per day.[35] The shale's development implicates large sums of money both in the present and the near future. In 2008, the shale's development in Pennsylvania alone generated $2.3 billion in total value added, as well as 29,000 jobs and $240 million in state and local taxes.[36] The pace of development in the shale is rapidly transforming from the testing and evaluation stage into full commercial production.[37]

Some groups oppose development, including some citizens who have previously leased land to oil companies for drilling, while other citizens with land that could be leased are in favor of the practice of hydraulic fracturing.[38] Opponents argue that the wells were unobtru-

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[31] *Id.* at 7–10.

[32] U.S. DEP'T OF ENERGY, *supra* note 15, at 25.

[33] *Id.* at 25; *Marcellus Shale—Appalachian Basin Natural Gas Play*, GEOLOGY.COM (Oct. 30, 2009), http://geology.com/articles/marcellus-shale.shtml.

[34] TIMOTHY CONSIDINE, THE ECONOMIC IMPACTS OF THE MARCELLUS SHALE: IMPLICATIONS FOR NEW YORK, PENNSYLVANIA, & WEST VIRGINIA 11 (2010), *available at* http://www.api.org/policy/exploration/hydraulicfracturing/upload/API_Economic_Impacts_Marcellus_Shale.pdf. "[A]bundant supplies of natural gas would enable electricity producers to cost effectively reduce greenhouse gas emissions because natural gas has considerably less carbon content than coal and oil." *Id.* at iv.

[35] CONSIDINE, *supra* note 10, at 10.

> There is also a considerable amount of coal-fired electric power generation in this region. In the unlikely event that all of this capacity was converted to natural gas, an additional 9 BCF per day of natural gas would be required. So within a 200-mile radius of the Marcellus, there is an existing and potential market of over 18 BCF per day.

Id.

[36] *Id.* at ii.

[37] The pace of development of the shale resulted in such a dramatic increase in economic output that estimated total value added to Pennsylvania for 2009 doubled, while state and local taxes were predicted to increase to $400 million and total job creation of 48,000. *Id.*

[38] *See infra* notes 39–41, 43.

sive, lucrative ways to use rights that were purchased when the homeowners bought the land.[39] Other people point to neighboring states and either desire to follow the same lucrative paths[40] or avoid suffering the lessons that citizens and leaders of other states have learned through great pain and damage.[41] Other citizens are fearful of the dangerous consequences of hydrofracking—a few share fearful, bitter stories of blighted or depleted water supply after companies hydrofracked[42] coalbed methane (CBM) wells.[43]

There are several public environmental concerns associated with the process of hydraulic fracturing. The first issue is anecdotal evidence of changes in water quality (so-called introduction issues) and quantity (so-called reduction issues) following the commencement of fracking operations in communities.[44] Another source of concern stems from personal stories of contaminated well water, dead farm animals, and impaired human health.[45] Environmental activists have pointed to citizens' experiences that are redolent with misinfor-

[39] *See* Siobhan Hughes, *New York Congressman's Lead Slips as Gas-Drilling Fight Heats Up*, WALL ST. J. (Oct. 21, 2010), http://online.wsj.com/article/BT-CO-20101021-720593.html.

[40] *E.g.*, Andrew Maykuth, *Strong Positions on Either Side of "Fracking" at EPA Hearing*, PHILLY.COM (Sept. 14, 2010), http://www.philly.com/philly/news/special_packages/inquirer/marcellus-shale/20100914_Strong_positions_on_either_side_of__quot_fracking_quot__at_EPA_hearing.html. "[L]and owners such as Chris Ostrowsky expressed exasperation that Pennsylvanians a few miles away in Susquehanna County were striking it rich while New Yorkers were in limbo . . . . 'It's real frustrating to see what's going on across the border, how the economy is booming in Pennsylvania,' Ostrowsky said." *Id.*

[41] *E.g.*, Abrahm Lustgarten, *Reporter's Notebook: Hydraulic Fracturing*, YOUTUBE (Jan. 21, 2009), http://www.youtube.com/watch?v=yy556ACxJ2I.

[42] Hydraulic fracturing is also known as "hydrofracking," "fracking," "frac'ing," and many other informal terms.

[43] *E.g.*, Mireya Navarro, *Signing Drilling Leases, and Now Having Regrets*, N.Y. TIMES, Sept. 22, 2011, at A25; Katie Benner & Shelley DuBois, *Odorless, Colorless: the Quiet Rise of American Big Gas*, FORTUNE (Oct. 1, 2010, 3:54 PM ET), http://money.cnn.com/2010/09/29/news/companies/fracking_natural_gas_industry.fortune/index.htm; Louis Meeks, *Gas Drilling Has Blighted My Life: We Need Energy But Not at the Cost of Clean Water*, HIGH COUNTRY NEWS (Oct. 12, 2010), http://www.hcn.org/wotr/gas-drilling-has-blighted-my-life .

[44] ENVTL. PROT. AGENCY, *supra* note 3, at 1–2 (noting the potential contamination of underground sources of drinking water (USDWs) or surface water through hydraulic fracturing processes and the impact on water quantity through the large volume of water used—each well could potentially use between two to five million gallons of water in drilling and hydrofracking the well).

[45] Don Hopey, *1,200 Hear Marcellus Shale Debate EPA Hearing in Canonsburg One of Four Nationwide*, PITTSBURGH POST-GAZETTE, July 23, 2010, at A1 ("[Pennsylvania residents] attributed the problems to water contamination caused by the deep gas drilling operations that are increasing quickly through much of the state.").

mation concerning regulation and unsubstantiated incidents of water contamination.[46] This fear stems from a lack of public knowledge concerning the components of the fracking fluid.[47]

On June 9, 2009, U.S. Senators Robert P. Casey Jr. (D-PA) and Charles E. Schumer (D-NY) and Representatives Diana DeGette (D-CO), Maurice Hinchey (D-NY), and Jared Polis (D-CO) introduced two companion bills dubbed the FRAC Act.[48] The bills called for the EPA to obtain jurisdiction over hydraulic fracturing under the Safe Drinking Water Act (SDWA)[49] and for companies engaging in hydraulic fracturing to provide certain disclosures regarding the chemicals used in the process.[50] In 2010, the 111th Congress asked the EPA to produce a study determining the risks to groundwater associated with hydraulic fracturing, with anticipated results available in 2014.[51]

Industry officials have welcomed the EPA's decision to study the complex relationship between hydraulic fracturing and drinking water to learn more about possible impacts hydraulic fracturing may have on such a vital natural resource.[52] Industry leaders, however, fear that the study will preclude current development and have argued for a focused study that will present a final conclusive answer on whether the EPA should be involved in regulation of hydraulic frac-

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[46] Tom Zeller, Jr., *EPA to Study Chemicals Used to Tap Natural Gas*, N.Y. TIMES, Sept. 9, 2010, at B3.

[47] Hopey, *supra* note 45.

[48] S. 1215, 111th Cong. (2009); H.R. 2766, 111th Cong. (2009); Abraham Lustgarten, *FRAC Act—Congress Introduces Twin Bills to Control Drilling and Protect Drinking Water*, PROPUBLICA (June 9, 2009, 1:31 PM), http://www.propublica.org/article/frac-act-congress-introduces-bills-to-control-drilling-609.

[49] 42 U.S.C. §§ 300f–300j-26 (2006).

[50] S. 1215; H.R. 2766.

[51] Zeller, *supra* note 46; Jim Efstathiou, *New Yorkers Spar over U.S. EPA Study of Natural-Gas Fracturing*, BLOOMBERG (Sept. 14, 2010, 12:00 AM ET), http://www.bloomberg.com/news/2010-09-13/new-york-gas-drilling-conflict-aired-over-u-s-fracturing-study.html.

> The EPA's new study "needs to be carried out with the utmost care to identify the full range of risks," said Kate Sinding, senior attorney with the New York-based Natural Resources Defense Council, an environmental organization. "It is no exaggeration to say all eyes, both in the United States and around the world, are on EPA."

Id.

[52] STUART KEMP, HALLIBURTON ENERGY SERVS., INC., COMMENTS OF HALLIBURTON ENERGY SERVICES, INC. 2 (2010), *available at* http://yosemite.epa.gov/sab/sabproduct.nsf/D94C67ADFAC802C38525773E0064F1AA/$File/Comments+of+Halliburton+Energy+Services+Inc+on+Hydraulic+Fracturing+6-9-10.pdf.

turing.[53] A fear persists among industry insiders[54] and consumers[55] that federal intrusion into the current state regulatory schemes will drive up prices and deter the gas industry from investing in production of this natural resource.[56]

The bills introduced in the Senate and House of Representatives seek to address these concerns through two mechanisms: first, through amendment of the SDWA to remove the explicit exemption[57] of hydraulic fracturing from the EPA's jurisdiction[58] and second, by requiring companies that use hydraulic fracturing to make public and emergency disclosures of the additives injected into the wells in

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[53] KEMP, *supra* note 52, at 2; INTERSTATE OIL & GAS COMPACT COMM'N, *supra* note 2.

[54] INTERSTATE OIL & GAS COMPACT COMM'N, RESOLUTION 09.011: SUPPORTING CONTINUED ENVIRONMENTALLY RESPONSIBLE DEVELOPMENT OF SHALE GAS IN THE UNITED STATES (2009).

> Hydraulic fracturing plays a major role in the development of virtually all unconventional oil and gas resources and, thus, should not be limited in the absence of any evidence that such fracturing has damaged the environment . . . . Regulation of hydraulic fracturing as underground injection under the SDWA would impose significant administrative costs on the state and substantially increase the cost of drilling oil and gas wells with no resulting environmental benefits.

Id. Attached to Resolution 09.011 were the resolutions passed by Alaska (S.J.R. 14), Alabama (H.J.R. 254), Louisiana (H.C.R. 38), Mississippi (S.C. 636), North Dakota (S.C.R. 4020), Oklahoma (H.C.R. 1012), Utah (S.J.R. 17), Texas (H.C.R. 67), and Wyoming (S.J. 0005).

[55] Maykuth, *supra* note 39. "Broome County Executive Barbara Fiala declared fracking 'safe' and expressed frustration with the slow pace of development in New York. 'All we ask is that this study be focused and not take forever to complete,' she said [at the EPA shareholder meeting in Binghamton, N.Y. in September 2010]." *Id.*

[56] INTERSTATE OIL & GAS COMPACT COMM'N, *supra* note 54.

[57] The FRAC Act aims to lift exemption of hydraulic fracturing from the Safe Drinking Water Act imposed by the Environmental Policy Act of 2005. *See* 42 U.S.C. § 300h (2006), *amended by* Pub. L. No. 109-58, § 322, 119 Stat. 594, 694 (2005). The exemption was enacted following extensive lobbying by the oil and gas industry for Congress to provide clarification about whether the EPA was required to regulate hydraulic fracturing under state UIC programs. *See* Part III.C.1, *infra*; *see also* Hannah Wiseman, *Untested Waters: The Rise of Hydraulic Fracturing in Oil & Gas Production and the Need to Revisit Regulation*, 20 FORDHAM ENVTL. L. REV. 115, 167 (2009). Professor Wiseman provides a comprehensive discussion of this history in Part V. Regulatory Problems and the Need for Reform. *Id.*

[58] Fracturing Responsibility and Awareness of Chemicals Act, S. 1215, 111th Cong. § 2 (2009); Fracturing Responsibility and Awareness of Chemicals Act of 2009, H.R. 2766, 111th Cong. § 2 (2009). The Senate bill was reintroduced by Sen. Robert Casey (D-PA), who sponsored the bill along with co-sponsors Benjamin Cardin (D-MD), Dianne Feinstein (D-CA), Kirsten Gillibrand (D-NY), Frank Lautenberg (D-NJ), Bernard Sanders (I-VT), Charles Schumer (D-NY), and Sheldon Whitehouse (D-RI). S. 587, 112th Cong. (2011). Rep. Diana DeGette reintroduced the bill in the House, along with thirty-seven co-sponsors. H.R. 1084, 112th Cong. (2011).

the mix used to fracture the coal beds.[59] Congress did not pass the bills in the 111th Congress, nor has it passed them in the 112th Congress to date.[60]

III. HYDRAULIC FRACTURING

A. The Mechanical Process of Hydraulic Fracturing

Hydraulic fracturing,[61] combined with the recent advent of horizontal drilling,[62] has resulted in unprecedented potential to access sources of methane gas that were previously too difficult to extract,[63] in terms of profit on investment.[64] The mechanical process of hydraulic fracturing uses fluid pressure to fracture the material surrounding the drill shaft.[65] Operators inject fluids into vertical or horizontal wells at high pressure to generate fractures or exacerbate existing fractures in the formation.[66] The fluids largely consist of wa-

[59] FRAC Act, S. 587, 112th Cong. § 2.

[60] For the current status of these bills, see GOVTRACK.US, http://www.govtrack.us/ (last visited Mar. 30, 2012). The bills may not be passed due to political impracticality; for instance, New York Congressman Hinchey faced a tight election as his constituents began to appreciate the economic consequences of the moratorium imposed by New York Department of Environmental Conservation following his push for a study of hydraulic fracturing by the EPA. Hughes, *supra* note 39.

[61] U.S. DEP'T OF ENERGY, *supra* note 15, at 13 ("Large scale hydraulic fracturing, a process first developed in Texas in the 1950s, was first used in the Barnett in 1986; likewise, the first Barnett horizontal well was drilled in 1992." (citing JEFF HAYDEN & DAVE PURSELL, PICKERING ENERGY, INC., THE BARNETT SHALE—VISITOR'S GUIDE TO THE HOTTEST GAS PLAY IN THE US (2005)).

[62] John A. Harper, *The Marcellus Shale—An Old "New" Gas Reservoir in Pennsylvania*, 38 PA. GEOLOGY 2, 10 (2008). Horizontal drilling consists of drilling vertically until the drill bit is at a specific height from the desired horizontal resource (the "kickoff point") at which point the drill is directed in an arc ending within the layer of material. *See* U.S. DEP'T OF ENERGY, *supra* note 15, at 52 Exhibit 30. The drill then moves forward, now drilling parallel to the surface. *See id.*

[63] U.S. DEP'T OF ENERGY, *supra* note 15, at 13 ("The combination of sequenced hydraulic fracture treatments and horizontal well completions has been crucial in facilitating expansion of shale gas development. Prior to the successful application of these two technologies in the Barnett Shale, shale gas resources in many basins had been overlooked because production was not viewed as economically feasible." (citing Harper, *supra* note 62)).

[64] *Id.* at 14 ("The combination of reduced economics and low permeability of gas shale formations historically caused operators to bypass these formations and focus on other resources." (citing M. Airhart, *The Barnett Shale Gas Boom: Igniting a Hunt for Unconventional Natural Gas Resources*, GEOLOGY.COM, http://geology.com/research/barnett-shale-gas.shtml (last visited Apr. 6, 2012))).

[65] ENVTL. PROT. AGENCY, *supra* note 3, at 1.

[66] *Id.*

ter with a small proportion of additives, which increase fluidity or prevent contamination, and sand or some other proppant,[67] which keeps the fractures open and permits the gas to flow to the surface freely.[68]

The process of hydraulic fracturing begins with the construction of a well pad, from which all subsequent operations are conducted.[69] Construction can take up to a month, following which the vertical well shaft is drilled with a smaller rig.[70] A larger rig is brought onsite for the horizontal drilling, which also takes up to two weeks per well, though more than one well may be drilled simultaneously.[71] To prepare the well for fracturing, it is lined with casing that serves to prevent fluids from escaping into the environment except where the operator directs them.[72] "Current well construction requirements consist of installing multiple layers of protective steel casing and cement that are specifically designed and installed to protect fresh water aquifers and to ensure that the producing zone is isolated from overlying formations."[73] The layered system of casings sealed with cement is tested at several steps during the process to ensure that "the casing used has sufficient strength, and that the cement has properly bonded to the casing."[74] Preparation for the hydraulic fracture takes between one and two months, depending on the time when the necessary equipment arrives.[75] Coordinating the availability of temporary tanks to store the water and the transportation of fracturing ("frac") fluid, water, sand, and other equipment, including computerized monitoring instruments, is essential.[76] The process of fracturing the well requires two to five days, "including approximately 40 to 100 hours of actual pumping."[77] Fluid return occurs over the

[67] A proppant, usually a silica sand mix, serves to maintain the fractures in the shale formation which were created through hydraulic pressure by "propping" them open with a solid piece of material. *See* CONSIDINE, *supra* note 10, at 5.

[68] ENVTL. PROT. AGENCY, *supra* note 3, at 1; N.Y. STATE DEP'T OF ENVTL. CONSERVATION, *supra* note 14, at 5-42.

[69] N.Y. STATE DEP'T OF ENVTL. CONSERVATION, *supra* note 14, at 5-124, tbl.5.15.

[70] *Id.*

[71] *Id.*

[72] U.S. DEP'T OF ENERGY, *supra* note 15, at 51–52.

[73] *Id.*

[74] *Id.* at 52.

[75] N.Y. STATE DEP'T OF ENVTL. CONSERVATION, *supra* note 14, at 5-124, tbl.5.15.

[76] *Id.*

[77] *Id.*

following two to eight weeks,[78] with the volume of flowback fluid accounting for thirty to seventy percent of the original fracture fluid.[79]

These activities are subject to extensive state and federal regulation, some of which are discussed below,[80] as well as current industry practices, which have been described elsewhere.[81]

B. State Control

Comprehensive state and local laws manage the process of producing oil and gas from exploration to delivery.[82] Individual assessments of "geology, hydrology, climate, topography, industry characteristics, development history, state legal structures, population density, and local economics" are appropriate and often form the basis for current regulatory schemes.[83] For instance, the wastewater generated at wells employing hydraulic fracturing can be injected deep underground into natural depositories, such as the depositories in the Barnett Shale in Texas[84] or in the Fayetteville Shale in Arkansas.[85] While this solution for water management is uniquely suited to such geological formations,[86] it may be utterly impracticable for a state where the underlying geological formations would not be conducive to such disposal methods.[87]

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[78] *Id.*; U.S. DEP'T OF ENERGY, *supra* note 15, at 66 (citing J. SATTERFIELD, CHESAPEAKE ENERGY CORP., MANAGING WATER RESOURCE'S CHALLENGES IN SELECT NATURAL GAS SHALE PLAYS (2008)).

[79] U.S. DEP'T OF ENERGY, *supra* note 15, at 66 (citing "[p]ersonal communication with numerous operators and service companies in a variety of shale gas plays").

[80] For an overview of state statutes governing the disposal of produced fluid, see *infra* Part III.B.1. For a description/overview of federal statutes currently addressing disposal of flowback fluid, see *infra* Part III.C.1.

[81] For a detailed discussion of the industry's current practices of managing produced fluid, see U.S. DEP'T OF ENERGY, *supra* note 15, at 66–70.

[82] *Id.* at 25.

[83] *Id.*

[84] U.S. DEP'T OF ENERGY, *supra* note 15, at 69 Exhibit 39.

[85] Adam J. Bailey, Comment, *The Fayetteville Shale Play and the Need to Rethink Environmental Regulation of Oil and Gas Development in Arkansas*, 63 ARK. L. REV. 815, 821–22 (2010).

[86] *Cf.* 42 U.S.C. § 300h(b)(3)(A) (2006) ("The regulations of the Administrator under this section shall permit or provide for consideration of varying geologic, hydrological, or historical conditions in different States and in different areas within a State.").

[87] *See* U.S. DEP'T OF ENERGY, *supra* note 15, at 69. "Underground injection of the produced water is not possible in every play as suitable injection zones may not be available. Similar to a producing reservoir, there must be a porous and permeable formation capable of receiving injected fluids nearby." *Id.*

1. State Regulations in Place

State oil and gas regulatory agencies provide guidance for protection of the environment and workers onsite with regulations addressing a broad range of production activities, including permit requirements, the required depth of protective casing, and even the time needed for the cement to dry before drilling continues.[88] The state regulatory approach has been described as a "cradle-to-grave" method that covers everything from "the drilling and fracture of the well, production operations, management and disposal of wastes, [to] abandonment and plugging of the well."[89]

The regulations require permits before drilling can commence and the application for such permits must include information regarding the well's location, construction, operation, and reclamation.[90] Some states compel operators to post a financial security or show financial resources sufficient to accomplish compliance with all applicable regulations.[91] States have also instituted voluntary reviews of their relevant statutes to ensure that regulatory programs are up to date and successful.[92] All of the states overlying the Marcellus Shale formation are members of the Interstate Oil and Gas Compact Commission (IOGCC).[93] Other third parties also produce reviews for

[88] U.S. DEP'T OF ENERGY, *supra* note 15, at 52–53; *see, e.g.*, IND. CODE § 14-37-7-5 (2011) (production string of casing requirement); 2010 KY. ACTS § 353.100 (casings requirement); MICH. COMP. LAWS § 319.51 (2010) (supervisor of wells to provide regulations relating to casing among other well activities); N.Y. ENVTL. CONSERV. LAW § 23-0305. (Gould 2012) (drilling, casing, and completion programs' purpose in preventing pollution); 58 PA. STAT. ANN. § 601.503 (West 2010) (department's authority to "issue such orders" necessary to enforce provisions of oil and gas act); 16 TEX. ADMIN. CODE § 3.8 (2012) (Texas Railroad Commission's prohibition against pollution of either surface or subsurface water).

[89] U.S. DEP'T OF ENERGY, *supra* note 15, at 26.

[90] *Id.*; *see, e.g.*, N.D. ADMIN. CODE 43-02-03-16 (2009) ("No drilling activity shall commence until such application is approved and a permit to drill is issued by the director.").

[91] U.S. DEP'T OF ENERGY, *supra* note 15, at 26; *see, e.g.*, FLA. STAT. § 377.2425 (2010); IDAHO CODE ANN. § 42-238 (2010); 225 ILL. COMP. STAT. 715/5 (2010); MICH. COMP. LAWS § 324.61506 (p) (2010); MONT. CODE ANN. § 82-1-104 (2010); N.Y. ENVTL. CONSERV. LAW § 23-0305 (2010); OHIO REV. CODE ANN. § 1509.07 (LexisNexis 2011); 58 PA. STAT. ANN. § 601.503 (West 2010); W. VA. CODE R. § 22-21-6 (2010). *But see* Keith G. Baurle, *Reaping the Whirlwind: Federal Oil & Gas Development on Private Lands in the Rocky Mountain West*, 83 DENV. U.L. REV. 1083, 1085 n.12 (2006) (criticizing the adequacy of such bonds to protect landowners potentially harmed).

[92] *See infra* note 95 and accompanying text.

[93] *See Member States*, INTERSTATE OIL & GAS COMPACT COMMISSION, http://www.iogcc.state.ok.us/member-states (last visited Mar. 21, 2012); *Map of Marcellus Shale*, INTERSTATE OIL & GAS COMPACT COMMISSION,

the public's education.[94] For instance, the Ground Water Protection Council (GWPC) produces reviews of state Underground Injection Control (UIC) programs.[95] GWPC also compiles a list of state agencies that promulgate regulations impacting groundwater and provides links to the agencies' websites.[96] An independent organization drawn from state, industry, and environmental stakeholders, known as STRONGER (State Review of Oil and Natural Gas Environmental Regulation, Inc.),[97] also offers a set of guidelines against which to judge state oil and gas environmental programs other than UIC programs.[98]

New York State has been particularly proactive in identifying potential threats to water resources. The New York State Department of Environmental Conservation, Division of Mineral Resources, produced a comprehensive draft supplemental generic environmental impact statement (Draft SGEIS) in 2009.[99] As part of this effort, New York asked multiple consulting groups[100] to evaluate the following factors identified as potentially leading to groundwater contamination from high-volume hydraulic fracturing:

http://www.marcellusshales.com/marcellusshalemap.html (last visited Mar. 21, 2012) (depicting of the contours of the Marcellus Shale superimposed on the states overlying the formation). The IOGCC is a government agency that spans multiple states and "works to ensure our nation's oil and natural gas resources are conserved and maximized while protecting health, safety and the environment." *About Us*, INTERSTATE OIL & GAS COMPACT COMMISSION, http://www.iogcc.state.ok.us/about-us (last visited Feb. 15, 2012).

[94] *See, e.g.*, *Independent Review Completed of Pennsylvania Department of Environmental Protection Program Regulating Hydraulic Fracturing of Oil & Gas Wells*, BUSINESS WIRE (Sept. 24, 2010), http://www.businesswire.com/news/home/20100923006018/en/Independent-Review-Completed-Pennsylvania-Department-Environmental-Protection [hereinafter *Independent Review Completed of Pennsylvania Program*].

[95] *Underground Injection Control*, GROUND WATER PROTECTION COUNCIL, http://www.gwpc.org/uic/uic.htm (last visited Feb. 15, 2012).

[96] *State Information*, GROUND WATER PROTECTION COUNCIL, http://www.gwpc.org/state_resources/state_resources.htm click on "State Agencies List" for the Excel spreadsheet) (last visited Mar. 21, 2012).

[97] *List of State Reviews*, STRONGER, INC., http://www.strongerinc.org/reviews/reviews.asp (last visited Feb. 15, 2012).

[98] U.S. DEP'T OF ENERGY, *supra* note 15, at 26.

[99] *See* N.Y. STATE DEP'T OF ENVTL. CONSERVATION, *supra* note 14.

[100] The New York State Energy Research & Development Authority contracted with consulting groups for the research needed to produce the SGEIS to ICF International, along with Alpha Environmental, Inc., URS Corporation and NTC Consultants. N.Y. STATE DEP'T OF ENVTL. CONSERVATION, *supra* note 14, at 6-37 to -38.

- wellbore[101] failure,[102]
- subsurface pathways,[103]
- waste transport,[104]
- centralized flowback water surface impoundments,[105]
- fluid discharges,[106]
- treatment facilities,[107]
- disposal wells,[108]
- solids disposal,[109]
- naturally occurring radioactive material disposition (NORM),[110]
- cuttings volume,[111]
- cuttings and liner associated with mud drilling,[112]
- potential impacts to subsurface New York City water supply infrastructure,[113]

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[101] A wellbore is also known as a borehole or the hole drilled by the bit. N.Y. STATE DEP'T OF ENVTL. CONSERVATION, GLOSSARY FOR DRAFT SUPPLEMENTAL GENERIC ENVIRONMENTAL IMPACT STATEMENT 20 (2009), *available at* http://www.dec.ny.gov/docs/materials_minerals_pdf/odsgeisglossary.pdf. "A wellbore may have casing in it or it may be open (uncased); or part of it may be cased, and part of it may be open. Also called a borehole or hole." *Id.*

[102] N.Y. STATE DEP'T OF ENVTL. CONSERVATION, *supra* note 14, at 6-37. "[T]he probability of fracture fluids reaching an underground source of drinking water (USDW) from properly constructed wells due to subsequent failures in the casing or casing cement due to corrosion is estimated at less than 2 x 10-8 (fewer than 1 in 50 million wells)." *Id.*

[103] *Id.* at 6-37 to -38.

[104] *Id.* at 6-38.

[105] *Id.* at 6-38 to -39. "Operators may propose to store flowback water prior to or after dilution in the onsite lined pits or tanks . . ., or in centralized facilities consisting of tanks or one or more engineered impoundments." *Id.* at 5-113.

[106] *Id.* at 6-39.

[107] *Id.* at 6-39 to -40.

[108] N.Y. STATE DEP'T OF ENVTL. CONSERVATION, *supra* note 14, at 6-40.

[109] *Id.*

[110] *Id.* "Marcellus shale is known to contain NORM concentrations at higher levels than surrounding rock formations," requiring employers to perform testing and provide appropriate worker protection. *Id.* at 6-129–6-130. As this impacts water supplies, however, New York has found that "[b]ased on the analytical results from field-screening and gamma ray spectroscopy performed on samples of Marcellus shale, NORM levels in cuttings are not likely to pose a problem." *Id.* at 6-40.

[111] *Id.* Cuttings volume consists of "[t]he very fine-grained rock fragments removed by the drilling process [which] are returned to the surface in the drilling fluid and managed either within a closed-loop tank system or a lined on-site reserve pit." N.Y. STATE DEP'T OF ENVTL. CONSERVATION, *supra* note 14 at 5-29.

[112] *Id.* at 6-41.

- degradation of New York City's drinking water supply,[114]
- floodplains,[115]
- primary and principle aquifers,[116]
- freshwater wetlands, ecosystems and wildlife,[117] and
- air quality.[118]

The consulting groups determined that the regulations implemented in New York are "sufficient to prevent fracturing fluid from flowing upward along the wellbore and contacting water-bearing strata adjacent to the borehole."[119] As part of the analysis that led to this conclusion, the groups analyzed the possibility of fracturing fluids migrating beneath the surface of the ground into USDWs.[120] Typical conditions for hydraulic fracturing produce wells with similar characteristics: aquifer maximum depth is less than 1000 feet, the fracture zone is greater than 2000 feet, the average hydraulic conductivity of intervening strata remains less than 1E-5 cm/sec, and the average porosity of intervening strata is over ten percent.[121] The report that, even in circumstances that are most favorable to flow, the current practices of hydraulic fracturing generate pressures and volumes that are insufficient "to cause migration of fluids from the fracture zone to the overlying aquifer in the short time that fracturing pressures would be applied."[122]

The Draft SGEIS identified at least one regulatory jurisdiction associated with each of the twenty-seven distinct events in the lifecycle of a horizontal well.[123] The regulatory jurisdictions include local government and health agencies, New York City agencies, New York State agencies, and federal agencies.[124]

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[113] N.Y. STATE DEP'T OF ENVTL. CONSERVATION, *supra* note 14, at 6-41.

[114] *Id.* at 6-41 to -42.

[115] *Id.* at 6-42.

[116] *Id.* at 6-42 to -43.

[117] *Id.* at 6-43 to -48.

[118] *Id.* at 6-48 to -94.

[119] N.Y. STATE DEP'T OF ENVTL. CONSERVATION, *supra* note 14, at 5-148.

[120] *Id.* at 6-53 to -56.

[121] N.Y. STATE DEP'T OF ENVTL. CONSERVATION, *supra* note 14, at 5-148.

[122] *Id.*

[123] *Id.* at 8-10 tbl.8.1.

[124] *Id.* Local government agencies included the New York City Department of Environmental Protection; New York State provided oversight through the Department of Environmental Conservation Divisions & Offices (Division of Mineral Resources, Division of Environmental Permits, Division of Water, Division of Solid and Hazardous Materials, Division of Fish, Wildlife and Marine Resources, Division of Air Re-

In Pennsylvania, oil and gas well developers must adhere to the Oil and Gas Act when they drill in the state.[125] Primarily, the Act requires drillers to procure a permit prior to beginning any drilling.[126] Permit fees are keyed to the length of the wellbore and the permit application requires a water management plan.[127] Other regulations address duties that arise before receiving the permit, including surveys, stipulation of angles and directions of non-vertical wells, and provision of notice to surface owners.[128] Pennsylvania's Department of Environmental Protection plays an active, protective, and productive role in the regulation of oil and gas development and production,[129] including oversight of permit and inspection programs.[130]

2. Issues Facing State Regulators

Once an agency is tasked with the specific role of regulating a part of the process, lack of scientific evidence demonstrating specific risks leaves the agency hobbled. "Regulatory officials from 15 states have recently testified that groundwater contamination from the hydraulic fracturing procedure is not known to have occurred despite the procedure's widespread use in many wells over several decades."[131] Issues arising in the producing states have largely related to insufficient casing or negligent operation of wells, in violation of existing

sources), the Department of Health, the Department of Transportation, the Public Service Commission, and the Office of Parks, Recreation & Historic Preservation; and federal agency involved were identified as the EPA, the United States Department of Transportation, and the U.S. Army Corps of Engineers. *Id.*

[125] 58 PA. STAT. ANN. §§ 601.101–.605 (West 1996); *see* Laura C. Reeder, *Creating a Legal Framework for Regulation of Natural Gas Extraction from the Marcellus Shale Formation*, 34 WM. & MARY ENVTL. L. & POL'Y REV. 999, 1016 (2009). Part IV of the note provides a comprehensive overview of the Pennsylvania regulation of drilling at both state and local levels. *Id.* at 1015–20.

[126] Reeder, *supra* note 125, at 1014.

[127] PA. DEP'T OF ENVTL. PROT., MARCELLUS SHALE WELL PERMIT APPLICATION FEES FACT SHEET (Apr. 2009), *available at* http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-84138/5500-FSDEP4239.pdf; Reeder, *supra* note 125, at 1015, nn.141–42 (citing Oil and Gas Act, 58 PA. STAT. ANN. §§ 601.101–.201 (West 1996)).

[128] § 601.201.

[129] *See Office of Oil and Gas Management*, PA. DEP'T ENVTL. PROT., http://www.dep.state.pa.us/dep/deputate/minres/oilgas/oilgas.htm (last visited Mar. 21, 2012).

[130] *See Independent Review Completed of Pennsylvania Program*, *supra* note 94.

[131] N.Y. STATE DEP'T OF ENVTL. CONSERVATION, *supra* note 14, at 6-37.

regulations.[132] In June 2010, the blowout of a well drilled into the Marcellus Shale in Clearfield County, Pennsylvania, brought responders from the state, as well as industry experts from Texas and the federal government.[133] Another blowout in the town of Killdeer resulted in a spill of more than 2000 barrels of oil and frack fluid.[134] The Killdeer spill was the first well blowout since the Department of Mineral Resources began requiring both pressure testing and the use of pressure-release valves during high-pressure hydraulic fracturing procedures in 2008.[135] The Department of Mineral Resources, as the state's regulatory agency, has demonstrated a responsive and conservationist attitude since the blowout.[136] The Mineral Resources Director traced the impetus behind the department's decision to impose regulation in 2008 to the previous blowouts seen in the state.[137] Environmental organizations, however, have complained that the current regulation lags behind industry innovation and that looming budget cuts will cripple already lax enforcement.[138]

C. Federal Oversight of Hydraulic Fracturing

1. Federal Statutes Regulate Parts of the Hydraulic Fracturing Process

General commercial use of complex chemicals, not only in hydraulic fracturing, is subject to scrutiny under numerous federal envi-

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[132] PA. ST. DEP'T OF ENVTL. PROTECTION, HYDRAULIC FRACTURING OVERVIEW, *available at* http://files.dep.state.pa.us/OilGas/BOGM/BOGMPortalFiles/MarcellusShale/DEP%20Fracing%20overview.pdf.

[133] *Gas Well Blowout Under Control in Clearfield County*, WJACTV.COM (June 4, 2010, 10:44 AM), http://www.wjactv.com/print/23792353/detail.html [hereinafter *Gas Well Blowout Under Control*].

[134] Lauren Donovan, *Killdeer Oil Spill Being Cleaned Up, Officials Investigate*, BISMARCK TRIBUNE (Sept. 2, 2010, 12:34 AM), http://www.bismarcktribune.com/news/state-and-regional/article_af6a8bd2-b712-11df-b4ff-001cc4c03286.html.

[135] *Id.*

[136] *Id.*

[137] *Id.*

[138] Mark Guarino, *Gulf Oil Spill Report Warning: U.S. Must Watch Offshore Drilling More Closely*, CHRISTIAN SCI. MONITOR (Jan. 11, 2011), http://www.csmonitor.com/USA/2011/0111/Gulf-oil-spill-report-warning-US-must-watch-offshore-drilling-more-closely. "'The technology, laws and regulations, and practices for containing, responding to, and cleaning up the spills lag behind the real risk associated with [oil and gas production] . . . government must close the existing gap and industry must support rather than resist that effort,' the report states." *Id.*

ronmental statutes.[139] All laws, regulations, and permit procedures that bind conventional oil and gas exploration and production also attach to activities aimed at producing natural gas from unconventional sources.[140] This Comment, however, examines only the potential results of the Act to amend the SDWA pending in Congress. Under the current version of the SDWA, Congress provided the EPA with a lever to use against states' inaction in protecting drinking water sources—a means to halt any "race to the bottom."[141] The typical justifications for placing environmental regulation under federal control "reflect commonly understood collective action problems, including negative environmental externalities, resource pooling, the 'race to the bottom,' uniform standards, and the 'NIMBY' (not in my

[139] For example, the U.S. Army Corps of Engineers oversees any wetlands necessary permits. Clean Water Act of 1972, 33 U.S.C. § 1344 (2006); *see also* Steven G. Davison, *General Permits Under Section 404 of the Clean Water Act*, 26 PACE ENVTL. L. REV. 35 (2009) (discussing in detail the permit requirements under this federal statute). The U.S. Department of Transportation oversees transportation of fracturing fluids as hazardous chemicals. 49 U.S.C. § 5103 (2006). The EPA retains primary jurisdiction over injection-well disposal under the SDWA. 42 U.S.C. §§ 300f–300j(26) (2006). Additionally, "the Resource Conservation and Recovery Act (RCRA) gives the EPA the authority to control hazardous waste from the 'cradle-to-grave.' This includes the generation, transportation, treatment, storage, and disposal of hazardous waste." *Summary of the Resource Conservation and Recovery Act*, EPA (June 28, 2006), http://www.epa.gov/lawsregs/laws/rcra.html; *see also Gas Well Blowout Under Control*, *supra* note 133. In a recent blowout of a well drilled into the Marcellus Shale in Clearfield County, Pennsylvania, responders came from the state level, as well as industry experts drawn from Texas and the federal government. *Id.*

[140] U.S. DEP'T OF ENERGY, *supra* note 15, at 25.

[141] For a detailed discussion of the "race-to-the-bottom" rationale for environmental regulation, see Robert L. Glicksman & Richard E. Levy, *A Collective Action Perspective on Ceiling Preemption by Federal Environmental Regulation: The Case of Global Climate Change*, 102 NW. U. L. REV. 579, 597–98 (2008).

> Another rationale for federal environmental regulation is the so-called "race to the bottom." A race to the bottom assumes that competition for business and industry will create a prisoner's dilemma in which states are driven to relax their environmental standards in order to gain the economic benefits and tax revenues that the business or industry brings. Individual states have the incentives to lower standards to compete for industry whether or not other states do the same, even though the states as a collective would be better off not doing so. Some environmental law scholars have argued either that the race to the bottom is not an empirical reality or that interjurisdictional competition is a good thing because it tends to produce socially efficient outcomes. Other academics have responded that the race to the bottom has been and remains a factor that provides obstacles to effective state environmental regulation.

Id.

back yard) phenomenon."[142] These concerns about pollution are particularly relevant in the context of protecting drinking water,[143] which consists of both surface and groundwater.[144] The resource of water is vulnerable to conflicts arising out of non-uniform protection due to its migratory characteristics.[145] Pollution spreads through migratory resources when states provide insufficiently protective regulation.[146] The difficulty in providing uniform protection is, in part, due to the fact that, between more protective and less protective states,

> courts are apt to discount or disregard empirical evidence relating to a statute's population health impact while accepting almost at face value claims relating to the burdens a statute imposes on commerce. Thus not only do the federal courts now frequently ignore public health claims in particular cases, they also sometimes reject, ostensibly as beyond their competence, the empirical and epidemiological evidence that public health can provide in support or refutation of particular public health statutes.[147]

As part of the SDWA program, the EPA requires states to develop regulations that at least meet the minimum standards established by the Agency before the states can obtain federal authorization to run their own UIC program.[148] But, because the SDWA does not explicitly define the term "underground injection" to include the process of hydraulic fracturing, the interpretation of that phrase belongs in the hands of the agency implementing the statute: the EPA.[149] Un-

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[142] *Id.* at 593–94.

[143] *The Water Cycle: Ground Water Discharge*, USGS (Dec. 27, 2011), http://ga.water.usgs.gov/edu/watercyclegwdischarge.html.

[144] P. JAYA RAMA REDDY, A TEXTBOOK OF HYDROLOGY 289 (2005) ("A groundwater basin is filled and the excess water is discharged by several ways until a quasi-equilibrium is reached.").

[145] Marc K. Landy, *Local Government and Environmental Policy*, *in* DILEMMAS OF SCALE IN AMERICA'S FEDERAL DEMOCRACY 227, 228 (Martha Derthick, ed. 1999) ("Air and water move; they do not respect state lines."). In particular, Landy observed that increased agricultural and industrial output occurring post-World War II resulted in such significant pollution that economic damage following the detrimental effect on the environment would indeed spill over state boundaries. *Id.* at 228–29.

[146] WENDY E. PARMENT, POPULATIONS, PUBLIC HEALTH AND THE LAW 78, 100–01 (2009).

[147] *Id.* at 97–98.

[148] 42 U.S.C. § 300h(a)(1), (b)(1) (2006).

[149] Legal Envtl. Assistance Found., Inc. v. EPA, 276 F.3d 1253, 1258 (11th Cir. 2001) (requiring the EPA to determine whether Alabama's revised UIC program provided an adequate permitting process for hydraulic fracturing). Using the two-part *Chevron* test, the court determined that the intent of Congress was not clear as to whether hydraulic fracturing fell within the purview of "underground injection," and thus the Agency was entitled to controlling weight for its interpretation of the

der SDWA § 300g-1, the EPA must establish a maximum acceptable level for specified contaminants and create a "national drinking water regulation," but only if certain conditions obtain.[150] The Administrator must first determine that the following three permissive characteristics are present: (1) the contaminant may have an adverse effect on human health, (2) the likelihood of permeating public water systems at a rate and quantity that gives rise to health concerns has become a "substantial likelihood," and (3) "in the sole judgment of the Administrator, regulation of" the contaminant will present the opportunity to reduce risk to human health.[151]

Additionally, to ensure that the contaminant is properly categorized, the Administrator must base this determination on "best available, peer-reviewed science."[152] The Administrator must examine seven factors,[153] two of which particularly require that "quantifiable and non-quantifiable health risk reduction benefits" exist "for which there is a factual basis to conclude" that such benefits would likely follow to identified populations.[154] In light of *Chevron U.S.A., Inc. v. Natural Resources Defense Council*, "considerable weight should be accorded to an executive department's construction of a statutory scheme it is entrusted to administer, and the principle of deference to administrative interpretations."[155] This dynamic is particularly illustrated in the

phrase, despite the existence of other possible interpretations, unless such interpretation was inconsistent with the clear terms of the statute. *Id.* at 1264.

[150] 42 U.S.C. § 300g-1 (b)(1)(A)(i)–(iii) (2006).

[151] *Id.*

[152] § 300g-1 (b)(3)(A)(i).

[153] § 300g-1 (b)(3)(C)(i)(I)–(VII). The statue lists the seven factors to be considered: (1) that reductions in health risks will occur as a result of compliance with the proposed treatment, (2) that the proposed treatment will target the contaminants causing the damage, (3) that costs resulting from the regulation are justified, (4) that the "incremental costs" resulting from compliance with the regulation have been considered, (5) that the contaminant's effect(s) on the general public as well as on children, the elderly, and pregnancies have been considered, (6) that the Administrator has considered any increased health risks stemming from compliance; and (7) any other "relevant factors," with discretion vested solely in the administrative agency. *Id.*

[154] § 300g-1 (b)(3)(C)(i)(I), (II).

[155] 467 U.S. 837, 844 (1984) (internal citation omitted). Judicial deference is consistent with a co-equal branch of government's review of matters explicitly delegated to administrative agencies when Congress relinquishes its discretionary power. INS v. Chadha, 462 U.S. 919, 956–59 (1983) (holding that Congress may not delegate authority to an executive branch agency while maintaining in the statute a clause granting to itself a legislative veto over actions of the executive branch because that is inconsistent with the bicameralism principle and Presentment Clause of the United States Constitution).

SDWA, in which Congress directed the EPA to apply its scientific and environmental expertise to evaluate best practices and promulgate appropriate regulatory schemes beyond the scope of the legislature's expertise or time to manage.[156]

2. Science, Policy, and Regulation

i. The EPA's Application of the Precautionary Principle

The precautionary principle requires that "when an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically."[157] This precept is one that remains deeply entrenched in the environmental management field,[158] and particularly in the American conception of environmental regulation.[159] Prevention rather than a cure is generally preferred; it is easier not to drop a fragile vase than it would be to clean up the myriad shards it would become once it hits the ground. On the other hand, where two mutually exclusive options present both advantages and dangers, it is extraordinarily difficult to pick one as the objectively better choice. Similarly, contemporary environmental risks engender complexities of scale, context, and uncertainty that make application of the precautionary principle difficult.[160] The application of the precautionary principle could have a sizeable impact on the scope

[156] *See The Safe Drinking Water Act Amendments of 1996: Strengthening Protection for America's Drinking Water*, ENVTL. PROT. AGENCY, http://water.epa.gov/lawsregs/guidance/sdwa/theme.cfm (last visited Mar. 30, 2012) [hereinafter *The Safe Drinking Water Act Amendments of 1996*].

[157] Joel A. Tickner, *Introduction*, *in* PRECAUTION, ENVIRONMENTAL SCIENCE, AND PREVENTATIVE PUBLIC POLICY, at xiii, xiii–xiv (Joel A. Tickner, ed. 2003) (quoting the 1998 Wingspread Statement on the Precautionary Principle) (internal quotation marks omitted). The four central components of the principle, as identified in the statement, are: "(1) taking preventive action in the face of uncertainty, (2) shifting burdens onto proponents of potentially harmful actions, (3) exploring a wide range of alternatives to possibly harmful actions, and (4) increasing public participation in decision-making." *Id.* at xiv (internal quotation marks omitted).

[158] MICHAEL FAURE & GORAN SKOGH, THE ECONOMIC ANALYSIS OF ENVIRONMENTAL POLICY & LAW 19, 21–26 (2003).

[159] *See, e.g.*, Pollution Prevention Act, 42 U.S.C. § 13101 (2006); *see also* CASS R. SUNSTEIN, RISK AND REASON: SAFETY LAW AND THE ENVIRONMENT 99 (2002). Consider "the phaseout of lead in gasolines, the use of solar power, and the substitution of electric cars for cars powered by gasoline." *Id.* at 100.

[160] Joel A. Tickner, *The Role of Environmental Science in Precautionary Decision Making*, *in* PRECAUTION, ENVIRONMENTAL SCIENCE, AND PREVENTATIVE PUBLIC POLICY *supra* note 157, at 3, 4.

and recommendations of the study that the EPA is currently producing.

ii. Politics and Public Involvement in EPA Scientific Practices

The EPA is seeking to involve all interested stakeholders in the articulation of the scope and methodology of its study on hydraulic fracturing's effects on groundwater.[161] This is consistent with the EPA's current practices in both community involvement and accountability.[162] "[I]n the context of complex environmental and health risks, it is much more useful to think of science and policy as dynamically informing each other . . . ."[163] Science is the basis on which to ground policy determinations, and public policy should prioritize which environmental issues to research first.[164] The study's conclusions regarding the practice's effects on groundwater will undoubtedly influence whether the EPA will regulate the use of hydraulic fracturing. The study would lose integrity, however, if it were structured around that knowledge so as to affect a particular outcome.

Ideally, if policy-setting behind environmental regulation was merely an empirical choice, it would be easy—through the weight of scientific evidence and the significance of intelligent recommendations—to articulate a new program and implement logical changes to the existing procedures.[165] "However, the policy process is more complex than superficial change can accommodate. In addition to context programs and administrative activity, the formulation and implementation process relies on something deeper and more fundamental: a core moral or normative belief."[166] Policy sets preferences in funding, priority, and objectives: the message communicated

[161] *EPA Seeks Gas-Drilling Facts*, WALL ST. J., Sept. 10, 2010, at B2. The EPA requested and received disclosure of chemicals used in hydraulic fracturing by the nine biggest natural gas companies and contractors. *Id.* The EPA also scheduled several public meetings for stakeholders. *Id.*

[162] *See The Safe Drinking Water Act Amendments of 1996*, *supra* note 156.

[163] Tickner, *supra* note 157, at xiii.

[164] *Id.*

[165] John Martin Gillroy & Joe Bowersox, *Introduction: The Roots of Moral Austerity in Environmental Policy Discourse*, *in* THE MORAL AUSTERITY OF ENVIRONMENTAL DECISION MAKING: SUSTAINABILITY, DEMOCRACY, AND NORMATIVE ARGUMENT IN POLICY AND LAW 1, 5 (John Martin Gillroy & Joe Bowersox eds., 2002).

[166] *Id.*

by the preferences is a moral statement.[167] That belief must be consistent across the law's reformulations, despite regular revisions and opportunity for competing moral standards to devise alternate methods of operation.[168]

Hydraulic fracturing produces virulent and intractable responses in its advocates and opponents alike. Such responses in the public make it difficult to establish a uniform policy. For instance, at a public stakeholders' meeting that the EPA held in Pennsylvania, Regional Administrator Judith Enck requested input regarding the design of the study proposed to be concluded in 2012, "not about the merits of hydraulic fracturing."[169] And nonetheless, "[n]early all [of the impassioned speakers present] urged the EPA to base its study on science, rather than emotion or political pressure—as long as it was the science that supported their position."[170]

The public has a limited scientific and historical context from which it can promote rational views on the preferred balance of economic and public health interests.[171] "[I]n recent years, environmental groups and community activists, pointing to inconclusive but sometimes compelling anecdotes of possible water contamination, have complained that the drilling practice is far too loosely regulated. Those complaints increased after the BP oil spill in the Gulf of Mexico."[172] Notably, the causes of the BP oil spill are but tenuously connected to possible future EPA regulation of hydraulic fracturing.[173] This combination of inflammatory discourse and lack of specialized

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[167] *Id.*

[168] *Id.* (paraphrasing GIANDOMENICO MAJONE, EVIDENCE, ARGUMENT AND PERSUASION IN THE POLICY PROCESS 146–49 (1989)).

[169] Maykuth, *supra* note 40.

[170] *Id.*

[171] Zeller, *supra* note 46.

[172] *Id.*; *see infra* notes 208–18 and accompanying text.

[173] *See generally* Christian Garcia, *Halliburton Comments on National Commission Cement Testing*, BUSINESS WIRE (Oct. 29, 2010), http://ir.halliburton.com/phoenix.zhtml?c=67605&p=irol-newsArticle&ID=1489037&highlight= ("Well logs and rig personnel confirm that the well was not flowing after the cement job. BP and/or others, following the misinterpreted negative results conducted after the cement job proceeded to displace mud in the production casing and riser with lighter sea water, allowing the well to flow. Given these numerous intervening causes, Halliburton does not believe that the foam cement design used on the Macondo well was the cause of the incident."); Ian Urbina, *BP Spill Report Hints at Legal Defense*, N.Y. TIMES (Sept. 8, 2010), http://www.nytimes.com/2010/09/09/us/09spill.html.

public knowledge leads to over-promotion of regulation without meaningful, critical analysis of the likely outcomes of such regulation.

iii. Previous EPA Study on Hydraulic Fracturing's Impacts on Drinking Water

The EPA previously produced a study on hydraulic fracturing that has come under attack for being too influenced by the private sector's interests.[174] In 2004, the EPA produced a report evaluating the impacts of hydraulic fracturing on USDWs.[175] During the first phase of the study, the EPA identified three specific means through which contaminants could migrate from the location where hydraulic fracturing was being used to USDWs: either direct injection into the USDW, creation of a hydrological connection between the coalbed and a USDW, or injection into a fracture already in "hydraulic communication with a USDW."[176] The EPA also studied reports of drinking water well contamination, finding no confirmatory evidence linking the hydraulic fracturing process to the contamination.[177] The first phase of the study ended the enquiry: the EPA looked at existing literature, interviewed industry and government officials, and solicited comments from concerned citizen and environmental groups.[178]

Based on these preliminary assessments, the EPA concluded that there was "no conclusive evidence that water quality degradation in USDWs is a direct result of injection of hydraulic fracturing fluids in-

[174] *See* Wiseman, *supra* note 57, at 170–80. Part V of Professor Wiseman's article details the accusation levied against the EPA's lack of objectivity in producing the study, in particular the decision to stop the study before instituting a more comprehensive examination of hydraulic fracturing. *Id.* at 172. The EPA is not only subject to the overbearing interests of the private sector; it also faces considerable pressure from the political party in power during the course of any particular decision. *Id.* at 178.

[175] ENVTL. PROT. AGENCY, EVALUATION OF IMPACTS TO UNDERGROUND SOURCES OF DRINKING WATER BY HYDRAULIC FRACTURING OF COALBED METHANE RESERVOIRS STUDY (2004), *available at* http://water.epa.gov/type/groundwater/uic/class2/hydraulicfracturing/wells_coalbedmethanestudy.cfm.

[176] *Id.* at ES-1.

[177] *Id.*

[178] *Id.* at ES-8. The EPA looked at water quality incident reports that may have been associated with CBM hydraulic fracturing. The Agency examined over 200 peer-reviewed publications, spoke with approximately fifty employees of industry leaders and officials at state and local government agencies, and contacted more than 500 local or county agencies in potentially affected areas, receiving no complaints from these officials. *Id.* at 7-1. The Agency also contacted and took comments from approximately forty concerned citizens and environmental groups. *Id.*

to CBM wells and subsequent underground movement of these fluids."[179] Additionally, the EPA concluded that chemicals, even if injected directly through USDWs, are unlikely to have more than minimal effect: "groundwater production, combined with the mitigating effects of dilution and dispersion, adsorption, and potentially biodegradation, minimize the possibility that chemicals included in the fracturing fluids would adversely affect USDWs."[180] Finally, citing the expansive horizontal and vertical distances between most USDWs and methane coal beds, the EPA determined that the material barrier between the two would prevent breach and contamination.[181]

In light of the results of the first phase, the EPA declined to produce a time-consuming, expensive study of hydraulic fracturing beyond the scope of the initial question, which it had already answered.[182] Based on the study's conclusions, Congress passed the Energy Policy Act of 2005[183] to amend the SDWA,[184] removing hydraulic fracturing from its jurisdiction and ending any perceived ambiguity in the statute.[185] The FRAC Act, currently pending in Congress, seeks to change this exception and would require the EPA to regulate hydraulic fracturing.[186] To properly balance the interests of the oil and gas industry against those of local businesses, citizens, and state and local governments, the federal government should approach this new avenue for regulation with eagerness to cooperate with existing state statutory schema and a respect for the competing and complementary interests of all parties.

IV. COOPERATIVE FEDERALISM

A. Overview of Cooperative Federalism

Cooperative federalism models share power between federal and state or local governments to promote consistency across the nation as well as localized solutions.[187] Within this collaborative dynamic, the

[179] *Id.* at 7-2.

[180] ENVTL. PROT. AGENCY, *supra* note 175, at 7-3.

[181] *Id.*

[182] *Id.* at 7-5.

[183] Pub. L. 109-58, § 322, 119 Stat. 594 (2005) (codified at 42 U.S.C. § 300h(d)(1)(2006)).

[184] 42 U.S.C. § 300h (d) (2006).

[185] *Committee Report: Legislative Committee*, 27 ENERGY L. J. 349, 353 (2006).

[186] *See* Lustgarten, *supra* note 48.

[187] Robert L. Fischman, *Cooperative Federalism and Natural Resources Law*, 14 N.Y.U. ENVTL. L. J. 179, 184 (2005). "[C]ooperative federalism . . . requires a greater degree

federal government remains the paramount authority.[188] For environmental policy, a marked preference for cooperative federalism permeates the statutes enacted over the past thirty years.[189]

The allocation of decision-making authority between federal or local government, industry, and citizens confronts fundamental questions related to democracy and citizen-government in the United States.[190] Individual involvement and interest in decision-making drops precipitously when the benefits connected to a decision are diffused across a large population.[191] This response occurs because the perceived cost of influencing a self-beneficial outcome outweighs the perceived benefit of promoting that outcome.[192] "Centralized regimes relying upon mandatory prescriptions that constrain discretion on the part of individuals are often accompanied by processes of psychological detachment, social disengagement, and loss of initiative on the part of those who seek to minimize their individual costs of en-

of coordination between the two levels of government. Since the New Deal, cooperative federalism typically appears as congressional or administrative efforts to induce (but not coerce or commandeer) states to participate in a coordinated federal program." *Id.*

[188] *Id.* at 183. "The adjectival root, 'federal,' aptly implies the strong national government created in the U.S. Constitution to repair the relatively weak central government created by the Articles of Confederation. Therefore, most scholarly approaches to federalism emphasize the national government as the dominant partner." *Id.*

[189] *See* Robert L. Glicksman, *From Cooperative to Inoperative Federalism: The Perverse Mutation of Environmental Law and Policy*, 41 WAKE FOREST L. REV. 719, 737–47 (2005). Part II.B.2.b of Professor Glicksman's article provides a comprehensive description of federal environmental statutes employing the use of cooperative federalism ideals in structure and implementation. *Id.* at 737–47.

[190] *See* Bruce Ledewitz, *The Present and Future of Federalism*, 43 DUQ. L. REV. 645, 645–47 (2005). Part I describes the relationship between federalism and the Constitution and the rest of the article examines the importance of political checks provided through federalism concepts. *Id.* at 645–47.

[191] Some federalism incarnations draw heavily from the economic model of competition among the states and local government propounded in 1956 by Tiebout, who theorized that the mobility of states' citizenry, when combined with diverse governmental models, would result in the efficient allocation of resources to the public. Charles Tiebout, *A Pure Theory of Local Expenditures*, 64 J. POL. ECON. 416, 418 (1956). This method of governance reduces the problem of pluralism where fiscal and decisional irresponsibility of representatives abounds because of the "concentration of benefits in a few hands while the concomitant costs are diffused among the population as a whole." Landy, *supra* note 145, at 231. Where a population is large enough so that each individual is only required to contribute inconsequential amounts to achieve a single result, citizen involvement in decision-making drops precipitously. *Id.* at 232.

[192] People with "skills and resources . . . better suited to the national scene have come to exert enormous leverage in Washington." *Id.* at 231.

trapment."[193] Consequently, in a centralized-control regime, the power to direct regulation would remain in the hands of a few—either federal officials tasked with regulating the process or those private individuals or corporations with sufficient economic incentive to participate. Centralized control over environmental issues through federal regulation has been touted as the apex of regulation for non-localized issues that is both sufficiently protective and efficient.[194] While national consistency in environmental protection has decided benefits, cooperative federalism allows decision-makers to weigh such benefits against the negative impacts that this kind of national uniformity will have at the local level.

Legislation addressing potential environmental effects on groundwater from hydraulic fracturing will require significant investment of money for research, broad participation by stakeholders, and some compromise between two important national interests—energy and protection of natural resources.[195] In matters of this kind, where "some states may be unwilling to enact statutes, particularly costly legislation, only national legislation sufficiently addresses these issues."[196] While states can address and regulate hydraulic fracturing that occurs within the state's boundaries,[197] suspicion persists that such regulation does not adequately protect migratory resources. This is an area where federal regulation might be required because one state's efforts to attract industry through looser regulation could have effects on another state's water or air supply through downstream effects.[198] Particularly for migratory resources that multiple states share or that are subject to effects from migratory pollution, "proponents of a purely federal approach reason that environmental concerns involve issues, such as air and water, not confined to any one state."[199]

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[193] VINCENT OSTROM, THE MEANING OF AMERICAN FEDERALISM: CONSTITUTING A SELF-GOVERNING SOCIETY 124 (1991).

[194] Krista Yee, *"A Period of Consequences": Global Warming Legislation, Cooperative Federalism, and the Fight Between the EPA and the State of California*, 32 ENVIRONS ENVTL. L. & POL'Y J. 183, 186 (2008). "Since environmental problems have far reaching effects on national—in fact, global—concerns, some argue only national legislation can adequately address these issue." *Id.*

[195] *See supra* Part II.B.

[196] Yee, *supra* note 194, at 186.

[197] For a detailed discussion of state regulation, see *supra* Part III.B.1.

[198] *See* Ledewitz, *supra* note 190, at 650 ("Scientifically speaking, there is no such thing, for example, as intrastate water. All water has moved across state borders in the past and, of course, will do so again in the future.").

[199] Yee, *supra* note 194, at 186.

Despite these concerns, state and local authorities typically take on great responsibility for implementing broad policy goals, particularly in the realm of environmental protection. Environmental statutes are largely administered through some form of cooperative federalism, requiring both federal and state participation.[200] Allowing states the discretion to deviate from a federally-established norm encourages innovation, and such exploration of alternatives can expose policymaking errors.[201] Additionally, cooperative federalism prevents some of the inefficiencies and policy failures that plague the command-and-control, centralized regulatory schema. These include inefficiencies associated with having a wide range of programs that cover interwoven aspects of a single problem, the difficulty in implementing "regulatory programs involv[ing] complex tradeoffs among competing social goals," and the over-involvement of any single interest group in setting policy throughout the regulatory process.[202]

B. Modified Cooperative Federalism

1. Criticism of Cooperative Federalism

The federal decision to devolve primary control over the federal programs—such as the UIC program—to the states has had its critics, despite the above-noted benefits.[203] The critics point out that, in practice, devolution can sometimes result in "economic inefficiency

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[200] *See* Glicksman, *supra* note 189, at 737–47. Part II.B.2.b of Professor Glicksman's article provides a comprehensive description of federal statutes employing the use of cooperative federalism ideals in structure and implementation. *Id.*

[201] Henry Butler & Jonathan Macey, *Externalities and the Matching Principle: The Case for Reallocating Federal Authority*, 14 YALE L. & POL'Y REV. 23, 25 (1996). "[D]ecentralization allows other people to visit on legislators and regulators the content of their preferences and the rigors of the marketplace." *Id.* at 35 (citing Peter H. Aranson, *Pollution Control: The Case for Competition*, *in* INSTEAD OF REGULATION: ALTERNATIVES TO FEDERAL REGULATORY AGENCIES 339, 383–84 (Robert W. Poole, Jr., ed., 1982)).

[202] Cass Sunstein, *Administrative Substance*, 41 DUKE L. J. 607, 627 (1991).

[203] *See, e.g.*, Rena I. Steinzor, *Devolution and the Public Health*, 24 HARV. ENVTL. L. REV. 351, 374 (2000). *But see* Shelia R. Foster, *Meeting the Environmental Justice Challenge: Evolving Norms in Environmental Decisionmaking*, 30 ENVTL. L. REP. 10,992, 11,005 (2000) (arguing that despite recent initiatives seeking to require environmental decision-makers to account for the limitations of current risk assessment methodology, there still exists a normative gap precludes full justice in environmental decisionmaking); Sheila R. Foster, *Environmental Justice in an Era of Devolved Collaboration*, 26 HARV. ENVTL. L. REV. 459 (2002) (addressing the means necessary to decentralize environmental decision-making without overpowering the voices of vulnerable communities).

of reinventing scientific and technical knowledge at the state level [that] more than counterbalances the supposed advantages of moving the standard-setting aspects of such decision-making closer to the people."[204] The criticism is accurate—needless repetition of complex science is an expensive method of encouraging participation by all interested citizens. In addition, cooperative federalism has been disparaged for fostering several problems: regulations that are less responsive to local preferences, higher taxes that are neither readily discernible nor traceable to a specific, received benefit, and lower accountability of politicians in both local and national government.[205]

One long-standing critic of cooperative federalism, Dr. Michael Greve, states that the theory produces insurmountable information costs, conceals accountability of elected representatives, and voids individual choice and state competition.[206] His critique dismisses cooperative federalism as insufficiently decentralized government. From the perspective of the individual citizen, these concerns represent substantial impediments to participation in policy-setting. "Citizenship is a mix of opportunity and obligation. . . . [A] voice in collective decisions [requires] . . . a share in the sacrifices those decisions impose. Centralizing policy and politics not only minimizes one's voice in public affairs, it reduces one's responsibilities."[207] When cooperative federalism fails to protect true diversity of regulatory options, it devolves into a multi-tiered game of bureaucratic blame-shifting, where each level of government fails to provide the necessary checks and balances against the others. As particularly illustrated in the story of the Deepwater Horizon blowout,[208] sharing responsibility be-

[204] Steinzor, *supra* note 203, at 374.

[205] Michael S. Greve, *Against Cooperative Federalism*, 70 MISS. L. J. 557, 598 (2000) ("Any form of cooperative federalism will reduce the range of policy variation among the states and deprive citizens of the benefits of diversity and choice; produce taxation that is hidden and therefore in excess of the voters' actual preferences; reduce political transparency; obscure political responsibility; and facilitate political blame-shifting.").

[206] MICHAEL S. GREVE, REAL FEDERALISM: WHY IT MATTERS, HOW IT COULD HAPPEN 57 (1999).

[207] Landy, *supra* note 145, at 231.

[208] For detailed information about the blowout, see *Oil Spill Gulf of Mexico 2010*, TIMES-PICAYUNE, http://www.nola.com/news/gulf-oil-spill/ (last visited Mar. 20, 2012). On April 20, 2010, the off-shore oil rig Deepwater Horizon had two days of work left to complete before its crew could place a temporary cap on the oil well that it had drilled and turn it over to a production platform, which would produce oil from the well thousands of feet below the surface of the ocean. EMMET MAYER III & DAN SHEA, WHAT HAPPENED ON THE DEEPWATER HORIZON (2010), *available at* http://media.nola.com/news_impact/other/oil-cause-050710.pdf. But as the rig

tween government authorities can result in a lack of transparency and agency capture.

Both state regulators and federal agencies responsible for providing oversight of the oil and gas industry had neglected their responsibilities for policing the industry before the incident occurred and then continued to do so afterwards, instead of ensuring that the operators responded to the spill properly.[209] Oil and seafood are mainstays of Louisiana's economy.[210] The explosion and subsequent spill of an estimated 4.4 million gallons of oil[211] resulted in severe consequences, such as damage to the Louisiana wetlands,[212] injury to the fishing industry,[213] and a temporary moratorium on offshore drilling in the Gulf.[214] Various commentators have traced the causes of the explosion to industry-wide bad practices,[215] specific operators' poor decision-making,[216] and the failure of government regulation.[217]

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disconnected, a blowout occurred and the rig exploded, catching fire and eventually sinking to the bottom of the ocean. *Id.*

[209] NAT'L COMM'N ON THE BP DEEPWATER HORIZON OIL SPILL, FINAL REPORT 78 (2011) ("Perhaps because of the cumulative lack of adequate resources, absence of a sustained agency mission, or sheer erosion of professional culture within some offices, MMS [Mineral Management Services] came progressively to suffer from serious deficiencies of organization and management: the fundamental traits of any effective institution."); *id.* at 138 (describing state officials' confusion over whether the Stafford Act or National Contingency Plan governed the spill response—one of which put state officials in charge with federal official assisting them, while the other put federal officials in charge); Steven Mufson, *Federal Records Show Steady Stream of Oil Spills in Gulf Since 1964*, WASH. POST, July 24, 2010, at A1. Federal records clearly point to a consistently poor industry and regulator record with 517,847 barrels dumped in the Gulf. *Id.*; *see also* Jen DeGregorio, *Oil and Gas Development Permits Overwhelmingly Approved by Louisiana*, TIMES-PICAYUNE, May 30, 2010, at A1. Many federal agencies, such as Mineral Management Services and the Department of Natural Resources, face dual obligations as both collectors of rents and regulators of the industries they manage. DeGregorio, *supra*.

[210] Chris Kirkham, *Oil and Fish Worlds Are Entwined in the Same Net*, TIMES-PICAYUNE, May 9, 2010, at A1.

[211] David Hammer, *History of Louisiana and Offshore Oil*, TIMES-PICAYUNE, July 18, 2010, at A1.

[212] David Batker et al., *Gaining Ground: Wetlands, Hurricanes, and the Economy: The Value of Restoring the Mississippi River Delta*, 40 E.L.R. 11106, 11107 (2010); Mark Schleifstein, *Splitting the Bill is Tricky, BP's Expenses Will Continue for Years*, TIMES-PICAYUNE, May 23, 2010, at A12.

[213] Bruce Alpert, *The Feds Declare Fisheries Disaster in Louisiana, Mississippi, Alabama*, TIMES-PICAYUNE, May 25, 2010, at A4.

[214] *See* Hammer, *supra* note 211.

[215] Dana Milbank, *Tusk-Tusk, Oil Execs*, WASH. POST, June 16, 2010, at A2.

[216] David Hammer, *Five Key Human Errors, Colossal Mechanical Failure Led to Fatal Gulf Oil Rig Blowout*, NOLO.COM (Sept. 5, 2010, 6:00 AM),

In particular, the government agencies that bore the responsibility for regulating the industry were found to have either engaged in unethical collusion with industry insiders or only laxly enforced the regulations that would have prevented the spill.[218] Such regulatory failure reduces confidence in local, state, and national governments' accountability, transparency, and objectivity.

2. Answers from Fundamental Values of Federalism

As a general political form, federalism is predicated in large part on competition between government actors to ensure the best provision of public services.[219] The competition stems from the separation of powers and the functions of the government.[220] The ultimate values of federalism derive from this tension intentionally created between national and local governments:

> All federal systems have reference to multiple units of government, each of which has an autonomous existence. . . .
> . . . .
> . . . Using power to check power amid opposite and rival interests (to combine phrases from Montesquieu and Madison) implies that such a system of government will have equilibrating tendencies. . . .
> . . . .

http://www.nola.com/news/gulf-oil-spill/index.ssf/2010/09/5_key_human_errors_colossal_me.html.

[217] Mufson, *supra* note 209. Federal records demonstrate a consistently poor industry and regulator record through the failure that resulted in 517,847 barrels having been dumped in the Gulf. *Id.*; *see also* DeGregorio, *supra* note 209. Many federal agencies, including the Mineral Management Services and the Department of Natural Resources, have nigh incompatible dual obligations as both collectors of rents and regulators of the industries they manage. DeGregorio, *supra* note 209.

[218] WILLIAM R. FREUDENBURG & ROBERT GRAMLING, BLOWOUT IN THE GULF: THE BP OIL SPILL DISASTER & THE FUTURE OF ENERGY IN AMERICA 51–61 (2011). The history of the relationship between the oil industry and the federal regulators includes such sordid episodes as sex and drugs passing between the two as well as a long, consistent history of favoring production of economic benefits over regulation of environmental impacts. *Id.* The oil industry outpaced the agency in growth and "[t]he number of accidents, spills and deaths regularly occurring in the region has far surpassed the agency's ability to investigate them." Marc Kaufman et al., *MMS Investigations of Oil-Rig Accidents Have History of Inconsistency*, WASH. POST (July 18, 2010), http://www.washingtonpost.com/wp-dyn/content/article/2010/07/17/AR2010071702807.html.

[219] *See generally* GREVE, *supra* note 206 (arguing that the benefits of federalism derive from the competition produced among different sovereigns).

[220] Greve, *supra* note 205, at 576 ("[T]he founders sought to foster institutional conflicts as 'auxiliary precautions' against the dangers of an overbearing government.").

> Government in a democratic society, then, is not simply a matter of command and control but of providing multiple structures that have reference to diverse methods of problem solving.[221]

The checks and balances ensure that all levels of government compete rather than collude—while intergovernmental collusion (where federalism dictates governmental competition) eviscerates this fundamental protection for citizens as the source of power.[222] While people have natural "parochial loyalties" leading to greater interest and involvement in issues closest to home, the Constitution sought to empower the national government with sufficient powers and ability to provide incentives for citizens to overcome these natural inclinations.[223] Simultaneously, the citizens sought to limit the scope of the federal government's power to interfere into the realm that the Founding Fathers envisioned as mere local concerns, so as to create a system that would foster state-specific solutions to local issues.[224]

Federalism promotes diversity of local solutions to widespread issues, prevention of tyranny, and citizen participation in democracy, as well as "the improvement of economic efficiency through competition among the states, the acceleration of progress through experimentation by the states, and perhaps the protection of certain values of community."[225] Cooperative federalism, however, decreases competition between governments. By its very nature, the theory works through collaboration between different governments, promoting both vertical and horizontal cooperation.[226]

Coordination of broad-scale efforts with the minute details of particular situations requires multi-tiered cooperation to ensure that national standards are followed and to provide incentives for reluctant jurisdictions to accept an unwanted standard.[227] Unfortunately,

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[221] OSTROM, *supra* note 193, at 7, 16, 17.

[222] *See id.* at 16–17. To compete, each seeks the preference and approval of the citizens under its jurisdiction. *Id.* In addition, the state and local governments can engage in a horizontal form of competition for each other's citizens. *See id.*

[223] *See* John Kincaid, *The Competitive Challenge to Cooperative Federalism: A Theory of Federal Democracy*, *in* COMPETITION AMONG STATES & LOCAL GOVERNMENTS: EFFICIENCY & EQUITY IN AMERICAN FEDERALISM 87, 87 (Daphne A. Kenyon & John Kincaid eds., 1991).

[224] "Dual federalism stresses the need for a constitutional distribution of powers that maintains coordinate, semiautonomous governments able to perform exclusive and concurrent functions." *Id.* at 89.

[225] Adam B. Cox, *Expressivism in Federalism: A New Defense of the Anti-Commandeering Rule?*, 33 LOY. L.A. L. REV. 1309, 1321 (2000).

[226] Greve, *supra* note 205, at 566.

[227] *Id.* at 596.

the price of uniformity is that the system is rigid, insofar as the participants fight off attempts to alter who it favors. The opportunity to affect national policy creates high stakes for big-interest involvement and the resultant policy schema correspondingly accommodates political and interest group influences, thus "giving organized groups a stake in the system."[228] This in turn reduces the number of successful challenges to a set protocol, not because the system rests on an ideal or unnaturally high-quality model, but merely because the political economy surrounding the system is antagonistic towards giving up any power in the burgeoning bureaucracy.[229] The solution to this quandary is to reinsert fundamental federalism values of separate, concurrent governance by the different levels of government in order to inject competition into the system. By returning competitive elements to cooperative federalism, the preference for a national standard that allows maximum transfer of funds and minimal accountability will be held in check by placing more decision-making power closer to impacted populations.

V. COOPERATIVE FEDERALISM WILL ENSURE PROPER REGULATION IF BALANCED WITH DUE WEIGHT FOR STATE VARIATION

Despite its problems, cooperative federalism is the best method for approaching regulation of hydraulic fracturing. As an issue that draws heated and intractable responses from both adherents and critics, hydraulic fracturing is susceptible to overly rosy impact analysis by industry insiders and apocalyptic fear from environmental advocates. Informational asymmetries create difficulties for policy-setting bodies—whether they are local governments writing ordinances, state legislators drafting well bond requirements, or the EPA putting together a national scientific study. Each level of decision-making, however, has its own strengths and abilities to protect certain interests, and cooperative federalism will allow these individual contributions to be reflected in the final regulatory schema.

State and local officials are necessarily more familiar with the terrain, processes, and current practices of the industry due to their history of regulating hydraulic fracturing as well as the state regulators' closer relationships with the geographical areas.[230] Accordingly, state and local officials are better suited to effectively attend to regu-

[228] *Id.* at 560.

[229] *Id.* at 596.

[230] For a discussion of state regulation of hydraulic fracturing, see *supra* Part III.B.1.

latory activities governing hydraulic fracturing. Moreover, permitting states to produce regulatory frameworks that further local goals will promote adaptive and particularized regulation, as opposed to a federal one-size-fits-all solution.[231] However, state officials face looming budgetary restraints and growing informational asymmetries that make policy setting and enforcement a daunting task.

To stay abreast of the dynamic expansion of the energy industry, both complex science and nuanced approaches to regulation are necessary. Energy-producing companies are driven by profit and innovation, and they change technological marvels more quickly than regulators can produce scientific evidence of harm. The regulatory schema should represent both accurate science and citizens' preferences for environmental protection and industry development. In formulating these regulations, the precautionary principle can provide guidance in the complex decision-making process if elected representatives make broader, normative decisions:[232]

> While the precautionary principle can remind us of our moral duty to prevent harm in general, it cannot prescribe what kind of sacrifice we should be prepared to make in each and every case. Thus the precautionary principle has the semantic status of a general norm rather than of a step-by-step rule of operation.[233]

When regulatory decisions require policy setting, a focused use of the precautionary principle will produce regulations that protect industry as well as the environment. Normative values underlie decisions that evaluate the extent to which the environment should be protected in a way that prejudices industry. This is a function best suited for the legislative branch rather than being shoehorned into the restricted authority delegated to an administrative agency.[234] The decisions about how to shape the landscape of the energy industry should be made with the help of consumers who have direct knowledge of the associated hardships or by their elected representatives, but not by appointed agency administrators who cannot be held directly accountable for the wide-reaching consequences of their decisions.

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[231] U.S. DEP'T OF ENERGY, *supra* note 15, at 25.

[232] The precautionary principle encourages avoidance of potentially risky activities where all risks have yet to be identified. This principle is difficult to follow when one population bears the risks that bring profit to a proponent of the activity. *See* FAURE & SKOGH, *supra* note 158, at 19–26.

[233] *Id.* at 22.

[234] Matthias Kaiser, *Ethics, Science, and Precaution: A View from Norway*, *in* PRECAUTION, ENVIRONMENTAL SCIENCE, AND PREVENTATIVE PUBLIC POLICY, *supra* note 157, at 21, 22.

Modifying cooperative federalism to reflect the core, competitive values of federalism may cure some of the ills engendered by sharing responsibility. By deliberately leaving room for states to enact variations of a federal program or protective scheme, rather than mandating the adoption or implementation of a uniform one, a more competitive, modified form of cooperative federalism will produce regulations that reflect the moral decision-making of impacted populations. Such potential variations do not need to be enunciated in a federal statute with explicit, limited possibilities. Instead, letting the states independently develop multiple methods of reaching a federally mandated level of protection would be more beneficial. This breathing room can permit some states to enact more stringent regulations, encourage others to provide tax exemptions to conforming businesses, and force others to find funds for investment in infrastructure that can ameliorate the greater burdens on individuals or businesses who must comply with the environmentally protective regulation.[235] A solution that reflects these values of modified cooperative federalism will provide a flexible, national, minimum standard that leaves room for state variation.[236]

The federal government faces a recent, large-scale example of federal agencies' failure to regulate the oil industry properly.[237] Congress must calculate the balance of power between the state and federal government in order to protect the environment and the citi-

[235] *See, e.g.*, Patricia Salkin, *Cooperative Federalism and Climate Change: New Meaning to "Think Globally—Act Locally*," 40 ENVTL. L. REP. NEWS & ANALYSIS 10562 (2010). Professor Salkin provides examples for recommendations to federal and state governments "to ensure that local governments have the tools, resources, authority, and support needed" to address the root causes of greenhouse gases and implement national policies for dealing with them. *Id.* at 10570–71.

[236] Philip J. Weiser, *Federal Common Law, Cooperative Federalism, and the Enforcement of the Telecom Act*, 76 N.Y.U. L. REV. 1692, 1697–98 (2001). Professor Weiser argues that lack of unified vision for the singular roles of federal regulatory agencies, state government, and federal judges has resulted in a failure to properly implement the cooperative federalism ideals set out in recent federal statutes. *Id.* at 1692–93.

> Cooperative federalism regulatory programs, which combine federal and state authority in creative ways, strike many courts and commentators as a messy and chaotic means of generating federal law. Compounding the hostility to such regimes, some argue that globalization and technological change leave little or no role for states in implementing complex regulatory regimes and thus endorse a "preemptive federalism" that relies primarily or exclusively on federal courts or administrative agencies to develop unitary and pinpointed federal policies.

Id. at 1693.

[237] *See supra* notes 208–19 and accompanying text.

zens' and commercial interests, not to spread liability and avoid accountability. The natural gas industry does not need to submit more paperwork that overworked federal employees will process and that will never reach state officials. Instead, the industry needs a clear set of authorities that force it to answer for any negligent practices or failed innovations.

The protection of groundwater must not be subordinate to the development of natural gas. But neither should the resources lying beneath the surface of the affected states be put into indefinite stasis. The best option should be more creative than a hastily-concocted moratorium that merely panders to the fears of an elected official's base. The EPA needs more time to study the actual effects of hydraulic fracturing chemicals on groundwater. Accordingly, states should avoid shutting down the industry due to lack of publicly available studies. States have other options to explore, such as instituting a staggered system of permitted activity that allows the industry to frack wells in low-risk geographical areas, but does not allow hydraulic fracturing in areas where the chemicals would present greater risks. A model of regulation drawn from modified principles of cooperative federalism would allow the EPA to produce a sufficiently comprehensive investigation of the inherent risks of hydraulic fracturing while avoiding damage to the industry.

VI. CONCLUSION

This Comment draws from the mechanical process of hydraulic fracturing and current state regulations to provide historical context for the EPA's forthcoming study. There are already federal statutes that regulate parts of the hydraulic fracturing process as well as gaps in the regulatory scheme, which the FRAC Act is intended to fill. Science and politics are dynamic forces shaping the format of the study. Recent failures in both federal and state agencies' accountability and ability to respond to disasters, as seen in the BP blowout, demonstrate the danger when poorly designated authority results in catastrophic breakdowns where federal and state powers overlap.

Under the SDWA, the EPA possesses the authority to set national policy goals for individual states to implement UIC programs.[238] Practical application of cooperative federalism in this context would require the EPA to implement a federal solution only when states show that they are incapable of maintaining adequately a regulatory pro-

[238] *See supra* Part III.C.1.

gram. The balance of competing interests—the need for sources of energy and the need to protect our water resources—calls for a respectful solution; solution that does not smother an industry while providing necessary resources for our consumption,[239] but which also protects our most vital resource. A partnership can develop between state and federal governments where the federal government provides uniform science and a minimum standard to calm individual concerns, but leaves room for more stringent or specific regulation to local government sources. This cooperation will provide the most comprehensive, protective, and accountable regulation of the natural gas industry, while preserving a balance between the competing interests.

[239] An IHS Global Insight study found that federal regulation would reduce gas production by 4.4 Tcf, or twenty-two percent, and reduce oil production by 400,000 b/d, or eight percent, by 2014. IHS GLOBAL INSIGHT, MEASURING THE ECONOMIC AND ENERGY PROPOSALS TO REGULATE HYDRAULIC FRACTURING 1–2 (2009), *available at* http://www.api.org/policy/exploration/hydraulicfracturing/upload/IHS_GI_Hydraulic_Fracturing_Exec_Summary.pdf.