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Hydraulic Fracturing: Identifying and Managing the Risks

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Massive domestic natural gas reserves previously uneconomical to develop are now, through hydraulic fracturing, feasible to produce. The process, which involves the injection of millions of gallons of water and chemical additives under high pressure into the subsurface, is not without risk. Over three dozen lawsuits have been filed alleging that hydraulic fracturing has caused damages to drinking water supplies, toxic exposures, and earthquakes. Regulation of this process at the federal level has been minimal; states are only now enacting legislation requiring the disclosure of the chemicals used in the fracturing process. Two municipalities in New York state have been successful in stopping exploration and development within their borders through the imposition of bans on hydraulic fracturing under local zoning laws. Studies completed thus far are inconclusive or contradictory as to whether hydraulic fracturing is causing ground and drinking water contamination or earthquakes. The risks associated with hydraulic fracturing are known, and can be managed and mitigated through the implementation of drilling controls, agency oversight, and insurance products tailored to the hydraulic fracturing process.

I. INTRODUCTION

Every U.S. president since Richard M. Nixon has championed U.S. energy independence. Reducing the country's reliance on imported oil to meet its energy needs has been part of U.S. energy policy since the oil price shocks of the 1970s. For decades, coal has played a major role in meeting the domestic demand for energy. The recent rise in the concern over greenhouse gas emissions, in particular CO_2 and global warming issues in general has resulted in an increased focus on the development of low carbon energy sources to meet this demand. A major component of this focus has been the exploration and

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development of domestic natural gas supplies; in particular, unconventional gas supplies located in low permeability shale formations. Natural gas is considered by many to be a bridge fuel, a lower carbon energy source[1] between coal and oil, the fuels currently relied upon to generate the majority of energy in the United States, and renewable sources of energy such as wind, solar, and water. In 2010 renewable sources accounted for less than 10 percent of the energy production in the United States. When hydropower and ethanol are removed from the equation, renewable sources accounted for less than 2 percent of the energy production. The United States has massive reserves of natural gas within its borders, much of which is trapped in low permeability shale formations that are being explored and developed.

The companies that initially leased large tracts of land for shale gas exploration were for the most part independent oil and gas exploration and production companies. That changed in 2009 when Exxon Mobil paid $41 billion to buy XTO Energy, the third-largest gas producer in the United States. In that same year Stat Oil paid $3.4 billion for 32.5 percent of Chesapeake Energy. In 2010 Shell Oil announced that it was purchasing Eastern Resources, which operates in the Marcellus Shale Gas play in northeastern United States, for $4.7 billion, and Chevron paid $3.2 billion for Atlas Energy Inc. In 2011 Consol Energy and Noble Energy entered into a $3.4 billion venture to explore the Marcellus Shale, while Exxon Mobil paid $1.7 billion to acquire Phillips Resources and TWP Inc., giving it access to 317,000 acres in the Marcellus Shale play.

In the United States, particularly in the northeast, the Marcellus and Utica Shale Formations, extending from eastern Kentucky through West Virginia, Ohio, Pennsylvania, Maryland, and New York, are considered to be two of the largest and most significant new potential sources of natural gas in the United States. It is estimated that the Marcellus Formation alone contains more than five trillion cubic feet of natural gas, enough to supply domestic demand for twenty years at current consumption rates. Similar deposits of shale gas can be found in the Barnett and Woodford Formations in Texas, the Bakken Formation in North Dakota, the Monterey Formation in California (primarily oil), and the Mancos and Green River Formations in Colorado and Utah. In these shale formations, the natural gas is trapped in microscopic isolated pockets within the shale beds. In conventional gas exploration and production a well is drilled vertically through the gas bearing formation, usually a permeable sand bed, exposing several tens of feet of the gas-bearing formation (the production zone) to the well bore. Pressure from within the formation allows gas to flow into the well bore. In low permeability shale

[1] The claim that shale gas has a lower carbon footprint than coal is the subject of much debate. See R. W. Howarth, R. Santoro, and A. Ingraffea, "Methane and the Greenhouse-Gas Footprint of Natural Gas from Shale Formations," *Climatic Change* 106/1(2012): 106.

formations, the production of trapped gas economically requires exposing the well bore to hundreds to thousands of feet of the gas-bearing shale beds and increasing the permeability of the shale beds. This is accomplished by horizontally drilling through the shale beds, creating an expanded production zone and then fracturing the shale beds to enhance the release gas from the formation into the well bore. This combined process is commonly referred to as hydraulic fracturing, or fracking.

The rapid growth of gas production from shale through the use of the hydraulic fracturing process has increased the tension between U.S. energy and environmental policies. Developing these unconventional resources is not without controversy and risk. The increased use of hydraulic fracturing as a means to expand natural gas production brings with it increased risks of groundwater contamination, chemical spills, air pollution, and the improper management and disposal of wastewater.

II. THE FRACKING PROCESS

Fracking is an exploration and production technique that has been used since the 1940s to recover oil and gas from low permeability formations. Advances in drilling technologies and well controls in the late 1990s, combined with similar advances in fracturing methodologies in the early 2000s, made shale gas, which was up to that point not commercially viable, an economically recoverable resource. In 2000 shale gas provided approximately 1 percent of the natural gas supply in the United States; by 2011 it was nearly 25 percent.

Extracting natural gas from these shale formations involves drilling wells vertically down to a kick-off point from which the well bore is then angled and drilled horizontally several thousand feet through the target or gas-bearing shale bed. At predefined depths during the drilling process, steel pipe, known as casing, is run into the well bore in stages as the depth of the well is increased. Each successive stage of casing is smaller in diameter than the previous stage, similar to an inverted pirate telescope. After each stage of casing is run into the well bore, cement is injected between the casing and the subsurface rock layers to create a barrier between the well bore and the rock layers. The barrier created by "running and cementing casing" is designed to protect subsurface aquifers by preventing fluids from migrating out of the well bore into the formations and preventing formation fluids from migrating into the well bore. The final casing string, known as production casing, is set through the gas-bearing shale. Once the production casing is set, a perforating gun is lowered into the well bore through the gas bearing shale formation. The perforating gun is then fired, shooting holes through the production casing and cement, and into the shale beds. The next step in the hydraulic fracking process involves the injection of millions of gallons of water combined with

sand or other proppants and small amounts of chemicals under very high pressure into the well bore and out into the shale beds, causing the beds to fracture. The fractures can extend hundreds of feet into the shale beds. The proppants remain in the fractures holding them open and creating pathways for the otherwise isolated natural gas, and in some cases oil, to flow into the well bore and up to the surface where it can be collected and processed.

III. FRACKING REGULATION

A. Federal Regulation

One would assume that the injection of millions of gallons of water containing chemicals under high pressure through subsurface drinking water supplies would be highly regulated at both the federal and state levels. Such is not the case. The principal federal statue governing the injection of fluids into the subsurface is the Safe Drinking Water Act (SDWA).[2] Congress enacted the SDWA in 1974 with the purpose of protecting the quality of drinking water in the United States. The SDWA established the underground injection control program (UICP) and prohibited any underground injection that endangered underground drinking water sources.[3] Underground injection was defined as the "subsurface emplacement of fluids by well injection."[4]

However, throughout the 1990s, the United States Environmental Protection Agency (USEPA) took the position that the SDWA did not apply to hydraulic fracking. The USEPA reasoned that the UICP applied only to operations whose principal function was the injection of fluids (principally wastes) into the subsurface for disposal, whereas the principal function of hydraulic fracking was resource recovery. Therefore, the USEPA adopted a hands-off policy and left the regulation of hydraulic fracking to the individual states. The USEPA's position went unchallenged until 1994, when Alabama citizens living near coal bed methane production sites reported contamination in their drinking water and, with the help of the Legal Environmental Assistance Fund (LEAF), petitioned the USEPA to require Alabama to take steps to regulate hydraulic fracturing activities or withdraw Alabama's authority to implement its UICP. On May 5, 1995, the USEPA denied the petition. On October 11, 1995, LEAF filed a Petition for Review of the USEPA's denial. The USEPA adopted the position that when Congress passed the SDWA it did not intend to require the USEPA to regulate hydraulic fracturing. A three-judge panel rejected the USEPA's positions and held that the plain language of the definition of "underground injection" did, in fact, cover hydraulic fracturing and ordered

[2] 42 USC § 300f et seq.
[3] 42 USC § 300h(b)(1).
[4] 42 USC § 300h(d)(2).

the USEPA to take action.[5] In November 1998 LEAF filed a Petition for a Writ of Mandamus alleging that the USEPA had taken no action in response to the 1997 order.[6] The USEPA's position was again rejected. In response to the *LEAF* decisions, the USEPA initiated a study and in 2004 issued a report in which the USEPA concluded that there was little or no risk of fracturing fluid contaminating underground sources of drinking water.[7] The USEPA's authority to directly regulate hydraulic fracturing was further limited in 2005 with passage of the Energy Policy Act of 2005.[8] Furthermore, oil and gas extraction activities are also generally exempt from the disclosure requirements of the Emergency Planning and Community Right to Know Act (EPCRA).[9]

B. State Regulation

States have traditionally regulated oil and gas exploration and development within their borders. These regulations, for the most part, pertain to drilling and well construction activities. Public outcry over hydraulic fracturing and the secrecy shrouding the chemicals used in fracturing fluids has led several states to step forward and enact disclosure statutes.[10] Approximately thirty states have either enacted or proposed regulations affecting hydraulic fracturing. By the end of 2011 Oklahoma, Ohio, New York, New Jersey, Idaho, Wyoming, Arkansas, Michigan, Texas, West Virginia, Montana, Louisiana, and Colorado adopted disclosure rules.

C. Municipal Regulation

Several municipalities in the Northeast and Midwest have enacted local laws that ban hydraulic fracturing, despite state statutes that expressly preempt all local laws relating to the regulation of oil and gas drilling except for laws governing local roads and property taxes. Numerous other municipalities have enacted or are considering moratoriums, which would temporarily suspend hydraulic fracturing pending the development of new zoning laws designed to restrict it. As reported by the Associated Press, fifty-four communities in upstate New York have already placed moratoria on drilling and passed ordinances. However, these local regulations run afoul of state laws, raising the issue of preemption. As an example, a 1981 amendment to New York state

[5] *LEAF v. EPA*, 118 F.3d 1467 (11th Cir. 1997).

[6] *LEAF v. EPA*, 276 F.3d 1253 (11th Cir. 2001), cert. denied, 537 U.S. 989 (2002).

[7] U.S. Environmental Protection Agency, Evaluation of Impacts to Underground Sources of Drinking Water by Hydraulic Fracturing of Coal Bed Methane Reservoirs)(June 2004)(EPA 816-R-04-003).

[8] Public Law 109-58—Energy Policy Act of 2005.

[9] Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA) § 313(b), 42 USC § 11023(b); 40 CFR § 372.23 (2010). EPCRA § 304, 42 USC § 11004, does require reporting of releases of "extremely hazardous substances."

[10] See http://www.FracFocus.com for a complete listing and status of regulations by state (accessed April 17, 2012).

law exempted oil and gas activities from local regulations.[11] In response, shale gas drilling opponents have turned to the state legislature to garner support for their efforts to ban hydraulic fracturing at the local level. At least four versions of so-called home rule bills are pending in the New York Legislature that would amend oil and gas laws to allow local governments to enact and enforce:

- Zoning ordinances that designate gas drilling as an impermissible use in one, several, or all of the zoning districts within a municipality; and
- Local laws of general applicability that might impact but do not expressly regulate oil and gas industry activities that are regulated by state law and/or permits.

If enacted, the home rule bills would remove that 1981 exemption for oil and gas activities.[12]

Lawsuits filed in 2011 tested the state preemption argument with regard to local bans on hydraulic fracturing. In *Northeast Natural Energy, LLC v. the City of Morgantown*, *West Virginia*, the Hon. Susan B. Tucker held that Morgantown's municipal ban on fracturing violated state law.[13] Morgantown had taken the position that its home rule authority[14] authorized it to ban drilling within its jurisdiction. Northeast Energy contended that the West Virginia Department of Environmental Protection regulations[15] preempted the city's ordinance and thus precluded its enforcement. The court agreed, finding that the comprehensive legislative and regulatory scheme promulgated by West Virginia fully and exclusively occupied the field of oil and gas regulation and that the ban was an ultra vires act by the municipality. The city missed the deadline to appeal, so the ban has been overturned.

On September 15, 2011, a landowner in the town of Middlefield, New York, filed a suit seeking to overturn the town's zoning law that prohibits oil, gas, and solution mining in all districts. The landowner argued the town's ban was preempted by state law that regulates both how and where gas drilling occurs and does not carve out an exception for local police or zoning powers. During oral argument, the attorney for the Town of Middlefield contended that the town's zoning regulation was a valid exercise of the town's zoning authority and not regulation of the drilling industry per se.

[11] Oil and Gas Solution Mining Act, N.Y. Environmental. Conservation Law §. 23-0303(2): The provisions of this article shall supersede all local laws or ordinances relating to the regulation of the oil, gas and solution mining industries; but shall not supersede local government jurisdiction over local roads or the rights of local governments under the real property tax law.

[12] On December 28, 2011, the Youngstown, Ohio, City Council approved a moratorium on oil and gas drilling and underground injection, raising legal issues regarding the scope of Youngstown's home rule authority.

[13] Civil Action No. 11-C-411 August 12, 2011.

[14] W.VA, Code § 8-12-2(1969).

[15] W.VA, Code § 22-1-1, et.seq (1994).

In August 2011 a natural gas driller and lessee of numerous drilling leases in the town of Dryden, New York, filed an action to invalidate Dryden's zoning amendment that prohibits all activities related to petroleum and natural gas drilling within its borders. Counsel for the company cited New York's 1981 state law in arguing that law superseded all local laws including zoning ordinances.

On February 21, 2012, Justice Phillip R. Rumsey of the Supreme Court of the State of New York (the state's trial level court) upheld the Town of Dryden's ban on hydraulic fracturing; two days later Justice Donald F. Cerio upheld the Town of Middlefield's ban on hydraulic fracturing. Both courts held that while the state has control over *how* drilling operations occur, local governments retain discretion over *where* such activities take place. Under the two decisions, town governments in New York state may now freely implement restrictive zoning regulations, including a complete ban on hydraulic fracturing operations within their borders.[16]

IV. FEDERAL STATUTES

A. Energy Policy Act of 2005

In response to the *LEAF* decisions and the 2004 USEPA study, Congress enacted the Energy Policy Act of 2005. The Energy Policy Act includes an amendment to the SDWA, exempting from its scope "the underground injection of fluids or propping agents [other than diesel fuels] pursuant to hydraulic fracturing operations related to oil, gas or geothermal production activities."[17] The Energy Policy Act also amended the Clean Water Act to exclude from the definition of "pollutant" any ". . .water, gas, or other material which is injected into a well to facilitate production of oil or gas, or water derived in association with oil and gas production and disposed of in a well, if the well is used either to facilitate production or for disposal purposes is approved by authority of the State in which the well is located, and if such State determines that such injection or disposal well will not result in the degradation of ground or surface water resources."[18] The act also provided a little noticed exemption for specified oil and gas drilling activities on federal lands under the National Environmental Policy Act of 1969 (NEPA) making these activities "subject to a rebuttable presumption" that the use of a "categorical exemption" under NEPA "would apply if the activity is conducted pursuant to the Mineral Leasing Act for the purpose of exploration or development of oil or gas."[19]

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[16] Anschutz, which has invested over $5.1 million on leasing and developing 22,000 acres in Dryden, has said it is considering filing a takings claim against the town.

[17] 42 USC § 300h(d)(1).

[18] 33 USC § 1362(B)(6).

[19] 42 USC § 15942.

B. Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act (RCRA),[20] which regulates the handling, storage, and disposal of hazardous waste, also includes an exemption for wastes from oil and gas exploration and production.[21] As a result of these exclusions, the USEPA's regulation of hydraulic fracturing under the SDWA and RCRA would appear to be effectively precluded, leaving regulation of hydraulic fracturing to the states.

C. Clean Water Act

Fracking is currently exempt from the Federal Clean Water Act. However, disposal of flow-back water into surface waters of the United States is regulated by the National Pollutant Discharge Elimination System (NPDES) permit program. The NPDES program would not apply to the underground injection of fracking fluids. In October 2011 the USEPA announced it would develop national standards for wastewater disposal produced by shale gas as well as coal bed methane extraction. The agency reports it will explore options for effective wastewater treatment based on "demonstrated, economically achievable technologies."

D. Fracturing Responsibility and Awareness of Chemicals Act

In 2009 and again in 2011 twin bills were introduced in the U.S. House and Senate (Fracturing Responsibility and Awareness of Chemicals (FRAC) Act, HR 1084; S 587) to amend the SDWA to specifically provide for the regulation of the underground injection of fluids used in hydraulic fracturing for oil and gas exploration and development. The legislation, if enacted, would specifically authorize the USEPA to regulate hydraulic fracturing under the UICP. The 2009 bills did not pass and the 2011 bills have been referred to committee.

V. USEPA ENFORCEMENT STRATEGY

Despite the exclusions, the USEPA has, using its emergency powers under the SDWA, begun regulating hydraulic fracturing. In 2010, using its authority under section 1431 of the SDWA, the USEPA issued an Emergency Administrative Order (EAO) to Range Resources, an exploration and production company drilling for natural gas in Texas, requiring Range Resources to halt its drilling activities and to investigate, among other issues, whether its fracturing operations caused methane contamination in private drinking water wells located on neighboring properties. In part, the EAO concluded that: (1) the

[20] 42 USC § 6921(b)(2)(A).
[21] 42 USC § 6921–6934.

presence of methane in the water wells "may present an imminent and substantial endangerment to the health of persons"; (2) the presence of methane was "likely to be due to impacts from gas development and production activities in the area"; and (3) the gas wells operated by Range Resources "are the only gas production facilities within approximately 2,000 feet of the domestic wells."[22] The day after the USEPA issued its EAO, the Texas Railroad Commission (TRRC) noticed a hearing to consider whether the Range Resources operations caused or contributed to the contamination and to evaluate whether an alternative source existed. A hearing was held on January 19, 2011, and on March 22, 2011, the TRRC issued its final decision finding that Range Resources operations did not cause or contribute to the contamination. On January 18, 2011, the USEPA brought an action in federal district court to enforce the EAO, alleging that Range Resources violated the EAO and sought a permanent injunction requiring compliance with the EAO and civil penalties. Range Resources filed a motion to dismiss, which was denied without prejudice. Range Resources also filed a petition for review in the Fifth Circuit Court of Appeals asserting that the EAO was not a final agency action and that the USEPA bore the burden of proof in the district court action to prove its claim under the SDWA. The district court stayed its proceedings pending a ruling from the Fifth Circuit. On March 27, 2012, the USEPA withdrew its 15-month-old emergency order against Range Resources, which alleged that methane contamination in water wells of two Parker County homes was the result of Range Resources exploration activities.

Another case that sheds light on the USEPA's strategy to regulate hydraulic fracturing is *Independent Petroleum Ass'n of America v. EPA*, D.C. Cir., No. 10-1233 filed in August, 2010. At issue in the suit filed by IPAA and the U.S. Oil and Gas Association is the statement the USEPA posted on its Web site, which said that any service company using diesel in fracturing fluids "must receive prior authorization" from the Underground Injection Program because a well using such fluids "will be considered Class II wells by the UIC program." Prior to this posting, the USEPA had not required a federal Class II UIC permit prior to drilling despite the fact that fracturing operations that used diesel were subject to SDWA regulation. Instead, the UIC program had been operated almost exclusively by the individual states. The industry group took the position that the USEPA had overstepped its authority by specifying the group of wells that can be used when the fracturing process uses diesel.[23] The oil and gas industry and the USEPA stayed the proceedings and entered into settlement talks to resolve the lawsuit over whether the USEPA had the

[22] Docket. No. SDWA-06-EAO2010-1208.

[23] The legal basis for the challenge centers on whether the Web site posting of the UIC permitting requirements constitutes a "final agency action" under the Administrative Procedures Act.

authority to require oil and gas companies to obtain drinking water permits if they use diesel oil in their hydraulic fracturing operations.

A non-oil and gas exploration case that will have significant impact on the USEPA's ability to use its enforcement authorization is *Sackett v. US EPA*.[24] In *Sackett,* the USEPA issued an Administrative Compliance Order (ACO) requiring the Sacketts to remove fill they placed on their property in the process of developing the property and building a house. The USEPA had determined that the fill violated the CWA because the property included a wetland subject to CWA jurisdiction. The Sacketts petitioned the USEPA for a hearing to challenge the wetland determination and, after the USEPA denied their petition, the Sacketts filed suit in U.S. district court. The USEPA took the position that its order was not subject to review unless it first sued the Sacketts, which it had not, and demanded the Sacketts comply with its order or face penalties of $37,500 per day for violating the ACO and $37,500 per day for violating the CWA. As it did in *Range Resources*, the USEPA took the position in *Sackett* that pre-enforcement review of USEPA administrative compliance orders was not allowed. The Ninth Circuit Court of Appeals agreed. The Sacketts appealed to the U.S. Supreme Court. The Supreme Court heard oral argument on the matter on January 9, 2012. On March 21, 2012, in a 9-0 decision the U.S. Supreme Court rejected the USEPA's position, which had been upheld by the Ninth Circuit, finding that access to judicial review was necessary to prevent "the strong-arming of regulated parties" by government agencies. Justice Antonin Scalia wrote that when an agency action "creates new obligations from which legal consequences will flow" it is a final agency action subject to judicial review.

VI. STUDIES

A December 8, 2011, draft report from the USEPA's Office of Research and Development has tentatively pointed a finger at hydraulic fracturing as a cause of groundwater contamination detected in a number of wells near the town of Pavillion, Wyoming. In the report, the USEPA said an analysis of groundwater from the area contained at least ten organic compounds known to be present in fracturing fluid that was likely the result of the "direct mixing of hydraulic fracturing fluid with ground water in the Pavillion gas field." The report, which has not yet undergone outside peer review, has set off alarm bells among both proponents and opponents of fracturing, including those in eastern states such as New York, New Jersey, and Pennsylvania. The USEPA also noted certain limitations of the study: its purpose was "to determine the presence, not the extent, of ground water contamination in the formation," and the results are

[24] 622 F.3d 1139 (9th Cir. 2010) cert. granted in part, 131 S.Ct. 3092 (2012 WL 28938 U.S. Jan. 06, 2012).

specific to the Pavillion area, where fracturing occurs in and below a drinking water aquifer and near drinking water wells, unlike production practices in many other parts of the country.[25] On March 8, 2012, the USEPA extended the public comment period for the draft report until additional data from a U.S. Geological Survey Study are available. The USEPA, at the direction of Congress, is currently undertaking a national study of the potential impacts of hydraulic fracturing on groundwater and drinking water.[26] Other studies by the United States Geological Survey appear to suggest that earthquakes may be associated with the process of hydraulic fracturing and the disposal of flow-back water into deep injection wells.[27]

The Massachusetts Institute of Technology (MIT) undertook an investigation into the environmental issues related to shale gas extraction and released a study, *The Future of Natural Gas*,[28] in June 2011 that identified five principal risks:

1. Contamination of groundwater aquifers with drilling fluids or natural gas while drilling and setting casing through the shallow fresh water zones;
2. Surface spills of drilling fluids, fracture fluids, and waste water from fracture flow-back;
3. Contamination as a result of inappropriate waste water disposal;
4. Excessive water withdrawals for use in high volume fracturing; and
5. Excessive road traffic and impacts on air quality.

The MIT analysis concluded that the identified risks were "challenging but manageable" and can be mitigated to acceptable levels through appropriate regulation and oversight. In particular, the risk of groundwater contamination through gas migration or from spills of flow-back or waste water can be effectively reduced, if not eliminated, if "best practice case setting and cementing protocols are rigorously enforced."

On January 31, 2012, the National Ground Water Association (NGWA) issued a statement outlining a series of principals aimed at protecting groundwater and drinking water resources through "best management practices." The NGWA also published a position paper in which it identified and discussed the risks posed by hydraulic fracturing and how best to manage them.[29] In February 2012 the Energy Institute at The University of Texas released a 414-page study that evaluated the technical and environmental risks, the regulatory

[25] Release Date: 12/08/2011 Contact Information: EPA HQ: Larry Jackson, 202-564-0236, jackson.larry@epa.gov; EPA Region 8: Richard Mylott, 303-312-6654, mylott.richard@epa.gov.

[26] USEPA, "Hydraulic Fracturing: Water," http://www.epa.gov/type/groundwater/uic/class2/hydraulicfracturing/wells_hydrowhat.cfm (accessed April 17, 2012).

[27] Mark E. Meremonte, John C. Lahr, Arthur D. Frankel, James W. Dewey, Anthony J. Crone, Dee E. Overturf, David L. Carver, and W. Thomas Bice, Open-File Report 02-0073.

[28] "The Future of Natural Gas: An Interdisciplinary MIT Study," MIT Energy Initiative, June 2011.

[29] "Hydraulic Fracturing: Meeting the Nation's Energy Needs While Protecting Groundwater Resources," http://www.ngwa.org (accessed April 17, 2012).

environment at both the federal and state levels, and public perceptions surrounding the development of shale gas resources. The Energy Institute study reached conclusions similar to MIT and NGWA, i.e., that the risks are known and can be managed through a combination of best management practices and reasonably regulatory oversight.[30]

VII. LITIGATION

Environmental agencies, governmental organizations, and universities are conducting studies to determine whether a causal link exists between the contamination claims and the fracturing process.[31] However, plaintiffs are not waiting for the conclusion of these studies and are filing an increasing number of actions alleging contamination from oil and gas exploration activities in the Marcellus, Fayetteville, Bakken, and Barnett Shale Formations. Furthermore, lawsuits are expanding beyond groundwater contamination to include claims of air pollution, patent infringement, financial fraud, employee exposure to hazardous chemicals, earthquakes, and even criminal liability. Plaintiffs are also suing entities outside the traditional oil and gas companies with claims against waste treatment plants and compressor stations involved in the disposal and transmission of fracturing fluid and natural gas obtained from the well sites.

The number of private actions arising out of hydraulic fracturing activities continues to increase. Since August 2009 at least thirty-eight lawsuits alleging groundwater contamination and toxic exposure have been filed. At the center of these suits are allegations that the additives used in fracturing fluids contain substances known or suspected to cause cancer in humans. In addition, a dozen class actions have been filed, several of which allege that hydraulic fracturing or the disposal of flow-back water in deep injection wells have caused or contributed to earthquakes. The legal theories asserted run the gamut, from the common law theories of nuisance, trespass, and negligence to strict liability and claims for medical monitoring and fear of cancer. Plaintiffs have also, to a lesser extent, asserted federal and state statutory claims. Several groundwater contamination actions allege that hydraulic fracturing caused methane to migrate into drinking water supplies.

[30] "Fact-Based Regulation for Environmental Protection in Shale Gas Development," February 2012, Energy Institute, University of Texas at Austin, http://energy.utexas.edu (accessed April 17, 2012).

[31] S. Plikunas, B. R. Pearson, J. Monast, A. Vengosh, and R. B. Jackson, "Considering Shale Gas Extraction in North Carolina: Lessons From Other States," discussion draft, November 2011, accepted for publication in the spring 2012 issue of *Duke Environmental Law & Policy Forum*; S. G. Osborn, A. Vengosh, N. R. Warner, and R. B. Jackson, "Methane Contamination of Drinking Water Accompanying Gas-Well Drilling and Hydraulic Fracturing," *PNAS Early Edition*, April 14, 2011, http://www.pnas.org/cgi/doi/10.1073/pnas.1100682108 (accessed April 17, 2012).

In *Fiorentino v. Cabot Oil & Gas*, an action brought by sixty-three homeowners in Dimock, Pennsylvania, plaintiffs alleged that methane gas contaminated their private wells.[32] Cabot agreed to pay $4,100,000 into a fund that nineteen neighboring homeowners could draw from and to undertake mitigation activities pursuant to a consent order with the Pennsylvania Department of Environmental Protection that also instituted an action against Cabot. As of January 2012 approximately $1.9 million had been withdrawn from the fund. Along with lawsuits in Pennsylvania, energy companies operating in other states are increasingly encountering litigation arising out of their fracturing operations on the Marcellus Shale. In April 2012 the USEPA released additional groundwater test results and concluded that the fracking process did not contaminate the Dimock water supply or pose a threat or immediate health risk. Several residents and environmental groups disputed the USEPA's findings and conclusions. In New York nine families in the town of Horseheads filed a groundwater contamination and toxic exposure lawsuit seeking $150 million in damages from Anschutz Exploration and its affiliates.[33] Another individual in Horseheads filed a multimillion-dollar action with similar claims against Gas Fields Specialists.

In West Virginia an employee of Schlumberger Technology alleged that he suffered serious physical injuries after his employer failed to provide him with adequate protection from exposure to fracking chemicals.[34] Plaintiffs are even filing lawsuits in states with no hydraulic fracturing operations. In May 2011 Maryland Attorney General Douglas Gansler announced his intent to sue Chesapeake Energy and its affiliates under RCRA and the CWA for potential contamination of the Chesapeake Bay from a spill in Bradford County, Pennsylvania, which discharged fracturing fluid into a tributary stream of the bay.

Numerous lawsuits, asserting claims for toxic exposure groundwater contamination, and air pollution from hydraulic fracturing operations have also been filed in Texas, Colorado, Louisiana, and Arkansas.[35]

[32] *Fiorentino v. Cabot Oil & Gas Corp.,* No. 3:09-02284, U.S. District Court for the Middle District of Pennsylvania (Scranton) Nov. 19, 2009.

[33] *Baker, et al. v. Anschutz Exploration Corp. et al.* (USDC NY (Rochester) No. 6:11-CV-061190CJS).

[34] *Bombardiere v. Schlumberger Technology Corp.,* CV No. 1:11-CV-50 (USDC ND W. Va. (Vicksburg)).

[35] *Scoma v. Chesapeake Energy Corp., Chesapeake Operating, Inc., Chesapeake Exploration, LLC*, No. 3:10-cv-01385 (N.D. Tex., July 15, 2010); *Mitchell v. EnCana Oil & Gas (USA), Inc., Chesapeake Operating, Inc., Chesapeake Exploration, LLC*, No. 3:10-cv-02555 (N.D. Tex., Dec. 15, 2010; *Harris v. Devon Energy Prod. Co., L.P.*, No. 4:10-cv-00708 (E.D. Tex., Dec. 22, 2010); *Strudley v. Antero Resources Corp., Calfrac Well Services, Frontier Drilling LLC*, No. 2011-cv-2218 (Denver County Dist. Ct., Mar. 23, 2011); *Andre v. EXCO Resources, Inc., EXCO Operating Co.*, No. 5:11-cv-00610-TS-MLH (W.D. La. April 15, 2011); *Beckman v. EXCO Resources, Inc., EXCO Operating Co.*, 5:11-cv-00617-TS-MLH (W.D. La. April 18, 2011; *Ginardi v. Frontier Gas Services, LLC, Kinder Morgan Treating LP, Chesapeake Energy Corporation, BHP Billiton Petroleum*, No. 4:11-cv-0420 BRW (E.D. Ark. May 17, 2011); *Tucker v. Southwestern Energy Co., XTO Energy, Chesapeake Energy Corp., BHP*

In addition to property damage and personal injury claims, plaintiffs have asserted fraudulent concealment and failure to disclose causes of action claiming that the exploration companies withheld or misrepresented material information to induce plaintiffs into acting differently than they would have otherwise had they known the risks associated with hydraulic fracturing. While statutes and regulations imposing a duty to disclose vary by state, the Restatement (2d) of Torts section 531 provides a standard against which to compare the conduct.[36] In addition to private parties filing lawsuits, state governments and environmental agencies are teaming up to prevent hydraulic fracturing in certain regions out of concerns that the drilling will contaminate their water supplies. In Arkansas, conservation and environmental nonprofit organizations are suing the federal government attempting to enjoin the government's issuance of gas-drilling permits to energy companies utilizing hydraulic fracturing to obtain natural gas in the Ozark National Forest. In light of XTO Energy's application to explore for natural gas in the Delaware River Basin, the State of New York sued the federal government, arguing that federal officials have not adequately studied how natural gas drilling in the basin will affect nine million water drinkers in New York. The federal government has responded that it will seek dismissal of New York's suit, alleging that the state has not suffered any injury and does not have the right to sue. The State of New Jersey is also entering the litigation arena, challenging decisions made by the Delaware River Basin Commission to exempt from regulation certain wells intended for shale formation exploration beneath the Delaware River Basin.

VIII. RISKS

Although hydraulic fracturing has been used by the oil and gas industry for more than fifty years, recent technological advances have substantially increased the ability to recover reserves, which has led to an expansion in exploration and production into areas, such as New York, Pennsylvania, Texas, Colorado, Ohio, Louisiana, and Arkansas, which hold substantial reserves of natural gas that was previously uneconomic to produce. Balancing the need to explore and develop domestic-based low carbon energy sources against the potential environmental risks posed by the use of hydraulic fracturing has become a major issue. Some of these risks are common to conventional oil

Billiton Petroleum, No. 1:11-cv-0044-DPM (E.D. Ark. May 17, 2011); *Berry v. Southwestern Energy Co., XTO Energy, Chesapeake Energy Corp., BHP Billiton Petroleum*, No. 1:11-cv-0045-DPM E.D. Ark. May 17, 2011.

[36] Restatement (Second) of Torts § 531 (1977). One who makes a fraudulent misrepresentation is subject to liability to the persons or class of persons whom he intends or has reason to expect to act or to refrain from action in reliance upon the misrepresentation, for pecuniary loss suffered by them through their justifiable reliance in the type of transaction in which he intends or has reason to expect their conduct to be influenced.

and gas exploration operations and several are unique to hydraulic fracturing operations. One of the unique aspects of hydraulic fracturing operations is the significant quantity of water necessary to fracture a well. It is estimated that four million to five million gallons of water are necessary to fracture a single well. That is the equivalent of seven Olympic-sized swimming pools. Of the four million to five million gallons of water, on average three million to four million gallons are returned to the surface and must be handled, stored, treated, and eventually disposed of properly. The other million or so gallons are not recovered and remain in the subsurface.

Environmental risks can be generally broken down into two categories, risk attendant to above ground or surface operations and subsurface risks associated with drilling, fracturing, and production. In each instance, some of the most pressing environmental risks are related to water, its source, subsequent use, handling, and disposal. One of the most pressing and widespread issues involved with the process of hydraulic fracturing is how to manage and dispose of the water used in the fracturing process that flows back to the surface after the hydraulic fracturing process has been completed. This so-called flow-back and the water produced from within the shale formations need to be properly handled, managed, and safely disposed of by the operator. The subsurface risks include the migration of fracking fluids and methane gas into groundwater and drinking water.

States, particularly those with a history of oil and gas exploration and development, have identified three areas in which increased environmental risks from hydraulic fracturing in deep shale generally arise: (1) the substantial volume of water necessary for hydraulic fracturing; (2) improper handling and disposal of chemical-laden flow-back water; and (3) subsurface releases due to well blowouts and other accidents from negligent well operations. Consequently, as is evident from the state regulations being adopted, states have begun requiring submissions, in varying detail, regarding withdrawal water volumes and sources, flow-back volumes and disposal options, well pressure data, and more stringent technical completion requirements to ensure the integrity of the well bore.

A. Old Wells

Another potential risk is the presence of older oil and gas wells in the vicinity of the hydraulic fracturing activities that have been drilled through shallow aquifers, including drinking water aquifers, which have not been properly cased or plugged and abandoned. These old wells can provide a conduit through which fracking fluid and/or methane that escape from the primary exploration well to migrate upwards into the shallow aquifers. Poorly constructed water wells can also act as conduits through which fracking fluids and methane can migrate into drinking water supplies.

B. Casing Risks

One of the most talked-about risks is the potential for releases from the casings of the hydraulically fractured wells to impact shallow aquifers with either fracturing fluid or methane. Typical well construction in oil and gas exploration, including wells that are to be fractured, starts with the insertion of steel pipe (casing) in stages, into the well as it is being drilled to create an impermeable barrier between the hole being drilled (well bore) from the subsurface formations through which the wells are drilled. Conductor casing, the widest diameter casing, is set at the surface to protect shallow soils. Next, surface casing is set through the zones that include most aquifers and drinking water supplies to protect water supplies and, depending on the depth of drilling, either production casing or intermediate casing follows. In each instance, the casing strings are "cemented in" as a means of stabilizing and securing the casing string and providing a barrier between the bore hole and the formations. A well-cased and cemented bore hole reduces the risk of formation fluids, methane, or other fracturing fluids from escaping from a deeper formation into a shallower formation, and protects aquifers and drinking water sources from being contaminated by these fluids.

C. Injection Wells

Another risk associated with but not directly involved in the actual drilling and fracturing of a well is the risk associated with the disposal of flow-back fluids in deep injection wells. The disposal of flow-back fluids in deep injection wells has been an accepted disposal method for more than fifty years. The improper disposal of millions of gallons of flow-back fluids can damage existing oil and gas reservoirs. Recently, there have been claims that the use of deep injection wells is contributing to the increase in earthquakes in locations such as Ohio, Arkansas, and Virginia.

IX. MANAGING THE RISK

Companies involved in the production of natural gas through the use of hydraulic fracturing are faced with a variety of environmental and business risks, some of them unique to hydraulic fracturing. Risks involved in hydraulic fracturing include water supply and disposal as well as contamination issues, release of chemicals used in the fracturing fluids at the surface, the impingement onto third-party properties, failure of wells and well blowouts, bodily injury and property damage, common law claims such as trespass nuisance, business interruption, and suits under federal environmental statutes and/or criminal enforcement actions pursuant to state or federal agency regulation.

Once identified, many of the risks presented can either be reduced, managed, mitigated, or transferred. Any analysis of risks arising from fracking operations, and the opportunity to transfer those risks, should include close review of all contractual agreements and all available insurance policies. In the oil and gas industry master service agreements are frequently used to transfer and manage risk and responsibilities among contracting parties. These agreements frequently require the parties to indemnify one another and to procure insurance, naming one another as additional insured. Of the several types of insurance products that provide cover for specific aspects of oil and gas operations, commercial general liability (with oilfield endorsements) and operator extra expense (control of well) are often the ones looked to by insureds for coverage.[37] Insurance is procured both to provide coverage for the named insured and to provide coverage for additional insureds as required by contracts.

A. Risk Allocation with Master Service Agreements

Contractual arrangements between oil and gas companies and contractors (such as drilling, service, and equipment companies) are frequently addressed via master service agreements, i.e., contracts entered into between parties governing their relationships for multiple projects and/or for a period of time. Master service agreements are often referenced or incorporated into purchase orders or short form contracts. Master service agreements typically include detailed indemnity and insurance provisions, requiring each party to indemnify and defend the other for particular claims and name each other as additional insureds in their insurance policies. Indemnity obligations may be limited to the amount of available insurance or the amount of insurance required by the contract. By endorsement, insurance policies can provide coverage for insured contracts, i.e., prior written contracts where the insured agrees to name a party as an additional insured. Policies often limit the coverage provided for insured contracts to the specific amount of required coverage by the contract or amount of required contractual indemnity, regardless of the policy limits.

Detailed review of master service agreements, particularly where they apply for long periods, multiple projects, or multiple locations, is critical. Indemnity and insurance provisions are often contained in attachments and are from time to time amended. Care must be taken to confirm that the complete updated/amended agreement is reviewed, with all referenced insurance policies. Careful analysis should be made to confirm that the agreement has not expired and in fact applies to the project, purchase order,or short form

[37] Pollution liability, property and business interruption, products liability and professional liability may also provide coverage depending on the exclusions and endorsements scripted into the policies.

contract.[38] The scope of the indemnity obligation should match the allegations of the petition or the facts underlying the accident.[39]

Potentially applicable indemnity agreements must specifically identify and apply to the parties involved.[40] Particular care must be taken to ensure that all related companies and subsidiaries are in fact named in the master service agreement. For example, if a successor company attempts to enforce its predecessor's contract, there must be a valid contractual assignment clause, or other proof that the contractual rights were assigned to the successor.[41]

It is important to determine what law applies to the master service agreement, and whether the indemnity provision is valid under the applicable law since indemnity provisions must meet the legal requirements of the specific jurisdiction. Close attention should be given to any state anti-indemnity statutes that may be applicable. For example, both Texas and Louisiana have anti-indemnity statutes that apply to oil and gas operations.[42] Consideration should be given as to whether any applicable law is selected in the contract or if the venue of any litigation is specified.

The master service agreement should be reviewed to determine if any insurance provision is included, the coverage required, the insurance limits specified, whether the indemnity agreement is backed by the insurance, and whether the available insurance is limited to the amount of the indemnity obligation. As mentioned above, the referenced policies should be reviewed, particularly for any exclusions. Master service agreements may provide separate indemnity and insurance obligations. This can be particularly important where the indemnity provision is not enforceable or the indemnitor becomes insolvent. Further, the insurance provisions may provide rights to the contracting parties under the required insurance policies, directly against the insurers.

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[38] See *Fontenot v. Mesa Petroleum Co*., 791 F.2d 1207, 1214 (5th Cir. 1986) ("[a] contract of indemnity. . .should not be read to impose liability for those losses or liabilities which are [not] expressly within its terms. . .").

[39] See, e.g., *Dahlen v. Gulf Crews, Inc.,* 281 F.3d 487, 499, 2002 AMC 566, 579 (5th Cir.), cert. denied, 123 S. Ct. 621 (2002) (holding that the injury involved did not fall under the language of the indemnity agreement where a barge operator suffered a back injury while unloading a grocery box upon an offshore platform. The relevant indemnity agreement applied to injuries arising out of, or related to, the performance of the vessel. The injury occurred on the platform during grocery unloading, and bore no relation to the vessel or the charter contract).

[40] See, e.g., *Channette v. Neches Gulf Marine, Inc.,* 440 Fed.Appx. 258, 2011 WL 3444207 (5th Cir. 2011) (not designated for publication)*;* see also, e.g., *Ray v. Global Indus., Ltd.,* No. 04-CV-0816, 2006 WL 305964 (W.D. La. Feb. 8, 2006) (unreported case).

[41] See generally *Davis Oil Co. v. TS, Inc.,* 145 F.3d 305 (5th Cir. 1998).

[42] The Louisiana Oilfield Indemnity Act of 1981, No. 427, § 1, effective September 11, 1981, is found at La. Rev. Stat. Ann. § 9:2780 (West Supp. 1988). The Texas Anti-Indemnity Statute, Tex. Civ. Prac. & Rem. Code §§ 127.001-127.008 (Vernon 1986), was originally enacted in 1973. See *Transworld Drilling Co. v. Levingston Shipbuilding Co*., 693 S.W.2d 19 (Tex. App.—Beaumont 1985, no writ) (addressing what type of contracts come within scope of Texas Anti-Indemnity Act).

Master service agreements should be analyzed to determine whether they provide a defense obligation and, if so, the extent of the obligation. In most master service agreements, one party will contractually agree to both "defend and indemnify" another party for its tort liability. Under such terms, the indemnitor is usually obligated to pay all reasonable defense costs of the indemnitee in connection with a claim for bodily injury or property damage by a third person or entity, as well as any settlement entered into by the indemnitee or any judgment against the indemnitee. However, indemnity and defense obligations may not apply to claims for the indemnitees' own, sole, or gross negligence, or for exemplary or punitive damages, fines, or penalties.[43] Likewise, some policy forms limit the defense provided in the event of a conflict between the contracting parties. Additionally, it is important to determine if defense expenses erode available insurance coverage or if the coverage provided is "protection and indemnity" cover that will only reimburse amounts actually paid, as such term can materially impact the available coverage. If indemnity is limited to the extent it is back by insurance coverage it is extremely important to fully understand coverage provided, including any exclusions, particularly for pollution risks and exposures.

Finally, flow though provisions are sometimes used to "stack" indemnity obligations. In such instance the indemnitor agrees not only to indemnify the indemnitee's tort liability, but to also indemnify the indemnitee for its contractual liability to indemnify other parties. The availability of insurance coverage for flow through agreements should be reviewed carefully as some courts have found that flow through contractual indemnity obligations are not "insured contracts" and therefore not covered by insurance. In such instance, there may be both covered and uncovered indemnity claims.

B. Insurance Coverage for Fracking Operations

A wide variety of insurance products are available and potentially applicable to risks arising out of hydraulic fracturing operations. Many of the risks associated with fracking are not, however, squarely covered or contemplated by traditional insurance policies. Insurance coverage premised on fortuity, or an accidental occurrence not expected or intended from the standpoint of the insured. "Fortuity" issues immediately arise as to fracking operations that involve intentional injection of fracturing fluid, intentional overpressuring,

[43] See, e.g., *Seal Offshore, Inc. v. American Standard, Inc.,* 736 F.2d 1078, 1081 (5th Cir.1984) ("Long-established general principles of interpreting indemnity agreements require that indemnification for an indemnitee's own negligence be clearly and unequivocally expressed."); see also *Corbitt v. Diamond M. Drilling Co*., 654 F.2d 329, 333 (5th Cir.1981) (stating that an indemnity provision should be construed to cover "all losses, damages, or liabilities which reasonably appear to have been within the contemplation of the parties." It should not be read, however, "to impose liability for those losses or liabilities which are neither expressly within its terms nor of such a character that it can be reasonably inferred that the parties intended to include them within the indemnity coverage").

and fracturing of formations and the handling of known contaminated fracking return water. While no cases have addressed these issues in the context of a fracking operation, it is debatable as to whether the fortuity requirements can be met. Further, traditional policy exclusions, such as pollution and radioactive material exclusions, may significantly limit the coverage available for many losses arising from typical fracking operations.

1. Commercial General Liability Coverage

CGL coverage provides coverage for all sums that the insured becomes obligated to pay as damages because of bodily injury and property damage caused by an accident. As discussed above, insurance coverage is premised on fortuity and claims resulting from expected and intended results of fracking operations likely will not constitute covered occurrences. Further, CGL policies typically exclude property damage to any oil or gas well or hole being worked on by the named insured, including any well head equipment. Oil industry endorsements, however, are available to broaden CGL coverage to include:

- Certain operation, including gasoline recovery, oil and gas lease operations, and oil and gas wells
- Underground resources and equipment hazard covering property damage to oil, gas, water, or other mineral substances; wells holes or other areas in or through which exploration for production is carried on; and casing, pipes, bits, tools, pumps, or other machinery or equipment located beneath the surface of the earth.
- CGL policies with and without oil field endorsements, generally exclude pollution coverage. Typical CGL coverage does not apply to:

  a. Any bodily injury, property damage, personal injury, or advertising injury arising out of the actual, alleged, or threatened discharge, dispersal, seepage migration, release, or escape of pollutants anywhere at any time.
  b. Any loss, cost, or expense arising out of any request, demand, order, or statutory or regulatory requirement that the insured or others test for monitor, clean up, remove, contain, treat, detoxify, or neutralize or in any way respond to or assess the effects of pollutants.
  c. Any loss, cost, or expense arising out of any claim or action by or on behalf of a government authority for damages because of testing for, monitoring, clean-up, removing, containing, treating, detoxifying, or neutralizing or in any way responding to or assessing the effect of pollutants.

Further, most CGL policies exclude all coverage for radioactive material. Some policies further specifically exclude TERM—Technically Enhanced Radioactive Material. Radioactive material is produced from the formation during the fracking process. As a result, radioactive material is present in both return frack water and produced frack water. TERM is frequently used in fracking (and many other oilfield operations) to identify the location from which the well produces. While the amount of the radioactive material is small, it is specifically excluded from coverage in many policies. Thus, claims arising out of disposal or spillage of frack return water may be excluded by insurance pollution, radioactive material, and TERM provisions. Some insureds, in an effort to obtain some pollution cover, have negotiated manuscript pollution exclusions. Alternatively, specialized pollution cover can be purchased.

2. Operator's Extra Expense—Control of Well

Operators extra expense coverage, or well control coverage, provides cover to oil and gas companies for declared wells for the costs and expense incurred by the insured with regard to loss of control of well, redrill, and pollution-related expenses and defense costs. Some policies also offer cover for "above ground explosions." Typically OEE forms provide cover for costs:

a. in regaining or attempting to regain control of any and all well(s) insured hereunder that get(s) out of control, including any other well that gets out of control as a direct result of a well insured hereunder getting out of control, but only such costs and/or expenses incurred until the well(s) is (are) brought under control as defined in paragraph 2(b) of this Section 2A; AND
b. in extinguishing or attempting to extinguish
(i) fire above the surface of the ground or water bottom from well(s) insured hereunder or from any other well(s) that are burning as a direct result of well(s) insured hereunder getting out of control of (ii) fire above the surface of the ground or water bottom that may endanger the well(s) insured hereunder.

The key question, particularly with regard to fracking operations, is what constitutes a well out of control.

Typically, a well is deemed to be out of control only when there is an unintended flow from the well of drilling fluid, oil, gas, or water above the surface of the ground or water bottom,

1. which flow cannot promptly be:
   a) stopped by use of the equipment on site and/or the blowout preventer, storm chokes, or other equipment required by the Due Diligence and Warranties clauses herein; or

b) stopped by increasing the weight by volume of drilling fluid or by the use of other conditioning materials in the well(s); or
c) safely diverted into production;

2. which flow is declared to be out of control by the appropriate regulatory authority

A well is not deemed out of control solely because of the existence or occurrence of a flow of oil, gas, or water into the well bore which can, within a reasonable period of time, be circulated out or bled off through the surface controls.

In addition to providing cover for control of well control, OEE policies also importantly provide cover for seepage, pollution, cleanup, and containment and defense of pollution claims.

Typically, policies provide cover for

a. all sums that the insured shall by law or under the terms of any oil and/or gas and/or thermal energy lease and/or license be liable to pay for the cost of remedial measures and/or as damages for bodily injury (fatal or nonfatal) and/or loss of, damage to, or loss of use of property caused directly by seepage, pollution or contamination arising from wells insured herein;
b. the cost of, or of any attempt at, removing, nullifying, or cleaning up seeping, polluting, or contaminating substances emanating from wells insured herein, including the cost of containing and/or diverting the substances and/or preventing the substances reaching the shore;
c. costs and expenses incurred in the defense of any claim or claims resulting from actual or alleged seepage, pollution, or contamination arising from wells insured herein, including defense costs and costs and expenses of litigation awarded to any claimant against the insured, provided, however, that the inclusion of the above costs and expenses shall in no way extend the combined single limit of liability of insurers over all sections of this policy.

However, OEE policies offer no cover in instances where a well is not out of control and it is questionable as to whether cover would be afforded for many of the claims arising out of fracking operations, due to the lack of fortuity. In light of recent developments in shale gas production, endorsements and warranties are being developed to afford some limited coverage for fracking operations. Some insurers are offering cover subject to a casing warranty whereby the insured warrants that casing will not be utilized during fracking operations beyond 80 percent of burst strength. This warranty resembles warranties often used with regard to pipeline coverage. Casing failure endorsements are also being developed. Notably such endorsements acknowledge cover for losses arising out of fracking operations but limit such coverage to specific circumstances and do not allow claims for redrilling for sidetracking the well.

X. CONCLUSION

The demand for a low carbon domestic energy source continues to increase. The massive reserves of natural gas trapped in the Marcellus, Utica, Bakken, Fayetteville, and other shale formations can provide that source. The economic extraction and production of these gas reserves requires these shale formations be hydraulically fractured. The environmental risks associated with this process are well known and need to be managed and insured against. State and federal oversight of the hydraulic fracturing process combined with industry input are necessary to ensure this important resource is fully developed, while simultaneously ensuring that drinking water supplies along with other natural resources are protected.

The plaintiffs bar and state and federal agencies have been and will continue to be active in filing suit and issuing administrative orders. As the exploration and development of shale gas continues to expand, a corresponding increase in private party and government actions is to be expected. Numerous scientific studies are underway to identify and evaluate the risks presented by hydraulic fracturing. Mitigating and managing these risks and responding to proven damages will require the collective effort of exploration and development companies, their insurers, state and federal legislatures, and regulatory agencies. Brokers and insurers are working to develop new insurance forms for the growing shale gas industry, and insureds should fully explore their options to identify insurance products that might fit their needs.

The economic development of these natural gas reserves requires a balancing of what at times may appear to be competing interests between environmental protection and energy production.