R&D GRAND CHALLENGES

A Roadmap for Addressing Environmental and Social Issues Associated With Horizontal Drilling and Hydraulic Fracturing

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Editor’s note: This is the latest in a series of articles on the great challenges facing the oil and gas industry as outlined by the SPE Research and Development (R&D) Committee. The R&D challenges comprise broad upstream business needs: increasing recovery factors, in-situ molecular manipulation, carbon capture and sequestration, produced water management, higher resolution subsurface imaging of hydrocarbons, and the environment. The articles in this series examine each of these challenges in depth. White papers covering these challenges are available at www.spe.org/industry/globalchallenges and allow reader comments and open discussion of the topics.

The energy industry faces a massive communications challenge in persuading sizeable sections of the public in the United States and overseas that natural gas operations relying on horizontal drilling and hydraulic fracturing can be conducted safely. Mitchell Energy founder George Mitchell has stated that industry has “the duty to fracture responsibly.” He was candid when he said, “There is no question that accidents have occurred and mistakes have been made during the rush to develop.”

Mitchell’s candor was remarkable because, for too many years, the industry has mainly responded to attacks on shale gas operations by pointing out errors or omissions in critical media accounts. The industry has also emphasized the 60-year history of hydraulic fracturing while ignoring the growth of legitimate public concerns arising from the exponential growth of combined horizontal drilling and hydraulic fracturing during the past 15 years. Thoughtful companies recognize that this has not been a successful strategy for building public trust, and they are beginning to speak directly to the real risks associated with their operations. These real risks include, for example, poor cementing practices in well construction and inadequate wastewater management.

Since mid-2009, investors have been seeking increased disclosure by companies of the environmental and social risks associated with natural gas operations in shale formations and the policies and procedures they are adopting to reduce or eliminate these risks. Risks are associated with the broad life cycle of shale gas operations, not just with hydraulic fracturing as technically defined. Fracturing and horizontal drilling together make substantial recovery of gas from shales economically possible and have brought drilling and production to localities on a scale previously not experienced.

Many governments and communities around the world are looking to learn from the US experience before deciding whether and how to permit exploitation of their shale resources. In the US, there have been numerous incidents of poorly constructed wells, equipment failures, degraded local and regional air quality, water contamination, strained community relations, and related government enforcement actions and private lawsuits. Moratoria or bans on hydraulic fracturing have been enacted in New York state, the Delaware River basin, and by local governments in several US states. Outside the US, France has banned fracking and Quebec and South Africa, among other jurisdictions, have enacted moratoria.

Bans and moratoria are denials of companies’ social license to operate—denials of public consent—arising from concerns about environmental and social risks. Bans and moratoria impose a wide range of costs on companies, ranging from the costs of delays to the complete loss of access to valuable resources where sunk costs must be written off.

Investors make decisions based on assessments of risks and rewards. Data on hard financial indicators are relatively easy to gather, but data on companies’ processes for managing environmental and social risks pose a greater challenge. To better address investor concerns, it is necessary for companies to provide investors with assurance that, all along the corporate chain of command, managers are reducing business risks by addressing operational hazards and are capturing the genuine, measurable business rewards flowing from environmental management practices that have the potential to lower costs, increase profits, and enhance community acceptance. Investors require relevant, reliable, and comparable information about companies’ operations to make investment judgments based on a robust assessment of companies’ environmental, social, and governance policies, practices, and performance.

To assist companies in their reporting and to promote greater consistency and comparability among company reports, in December 2011, the Investor Environmental Health Network and the Interfaith Center on Corporate Responsibility published Extracting the Facts: An Investor Guide to Disclosing Risks.
from Hydraulic Fracturing Operations. The guide evolved from two parallel investor engagements with companies. The first was a collaborative 18-month consultation jointly organized by Boston Common Asset Management and Apache Corporation to provide a safe harbor for conversation between investors and energy companies on risks, management practices, and disclosure. Six meetings were held in 2010 and 2011 that included a shifting mix of investors and companies. In addition, George King, global technology consultant at Apache, offered a half-day well construction course to educate investors on how to distinguish larger risks from smaller ones and what companies can do about them.

The guide also benefited from a series of bilateral conversations that other investment managers held with about two dozen companies between 2009 and 2011. These began with a series of letters directed by investors to individual companies asking for increased disclosures of risks, policies, and practices. In some cases, these led to constructive conversations and increased disclosures on corporate websites. In others, investors believed it necessary to file shareholder resolutions presented at corporate annual meetings formally asking for increased disclosures. As a result of all these engagements, companies have been disclosing much more than they formerly did, although disclosures remain very uneven.

The US Securities and Exchange Commission (SEC) further underscored the importance of such reporting when, in 2011, it began asking companies for information about the environmental impacts of their hydraulic fracturing operations, with an eye toward determining whether companies were providing adequate disclosure. The SEC’s areas of inquiry included:

- Established steps to ensure that drilling, casing, and cementing adhere to known best practices
- Real-time monitoring of the rate and pressure of the fracturing treatment
- Evaluation of the environmental impact of chemical additives
- Efforts to minimize water use or minimize the impact of disposal on surface waters
- The guide is organized around 12 core management goals, recommended practices to implement them, and indicators for reporting progress.
- The 12 core management goals for natural gas operations include:
  - Manage risks transparently and at the board level: Ensure that environmental, health, safety, and social risks are core elements of corporate risk management strategy.
  - Reduce surface footprint: Minimize surface disruption from natural gas exploration and production activities.
  - Assure well integrity: Achieve zero incidence for accidental leaks of hazardous gases and fluids from wellsites.
  - Reduce and disclose all toxic chemicals: Comprehensively disclose and virtually eliminate toxic chemicals used in fracturing operations.
  - Protect water quality by rigorous monitoring: Identify baseline conditions in neighboring water bodies and drinking water sources and routinely monitor quality during natural gas operations.
  - Minimize fresh water use: Draw the minimum potable water necessary to conduct fracturing operations, substituting nonpotable sources to the fullest extent practicable.
  - Prevent contamination from waste water: Store waste waters in secure, closed containers, not in pits open to the atmosphere, and recycle and reuse waste water to the maximum extent practicable.
  - Minimize and disclose air emissions: Prevent/minimize emissions of greenhouse gases and toxic chemicals by systematically identifying emission sources of all sizes, implementing operational practices to reduce emissions, and installing emission control equipment; monitor ambient air quality before and during operations.
  - Prevent contamination from solid waste and sludge residuals: Minimize risks and impacts by deploying closed loop systems for solid waste and sludge residuals from drilling and fracturing operations and fully characterizing and tracking toxic substances.
  - Assure best in class contractor performance: Systematically assess contractor performance against the company’s own best management practices and key performance indicators across the entire range of environmental, health, safety, and social concerns, with the objective of engaging and retaining best in class, continually improving contractors.
  - Secure community consent: During the site selection process, identify all communities affected and address major concerns central to community acceptance of company operations; establish community engagement process and third party conflict resolution mechanisms.
  - Disclose fines, penalties, and litigation: Acknowledge performance issues by disclosing infractions, legal controversies, and lessons learned.

Goals, practices, and indicators can:

- Drive operational efficiencies (reduced costs yield increased margins and profitability)
- Provide insurance in case of accident or natural disaster (lowered toxicities and volumes of chemicals reduce risks from chemical spills)
- Reduce air emissions and fresh water withdrawals that trigger violations of environmental standards (regulators consequently may ban and limit operations)
- Protect and enhance companies’ social license to operate by increasing the odds of positive community response to the best-managed, most transparent companies addressing community needs and concerns.
Some of the practices are immediately implementable—for example, systematic use of “green” completions to minimize air emissions—while some are more aspirational, such as virtual elimination of toxic chemicals from fracturing operations. The guide draws on documented examples of 17 different companies’ use of best practices.

The guide also addresses a central concern that invariably arises in discussions of best practices—that a “one size fits all” best practice may, in fact, not be best in all situations and might even create perverse incentives. To address this sticking point, the guide adopts the approach of “comply or explain.” That approach provides companies with an off-ramp for not using best practices in all cases. For example, green completions are increasingly used to reduce air emissions, but they’re more relevant to development wells than to exploratory wells. So, a company could report that its planning process makes green completions the default choice for well completion except where such completions are not technically feasible.

The companies most likely to be trusted by investors and most readily welcomed by local communities will be those that

▶ Have an across-the-board, transparent record of voluntary actions to reduce the quantity and toxicity of chemicals

▶ Develop innovative methods for reducing use of fresh water—for example, recycling fracturing waste waters or using saline or industrial waste waters for fracturing

▶ Systematically inventory and reduce air emissions from operations, including using green completions where appropriate and substituting closed waste storage structures for open pits

▶ Closely oversee their contractors to prevent shoddy well construction and demonstrate rapid emergency response capability

▶ Know what’s in their waste and what happens to it

▶ Anticipate and respond to local community noise, road damage, and other nuisance concerns

▶ Acknowledge regulatory transgressions and lessons learned from them

**References**


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