## СОММЕNТ

## Options for Regulating the Environmental Impacts of Hydraulic Fracturing

## by Leslie Carothers

Leslie Carothers is a Visiting Scholar at the Environmental Law Institute.

The exploitation of shale gas and oil reserves by hydraulic fracturing and horizontal drilling has transformed the U.S. energy industry, bringing desired economic development and greater energy independence for the United States but also new environmental challenges in the states where the resource is abundant. The technique of hydraulic fracturing involves pumping water containing various materials and chemicals into shale formations at high pressure to crack the rock and release the gas and oil contained in it. Combined with horizontal drilling, hydraulic fracturing opens huge shale deposits in the U.S. to production of gas and oil where recovery was not practical before.<sup>1</sup> Environmental law practitioners and academics are devoting significant attention to the demands of representing the actors in the industry and to examining the extent to which the existing environmental regulatory framework for the oil and gas industry is equal to the task of responding to the risks presented by the rapid adoption of a novel technology. The ELI-Vanderbilt Law School Environmental Law and Policy Annual Review identifies outstanding academic work in the field of environmental law. The reviewers selected two excellent articles on the challenges of hydraulic fracturing (fracking for short) to the regulatory system for presentation and discussion at the 2015 program on Capitol Hill: David A. Dana and Hannah J. Wiseman, A Market Approach to Regulating the Energy Revolution: Assurance Bonds, Insurance, and the Certain and Uncertain Risks of Hydraulic Fracturing,<sup>2</sup> and Thomas W. Merrill and David M. Schizer, The Shale Oil and Gas Revolution, Hydraulic Fracturing, and Water Contamination.3 Both articles address many of the common

issues raised about the strengths and weaknesses of the current and potential alternative regulatory approaches, while emphasizing different but not mutually exclusive solutions. This comment will focus primarily on the approaches to setting regulatory standards and securing compliance by the key actors in the cycle of production and site restoration. It concludes with a comment on the problem of cumulative impacts of fracking on landscapes, an issue receiving less attention in the articles, and the importance of maintaining local land use authorities to contend with those impacts.

By way of background, the oil and gas industry has historically been regulated by state agencies, either specialized oil and gas agencies or-more commonly in the eastern gas producing states-by environmental agencies. At the federal level, the Interior Department has a role like the state oil and gas commissions in regulating gas and oil exploration and production on federal lands, Indian reservations, and offshore waters. The Department has recently issued regulations for hydraulic fracturing on federal lands, an action challenged by some representatives of the oil and gas industry on the ground that the agency should defer to the requirements in the states where the federal lands are located.<sup>4</sup> The Interior Department, like the state agencies, has been subject to criticism that as an agency with the mission both to promote and to regulate energy production, it has been less than alert to new risks, as in the case of the deep ocean oil drilling involved in the Deepwater Horizon spill.<sup>5</sup> The U.S. Environmental Protection Agency (EPA) is a regulatory agency with no mission to promote energy development, but EPA has limited statutory authority to regulate oil and gas operations. The agency regulates air quality impacts like methane emissions<sup>6</sup> and underground injection of production wastes. However, other major

See ENVTL. LAW INST. AND WASHINGTON & JEFFERSON COLLEGE CTR. FOR ENERGY POLICY & MGMT., GETTING THE BOOM WITHOUT THE BUST: GUIDING SOUTHWESTERN PENNSYLVANIA THROUGH SHALE GAS DEVEL-OPMENT 4 (2014), available at http://www.eli.org/research-report/gettingboom-without-bust-guiding-southwestern-pennsylvania-through-shale-gasdevelopment [hereinafter ELI and W&J Report].

David A. Dana & Hannah J. Wiseman, A Market Approach to Regulating the Energy Revolution: Assurance Bonds, Insurance, and the Certain and Uncertain Risks of Hydraulic Fracturing, 99 Iowa L. Rev. 1523 (2014).

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).

See Carol Davenport, New Federal Rules Are Set for Fracking, N.Y. TIMES, Mar. 21, 2015, at A-10. Tradition aside, there appears to be no current legal basis for an objection to the Interior Department's regulation of oil and gas development on federal lands.

<sup>5.</sup> Dana & Wiseman, supra note 2, at 1553.

<sup>6.</sup> Merrill & Schizer, supra note 3, at 169-70.

sources of authority like the Clean Water Act's storm water provisions and the general federal waste regulation laws are expressly inapplicable to the oil and gas industry.<sup>7</sup> Consequently, neither the Interior Department nor EPA provides federal oversight of state regulation of most oil and gas drilling activities. The focus needs to be on supporting and strengthening state programs by improving best practices and enforcement methods to deal effectively with the explosive growth in shale gas and oil production and the greater risk of water contamination presented by new production technologies. Both articles address these tasks.

The most important elements of an effective regulatory program are setting standards and making them stick through traditional enforcement tools or other methods of ensuring compliance. The challenges encountered in these two areas depend on (1) the production processes and their associated environmental impacts, and (2) the players—what entities are involved and regulated in the processes and what their technical and financial capabilities are. Both articles describe in detail the phases of shale gas production and the environmental risks at each stage. Neither offers a similarly clear picture of the number and size of the businesses involved in each phase. The composition and capacities of the regulated community are major factors in assessing the effectiveness of compliance strategies, including liability regimes and insurance requirements.

In brief, the production process generally involves: (1) site assessment; (2) building the well pad and any roads needed; (3) vertical and horizontal drilling; (4) hydraulic fracturing, including introduction of materials and chemicals to keep the cracks open; (5) withdrawal of waste cuttings and fluids from the well upon completion; (6) waste handling and disposal, principally water; (7) ongoing recovery of gas and oil from successful wells; and (8) closure of wells and site restoration.8 The Merrill and Schizer article concludes that managing wastewater from these processes is the most important problem because the amount of water used in hydraulic fracturing is much greater than in conventional oil and gas drilling,9 and the wastewater includes contaminants from fracking chemicals as well as material churned up in the drilling process. The authors acknowledge the possibility of fluid or methane migration from shale seams to aquifers. However, they state that studies have found no recorded cases of direct invasion of shallow water zones by fracture fluids during the fracking process.<sup>10</sup> Merrill and Schizer also recognize the risk of leaks from cracked well casings above the water table, though they treat this risk as one that is common to conventional drilling and not a new problem presented by fracking.<sup>11</sup>

Dana and Wiseman provide a table of risks at each stage of the fracking process; it shows the impacts on water resources principally from transport and storage of drilling materials on site, waste storage and disposal, and well termination and post-termination activities at the well sites.<sup>12</sup> Both articles suggest that developing and implementing appropriate leak and spill prevention and disposal options for process and wastewaters are high priorities. Substantial work is being done on these issues, including work on methods to minimize the pollutants in the waste stream and to maximize the possibilities for recycling. The states do not lack numerous public and private sources of recommended best practices for water management, as well as other impacts, that can be adopted in setting permitting requirements.<sup>13</sup>

In the writer's opinion, the greater problem may be securing compliance with best practices by the large numbers and diverse capabilities of the many players at various phases of shale gas development. If the primary environmental impacts result from poor site operations and management and not from major equipment problems, good performance is a function of the competence, training, and supervision of the workforce. Achieving this is a management challenge even for very sophisticated and well-funded companies. It is therefore important in designing enforcement programs to know what types of businesses are active in the fracking process. The information on this point in the two articles is at best inconclusive. The well operator is likely to be a substantial company, like Chesapeake Oil or a subsidiary of Shell. However, many operations including drilling and fracturing are contracted out to smaller service companies.<sup>14</sup> Major oil service companies like Hal-

<sup>7.</sup> Id. at 200-01.

<sup>8.</sup> See Dana & Wiseman, supra note 2, at 1535-41, 1544.

Merrill & Schizer, *supra* note 3, at 177 (citing an EPA estimate that 2-4 million gallons of water are used per well). Blowouts from well operations do occur, but are rare. Dana & Wiseman, *supra* note 2, at 1537.

<sup>10.</sup> See Merrill & Schizer, supra note 3, at 189-91.

<sup>11.</sup> Id. at 185. However, it should be noted that the new Department of the Interior regulations of fracking operations on federal lands upgrade existing well casing requirements, and the Department specifically rejected the industry assertion that there is no evidence that fracking has caused contamination of groundwater. See Hydraulic Fracturing on Federal and Indian Lands, 80 Fed. Reg. 16128, 16180 (Mar. 26, 2015) (to be codified at 43 C.F.R. pt. 3160) [hereinafter DOI Hydraulic Fracturing Rule].

<sup>12.</sup> Dana & Wiseman, *supra* note 2, at 1544. Merrill & Schizer also cite an earlier article by Wiseman concluding that the most pressing risks result not from injection of fracking fluids but from other stages in the well development process and the higher rate of drilling activity. Merrill & Schizer, *supra* note 3, at 184 n.189 (citing Hannah J. Wiseman, *Risk and Response in Fracturing Policy*, 84 U. COLO. L. REV. 101 (2013)).

<sup>13.</sup> These include major industrial associations such as the America Petroleum Institute, regional state and industry organizations, and nonprofit partners working on development of standards for fracking operations. *See* Merrill & Schizer, *supra* note 3, at 217 n.345, 218 n.348. The Environmental Defense Fund has worked with partners on a program to certify users of good practices. *Id.* at 227.

<sup>14.</sup> Dana & Wiseman, *supra* note 2, at 1558 n.140 (citing Professor Jennifer Nash, Exec. Dir. Regulatory Policy Program, Harvard Univ. Kennedy Sch., Remarks at the Workshop on Governance of Risks of Unconventional Shale Gas Development National Research Council (Aug. 16, 2013), *available at* http://sites.nationalacademies.org/xpedio/groups/dbassesite/documents/ webpage/dbasse\_084368.pdf).

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liburton and Schlumberger serve the business, but again, many other companies are entering the field. The new entrants appear to be smaller, not larger companies.<sup>15</sup> A report by the Manhattan Institute estimates that 20,000 small and midsize firms with median employment of 15 are engaged in drilling, extraction and support work, although it is not clear how many are directly engaged in the higher risk activities of fracking.<sup>16</sup> The well operator and permit holder's responsibility for the performance of contractors is an unexamined question.<sup>17</sup> Without a clearer picture of the firms at work in fracking activity, it is at best premature to conclude that solvency will not be a barrier to compliance.<sup>18</sup>

Smaller companies are less likely to have the financial resources to assure that the environmental impacts of operation and closure are addressed, especially at multiple well sites, assuming the firms are still in business after potentially decades of well operation.<sup>19</sup> The sheer number of new permits (estimated by EPA at 11,400 new gas wells fractured annually)<sup>20</sup> and the number and changing identities of contractors involved present a big problem for regulatory agencies attempting to ensure compliance with standards for all phases of production and well closure. Both authors point out the huge inventory of existing wells and the prevailing underfunding of oil and gas enforcement agencies.<sup>21</sup>

The Dana and Wiseman proposal's use of market mechanisms including assurance bonds or insurance has considerable appeal in a situation where the regulated community is so large and the technical and financial strength appears

 Merrill & Schizer, *supra* note 3, at 249-50 (concluding that solvency is less of an issue given the authors' belief that major companies are commanding an increasing share of shale oil and gas production). likely to be variable among the companies involved. The effectiveness of using assurance bonds in practice is hard to assess; the amounts of bonding required in the examples given do not seem high enough to produce the kind of funding that would be needed to compensate for inadequate closure of wells, for example.<sup>22</sup> Assuming these levels have to be set by regulation means that there will be considerable industry pressure to keep them low.

The requirement for insurance could be easier to establish. Indeed, several states have set high dollar insurance requirements, though one of them, Maryland, does not yet allow hydraulic fracturing at all.<sup>23</sup> Insurance requirements could be applied to each company involved in the well development and production process and tailored to the risks in that phase of the operation. From the standpoint of securing compliance with best practices and assuming responsibility for closure at the end of life of a well, the presence of insurance payable to the agency or to anyone harmed by noncompliance would be both an incentive to comply to reduce premium costs and a means to fund corrective action. The Dana and Wiseman article also makes persuasive arguments for the role of insurers in helping to promote development and adoption of best practices as well as providing a source of funds recoverable in tort proceedings that would otherwise not be undertaken against small and medium sized companies.<sup>24</sup> They cite the very positive results of instances where insurance requirements have been imposed on underground tank owners and rates of non-compliance have gone down.<sup>25</sup> An insurance requirement that has the effect of eliminating weak players from engaging in this activity is also a benefit of this market-based approach.

Another potential advantage of an insurance strategy for hydraulic fracturing is the possibility of adjusting conditions and premiums to heterogeneous and especially higher risk locations for development. Dana and Wiseman point out that the risks of activity "near major population centers, ecologically sensitive areas or areas with more vulnerable groundwater supplies" would be greater and presumably more expensive to insure<sup>26</sup>; mandatory insurance could thus exert pressure to avoid such locations.<sup>27</sup>

Experience with hydraulic fracturing in Pennsylvania, where the Marcellus Shale underlies vast areas of populated and forested land, illustrates the greater risk and controversy presented by comparison to development in the wider open spaces of North Dakota or Texas.<sup>28</sup> Even an insurance regime cannot deal with the unavoidable landscape impacts presented by multiple wells, gas pipeline gathering systems, and associated roads. The question of cumulative impacts of hundreds of wells in areas previously undeveloped is not easy to address with best practices, strict liabil-

<sup>15.</sup> Merrill & Schizer, *supra* note 3, at 249-50 n.424 (citing Alison Sider, *Fracking Firms Face New Crop of Competitors*, WALL ST. J., July 9, 2013, at B6). An earlier Wall Street Journal article is cited for the point that larger multinational companies are buying up smaller drillers. It is unclear whether this information is conflicting or whether different phases of the fracking operation and different sets of companies are involved. *Id.* at 250 n.425.

MARK P. MILLS, MANHATTAN INST. FOR POLICY RESEARCH, POWER & GROWTH INITIATIVE REPORT NO. 4, WHERE THE JOBS ARE: SMALL BUSI-NESSES UNLEASH ENERGY EMPLOYMENT BOOM (2014), available at www. manhattan-institute.org/html/pgi\_04.htm#.VQ9JPEY8qu4.

<sup>17.</sup> An example of the tendency of larger players in a chain of development to try to shift compliance responsibilities to others in the chain is mentioned in the Department of the Interior's preamble to its new fracking rules. The Department noted that permitted drill site operators cannot use a contract with a service contractor to escape responsibility for all operations on the permitted site. *See* DOI Hydraulic Fracturing Rule, *supra* note 11, at 16173. Whether states with regulatory authority take the same position is an important question.

<sup>19.</sup> Dana & Wiseman, *supra* note 2, at 1558. For example, the average reclamation costs for a fracking well in Pennsylvania's Marcellus Shale are estimated at \$100,000. *See* ELI and W&J Report, *supra* note 1, at 56. It is worth noting that the slowdown in drilling resulting from the dramatic decline in oil prices has caused many companies to exit the business. One fracking service company executive stated that the 61 service companies in the business at the beginning of 2014 had declined to 41 and that the numbers will decline further. David Wethe, *Half of U.S. Fracking Companies Will Be Dead or Sold This Year*, BLOOMBERG NEWS (Apr. 26, 2015, 11:21 AM), http://www.bloomberg.com/news/articles/2015-04-22/half-of-u-s-fracking-companies-will-be-dead-or-sold-this-year. It is reasonable to expect that many smaller companies involved in later stages of drill site operations and management are also leaving the business.

<sup>20.</sup> See Dana & Wiseman, supra note 2, at 1541.

See id. at 1533 n.123 (citing Hannah J. Wiseman, State Regulation: Regulatory Risks in Tight Oil and Gas Development, NAT. GAS & ELECTRICITY, Dec. 2012, at 6).

<sup>22.</sup> Id. at 1531, 1562.

<sup>23.</sup> See ELI and W&J Report, supra note 1, at 58.

<sup>24.</sup> Dana & Wiseman, supra note 2, at 1565-67.

<sup>25.</sup> Id. at 1565.

<sup>26.</sup> Id. at 1564.

<sup>27.</sup> *Id.* 

<sup>28.</sup> See ELI and W&J Report, supra note 1, at 14-26.

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ity regimes, or insurance requirements. In Pennsylvania, impact fees for municipalities and the restoration by the Pennsylvania Supreme Court of local zoning powers that the legislature had eliminated are, at present, the only tools to deal with intense development in more developed and forested areas.<sup>29</sup> A strong start in thinking through the options for regulating shale gas production has been made as evidenced by the articles discussed in this comment, but there is more legal and policy work to be done to strengthen the tools of local as well as state government in regulating the long term and cumulative impacts and risks of the energy revolution.

<sup>29.</sup> Id. at 79-96 (impact fees), 113-18 (land use authorities).