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# A Market Approach to Regulating the Energy Revolution: Assurance Bonds, Insurance, and the Certain and Uncertain Risks of Hydraulic Fracturing

by David A. Dana and Hannah J. Wiseman

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In the industrial revolution of the nineteenth century, the United States was transformed from a largely agrarian nation of farmers to a major center of manufacturing. With industrialization came new risks to public welfare and, ultimately, changes in law to address those. The United States is now undergoing another revolution, an energy revolution that has the potential to transform the United States from a net energy importer into the next Saudi Arabia.[1] Like the industrial revolution, this energy revolution entails new risks and, by necessity, will produce new legal responses to those risks. It has fomented one of the greatest environmental regulatory challenges of our time, and calls for an effective solution that must be rapidly implemented. This Article addresses a set of important legal responses that so far have received scant attention from academic commentators and lawmakers—market-based requirements for enhanced bonding and, more importantly, environmental liability insurance for wells.

The key to the current energy revolution is innovation in the techniques that allow extraction of natural gas from underground rock formations. Advances in horizontal drilling and hydraulic fracturing (or "fracking") have opened up massive natural gas deposits in several regions of the United States.[2] These technologies have driven this revolution by enabling unconventional well development—the production of oil and gas from formations once deemed inaccessible—which we describe as "unconventional development" or "unconventional oil and gas."[3] Unconventional development has begun, and will continue, to change the landscape of this country. Wells already dot the surface of many counties,[4] and this is only the beginning. This development will continue, with tremendous intensity, very likely for several decades at a minimum.

Just as the industrial revolution gave rise to new risks, such as risks from industrial air pollution and factory fires, unconventional development has generated new risks to public welfare. These risks are not, individually, as massive as those seen in the industrial revolution; public perceptions and environmental protections have changed. But cumulatively, they are likely to be substantial. Some of these risks are relatively certain: we know from past

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1. Int'l Energy Agency, World Energy Outlook 2012: Executive Summary 1 (2012), *available at* http://www.worldenergyoutlook.org/publications/weo-2012/.

2. *See Shale Gas Production*, U.S. Energy Info. Admin. (Aug. 1, 2013), http://www.eia.gov/dnav/ng/ng_prod_shalegas_s1_a.htm.

3. We focus on unconventional wells because, first, unconventional wells pose more risks by adding more stages to the well-development process. Although horizontal drilling of unconventional wells might cause some risks to decline by lowering the surface footprint, on net the risks might be higher. *See* Hannah J. Wiseman, *Risk and Response in Fracturing Policy*, 84 U. Colo. L. Rev. 729 (2013) [hereinafter Wiseman, *Risk and Response*]. Second, unconventional well development will be the most common form of well development in the United States moving forward. *See* U.S. Energy Info. Admin., U.S. Dep't of Energy, Annual Energy Outlook 2013 With Projections to 2040 76-79 (2013), *available at* http://www.eia.gov/forecasts/aeo/pdf/0383(2013).pdf.

4. For example, in Fort Worth, Texas, alone there are 2,095 producing wells with 32 permitted. *See Applications and Permits*, City of Fort Worth, http://fortworthtexas.gov/gaswells/default.aspx?id=50608 (last visited Mar. 12, 2015). Well numbers have also rapidly expanded in Pennsylvania, Colorado, North Dakota (shale oil), and other states. *See* Wiseman, *Risk and Response*, *supra* note 3, at 735-36.

experiences with drilling and mining that there is a large risk that certain well operators will simply abandon wells when they are no longer productive and will not make the investments necessary to ensure that the wells are safely closed and sites adequately restored so as to avoid producing pollution.[5] While the rates of abandonment will likely be lower than in the past due to improved state well plugging regulations, constraints on state enforcement of regulations[6] and the sheer number of new wells being developed suggest that abandonment still will occur, as will, perhaps more commonly, inadequate site restoration and cleanup. There is also the relatively near-term risk that while the wells and their associated disposal facilities are operating, there will be major accidents and associated pollutant releases. And then there is the long-term risk, a highly uncertain risk—often referred to as "the long-tail risk"—that once all the unconventional development is done, we will discover that this activity degraded the environment and endangered public health in ways that cannot be linked to specific, identified accidents at active well operations.

While commentators have addressed the question of who should address fracking and other unconventional well development risks,[7] they have paid less attention to how these risks should be addressed. By and large, scholars have assumed that the way to address these risks is prescriptive, "command-and-control" public regulations that establish specific requirements that drilling operators must follow or technologies they must implement.[8] More recently, it has been suggested that state tort law can fill any holes left by command-and-control regulations by incentivizing operators to follow certain practices or risk penalties in court.[9] What has been missing from the academic literature, and largely the political debate, is a discussion of a market approach to addressing the known and unknown risks from unconventional development.

In market approaches to addressing risks, the sources of risks face financial incentives to mitigate the risks that are subject to their control. Assurance bonds are one kind of market mechanism whereby the operator of a facility is required to post upfront funds or other proof of committed financial resources, which the bondholder can return to the operator once it provides assurance that it closed the facility in a safe way. The incentive to recover the bond motivates, at least in part, responsible conduct. Mandatory insurance is another market mechanism, and generally a more effective one, especially for longer term risks. Insurance provides a mechanism for reducing risk to the extent insurance premiums are set to reward behavior that creates less risk and penalize behavior that creates more risk.

These two market approaches, assurance bonds and mandatory insurance, have important advantages over other responses to risk. First, precisely because the risks from emerging or new industries are not well understood,[10] policymakers cannot easily formulate command-and-control regulations that assure a reasonable level of safety. Market approaches tap into industry's own understandings of the risks associated with its behaviors, and incentivize another actor, insurers, to generate more information about which behaviors are more or less risky. Market approaches are thus information-generating—and in a much more meaningful and comprehensive way than, for example, information-forcing regulations.[11] And information generation is key in unconventional oil and gas, where several of the risks are not well understood, but barring the industry until the risks are well understood seems to be too costly. Market mechanisms offer an appealing, pragmatic alternative that sits between the precautionary approach, in which no practice should be undertaken until it is well known to be safe,[12] and the laissez-faire approach, which allows economic activity to continue until it is shown to be unsafe.

Second, assurance bonds and mandatory insurance, even when they do nothing to alter the conduct of industry actors, generate a pool of money that can be used for the remediation of the environmental harms that the actors knowingly or (more often) unknowingly created. Reserving this pool of money[13] is critical because, absent such funds,

5. *See, e.g.*, R.R. Comm'n of Tex., Oil Field Cleanup: State Well Pluggings Remaining by District (Public) (Mar. 31, 2013), *available at* http://www.rrc.state.tx.us/environmental/plugging/Wells_Remaining_0313.pdf; Bureau of Oil & Gas Mgmt., Pa. Dep't of Envtl. Prot., Pennsylvania's Plan for Addressing Problem and Abandoned Wells and Orphaned Wells 4 (2000), *available at* http://www.elibrary.dep.state.pa.us/dsweb/Get/Version-48262/.
6. *See, e.g.*, Hannah J. Wiseman, *State Regulation: Regulatory Risks in Tight Oil and Gas Development*, Nat. Gas & Electricity, Dec. 2012, at 6.
7. *See, e.g.*, Michael Burger, *Fracking and Federalism Choice*, 161 U. Pa. L. Rev. PENNumbra 150, 163 (2013); Elizabeth Burleson, *Climate Change and Natural Gas Dynamic Governance*, 63 Case W. Res. L. Rev. 1217, 1277 (2013).
8. *See, e.g.*, Wiseman, *Risk and Response*, *supra* note 3.
9. *See generally* Thomas W. Merrill & David M. Schizer, *The Shale Oil and Gas Revolution, Hydraulic Fracturing, and Water Contamination: A Regulatory Strategy*, 98 Minn. L. Rev. 145 (2013).
10. Some of the risks of gas and oil development enabled by fracturing—and of fracturing—itself are well understood, but others are not. *See id*. at 217-22; U.S. Gov't Accountability Office, GAO-12-732, Oil and Gas: Information on Shale Resources, Development, and Environmental and Public Health Risks 4 (2012), *available at* http://www.gao.gov/assets/650/647791.pdf.
11. *See, e.g.*, Keith B. Hall, *Hydraulic Fracturing: Trade Secrets and the Mandatory Disclosure of Fracturing Water Composition*, 49 Idaho L. Rev. 399, 405-09 (2013).
12. For definitions of the precautionary approach, see Jonathan B. Wiener, *Whose Precaution After All? A Comment on the Comparison and Evolution of Risk Management Systems*, 13 Duke J. Comp. & Int'l L. 207, 210 n.11 (2003).
13. Insurance and assurance bonds require parties to produce different types of information in order to tap money from the pool. For bonds, the pool is more accessible. State agencies typically presume that the bond money will be available for cleanup unless oil and gas operators demonstrate that they have adequately restored sites and plugged wells. For insurance, in the scheme we envision, money would not go to a general cleanup fund. Rather,

there is a high likelihood that operators or public actors will never undertake environmental remediation. Abandoned wells and mines are commonplace, and "orphan" contaminated industrial waste can be found in virtually every city. Even where such sites pose environmental and health risks, no action often is what we observe. In theory, after well development is done and the damage is apparent, policymakers could reallocate public funds from other uses to address that damage. But history (as well as theories of political economy) tells us that the political process usually does not work that way, and hence if there is not a source of remediation funds other than tax revenue, remediation will not occur, especially in the poorer and less politically powerful localities.[14]

Improved assurance bonds and mandatory insurance thus should be a central part of the response to the risks posed by unconventional wells on a massive scale but are currently inadequate. Certain states and localities require bonds,[15] although not bonds especially for fracking or environmental remediation (as opposed to drilling generally); the bonds that are required vary substantially and are not nearly high enough. Mandatory insurance for modest coverage is required in a few localities[16] but in only two states that we are aware of,[17] and no state has attempted to establish insurance pooling for areas with unconventional well development, which, as we explain, will need to be a key component of effective mandatory insurance. This Article aspires to shift attention to the pressing need for federal, state, and local governments to move forward with market mechanisms as part of their overall response to unconventional development.

parties demanding insurance funds would have to show that the insured caused contamination, but unlike in tort cases, plaintiffs and plaintiffs' attorneys will see more payoff in lawsuits because insurance funds will be available, and the causation standard is different. *See, e.g.*, Tom Baker, *Liability Insurance as Tort Regulation: Six Ways That Liability Insurance Shapes Tort Law in Action*, 12 Conn. Ins. L.J. 1, 4 (2005); Kent D. Syverud, *On the Demand for Liability Insurance*, 72 Tex. L. Rev. 1629, 1634 (1994).

14. *See* David A. Dana, *State Brownfields Programs as Laboratories of Democracy?*, 14 N.Y.U. Envtl. L.J. 86, 103 (2005); Kirsten H. Engel, *Brownfield Initiatives and Environmental Justice: Second-Class Cleanups or Market-Based Equity?*, 13 J. Nat. Resources & Envtl. L. 317, 319 (1997-1998).
15. *See, e.g.*, Cal. Pub. Res. Code §3205.2 (West 2001) (requiring an indemnity bond of $100,000 per oil and gas waste disposal well); Ind. Code Ann. 14-37-6-1 (LexisNexis 2003) (requiring a bond of $2,500 per oil and gas well in addition to an annual fee); Ohio Admin. Code 1501: 9-1-03 (2004) (requiring a bond of $5,000 for a single well); Tenn. Code Ann. §60-1-202(a)(4)(R) (West 2001 & Supp. 2013) (giving the state regulatory board the power to require a bond of up to $15,000 per well site).
16. *See, e.g.*, Arlington, Tex. Code of Ordinances No. 11-068, art. VI, §6.01(C)(4)(a) (2011), *available at* http://www.arlington-tx.gov/cityattorney/wp-content/uploads/sites/15/2014/05/GasDrilling-Chapter.pdf (requiring energy companies to carry environmental pollution liability insurance that will cover $5 million per incident); Farmington, N.M. Code of Ordinances §19-2-102(a) (2006), *available at* http://library.municode.com/index.aspx?clientId=10760 (same); Fort Worth, Tex., Ordinances ch. 15, art. II, §15-41(C)(4)(a) (2009), *available at* http://www.fortworthgov.org/uploadedFiles/Gas_Wells/090120_gas_drilling_final.pdf (same).
17. Maryland, which does not yet allow hydraulic fracturing, requires environmental pollution liability coverage. *See* Md. Code Ann., Envir. §14-111 (West 2013). Illinois requires "proof of insurance to cover injuries, damages, or loss related to pollution or diminution in the amount of at least $5,000,000." 225 Ill. Comp. Stat. 732/1-35(a)(3) (2013).

## I. Well Contamination Over Time

Oil and gas wells pose both long- and short-term risks because of the time horizon on which they operate. After an initial period of intense industrial activity, wells may remain in a production stage for 25, 50, or even 100 years, depending on the abundance of oil and gas. Estimates vary and will likely change as more production numbers are available, but some suggest that the average shale gas well produces for 30 years or more.[18] When production tails off during this period, operators sometimes refracture the well, use other enhanced recovery techniques, or abandon it. Abandonment of a well triggers another stage of potential pollution. Nearly all states require operators to plug wells—to remove some of the casing and pour cement into the well and seal it off.[19] This is supposed to prevent any lingering oil or gas from traveling into nearby groundwater and groundwater from entering the well. Thousands of wells are improperly plugged or not plugged at all,[20] however, and even properly plugged wells can leak over time.[21]

These and other incidents create a challenging long-term contamination problem. If we assumed an average well life of 30 years, and that 11,400 new gas wells were fractured in 2014 (ignoring the many oil wells that were also fractured), in 2044 alone at least 11,000 gas wells will be plugged—if we assume solvent, responsible operators—and abandoned. And this estimate is unreasonably low; in addition to the 2014 newly fractured wells that operators might abandon in 2044, a portion of this country's more than 500,000 existing gas wells also will be abandoned that year, while others will still be active, causing their own types of pollution. Further, operators will drill new wells in 2044, contributing to a continuing cycle of potential contamination from newly drilled, active, and abandoned wells.

## II. The Case for Mandatory Insurance

Bonds and mandatory insurance bring some of the comparative advantages of market-based approaches to regulatory risks into the current regime. These market-based approaches, which are not currently widely deployed aside from basic bonding requirements, can improve allocative efficiency by forcing internalization of the social costs of oil and gas development, and they can reduce the social

18. Kathy Shirely, *Tax Break Rekindled Interest: Shale Gas Exciting Again*, Explorer, Mar. 2001, *available at* http://www.aapg.org/explorer/2001/03mar/gas_shales.cfm; Nat'l Park Serv., U.S. Dep't of the Interior, Development of the Natural Gas Resources in the Marcellus Shale 6 (2009), *available at* http://www.marcellus.psu.edu/resources/PDFs/marcellusshalereport09.pdf.
19. *See* Nathan Richardson et al., The State of State Shale Gas Regulation 67 (2013), *available at* http://www.rff.org/rff/documents/RFF-Rpt-StateofStateRegs_Report.pdf.
20. *See* Dan Frosch, *Wyoming May Act to Plug Abandoned Wells as Natural Gas Boom Ends*, N.Y. Times (Dec. 24, 2013), http://www.nytimes.com/2013/12/25/us/state-may-act-to-plug-abandoned-wyoming-wells-as-natural-gas-boom-ends.html?_r=0.
21. *See, e.g.*, Bureau of Oil & Gas Mgmt., Pa. Dep't of Envtl. Prot., Stray Natural Gas Migration Associated With Oil and Gas Wells 1 (2009), http://www.dep.state.pa.us/dep/subject/advcoun/oil_gas/2009/Stray%20Gas%20Migration%20Cases.pdf.

costs of development by providing incentives for ongoing risk mitigation.

In regimes (like the current oil and gas regime) characterized by non-redundant regulatory enforcement, where the sole regulators (for oil and gas, primarily state regulators) are constrained by possible "capture" and insufficient enforcement resources, insurance can help fill in the monitoring and enforcement gap by bringing to bear another regulatory force—private insurance companies. These entities cannot be captured in the way legislators or agencies can be, and they are not constrained by the pathologies of the budgetary appropriations processes.

Bonds and insurance, if mandatory, also will be essential to an effective liability regime for unconventional development, especially as to longer-term risks, because bonds and insurance can mitigate what we call the "insolvent defendant" problem and the "clouded causation" problem. Plaintiffs can only collect tort judgments from solvent, viable, ongoing entities. Thus, a corporation, corporate subsidiary, or limited liability company will radically discount expected costs from liability that plaintiffs might seek to impose after the expected "life" of the corporation, corporate subsidiary, or LLC.[22] Even if the entity anticipates operating over the very long term, it can effectively cap its liability by limiting its capitalization, even if its owner/shareholders hold massive amounts of capital.[23]

There is also the "clouded causation" problem: common law tort liability requires that the plaintiff prove by a preponderance of the evidence that a given defendant specifically caused the harms. Where there are multiple possible causes for contamination, however, as where there is a cluster of potentially contaminating operations in a single area, or where a single operation has received waste or other potentially harmful materials from multiple actors, attributing specific harms to specific defendants and proving actual and "proximate" causation can be an uphill battle and certainly very expensive. Because the passage of time tends to correlate with the loss of direct evidence of what occurred and with the mixing and merging of pollutants from different sources, the clouded causation problem is particularly likely to impede liability with respect to claims brought many years after a defendant ceases operations. Although parties still must demonstrate underlying tort liability to trigger liability insurance, parties will be more likely to file tort claims—even for cases with difficult causation questions—if they know that a pool of money is available. Further, a finding of tort liability is not necessary to use assurance bonds for contamination cleanup long after the site was contaminated.

A well-designed mandatory insurance regime can help reduce the risks and hence harms associated with a risk-laden and not fully understood activity like unconventional development in two distinct ways. First, horizontal drilling and fracking have inherent features—proximity to aquifers, use of huge amounts of water, and production of wastewater, among many others—that entail at least some non-reducible liability risk. Moreover, unconventional development in some areas (such as near major population centers, ecologically sensitive areas, or areas with more vulnerable groundwater supplies) is likely to involve more non-reducible risk than development in other areas. Mandatory insurance, to the extent it is able to price in such irreducible or inherent risk, will not change how unconventional development is done, but it may change how much of it is done and where it is done.[24]

That is a good thing, because from an allocative efficiency perspective, unconventional development that does not internalize even irreducible risks is likely to be overdone—to have too many resources devoted to it. Absent insurance, too much unconventional development is likely to occur in areas where the risks are greatest (again, highly populated and ecologically sensitive regions) and comparatively too little in areas where risks are lower. Both the net amount and distribution of this development would be changed—and made closer to the socially optimal level—if the development absorbed irreducible risks via insurance premium payments. For example, one consequence of an insurance requirement could be relatively less horizontal drilling and fracking in regions where exposures to major population centers are particularly high.[25]

This point is relevant to the debate about unconventional development's effect on the market for investment in energy efficiency technologies and renewable energy like solar and wind.[26] These energy (and energy use reduction) sources do not carry anything like the irreducible environmental risk and potential liability unconventional development does.[27] And to the extent that is true, absent mandatory insurance, the status quo, at least at the margin, will overproduce investment in new unconventional oil and gas relative to other fundamentally less risky forms of energy production.

Second, some of the risk associated with unconventional development at any site is not irreducible but rather *can* be mitigated and minimized through good safety practices. Command-and-control regulation may not produce regulations that mandate these practices, even putting aside issues of capture and inadequate enforcement appropriations, because it is too slow and inflexible, almost necessarily, and not fully informed by what industry knows or could know and share with the public. Private insurers have a strong incentive to encourage insureds to go beyond what

22. *See* Wendy E. Wagner, *Choosing Ignorance in the Manufacture of Toxic Products*, 82 Cornell L. Rev. 773, 811, n.143 (1997).

23. For a sophisticated model of how corporations might evaluate the costs and benefits of judgment-proofing strategies, see Richard R.W. Brooks, *Liability and Organizational Choice*, 45 J.L. & Econ. 91 (2002).

24. Insurance will be more readily available in those "specific geographic regions" where unconventional development appears to pose lower risks. Willis Ltd., Willis Energy Market Review 2012: All Fracked Up? 29 (2012), *available at* http://www.willis.com/Documents/publications/Industries/Energy/10396_EMR%202012_Complete.pdf.

25. *See* Hannah Wiseman, *Urban Energy*, 40 Fordham Urb. L.J. 1793, 1811 (2013).

26. *Cf.* Henry D. Jacoby et al., *The Influence of Shale Gas on U.S. Energy and Environmental Policy*, 1 Econ. Energy & Envtl. Pol'y 37, 50 (2012).

27. *See* Garrick B. Pursley & Hannah J. Wiseman, *Local Energy*, 60 Emory L.J. 877, 895 (2011).

command-and-control regulations require, at least where there is no strong regulatory compliance defense uniformly recognized, because insurers are economically better off if they can take actions that reduce the liabilities they are responsible to cover for any given policy period.[28] Insurers also have an incentive to gather information regarding safety that will be relevant to setting the next premium. Moreover, an insured in a regime where an entity can only operate with insurance has a strong incentive to cooperate in producing information lest they be denied coverage. "Insurers" are thus "strategically well placed to gather information and engage in risk management, and reflect these costs through premium differentiation."[29]

At the same time, insureds have an incentive to gather information and implement practices that make their operations safer than what command-and-control regulations mandate because they can then use this information and practices as a basis for arguing for a rebate or reduction in premiums for the next policy period. For example, as Haitao Yin, Howard Kunreuther, and Matthew White document, there was a dramatic decline in leaks from underground fuel tanks in certain states when those states required gas stations to carry private cleanup and liability insurance.[30] They explain that "the price structure for market-based insurance gives tank owners economic incentives to invest in equipment that reduces the chance of accidental fuel tank leaks."[31] In sum, mandatory insurance aligns the incentives of both insured and insurers in favor of learning about safety and trying to improve safety in the insured's operations.

More directly to the point of the unconventional development context, insurers have proven substantially effective as a force for ex ante market-based regulation in the hazardous waste industry, where "environmental liability insurers require, or offer significant premium discounts for, compliance with private environmental safety codes that are managed and audited by third parties and that are stricter than governmental environmental regulation."[32] Unlike safety codes derived from state regulations or formulated by industry itself, which may reflect industry interests in near-term cost containment at the expense of safety considerations, codes created by insurers acting in collaboration with industry and environmental NGOs are likely to represent what Merrill and Schizer called "best practices" and to come close to reducing that element of risk which is truly reducible with feasible safety measures.[33]

Moreover, environmental liability insurers outside oil and gas offer discounts for firms that implement environmental management systems that help detect and address possible risks and that also cumulatively generate firm knowledge as to actual conditions on the ground and possible means of operational improvement.[34] In the fracturing context, well operators could potentially receive insurance discounts for installing electronic monitors and other devices to demonstrate a lack of pollution at their sites. And environmental liability insurers can become involved even prospectively in project planning by insureds, in the interest of managing risk: "Major environmental insurance providers now often include environmental engineering support, serving to improve project supervision and review project data and willingness to monitor for risky activities relevant to underwriting decisions."[35] An environmental management system designed to achieve a strict insurer-approved code, and combined with internal firm auditing and external third-party auditing, may provide a far superior form of ex ante regulation of unconventional development than the current motley and often unrigorous mix of state regulations that are enforced, to the extent they are, by infrequent inspection by an overworked and possibly insufficiently independent corps of state inspectors.

Insurers not only may supplement state-based command-and-control regulation, but also improve it in several ways. First, to the extent that environmental liability insurers will operate in multiple states and multiple unconventional oil and gas regions, as it is reasonable to assume they would, they will have an opportunity and need to see how well state regulatory practices operate across the country. They could identify those regulations and practices that work best and those that are unhelpful, and can serve as a force in disseminating that knowledge not just to industry but also to state regulators in the states where unconventional development occurs. Insurers thus can form a kind of national coordinating mechanism, picking and choosing among the best state approaches and publicizing them, in the way that democratic experimentalism scholars have advocated the federal government should do in areas dominated by state regulations.[36] The federal government could take on this coordinating role, but unlike insurers, it lacks a profit-based reason to do so, and has not consistently acted as a coordinator as a general matter. And in unconventional development, federal regulators at EPA appear hesitant to do anything that might antagonize state regulators or industry.[37] Finally, it bears noting that redundancy can be a good thing: both insurers and the federal government could act to coordinate state experiments in the interest of promoting a better, safer national approach.

28. *See* Omri Ben-Shahar & Kyle D. Logue, *Outsourcing Regulation: How Insurance Reduces Moral Hazard*, 111 Mich. L. Rev. 197, 203-05 (2012).
29. Benjamin J. Richardson, Environmental Regulation Through Financial Organisations 363 (2002).
30. Haitao Yin et al., *Does Private Insurance Reduce Environmental Accidents?*, Regulation, Summer 2012, at 36, *available at* http://opim.wharton.upenn.edu/risk/library/J2012Summer_Regulation_HY-HK-MW_EnvironmentalInsurance.pdf.
31. *Id.* at 37.
32. Ben-Shahar & Logue, *supra* note 28, at 211.
33. *See* Willis Ltd., *supra* note 24 at 5.
34. Benjamin J. Richardson, *Mandating Environmental Liability Insurance*, 12 Duke Envtl. L. & Pol'y F. 293, 315-16 (2002).
35. *Id.* at 315; *see also* David J. Dybdahl, Am. Risk Mgmt. Network, A User's Guide to Environmental Insurance 12.
36. *See* Michael C. Dorf & Charles F. Sabel, *A Constitution of Democratic Experimentalism*, 98 Colum. L. Rev. 267, 340-56 (1998).
37. *See* Draft Research Report: Investigation of Ground Water Contamination Near Pavillion, Wyoming, 78 Fed. Reg. 55694 (Sept. 11, 2013) (publishing an EPA report transferring authority to Wyoming to continue investigation of potential groundwater contamination from fracturing).

It is also realistic to think that the availability and adequacy of insurance affects lawyers, judges, and even legislators when they make decisions regarding the imposition of liability. Lawsuits based on accidents at unconventional wells or gradual seepage will not be easy cases to win, and they will not be inexpensive cases to litigate.[38] The plaintiffs' lawyers and government lawyers who consider bringing such cases will only want to do so if there is a reasonable possibility of recovery, and if the defendants are insolvent and lack insurance, there will be no rational reason to proceed with litigation and no reason to invest in testing the contours of liability.[39]

Judges, too, may be affected by the availability of insurance. In cases involving unconventional oil and gas-related harms where there are allegedly multiple contributing industry entities but only one or a few that have insurance or can otherwise cover liabilities, considerations of fairness and proportionality may dissuade courts from finding joint and several liability. Courts also might be unlikely to apportion liability based on some proxy, such as the amount of production of gas or oil or years of active drilling of each of the entities involved in the geographic area at question. But if all of the entities, even insolvent ones, have insurance, and courts could hold them financially responsible ex post with insurance proceeds, courts may be more likely to find liability for harms where a number of unconventional well operations were underway in a concentrated space (which describes many unconventional oil and gas settings).[40]

If this analysis is correct, then mandatory insurance is important not just to ensure that whatever liability is imposed is satisfied in the form of recovered judgments. Mandatory insurance will affect the amount of liability that is imposed—that is, it will lead to, on the margin, more suits and more and larger judgments or settlements made in light of anticipated judgments. Realizing this, the actors in the unconventional oil and gas industry ex ante may anticipate more liability, and so too will their insurers. This will mean higher premiums to account for the higher risks of liability but also even greater measures to try to mitigate risk through effective safety practices on the ground. The ambiguity as to the exact contours of liability at any time will translate into what Kunreuther and other scholars have called an ambiguity premium, a premium that reflects insurers' ambiguity aversion, and as long as insurers may charge for such ambiguity, the co-evolution of the liability and insurance regimes is feasible.[41]

The objection that it is impossible to insure a new, highly risky activity for which the risks are not fully known is an old one, and has been disproven in the offshore oil drilling context. And to the extent that insurers lack risk information to set adequate premiums, they will likely gather this data from industry, providing a useful cross-well comparison that individual plaintiffs—and even regulators, with whom industry is reluctant to share risks—are unlikely to see. If this information is still not enough, states have begun to require industry testing and disclosure of pollution at sites,[42] thus providing further information on risks to a potentially reluctant insurance industry. Furthermore, to the extent that an insurance mandate would push the industry toward larger, highly capitalized operators, if we think that including small operators in this business is important, these operators could pool their resources to purchase insurance. And we have not proposed to allow large operators to self-insure—a policy that would indeed slant the industry toward certain types of firms. Self-insurance removes the objective third-party assessment and monitoring of risk that is essential to the regime proposed here.

Finally, we note that the bonding and insurance requirements that we propose here must have detailed measures to ensure adequate risk protections. They must be site-specific and apply to each party that owns the mineral interests or associated facilities, thus requiring state supervision to ensure that insurance coverage continues along with changes in ownership. States, or insurance companies, must also review operators' financial integrity prior to the purchase of insurance to guarantee that the companies will be able to pay relatively large deductibles. Bonds provided by industry to ensure proper well plugging and abandonment also must cover all potential costs, and must be stringently enforced.

Insurance and bonding strategies alone will not address all of the risks of unconventional development, but they could achieve substantial progress in this area.

38. Smita Walavalkar, Ctr. for Climate Change Law, Columbia Law Sch., Digest of Hydraulic Fracturing Cases (2013), *available at* http://www.law.columbia.edu/null/download?&exclusive=filemgr.download&file_id=622373.

39. *See, e.g.*, Stephen G. Gilles, *The Judgment-Proof Society*, 63 Wash. & Lee L. Rev. 603, 606 (2006).

40. Insurers could respond to such judicial moves by turning to the state legislatures in order to obtain legislation specifying a traditional, and strict, causation standard for claims based on unconventional drilling. However, it is unclear whether such efforts would result in legislation, and even if they did in some states, they might not in others. Such efforts by insurers would come up against the political opposition of the plaintiffs' bar.

41. *See* Howard Kunreuther & Robin M. Hogarth, *How Does Ambiguity Affect Insurance Decisions?*, *in* Contributions to Insurance Economics 307, 321 (Georges Dionne ed., 1992); Laure Cabantous et al., *Is Imprecise Knowledge Better Than Conflicting Expertise? Evidence From Insurers' Decisions in the United States*, 42 J. Risk. Uncertainty 211 (2011).

42. *See* Hannah J. Wiseman, *Hydraulic Fracturing and Information Forcing*, 74 Ohio St. L.J. Furthermore 86, 92-93 (2012).