

# DISCLOSING THE FACTS:

TRANSPARENCY AND RISK IN HYDRAULIC FRACTURING OPERATIONS



A COLLABORATIVE PROJECT OF:



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# COLLABORATING ORGANIZATIONS

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**THE INVESTOR ENVIRONMENTAL HEALTH NETWORK (IEHN)** is a collaborative partnership of investment managers and advisors concerned about the impact of corporate practices on environmental health.

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# TABLE OF CONTENTS

- EXECUTIVE SUMMARY .....4
- INTRODUCTION.....8
- SCORECARD .....10
- COMPANY PERFORMANCE ON RISK MANAGEMENT  
DISCLOSURE INDICATORS .....11
  - Toxic Chemicals .....11
  - Water and Waste Management .....14
  - Air Emissions .....21
  - Community Impacts.....25
  - Management and Accountability.....28
- APPENDIX A: RECOMMENDATION CHART .....32
- APPENDIX B: SCORECARD QUESTIONS.....33
- APPENDIX C: METHODOLOGY.....35

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# EXECUTIVE SUMMARY

Since 2009, institutional investors have been pressing oil and gas companies to be more transparent in reporting how they manage and mitigate the environmental risks and community impacts of their hydraulic fracturing operations. Measurement and disclosure of best management practices and impacts are the primary means by which investors gauge how companies are addressing the business risks of their operations.

This inaugural scorecard is a collaborative effort of As You Sow, Boston Common Asset Management, Green Century Capital Management, and the Investor Environmental Health Network. The scorecard analyzes and benchmarks the public disclosures of 24 oil and gas companies on the use and effectiveness of best management practices for reducing and managing environmental risks and community impacts from hydraulic fracturing operations. It does so by examining overall industry performance on use of quantitative metrics for disclosure, identifying those indicators most commonly reported, and distinguishing companies disclosing more about their practices and impacts from those disclosing less. The scorecard specifically measures company disclosures across five areas of environmental, social, and governance metrics: (1) toxic chemicals; (2) water and waste management; (3) air emissions; (4) community impacts; and (5) management accountability, on a play-by-play basis.<sup>1</sup>

The assessment in this scorecard is based solely on information companies make publicly available on their websites and in their financial statements.

The results of the scorecard demonstrate a widespread industry trend of underperformance in disclosure of key performance metrics. Companies, nearly across the board, are failing to provide investors and the public with sufficient quantitative information to adequately understand and compare the risks and opportunities these companies present within their hydraulic fracturing operations.

## KEY FINDINGS

- Poor Overall Industry Performance on Disclosures of Key Metrics:** Quantitative, play-by-play disclosure is inadequate across the industry. Company disclosures remain mostly qualitative and narrative in form, making it difficult for investors to rigorously assess and compare company performance. Too often, companies provide aggregate reporting (e.g., on a companywide or countrywide basis) and rely on anecdotes or narrative statements as a substitute for systematic, quantitative reporting on critical regional and local practices and impacts. Further, we believe that narrative reporting does not give investors and other stakeholders the information necessary to determine if individual companies are sufficiently managing the risks inherent to their operations across their multiple plays.
- Reporting Varies Widely Company to Company:** The highest scoring company in this review, Encana, provided disclosures on only 14 of the 32 indicators. QEP provided disclosures on only 1 of 32 indicators, receiving the lowest score in the report.
- Most Commonly Reported Indicators:** The most commonly reported survey indicators were: executive compensation tied to health, environment, and safety performance (71% of companies surveyed); the use of pipelines to transport water in lieu of diesel trucks to lower air emissions (62%); and company policy on the use of non-potable versus fresh water (46%).
- Least Reported Indicators:** Companies scored worst on their disclosure of how community concerns are tracked and responded to, especially on a play-by-play basis. Only 6 companies received any points in the community impacts section of the scorecard. While certain companies may be addressing local community impacts, no company is systematically reporting company successes and failures in accommodating community concerns on a play-by-play basis.

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1. According to the U.S. Geological Survey, a "play" is defined as "a set of known or postulated oil and/or gas accumulations sharing similar geologic, geographic, and temporal properties, such as source rock, migration pathways, timing, trapping mechanism, and hydrocarbon type." See <http://proceedings.esri.com/library/userconf/proc02/pap0826/p0826.htm>. Examples include the Barnett Shale, the Marcellus Shale, and the Bakken formation. "Play-by-play" disclosure refers to a company reporting the distinct operational practices and impacts that are occurring at each play in which a company is operating, as distinct from reporting at an aggregate level such as company or countrywide.

## AREAS FOR FUTURE INVESTOR AND COMPANY DIALOGUE

This report reflects a first attempt to provide a comparison of companies on relevant risk metrics associated with hydraulic fracturing operations. Review of company data in the course of preparing the scorecard revealed methodological issues that may benefit from further dialogue with the industry. First, play-by-play analysis may not reflect all variations that exist within a single shale play. Variations within a play may require new or different methods of reporting that may not fit within current business reporting models. We welcome dialogue regarding the appropriate framework for disaggregating metrics on a regional or local basis. Second, the timing of reporting by companies within geographic areas may also merit further analysis. Investors expect that companies are managing the risks and impacts of operations as soon as they initiate operations in an area, but we welcome dialogue regarding when it is reasonable to expect reporting to begin on the various metrics. Finally, the focus of this report is on quantitative metrics comparable from company to company, so points have not been provided for companies' narrative reporting, the evaluation of which would require a more subjective rating system. Nevertheless, we invite additional input as to whether and how future reports might better capture this information.

### FINAL RECOMMENDATION: COMPANIES SHOULD INCREASE QUANTITATIVE REPORTING

Narrative reporting, aggregate companywide reporting, or, for multi-play companies, reporting of activities in a single play, do not sufficiently inform investors of the risks or strengths of companies' hydraulic fracturing operations and practices. Rather, companies should collect data and report quantitatively, on a play-by-play or other appropriate regional basis. Companies that have data management systems in place for collecting and reporting aggregate emissions for water, waste, or other key concerns, should make the information available on a disaggregated, play-by-play basis. Finally, where companies are already implementing current best practices, such practices should be disclosed.

## CONCLUSION

At the time of this publication, company disclosures are insufficient to meet the needs of investors seeking to evaluate how companies are reducing the potential health and environmental risks of natural gas and oil operations using hydraulic fracturing in the United States and Canada. We believe companies implementing current best practices in operations and providing thoroughly transparent information will reduce regulatory and reputational risks; enhance their likelihood of securing and maintaining their social license to operate; reduce liabilities associated with poor performance, spills, contamination, and lawsuits; and thereby increase their access to capital.

Although companies still have a long way to go, disclosure in the oil and gas industry has improved during the four years since investor engagements began. Increased disclosure has been driven not only by companies' constructive

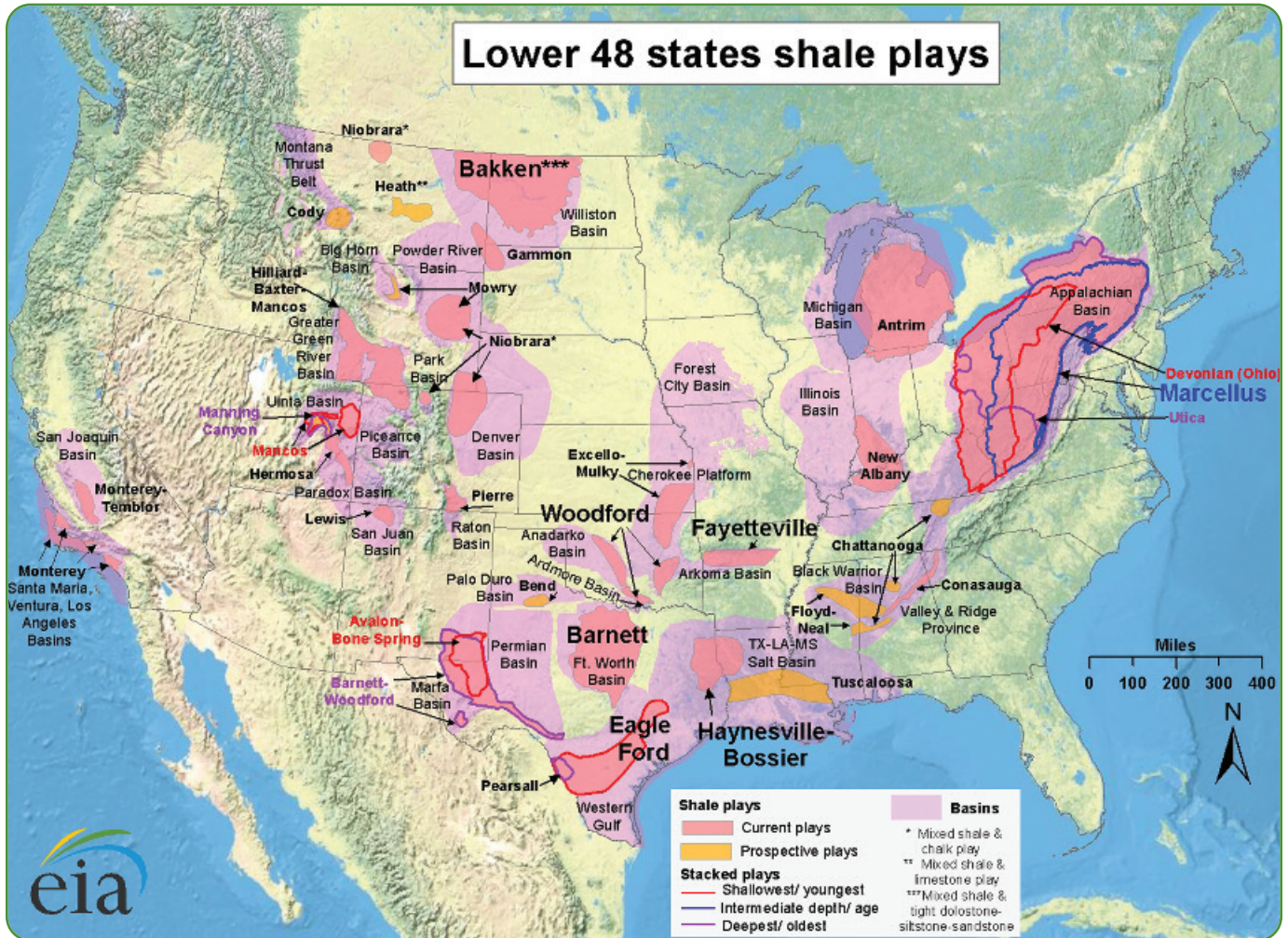
2. Many of the questions in the scorecard seek play-by-play disclosure. Ultra Petroleum reports that it has active completion operations in only one play in 2012 and 2013.

## THE SCORECARD

(Out Of Possible 32 Points)  
SCORE

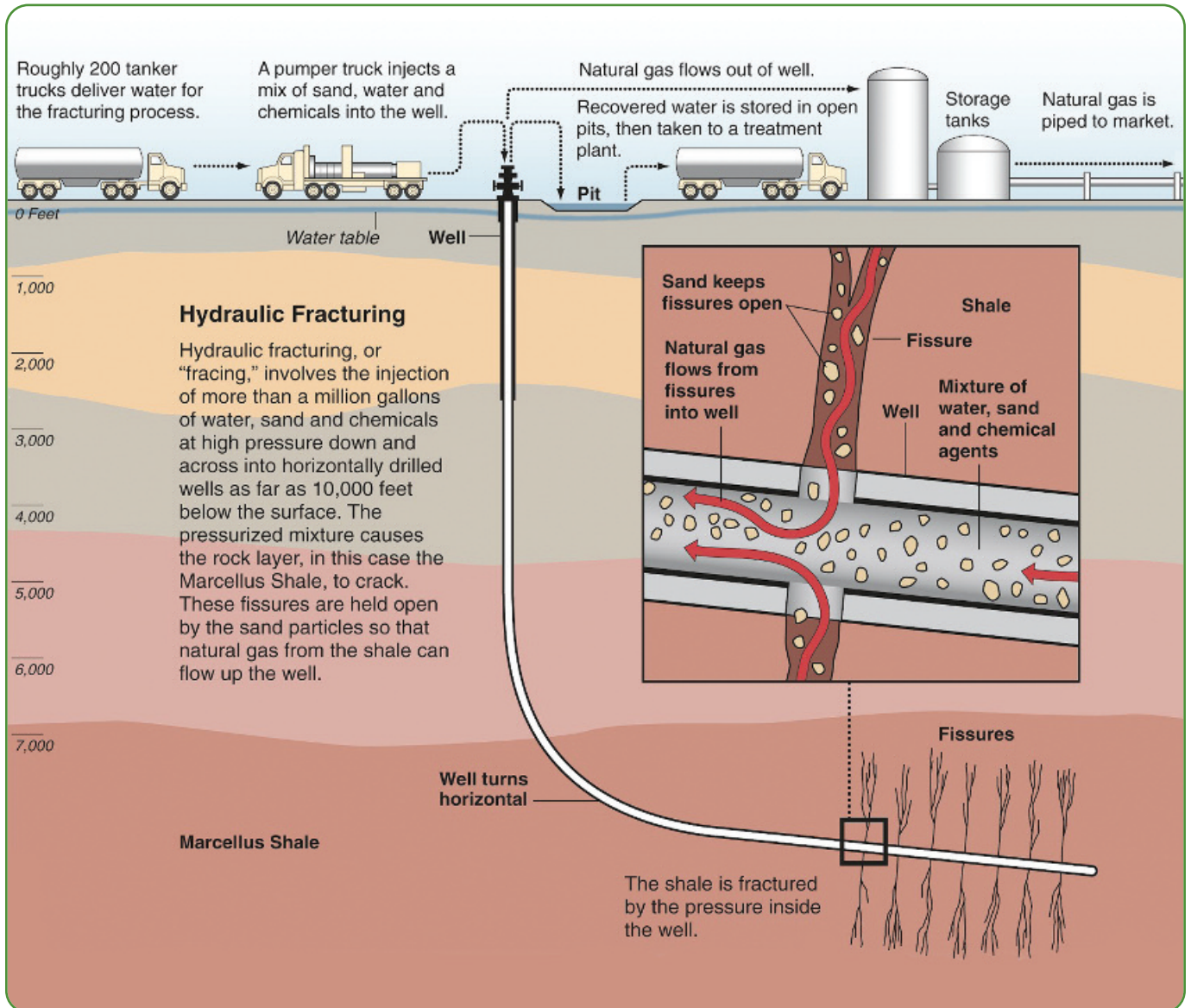
COMPANY	SCORE
<b>Encana Corp.</b> (Encana)	14
<b>Apache Corp.</b> (Apache)	10
<b>Ultra Petroleum Corp.</b> <sup>2</sup> (Ultra)	10
<b>Hess Corp.</b> (Hess)	8
<b>Noble Energy, Inc.</b> (Noble)	7
<b>Royal Dutch Shell plc</b> (Shell)	7
<b>EOG Resources, Inc.</b> (EOG)	6
<b>Cabot Oil &amp; Gas Corp.</b> (Cabot)	5
<b>Chesapeake Energy Corp.</b> (Chesapeake)	5
<b>ConocoPhillips Corp.</b> (ConocoPhillips)	5
<b>CONSOL Energy, Inc</b> (Consol)	5
<b>EQT Corp.</b> (EQT)	5
<b>Anadarko Petroleum Corp.</b> (Anadarko)	4
<b>Devon Energy Corp.</b> (Devon)	4
<b>Chevron Corp.</b> (Chevron)	3
<b>Range Resources Corp.</b> (Range)	3
<b>Talisman Energy, Inc.</b> (Talisman)	3
<b>WPX Energy, Inc.</b> (WPX)	3
<b>BHP Billiton Ltd.</b> (BHP)	2
<b>BP plc</b> (BP)	2
<b>Exxon Mobil Corp.</b> (Exxon)	2
<b>Occidental Petroleum Corp.</b> (Occidental)	2
<b>Southwestern Energy Co.</b> (Southwestern)	2
<b>QEP Resources, Inc.</b> (QEP)	1

conversations with investors and community members, but also by their own recognition that repeated assurances of safe operations are not sufficient to address the high-profile environmental and social challenges associated with hydraulic fracturing operations. Where companies are implementing but not disclosing their own use of best management practices and how they learn from on-the-ground failures, they are missing an opportunity to publicly demonstrate industry leadership and address investor and community concerns.



CREDIT: U.S. Energy Information Administration

Source: U.S. Energy Information Administration based on data from various published studies.  
Updated: May 9, 2011



CREDIT: Al Granberg for Propublica.org

# INTRODUCTION

Hydraulic fracturing operations typically use millions of gallons of water per well, require careful transport and storage of thousands of gallons of chemicals, produce large volumes of waste water, and create greenhouse gases and other air emissions.<sup>3</sup> These industrial operations also have significant social impacts on communities and the regions in which they operate. They can impair health, damage roads, create significant traffic congestion, increase burdens on emergency services, and reduce the availability of affordable housing, among other impacts.

As a result of the environmental and social impacts of fracturing operations, companies face an abundance of regulatory, reputational, and litigation risk. Governments—from local towns to nation-states—have enacted bans and moratoria on hydraulic fracturing operations.<sup>4</sup> Such actions represent denial of companies’ “social license to operate” and can result in significant negative impacts to a company’s bottom line due to loss of revenue.

Investors in the U.S. and other countries are closely scrutinizing how such risks are managed. Companies adopting and disclosing best management practices may not only position themselves better in securing and maintaining their right to operate but also can realize cost savings and profit opportunities. Importantly, what are considered best management practices change over time, so companies must be diligent in continuously monitoring, adopting, and disclosing best practices.

Detailed industry reporting is not an end in itself, but an essential first step in enabling investors to understand the potential environmental and social impacts of a company’s practices, procedures, and actions. To exercise their fiduciary duty, investors require comprehensive, high quality data demonstrating that company managers are (1) managing business risks by addressing operational hazards and (2) capturing the genuine, measurable business rewards flowing from environmental management practices that have the potential to lower costs, increase profits, and enhance community acceptance. We believe companies implementing best practices in operations and providing thoroughly transparent information will reduce regulatory and reputational risks; enhance their likelihood of securing and maintaining their social license to operate; reduce liabilities associated with poor performance, spills, contamination, and lawsuits; and thereby increase their access to capital.

## History of Shareholder Actions

Since 2009, institutional investors in the U.S. and Canada have been pressing companies to be more transparent in identifying how they manage and mitigate the environmental risks and community impacts inherent to hydraulic fracturing operations. To date, investors have engaged over two dozen companies and filed nearly 40 shareholder proposals on these issues. More recently, investors in other parts of the world have also engaged oil and gas companies on these issues. Investors have urged companies to minimize, mitigate, and eliminate the environmental and social impacts associated with fracturing operations and to transparently report progress on company performance.

When investors first began engaging companies, the companies were failing to report on their hydraulic fracturing operations in any meaningful way and some stated that hydraulic fracturing had been carried out for decades without negative impact. Such statements failed to account for the dramatic technological revolution in the marriage of horizontal drilling and hydraulic fracturing in the closing decades of the 20th century that led to greatly expanded drilling and fracturing operations in new areas, accompanied by large increases in demand for water and in use of chemicals.

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3. Companies developing energy from shale and other “tight” formations using horizontal drilling and hydraulic fracturing follow a multi-step process, including leasing, site development, drilling, well completion (which includes “hydraulic fracturing” as technically defined), and production. When discussing “hydraulic fracturing operations,” this report focuses principally on practices, policies, and impacts associated with drilling and well completion. References in this report to “shale” also encompass other types of rock from which natural gas, natural gas liquids, and oil are extracted using hydraulic fracturing techniques.
  4. On Quebec’s moratorium, see <http://www.cbc.ca/news/business/story/2012/11/23/fracking-ban-nafta-lawsuit.html>.  
On Bulgaria’s, see <http://www.shalegas-europe.eu/en/index.php/resources/shale-opportunities-in-europe/bulgaria>.  
On France’s, see <http://www.shalegas-europe.eu/en/index.php/resources/shale-opportunities-in-europe/france>.  
On the Delaware River Basin Commission’s de facto moratorium, see <http://stateimpact.npr.org/pennsylvania/tag/drbc/>.  
On the State of Maryland’s de facto moratorium, see <http://www.baltimoresun.com/features/green/blog/bal-bmg-legislative-fracking-ban-in-maryland-proposed-20120912,0,6855106.story>.  
On local bans and moratoria in New York State, see <http://www.fractracker.org/maps/ny-moratoria/>.



Although many companies have begun adopting policies specific to hydraulic fracturing, the effectiveness of these policies can only be measured using systematically gathered, disclosed data. Investors seek comprehensive, comparable information to distinguish corporate risk reduction leaders from laggards. Without this information, investors have no way of assessing the relative performance of companies in addressing these risks and impacts, or in gauging year-by-year improvement, presenting challenges in the exercise of fiduciary duty. Consistently high votes on shareholder proposals relating to the management of risk associated with hydraulic fracturing operations (two-thirds of votes exceeded 30% and one-third exceeded 40% since 2010) highlight investor concern and have prompted companies to engage in dialogues with investors on these issues.

In 2011, to clearly articulate investors' reporting expectations, the Investor Environmental Health Network ("IEHN") and the Interfaith Center on Corporate Responsibility ("ICCR") published *Extracting the Facts: An Investor Guide to Disclosing Risks from Hydraulic Fracturing Operations*.<sup>5</sup> An eighteen-month investor dialogue with energy companies, convened by Boston Common Asset Management and Apache Corporation, and supported by members of ICCR and Ceres, provided a venue for extended conversations concerning risks, management practices, and disclosures associated with hydraulic fracturing operations and a forum for industry experts to review draft practices and indicators. The dialogue became the foundation for *Extracting the Facts*. The report identifies 12 core management goals, best management practices, and key performance indicators on which investors require disclosure to adequately assess risk management practices. *Extracting the Facts* was intended to promote a "race to the top," encouraging companies to be more transparent and strive for and report on best practices. It urges companies to implement best management practices or to explain why such practices cannot be carried out. Furthermore, it emphasizes the importance of going beyond compliance with existing regulations since the current regulatory framework, primarily at the state level, varies in stringency and, as evident from local bans and moratoria, may not be trusted by local communities.<sup>6</sup>

After years of constructive engagement, as well as pressure by various stakeholders, there has been a growing recognition by companies of a need to be more explicit about the policies and practices they use to address concerns about shale energy development. Examples include Cabot Oil & Gas' *Policy on Hydraulic Fracturing Fluids*,<sup>7</sup> which lists practices to seek safer fracturing chemicals; Ultra Petroleum's water and waste management practices;<sup>8</sup> and Noble's disclosure on its monitoring practices and testing of cement to assess well integrity.<sup>9</sup> Perhaps most prominently, companies and state regulators working together created a collaborative website, [www.FracFocus.org](http://www.FracFocus.org),<sup>10</sup> for well-by-well disclosure of chemical use; Range Resources pioneered such disclosures on its own website in 2010.

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5. Available at <http://www.iehn.org/documents/frackguidance.pdf>.

6. Bans and moratoria and variations in state regulations are noted in Joint Institute for Strategic Energy Analysis, "Natural Gas and the Transformation of the U.S. Energy Sector: Electricity", chapter 2, page 61 (2012). (Hereafter cited as "JISEA Report") <http://www.nrel.gov/docs/fy13osti/55538.pdf>. Variations among state regulations and a lack of transparency makes comparative assessment of state regulatory structures challenging as noted in Resources for the Future, "The State of State Shale Gas Regulation" (2013) (Hereafter cited as "RFF Regulatory Report") [http://www.rff.org/RFF/Documents/RFF-Rpt-StateofStateRegs\\_Report.pdf](http://www.rff.org/RFF/Documents/RFF-Rpt-StateofStateRegs_Report.pdf). Unevenness in state regulatory practices and lack of transparency are also noted in a report by Earthworks, "Breaking All the Rules: The Crisis in Oil & Gas Regulatory Enforcement" (2012) <http://www.earthworksaction.org/files/publications/FINAL-US-enforcement-sm.pdf>.

7. <http://www.cabotog.com/pdfs/Frackingfluidpolicy.pdf>.

8. These include: utilizing 100% recycled water for completions in all currently active operations; eliminating diesel and "BTEX" chemicals (benzene, toluene, ethylbenzene, and xylenes) in its hydraulic fracturing fluid; and managing all drilling fluids in closed loop systems.

9. See <http://www.nobleenergyinc.com/Responsibility/Environment/Hydraulic-Fracturing-302.html>; also, Noble 2011 Sustainability Report, page 32, accessible at <http://www.nobleenergyinc.com/annualreport/nei12/index.html>.

10. The first iteration of FracFocus was widely criticized due to its limited functionality and searchability. For example, see "Fracking Hazards Obscured in Failure to Disclose Wells", <http://www.bloomberg.com/news/2012-08-14/fracking-hazards-obscured-in-failure-to-disclose-wells.html>; "FracFocus Can't Replace Full, Public Disclosure, Groups Say", <http://www.eenews.net/stories/1059964669>; and "A Red Flag on Disclosure of Hydraulic Fracturing Chemicals", <http://blogs.edf.org/energyexchange/2012/12/12/a-red-flag-on-disclosure-of-hydraulic-fracturing-chemicals/>. An upgraded version, released in summer 2013, is more user-friendly and searchable. A discussion regarding the functionality of FracFocus continues.

While some companies have voluntarily increased disclosures, particularly around chemicals used in hydraulic fracturing operations, much of this reporting is narrative and difficult for investors to rigorously analyze. Across the industry there is still limited systematic and readily comparable reporting on risk management and appropriate actions to reduce environmental and community impacts. As a result, investors may lack information critical to fully evaluate the risks and strengths of energy companies engaged in shale gas and tight oil extraction using hydraulic fracturing methods. At the same time, authoritative bodies such as the International Energy Agency and the U.S. Secretary of Energy Advisory Board, Shale Gas Production Subcommittee have called for increased transparency and best management practices to reduce the impacts of fracturing operations.<sup>11</sup>

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## SCORECARD

### OVERVIEW

This scorecard, a collaborative effort of As You Sow, Boston Common Asset Management, Green Century Capital Management, and the Investor Environmental Health Network, benchmarks oil and gas company disclosures on the adoption and effectiveness of best management practices for reducing and managing environmental risks and community impacts from hydraulic fracturing operations. It does so by examining overall industry performance on use of quantitative metrics for disclosure; identifying those indicators most commonly reported; and distinguishing companies disclosing more about their practices and impacts from those disclosing less. **Disclosure is critical—as it is the primary vehicle by which investors gain insight into the extent to which companies are adopting best management practices and realizing their benefits.** Risk management policies are most meaningful when accompanied by data disclosing their effectiveness. Some companies may, in fact, be implementing best practices on a broad scale but—absent disclosure—investors are left in the dark about these efforts.

The scorecard scores 24 oil and gas companies on their performance on 32 disclosure indicators derived from *Extracting the Facts*. (See appendices A and B for details on indicators and scoring methodology). Each company was scored based solely on documents and information available on its public website. These include, among others, website text, U.S. Securities and Exchange Commission (“SEC”) proxy and annual report filings, air and water management reports to CDP (formerly the Carbon Disclosure Project) posted directly on websites, and sustainability/social responsibility reports.

The scorecard indicators incorporate risk management practices found in cutting-edge regulations that have been recently adopted or proposed.<sup>12</sup> They are grouped into five areas of risk management disclosure:

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11. Secretary of Energy Advisory Board Shale Gas Production Subcommittee Second Ninety Day Report (2011) [http://energy.gov/sites/prod/files/90day\\_Report\\_Second\\_11.18.11.pdf](http://energy.gov/sites/prod/files/90day_Report_Second_11.18.11.pdf). See also International Energy Agency, “Golden Rules for a Golden Age of Gas” (2012), [http://www.iea.org/publications/freepublications/publication/WEO2012\\_GoldenRulesReport.pdf](http://www.iea.org/publications/freepublications/publication/WEO2012_GoldenRulesReport.pdf). APG, a \$450 billion Dutch pension fund (serving 4.5 million pensioners) noted in 2012 that it had decided not to invest in a U.S. company using hydraulic fracturing because of the company’s “lack of transparency...and concerns about the social and environmental practices of the relevant manager.” APG “requested more quantitative reporting on performance indicators and the application of best practice standards” See “Investing in Sustainability, May 2012”, [http://www.apg.nl/apgsite/pages/images/investing-in-sustainability-2012-1\\_tcm124-147592.PDF](http://www.apg.nl/apgsite/pages/images/investing-in-sustainability-2012-1_tcm124-147592.PDF), page 8.
  12. Southwestern Energy has been collaborating for several years with the Environmental Defense Fund in developing strong model regulations for both chemical disclosure and for strengthening well drilling and completion practices. The model disclosure regulations have triggered enactment of multiple state regulations on chemical disclosures, although they vary in their stringency. The model drilling regulations (hereafter cited as “EDF/Southwestern Model Regulatory Framework”) have been used to advocate for strengthened regulation within states. The Southwestern/EDF collaboration is discussed here: [http://portal.ncdenr.org/c/document\\_library/get\\_file?uuid=8356eb89-9c9f-4f8e-bb4d-4bb51b605575&groupId=8198095](http://portal.ncdenr.org/c/document_library/get_file?uuid=8356eb89-9c9f-4f8e-bb4d-4bb51b605575&groupId=8198095). Illinois enacted the Illinois Hydraulic Fracturing Regulatory Act in June 2013 (hereafter cited as “Illinois regulations”). For the full text of the legislation, see <http://www.ilga.gov/legislation/publicacts/98/PDF/098-0022.pdf>. Among other provisions, the Illinois regulations call for storing waste water in closed tanks and pre-drill and periodic post-drill monitoring.

1. Toxic chemicals
2. Water management: sourcing, well integrity, waste management, and monitoring
3. Air emissions
4. Community impacts
5. Management and accountability

The scorecard places special emphasis on the quantitative reporting of activities and impacts on a play-by-play basis due to the regional and local impacts of certain hydraulic fracturing operations, especially operations that impact water, air, waste, and communities. A focus on region-specific reporting also reflects the reality of diverse regulatory systems, as onshore oil and gas exploration and production in the U.S. is largely state regulated, as opposed to federally regulated. While investors recognize that companies must also have company-wide policies and risk-management practices in place to guide operations across all plays, the scorecard's emphasis on quantitative play-by-play reporting seeks to capture the regional impacts of hydraulic fracturing operations while addressing regional and local variations among plays. Disclosing emission reduction efforts in one play does not mean that such improvements are being made in another play, particularly if the reported play is subject to more stringent air quality regulations. Similarly, reporting aggregate air emission reductions on a company or countrywide basis is of limited use in understanding what is happening to air quality in a specific location. It is essential for investors to understand the specific risks that companies face in individual regions and how that may have an impact upon shareholder value.

This scorecard report reflects a first attempt to provide a comparison of companies on relevant metrics regarding management of risks posed by hydraulic fracturing operations. Future editions of this scorecard will likely refine the criteria and scoring system. We particularly invite dialogue on three complex issues—the geographic scope of reporting, the timing of reporting, and the incorporation of non-quantitative or narrative disclosures that may give investors valuable insight into company operations.

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## COMPANY PERFORMANCE ON RISK MANAGEMENT DISCLOSURE INDICATORS

The following discussion provides detail on the five areas of risk management disclosure addressed in the scorecard. It presents analysis as to why these issues constitute risks and are of concern to investors; discusses how companies scored on the indicators; makes recommendations for further action; and provides examples of notable practices and disclosures of various companies. Although these notable practices are not necessarily “best practices” per se (especially if they reflect disclosure for one shale play when best disclosure would be providing such information for all plays), they do signal types of corporate practices and reporting that are responsive to investor concerns and are worth highlighting. Finally, while no one company scores well on all indicators, a few companies score well on particular indicators.

Note that in the following sections, only companies that scored at least one point are listed in the accompanying charts. Any company not listed in a chart scored no points in that section.

### 1. TOXIC CHEMICALS

#### Issue

Institutional investors have expressed concern about how companies manage toxic chemicals because of their potential to pollute water and affect public health. Due to these risks, toxic chemicals are one of the core public flashpoints generating controversy over hydraulic fracturing.

Two (2) chemical categories of particular concern (among many others, including endocrine disruptors and bio-accumulative chemicals) are diesel fuels and BTEX (benzene, toluene, ethylbenzene, and xylenes). Diesel fuel contains chemicals of concern including BTEX, which is a family of “poster child” toxic chemicals associated with leukemia, neurological damage, and other health effects. Several companies have successfully removed these chemicals as safer, more effective chemicals have become available.

Using the least toxic chemicals functionally effective in hydraulic fracturing operations reduces risks, which helps protect a company’s bottom line and preserve its social license to operate. Therefore, best practice is to provide comprehensive disclosure on chemicals used and efforts to reduce toxicity of fracturing fluids.

## Questions<sup>13</sup>

To understand company practices on managing toxic chemicals, the scorecard asks whether the company provides quantitative reporting on progress in reducing the toxicity of hydraulic fracturing additives; whether the company has a practice to not use diesel or BTEX in its fracturing fluids; and whether the company clearly states on its website that FracFocus reports may exclude chemicals protected by claims of confidential business information (“CBI”).

## Scores and Discussion

**Reporting of elimination of harmful chemicals:** While several companies state that they are seeking lower-toxicity additives, only 1 company, Chevron, quantitatively reports on toxicity reduction, providing the specific number of MSDS-listed chemicals it has eliminated from use in the Marcellus shale.<sup>14</sup>

**Eliminating diesel & BTEX chemicals:** Only 4 of the 24 companies assessed reported that they eliminated BTEX and 9 out of 24 companies reported that they eliminated diesel from their fracturing fluids. The relatively greater number of companies eliminating diesel reflects both widespread recognition and movement within the industry that diesel can be replaced with safer alternatives in many applications and that diesel has been singled out for regulation under the U.S. Safe Drinking Water Act, thereby posing an additional regulatory risk for companies using it.<sup>15</sup>

**Disclosure of toxic chemicals & CBI claims:** Having started from a base of no meaningful chemical disclosure in 2009, companies have substantially increased reporting on the fracturing chemicals they use, posting to a dedicated website, FracFocus ([www.FracFocus.org](http://www.FracFocus.org)). However, the exact names of chemicals whose identities are claimed as confidential business information (“CBI”) by chemical suppliers or companies are not disclosed on FracFocus.<sup>16</sup>



CREDIT: Ecowatch.com

[Chemical trailers at contractor site](#)

13. Note that the scorecard questions here and in following sections are paraphrased. For complete questions see Appendix B.

14. Chevron, “Partnering in the Marcellus”, <http://www.chevron.com/documents/pdf/PartneringMarcellus.pdf>.

15. <http://water.epa.gov/type/groundwater/uic/class2/hydraulicfracturing/hydraulic-fracturing.cfm>. Industry players Halliburton, BJ Services, and Schlumberger signed a Memorandum of Agreement (MOA) with the EPA to not use diesel in coal bed methane extraction. See <http://www.nytimes.com/gwire/2011/01/31/31greenwire-fracking-companies-injected-32m-gallons-of-die-24135.html?pagewanted=all>.

16. FracFocus responds to the question “What chemicals are disclosed on this website?” by stating that “All chemicals that would appear on a Material Safety Data Sheet (MSDS) that are used to hydraulically fracture a well except for those that can be kept proprietary based on the ‘Trade Secret’ provisions related to MSDS found on the Trade Secret link at 1910.1200(j)(1).” See <http://fracfocus.org/faq>.

The extent to which companies, or their chemical suppliers and service companies, can legitimately shroud chemicals with claims of confidential business information has been a central issue of recent public policy debates over disclosure laws as well as the focus of a lawsuit by environmental groups challenging such claims.<sup>17</sup> Investors should be concerned that companies may suffer the effects of lost credibility if, on their websites, they claim to fully disclose chemicals on FracFocus, but the actual listings conceal chemical identities behind claims of confidential business information. Thus, the last question asked in the scorecard's toxicity section is whether the company clearly states on its website that their FracFocus reports exclude chemicals that are claimed to be confidential business information. This is important because it signals transparency while setting appropriate expectations. Only 4 of the companies surveyed clearly state on their websites that some of the chemicals they use are protected by confidentiality claims and thus are not disclosed. Responses to this question indicate that most of the industry's website representations about the disclosure of hydraulic fracturing chemicals are incorrect to the extent they convey an expectation that chemical disclosure is complete when in fact it is not.

<b>TOXICS</b>					
<b>COMPANY</b>	<b>Quantitative Reporting Toxicity Reduction</b>	<b>No Diesel Fuel in Fracturing Fluids</b>	<b>No BTEX in Fracturing Fluids</b>	<b>Website Disclaimer CBI Exclusion</b>	<b>TOTAL</b>
<b>Apache</b>		1	1	1	3
<b>Cabot</b>		1	1		2
<b>Encana</b>		1	1		2
<b>Shell</b>		1		1	2
<b>Ultra<sup>18</sup></b>		1	1		2
<b>Anadarko</b>				1	1
<b>Chevron</b>	1				1
<b>EOG</b>				1	1
<b>Hess</b>		1			1
<b>Noble</b>		1			1
<b>QEP</b>		1			1
<b>Range</b>		1			1

Companies that did not receive points for any indicator in this category are not included in this chart. They are BHP, BP, Chesapeake, ConocoPhillips, Consol, Devon, EQT, Exxon, Occidental, Southwestern, Talisman, and WPX.

## Recommendations and Notable Practices

Managing chemicals-related risks can be one of the most important steps a company takes to maintain its social license to operate, reduce its impacts on communities and the environment, and protect its bottom line. To ensure companies do so, investors recommend that companies:

17. See Harvard Law School, Environmental Law Program, "Legal Fractures in Chemical Disclosure Laws; Why the Voluntary Chemical Disclosure Registry FracFocus Fails as a Regulatory Compliance Tool, April 2013, <http://blogs.law.harvard.edu/environmentallawprogram/files/2013/04/4-23-2013-LEGAL-FRACTURES.pdf> for a discussion of concerns about how reporting of chemicals on FracFocus may allow inconsistent trade secret assertions, unnecessarily limit the public's knowledge about chemical use, and may reduce the public's ability to challenge companies' CBI claims ("Harvard critique"). For a response to the Harvard critique by the Groundwater Protection Council, which sponsors FracFocus, see <http://fracfocus.org/node/344>. In the lawsuit, plaintiffs challenged the Wyoming Oil & Gas Commission's failure to provide the identity of hydraulic fracturing chemicals used in Wyoming; the documents were withheld on the basis of exemptions granted for confidential business information. [http://earthjustice.org/sites/default/files/WOGCC\\_petition.pdf](http://earthjustice.org/sites/default/files/WOGCC_petition.pdf). See also [http://wyofile.com/ee\\_daily/wyomings-fracking-chemical-disclosure-requirements-draw-lawsuit/](http://wyofile.com/ee_daily/wyomings-fracking-chemical-disclosure-requirements-draw-lawsuit/).

18. Certain questions in this section seek play-by-play disclosure. Ultra Petroleum reports that it has active completion operations in only one play in 2012 and 2013.

- **Reduce the toxicity of fracturing fluids.** In order to comprehensively reduce the toxicity of fracturing fluid, companies should dedicate staff or consultants to continually evaluate chemical additive use and industry developments and, where relevant, ask their contractors to provide reduced toxicity options in requests for proposals and other procurements. Companies should actively seek alternatives to diesel, BTEX, and other toxic chemicals that serve their functional needs.
  - As an example, Apache has hired a chemicals manager whose goal is to incorporate use of chemicals from the U.S. Environmental Protection Agency's ("EPA") "Design for the Environment" program into the company's drilling, completion, and production operations.<sup>19</sup> This EPA program identifies cost effective products that are safer for the environment.
- **Report quantitatively on progress in toxicity reduction.** Companies should publicly report progress in reducing the toxicity of chemicals used in their hydraulic fracturing operations, particularly chemicals in fracturing fluids.<sup>20</sup>
  - Chevron reports that it has reduced use of MSDS-listed chemicals in the Marcellus by 77% from 31 chemicals to 7, thereby reducing the number of toxic chemicals present at their well sites.<sup>21</sup>
- **Clarify when CBI claims prevent full disclosure of chemicals used.** Where CBI claims prevent the disclosure of certain chemicals, it is incumbent on companies to make that limitation clear. Further, oil and gas companies should be aware of all the chemicals they are using in their wells, executing nondisclosure agreements if necessary with their suppliers to learn chemical identities.<sup>22</sup>
  - Apache states on its website: "Apache attempts to disclose 100 percent of all deliberately added chemical additive components whenever possible. Some vendors and chemical suppliers maintain legal rights granted by state or federal authorities to protect intellectual property and refuse to fully detail additive compositions. In those limited cases, Apache can post only what has been legally disclosed to the company. Generally, that means we are limited to disclose a category of chemical instead of a specific chemical."<sup>23</sup>

## 2. WATER AND WASTE MANAGEMENT

### Issue

Hydraulic fracturing operations may use millions of gallons of water each time a well is fractured. In addition to water consumption (quantity) issues, addressing water quality concerns is also vital for hydraulic fracturing risk mitigation. While the actual fracturing process in shale formations typically occurs significantly below potable water sources, wells are generally drilled through or near drinking water aquifers and groundwater sources, presenting a potential opportunity for leakage if the internal well barriers fail or channels are created for migration of methane and other

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19. See [http://www.apachecorp.com/Sustainability/Environment/Chemicals/Chemicals\\_in\\_hydraulic\\_fracturing\\_operations/index.aspx](http://www.apachecorp.com/Sustainability/Environment/Chemicals/Chemicals_in_hydraulic_fracturing_operations/index.aspx) for a description of Apache's chemical management actions. For more information regarding the EPA's Design for Environment Program, which establishes criteria for designating environmentally preferable chemicals, see <http://www.epa.gov/dfe/>.
20. In support of toxicity reduction, major chemical suppliers to oil and gas companies have developed toxicity scoring systems which rank the toxicity of their company's products. Such systems enable oil and gas companies to select safer chemical alternatives to meet their needs. See, for example, Baker Hughes' system, [http://public.bakerhughes.com/ShaleGas/collateral/Quantitative\\_Ranking\\_Measures\\_Oil%20Field\\_Chemicals\\_Environmental\\_Impact.pdf](http://public.bakerhughes.com/ShaleGas/collateral/Quantitative_Ranking_Measures_Oil%20Field_Chemicals_Environmental_Impact.pdf) and Halliburton's system, [http://www.halliburton.com/public/pe/contents/Data\\_Sheets/web/H/H09731.pdf](http://www.halliburton.com/public/pe/contents/Data_Sheets/web/H/H09731.pdf).
21. Chevron, "Partnering in the Marcellus", <http://www.chevron.com/documents/pdf/PartneringMarcellus.pdf>. Material Safety Data Sheets ("MSDS") are produced pursuant to U.S. Occupational Safety and Health Administration (OSHA) guidelines and are intended to inform workers of potentially harmful substances handled in the workplace. However, as noted by energy service company Baker Hughes, which has developed a toxicity scoring system for chemicals, MSDS may not include all chemicals posing a hazard to the environment. See: [http://public.bakerhughes.com/ShaleGas/collateral/Quantitative\\_Ranking\\_Measures\\_Oil%20Field\\_Chemicals\\_Environmental\\_Impact.pdf](http://public.bakerhughes.com/ShaleGas/collateral/Quantitative_Ranking_Measures_Oil%20Field_Chemicals_Environmental_Impact.pdf).
22. See "Fracking Chemicals May Be Unknown, Even To Gas Drillers, Lawsuit Documents Suggest," [http://www.huffingtonpost.com/2013/09/27/fracking-chemicals\\_n\\_3998319.html](http://www.huffingtonpost.com/2013/09/27/fracking-chemicals_n_3998319.html).
23. [http://www.apachecorp.com/Sustainability/Environment/Chemicals/Working\\_towardtransparency/index.aspx](http://www.apachecorp.com/Sustainability/Environment/Chemicals/Working_towardtransparency/index.aspx).

pollutants.<sup>24</sup> After the fracturing process is completed, water mixed with chemicals and contaminants—some that were added intentionally to aid the fracturing process and others that are picked up along the way from the geologic formation, such as minerals and naturally occurring radioactive materials—returns to the surface for storage, treatment, reuse, and disposal.<sup>25</sup> The high volume of water used combined with the toxic nature of some chemicals used in the fracturing fluid have raised numerous concerns surrounding the industry’s impact on both water availability and water quality. Social media videos of contaminated, discolored water containing methane and other chemicals attributed to fracturing operations are iconic representations of public concern about water contamination.

Management of water risks at each stage of drilling and completion, encompassing access to adequate supply of water, potential contamination of groundwater during the drilling process, and the treatment and disposal of wastewater, is an increasingly controversial facet of oil and gas production that must be a core risk management concern for a company.<sup>26</sup>

In evaluating corporate disclosures on water management practices, play-by-play reporting is critical. Only by reviewing quantitative data on a company’s management practices in light of regional hydrological conditions can investors and community members properly assess “water risk.” Some companies provide relatively good disclosure on some water indicators, but limit disclosure to just one or a few plays. (Multi-play companies do not receive credit on the scorecard for this type of limited reporting). For example, Chesapeake states that it recycles 97% of the waste water associated with its



CREDIT: WV Host Farms Program

**Buckeye Creek spill, West Virginia**

24. Other potential risk pathways can occur when a fracture intersects a natural fault/fracture; another well fracture; or offset wells that are improperly constructed or abandoned. See *Hydraulic Fracturing: When 2 wells meet, spills can often follow*, Gayathri Vaidyanathan, August 5, 2013 E&E, [http://www.eenews.net/special\\_reports/overflow/stories/1059985587/print](http://www.eenews.net/special_reports/overflow/stories/1059985587/print). Well integrity, defined as the quality of well construction, appears to be a more sizeable risk than the fractures themselves. Industry data for thousands of fracturing jobs in the Barnett Shale show that no fractures penetrated within 3,000 feet of the deepest fresh water sands in the area. Data from 350 fracturing jobs in the Marcellus show a 3,500 foot distance between the deepest fresh water sand and the uppermost end of a fracture. Reprinted in George King, “Hydraulic Fracturing 101: What Every Representative, Environmentalist, Regulator, Reporter, Investor, University Researcher, Neighbor and Engineer Should Know About Estimating Frac Risk and Improving Frac Performance in Unconventional Gas and Oil Wells” (Society of Petroleum Engineers Paper SPE 152596 (2012) (hereafter cited as “King 2012”) [http://FracFocus.org/sites/default/files/publications/hydraulic\\_fracturing\\_101.pdf](http://FracFocus.org/sites/default/files/publications/hydraulic_fracturing_101.pdf).
25. Waste water disposal through salt water disposal wells (SDWs) permitted by the EPA is the default option for the industry due to cost and availability. Induced seismicity caused by SDWs poses a meaningful risk of operations interruption and/or increased costs for disposal. See <http://www.reuters.com/article/2013/08/27/us-usa-energy-quakes-insight-idUSBRE97Q05N20130827>.
26. The scientific and regulatory data regarding the magnitude of risk provide a mixed picture. Research in Arkansas shows no contamination from fracturing operations. “No Contamination from Fayetteville Shale Exploration Found in Sampled Wells” <http://www.usgs.gov/newsroom/article.asp?ID=3489>. However, research in Pennsylvania shows higher levels of methane in water wells near fractured wells but no evidence of contamination from fracturing chemicals. See “Higher Levels of Stray Gases Found in Water Wells Near Shale Gas Sites”, <http://www.nicholas.duke.edu/news/higher-levels-of-stray-gases-found-in-water-wells-near-shale-gas-sites>. Still, other research shows no impact from fracturing in Pennsylvania. See Center for Rural Pennsylvania, “The Impact of Marcellus Gas Drilling and Rural Drinking Water Supplies” (2012), [http://www.rural.palegislature.us/documents/reports/Marcellus\\_and\\_drinking\\_water\\_2012.pdf](http://www.rural.palegislature.us/documents/reports/Marcellus_and_drinking_water_2012.pdf). Investigative journalists have reported numerous spill and water contamination incidents, some specifically related to hydraulic fracturing operations and others to oil and gas drilling more generally. Various companies have reached legal settlements over alleged contamination, but these settlements are sealed from public view. See “Drillers Silence Fracking Claims With Sealed Settlements”, <http://www.bloomberg.com/news/2013-06-06/drillers-silence-fracking-claims-with-sealed-settlements.html>. For examples of other incidents and questions about the adequacy of state enforcement, see “Puny Fines, Scant Enforcement Leave Drilling Violators With Little to Fear”, <http://www.eenews.net/stories/1059956366> and “Buried Secrets: Is Natural Gas Drilling Endangering U.S. Water Supplies”, <http://www.propublica.org/article/buried-secrets-is-natural-gas-drilling-endangering-us-water-supplies-1113>.

operations in the northern Marcellus Shale, 52% in the southern Marcellus Shale, and 89% in the Utica Shale, but does not offer similar statistics for its other shale plays.<sup>27</sup>

## Questions

Due to the large number of questions in this section, the questions are set forth below in each discussion section.

## Scores and discussion

**Well integrity:** Proper construction of wells—“well integrity”—is widely viewed by experts as a key factor in reducing risks to groundwater from hydraulic fracturing operations,<sup>28</sup> and the methods for monitoring well integrity are improving. The scorecard asks whether companies report the principal practices used to test well integrity beyond simple pressure testing, which is a critical but not complete measure of potential problems. Only 7 companies report additional testing to further assure the integrity of cement.<sup>29</sup>

**Groundwater monitoring pre- and post-drilling:** The scorecard next asks whether companies conduct monitoring of groundwater prior to and following well drilling and hydraulic fracturing. Pre-drill testing is critical for providing a baseline of water quality data against which claims of water contamination can be measured.<sup>30</sup> Post-drill testing and monitoring is additionally important for continued evaluation of water quality to ensure timely action should any concerns arise.<sup>31</sup> Nine (9) of the companies surveyed report they conduct some type of pre-well monitoring, while only 5 report that they conduct post-drill monitoring. Companies most commonly report pre-drilling monitoring practices in Pennsylvania. Although the state does not require pre-drilling monitoring, Pennsylvania law presumes that if contamination of a drinking water well within 2,500 feet of a newly drilled oil or gas well occurs within a year of the oil or gas well being drilled, the oil or gas company that drilled that well is responsible, establishing an incentive for companies to conduct pre-drill monitoring.<sup>32</sup> Pre-drill monitoring by a company can also be perceived by the community as a demonstration of goodwill and responsibility, promoting community acceptance.

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27. Chesapeake Energy 2011 Corporate Responsibility Report, “Leading a Responsible Energy Future”, page 22. (Hereafter cited as “Chesapeake CSR Report”). <http://www.chk.com/Media/Publications/Corporate-Responsibility-Report/Documents/pdf/2011CorporateResponsibilityReport.pdf>.

28. Resources for the Future’s survey of expert opinion noted, “All experts identified the same two accidents in their top three most frequently chosen priorities: cement failure and casing failure.” See “Pathways to Dialogue: What the Experts Say About the Environmental Risks of Shale Gas Development: Overview of Key Findings” (2013), [http://www.rff.org/Documents/RFF-Rpt-PathwaystoDialogue\\_Overview.pdf](http://www.rff.org/Documents/RFF-Rpt-PathwaystoDialogue_Overview.pdf), page 8 (hereafter referred to as “RFF Risk Report”). A 2013 paper for the Society of Petroleum Engineers concludes, based on statistical analysis of well experience in the United States, “while individual barrier failures . . . in a specific well group may range from very low to several percent [depending on geographical area, operator, era, well type and maintenance quality], *actual well integrity failures* are very rare. Well integrity failure is where all barriers fail and a leak is possible.” (Emphasis in original), see George E. King and Daniel E. King, “Environmental Risk Arising From Well Construction Failure: Difference Between Barrier and Well Failure, and Estimates of Failure Frequency Across Common Well Types, Locations and Well Age” (hereafter referred to as “King 2013”).

29. King 2013 notes that one test method, a cement bond log (“CBL”), is widely used to help build a good cement job in the first few wells in an area and validate a good cementing program for subsequent use, although CBLs have technical limitations.

30. See RFF Regulatory Study, page 29, and Illinois regulations, Section 1-80. Wyoming has initiated rule-making for groundwater monitoring. See <http://www.edf.org/news/wyoming-oil-and-gas-commission-votes-initiate-rule-making-process-baseline-water-testing-groups>. The Center for Sustainable Shale Development (“CSSD”) has released new performance standards calling for pre- and post-drill monitoring (hereafter cited as “CSSD performance standards”). Some environmental groups contend that the CSSD standards are inadequate and have criticized the process by which companies (Chevron, Consol, EQT, and Shell), other environmental groups (EDF and others), and private foundations established the standards. For the text of the standards, see <http://037186e.netsolhost.com/site/wp-content/uploads/2013/03/CSSD-Performance-Standards-3-27-GPX.pdf>. For a description of the controversy, see “Anti-fracking groups dismiss drilling certification as ‘publicity stunt’”, <http://www.vindy.com/news/2013/apr/15/anti-fracking-activists-assail-alliance-/?print> and “Fracking coalition upsets both greens and drillers”, <http://www.observer-reporter.com/article/20130407/NEWS080101/130409441#.Ufv2jqwcoSZ>.

31. For example, see recently enacted Illinois hydraulic fracturing regulations and Wyoming’s proposed monitoring rules. See: <http://wyofile.com/dustin/wyoming-embarks-on-groundwater-monitoring-rule-for-oil-and-gas-development/>.

32. See <http://www.legis.state.pa.us/WU01/LI/LI/CT/HTM/58/00.032.018.000..HTM>. Illinois regulations, section 181 contain a rebuttable presumption provision. For other similar state provisions, see RFF Regulatory Study, page 31. U.S. Geological Survey research has detected elevated methane levels in household wells used for drinking water in Pennsylvania and New York where horizontal drilling is not occurring. See <http://www.usgs.gov/newsroom/article.asp?ID=3619> and <http://www.usgs.gov/newsroom/article.asp?ID=3391>.



**Water Use:** The high volume of water used during hydraulic fracturing operations can pose substantial risks to companies operating in water constrained regions—from impeding operations, to increasing costs where water must be purchased, to creating competition (actual or perceived) for limited water resources—especially in arid areas and regions experiencing droughts.<sup>33</sup> A recent study illustrated that most hydraulic fracturing operations in the U.S. occur in areas currently experiencing high water stress. Increased recycling and reuse of produced water or waste water in fracturing operations can reduce companies’ need for fresh water, while also reducing waste disposal costs and allaying community concerns.<sup>34</sup> Sourcing of non-potable water for operations is another way companies can minimize impacts on fresh water. The efficient use of water by oil and gas companies can be a competitive advantage and a critical indicator of company performance, particularly for those operating in areas that may be subject to water scarcity.<sup>35</sup> The scorecard therefore asks whether companies disclose the percentage of flowback waste water managed and reused; the aggregate quantity of water used; the sources of water used in operations (e.g., ground and surface water); the intensity of water use (i.e., the amount of water used to produce a unit of energy); and whether the company has a policy to use non-potable water whenever technically possible.<sup>36</sup>

Our review indicates that, while many companies operating in Pennsylvania’s Marcellus Shale region report recycling rates and groundwater monitoring practices, recycling is not systematically reported in other regions (e.g., Oklahoma and Texas). Of the 24 companies reviewed, none report aggregate water use per play and only 3 report the percentage of flowback water managed and reused per play. This critical information, which provides information about water consumption and management on the regional level, is thus grossly under-disclosed across the industry. Promisingly, 11, or nearly half of the companies surveyed, do disclose policies favoring use of non-potable water sources. Zero (0) companies report quantitatively on the percentage of water sourced from various water types for each shale play. One (1) company, Chesapeake, discloses its water intensity—the volume of water used by the company in order to produce one unit of energy—on a play-by-play basis.



CREDIT: EARTHWORKS Action  
**Damaged lined waste pit**

33. A recent study of 25,000 shale wells revealed that nearly half were developed in water basins with “high” or “extremely high” water stress. For example, 92% of Colorado’s nearly 4,000 wells were drilled in “extremely high” water stress areas, and even in the Susquehanna River Basin, where water is abundant, drought conditions caused the Susquehanna River Basin Commission to suspend water withdrawal privileges for companies during two recent summers. See Ceres, “Hydraulic Fracturing & Water Stress: Growing Competitive Pressures for Water”, (2013) <http://www.ceres.org/resources/reports/hydraulic-fracturing-water-stress-growing-competitive-pressures-for-water>.
34. Industry decisions about waste water recycling and reuse will be influenced by such factors as the amount and quality of flowback water, the cost of treatment options, and the availability of nearby deep well disposal facilities. In Pennsylvania, disposal options are very limited. For a review of the potential and achieved savings from recycling and programs by Halliburton and Baker Hughes to promote waste water recycling, see “These Companies Could Drown in Recycled Water”, <http://www.fool.com/investing/general/2013/06/11/these-companies-could-drown-in-recycled-water.aspx>. Note, however, that where recycling and reuse increase truck traffic or surface storage, there is the potential for increased traffic hazards, road damage, and risks of surface leakage.
35. In 2012, KPMG released *Expect the Unexpected: Business Value in a Changing World*, which observed that “shortages of a number of key resources are becoming apparent, from arable land, fresh water and metals to fossil fuels” and suggested that “companies in all sectors need to prepare themselves for a world where raw materials may be in short supply and subject to price volatility, including large price rises and increased disruption to supplies.” <http://www.kpmg.com/Global/en/IssuesAndInsights/ArticlesPublications/Documents/building-business-value.pdf>, page 10.
36. More detailed disclosure is consistent with “Oil and Gas Industry Guidance on Voluntary Sustainability Reporting” released in 2010 by U.S. and global oil and gas industry trade associations. Indicator E6 of the guide, which addresses fresh water, discusses identifying operations in water-scarce areas. Reporting elements can include volumes withdrawn from different water sources and examples of where companies have minimized fresh water withdrawal by using lower quality sources. See IPIECA/API/OGP, “Oil and Gas Industry Guidance on Voluntary Sustainability Reporting”, 2d edition, 2010, p. 53, (hereafter referred to as “IPIECA guidelines”), [http://www.api.org/~media/Files/EHS/Environmental\\_Performance/voluntary\\_sustainability\\_reporting\\_guidance\\_2010.pdf](http://www.api.org/~media/Files/EHS/Environmental_Performance/voluntary_sustainability_reporting_guidance_2010.pdf).

**Treatment and disposal of waste water and surface water protection:** Water contamination can occur not only from chemicals deliberately added to fracturing fluids, but also from the naturally occurring contaminants in waters that are brought to the surface from shale formations as wells are completed. “Flowback water” is the water that flows back to the surface immediately after a well is fractured and includes both injected materials and water already present in the formation. “Produced water” refers not only to the larger amounts of water flowing upwards immediately after a well is fractured but also includes the water in the formation that subsequently flows back in smaller quantities over the life of the well.<sup>37</sup> Flowback water is usually briny—much saltier than sea water—and can contain toxic organic chemicals such as benzene and naturally occurring radioactive materials (“NORMs”). NORMs have drawn considerable attention in the Marcellus Shale, spurred by reports of increasing numbers of radioactivity warning alarms sounding at dump sites.<sup>38</sup> The wastes and “drilling mud” generated from drilling operations can also contain toxic chemicals and need to be disposed of responsibly. As the horizontal lengths of wells grow longer—on the order of half a mile to one mile or more—and as companies drill larger numbers of wells from single drill pads,<sup>39</sup> substantial amounts of drilling wastes are being generated and stored. This raises questions about the potential environmental risks of storing or disposing of these wastes locally in pits or via “land-farming.”<sup>40</sup>

Closed, above-ground storage tanks, while not entirely risk-free, can lower risks to surface and groundwater associated with leaks and overflows from open pits and can lower the surface footprint of wastewater management operations.<sup>41</sup> Closed tanks<sup>42</sup> can also mitigate risks to air quality, as toxic chemical vapors can escape when waste water is stored in surface pits open to the atmosphere, potentially posing local and regional air quality risks. The use of “closed loop” systems for storing drilling residuals is another means of reducing contamination. The scorecard therefore asks whether companies report a policy to store flowback water in closed tanks for its wells in all shale plays; and also whether the company uses closed loop systems for the management of drilling residuals for each shale play.

Of the companies surveyed, only 3 companies report that they use closed tanks for wastewater storage for all plays and only 2 report routinely using closed loop management of drilling wastes across their plays. Finally, only Ultra Petroleum reports a standard procedure for identifying and addressing NORMs from the company’s produced water.

## Recommendations and notable practices

Due to the significant risks associated with water use and contamination, it is important that companies significantly improve their disclosure of water management issues on a play-by-play basis. In particular, investors would like to see companies provide quantitative, play-by-play data on the following areas of recommended action:

- **Reduce overall water use and provide metrics on the efficiency of water use.** As access to water becomes more limited, companies reducing overall water consumption may improve their margins and lower their cost. In addition, disclosing metrics on the efficiency of water use will help investors better compare the relative performance of companies in this critical area.<sup>43</sup>

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37. See [http://www.halliburton.com/public/projects/pubsdata/hydraulic\\_fracturing/glossary.html](http://www.halliburton.com/public/projects/pubsdata/hydraulic_fracturing/glossary.html).

38. See <http://triblive.com/business/headlines/3945499-74/gas-radiation-radioactivity#axzz2YTV27thv>. Pennsylvania’s Department of Environmental Protection launched a study of NORMs in early 2013 in response to public concerns. *Id.*

39. For example, Devon reports having drilled 36 wells from one pad and 21 from another. See: <http://www.dvn.com/CorpResp/initiatives/Pages/Multi-wellPads.aspx>.

40. “Land-farming” relies on naturally occurring organisms in soil to break down hydrocarbon wastes and is allowed in some states. See: <http://stateimpact.npr.org/texas/2012/11/12/landfarms-for-disposing-drilling-waste-causing-problems-in-texas/>.

41. References in the text to “closed” tanks assume that tanks use vapor recovery units as appropriate for environmental and safety reasons. Closed tanks are not entirely risk-free because they can leak or mistakes can be made in their management. See, for example, “XTO Energy agrees to pay \$100,000 fine for fracking spill”, (July 18, 2013), <http://www.reuters.com/article/2013/07/18/us-usa-energy-xto-idUSBRE96H1FT20130718>.

42. Illinois requires closed tanks. See Illinois regulations, Section 175(c)(1).

## WATER AND WASTE ISSUES

COMPANY	Well integrity	Pre-drill H <sub>2</sub> O monitor <sup>^</sup>	Post-drill H <sub>2</sub> O monitor <sup>^</sup>	Flowback water reuse % <sup>^</sup>	Total water use <sup>^</sup>	Water source types <sup>^</sup>	Non-potable water policy	Water intensity <sup>^</sup>	Closed tank waterstore <sup>^</sup>	NORMs disclosure	Closed loop drilling residuals <sup>^</sup>	TOTAL
Ultra <sup>44</sup>		1	1	1		1		1	1			6
Encana	1	1	1			1				1		5
Chesapeake						1	1	1				3
EQT		1	1	1								3
Hess		1	1			1						3
Shell		1	1			1						3
Apache	1					1						2
Cabot	1							1				2
Consol						1				1		2
Noble	1	1										2
WPX	1	1										2
Anadarko	1											1
BP		1										1
ConocoPhillips						1						1
Devon						1						1
EOG						1						1
Occidental						1						1
Southwestern				1								1
Talisman		1										1

Companies that did not receive points for any indicator in this category are not included in this chart. They are BHP, Chevron, Exxon, QEP, and Range.

“^” = Question requests disclosure by play.

- As noted above, Chesapeake, the second largest natural gas producer in the U.S., operating in many more plays than most other companies, uniquely reports water use intensity on a play-by-play basis. In each of its 10 shale plays, the company uses an average of 5 million gallons per well for fracturing, but this ranges from a low of 1.9 million in the Permian Basin to 5.6 million gallons per well in the Haynesville/Bossier and Marcellus shales. Though the latter plays use the most water in absolute terms, they use the least water per million BTUs of energy produced—half of the water intensity of some other Chesapeake shale plays.<sup>45</sup>

43. Considerable research is underway on methods to minimize fresh water use, reflecting industry concern about water availability and the business opportunities associated with innovative alternatives. Much of this research relates to increasing use of non-fresh water and developing new packages of fracturing chemicals that can work effectively in non-fresh water. See “Drillers Begin Recycling ‘Frack Water’”, <http://online.wsj.com/news/articles/SB10001424052970203937004578077183112409260>; “These Companies Could Drown in Recycled Water”, <http://www.fool.com/investing/general/2013/06/11/these-companies-could-drown-in-recycled-water.aspx>; and “Water Recycling is Big Business for Oil, Gas Support Firms”, <http://www.star-telegram.com/2013/04/27/4808206/water-recycling-is-big-business.html>.

44. Certain questions in this section seek play-by-play disclosure. Ultra Petroleum reports that it has active completion operations in only one play in 2012 and 2013.

45. Chesapeake CSR Report, page 21. For broad comparisons of the water intensity of energy production and consumption for various energy sources, see Harvard University Belfer Center for Science and International Affairs report, *Water Consumption of Energy Resource Extraction, Processing and Conversion* (2010), <http://belfercenter.ksg.harvard.edu/files/ETIP-DP-2010-15-final-4.pdf>.

- **Reduce freshwater withdrawals.** Companies should make every effort to use non-potable water and to recycle water from their operations. Sourcing of non-potable water such as treated industrial waste water and saline water can reduce the need for fresh water. Increased recycling and reuse, especially on site and within a relatively small geographic area, can additionally reduce reliance on fresh water, greenhouse gas (“GHG”) emissions from transportation of waste water, and the need for deep well injection of wastes, which has raised seismicity and other concerns.<sup>46</sup> Some notable examples of these practices are as follows:
  - Southwestern Energy has designed and built an extensive network of ponds to collect rainwater runoff, thereby minimizing the need for water from public sources and reducing truck traffic.<sup>47</sup>
  - EQT opened a dedicated \$29 million commercial treatment facility in Fairmont, West Virginia in 2009, which “accepts all of EQT’s backwater and has the capacity to process waste water from other industry sources, recycling it back into pure water.”<sup>48</sup> EQT “routinely collects nearly 100% of the water that flows back from completed wells, and re-uses that water at other sites to product new wells.”<sup>49</sup>
  - Encana uses treated industrial effluent for fracturing in the Haynesville Shale.<sup>50</sup>
  - Apache, with its partner Encana, uses subsurface saline water for fracturing in Canada’s Horn River Basin.<sup>51</sup>
  - Consol, historically a major coal producer, places an emphasis on using non-potable, treated acid mine drainage for its own fracturing operations, even selling it to other companies for their fracturing operations.<sup>52</sup>
- **Increase water quality monitoring and conduct more detailed site assessment.** Companies should increase disclosure of their water quality monitoring practices. They should also report the steps they take to identify nearby wells that could be a conduit of groundwater contamination from the companies’ fracturing operations; repair or avoid such wells; and verify the location of aquifers. This will provide investors with assurance, where state regulations do not adequately address these issues, that companies are operating to the highest standards to minimize contamination risks.<sup>53</sup>
- **Assure well integrity.** A recent study of state regulation of natural gas development contends that “additional regulation is likely in the area of well integrity standards—specifically, greater adoption of requirements to ensure adequate casing and cement jobs such as cement bond logs and pressure testing of casing.”<sup>54</sup> These changes are in line with expert opinion about the centrality of well integrity to risk reduction. Companies should demonstrate to investors that they are voluntarily meeting such standards even in the absence of regulation.

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46. See, for example, “Earthquakes: States Deciding Not to Look at Seismic Risks of Drilling”, <http://www.eenews.net/stories/1059978378>. In a 2012 report, the U.S. National Research Council concluded that hydraulic fracturing itself poses a low risk of earthquakes, but that the risks are higher for waste injection wells. See <http://www8.nationalacademies.org/onpinews/newsitem.aspx?RecordID=13355>. Ohio regulators have tightened waste disposal regulations in response to seismicity concerns, [http://www.ohiodnr.com/home\\_page/NewsReleases/tabid/18276/EntryId/2711/Ohios-New-Rules-for-Brine-Disposal-Among-Nations-Toughest.aspx](http://www.ohiodnr.com/home_page/NewsReleases/tabid/18276/EntryId/2711/Ohios-New-Rules-for-Brine-Disposal-Among-Nations-Toughest.aspx). For litigation related to seismicity and deep well injection in Arkansas, see: “Fracking’s Alleged Links to Water Contamination and Earthquakes”, <http://apps.americanbar.org/litigation/committees/energy/articles/spring2012-0512-frackings-alleged-links-water-contamination-earthquakes.html>.

47. [http://www.swn.com/responsibility/documents/water\\_fact\\_sheet.pdf](http://www.swn.com/responsibility/documents/water_fact_sheet.pdf).

48. <http://www.eqt.com/docs/pdf/EQTCSRBrochure-d.pdf>, page 7.

49. [http://www.eqt.com/docs/pdf/EQT\\_CSR\\_Report\\_2011-2012.pdf](http://www.eqt.com/docs/pdf/EQT_CSR_Report_2011-2012.pdf), page 10.

50. Encana 2012 report to CDP Water. See response to question 1.1c, <http://www.encana.com/pdf/investors/esg/water-disclosure-project.pdf>.

51. [http://www.apachecorp.com/Operations/Canada/British\\_Columbia/index.aspx](http://www.apachecorp.com/Operations/Canada/British_Columbia/index.aspx).

52. Consol Corporate Responsibility Report 2012, page 25, <http://consolenergy.com/corporateresponsibilityreport/>.

53. For example, newly-enacted Illinois legislation requires both pre- and periodic post-fracturing testing of surface and groundwater sources near wells. CSSD performance standards, though controversial, call for pre- and post-drill monitoring, and Wyoming’s newly-released energy strategy calls for pre-drill monitoring.

54. JISEA Report, chapter 2, page 61.

- WPX Energy stands out from other companies in the many pages of detail it provides on well integrity and water monitoring practices as part of the risk discussion in its annual 10-K report to the U.S. SEC.<sup>55</sup> For example, the company acknowledges “rare” but “possible...failures” to isolate the well bore sufficiently. It notes its use of temperature or acoustical cement bond logs to assess cementing integrity. When pressure tests identify compromised casing, company policy is that regulators are notified and problems are remedied prior to further operations.
- **Adopt closed loop management of drilling wastes and eliminate open storage pits.** The wastes generated from drilling can pose local water, air, and soil contamination risks, and use of open pits for disposal increases the surface footprint of hydraulic fracturing operations. Closed loop management systems help mitigate these risks. The use of open pits has been identified by a cross-section of experts as one of a dozen risk pathways deserving greater attention.<sup>56</sup>
  - In its Marcellus and Wattenberg operations, Anadarko conducts closed-loop management of solid material and drilling fluids generated by initial drilling of wells, eliminating the need to dispose of these materials in pits.<sup>57</sup>
  - Consol Energy states that it was the “first to move to conduct 100% flow-back water recycling and also the first company to move to complete closed loop design across the Marcellus Shale area.”<sup>58</sup> The company has “fully implemented closed loop processes that allow for the capture and disposal of drill cuttings into containers, eliminating the use of open pits on site” in its Marcellus operations.<sup>59</sup>
  - Encana substitutes closed loop systems for open pits in the Denver-Julesburg basin in eastern Colorado.<sup>60</sup>
- **Conduct play-by-play reporting on water use and water management practices.** All companies should, at a minimum, be reporting on water, air, waste, and community practices on a play-by-play basis. Companies that already implement data management systems for aggregate internal and external reporting on water use and disposal have a head start and should configure these systems to report data on a disaggregated play-by-play basis.

### 3. AIR EMISSIONS

#### Issue

Air contaminants are emitted during multiple stages of oil and gas development. Studies have linked air emissions from oil and gas operations to declining air quality and associated risks to public health.<sup>61</sup> Play-by-play reporting on management of air emissions is particularly relevant for investors in assessing local impacts and the special demands that may be placed on companies operating in regions that violate or may be at risk of violating human

55. [http://www.wpxenergy.com/media/149361/wpx-annualreport\\_web\\_sm.pdf](http://www.wpxenergy.com/media/149361/wpx-annualreport_web_sm.pdf).

56. RFF Risk Report, page 6.

57. [http://www.anadarko.com/SiteCollectionDocuments/PDF/Fact%20Sheets/2013\\_APC\\_Marcellus%20Fact%20Sheet\\_2013.pdf](http://www.anadarko.com/SiteCollectionDocuments/PDF/Fact%20Sheets/2013_APC_Marcellus%20Fact%20Sheet_2013.pdf); <http://www.anadarko.com/SiteCollectionDocuments/PDF/WattenbergHZ/Wattenberg%20HZ%20Overview.pdf>.

58. Consol Corporate Responsibility Report 2011, pages 41, 42, <http://consolenergy.com/corporateresponsibilityreport/>.

59. *Id.*

60. See “Encana’s best management practices for the Front Range of Colorado”, <http://www.encana.com/news-stories/in-the-news/encana-front-range-erie-best-practices.html>.

61. This is particularly a problem in Western states. See, for example, “Wyoming’s Smog Exceeds Los Angeles’ Due to Gas Drilling”, <http://content.usatoday.com/communities/greenhouse/post/2011/03/wyomings-smog-exceeds-los-angeles-due-to-gas-drilling/1#.UknybI26ZAc>. Recent studies from Pennsylvania’s Department of Environmental Protection show no impacts on short-term air quality in several drilling areas, although they do not address potential cumulative impacts from continued drilling. See “PA DEP Report: Marcellus Operations in Northcentral Region Show No Impact on Short-Term Air Quality”, <http://www.pnewsire.com/news-releases/pa-dep-report-marcellus-operations-in-northcentral-region-show-no-impact-on-short-term-air-quality-122248508.html>.

health-based air quality standards, particularly in Colorado and California.<sup>62</sup> Given the significant greenhouse gas impact of methane, the scorecard also asks for methane emissions data from well completion operations. Air emission reductions, in addition to reducing impacts and liability, also present the potential for cost-savings and profit-making opportunities.

Technical experts generally agree that a sizeable number of cost-effective emission reduction measures are currently available to substantially reduce methane and other emissions. Some examples include using natural gas or renewable fuels to power pad operations, substituting pipelines for trucks to haul water, and converting vehicle fleets from diesel fuel to natural gas.

The questions highlighted below cover the drilling, completion, and transportation activities for shale oil and gas development that can contribute to elevated air emissions.

## Questions

### The scorecard asks two questions on methane

**emissions:** whether the company discloses the percentage of wells for which it uses green completions for each play,<sup>63</sup> and whether the company reports total methane emission data from well completion operations.<sup>64</sup> The scorecard further asks whether companies report, by shale play, on the following indicators: the use of natural gas, low emission diesel engines, or other reduced-emission methods to power well pad operations; whether the company reports the percentage of its vehicle fleet converted from diesel to lower emission non-diesel fuels; whether the company discloses data or estimates for nitrogen oxides (“NOx”) and volatile organic compounds (“VOCs”) emitted from well drilling and completions; and whether the company reports reductions in NOx and VOC emissions from its emission reduction efforts.<sup>65</sup>



CREDIT: WV Host Farms Program

Well pad flare

62. For Colorado, see “Tighter Emissions Control Standards Next Challenge for Oil and Gas Industry in Weld”, <http://www.greeleytribune.com/news/7260650-113/emissions-gas-oil-industry>. For California, see “SCAQMD Adopts New Notification and Reporting Requirements for ‘Fracking’ and Other Oil and Gas Well Drilling Activities,” <http://www.aqmd.gov/news1/2013/bs040613.htm>.
63. In green completions, companies deploy portable equipment that enables them to quickly capture natural gas for sale rather than release it directly to the atmosphere or burn it off.
64. When burned, natural gas produces fewer CO<sub>2</sub> emissions than coal, but this advantage can be offset by methane leakages during well completion, production, and transport. Various studies estimate different rates of leakages from these operations. Much of the debate has been triggered by a study produced by Cornell University researchers estimating very high leakage rates from well completion activities, transportation, and distribution of natural gas. Other studies estimate much lower rates. For an overview of the conclusions from various modeling studies, see World Resources Institute, “Clearing the Air: Reducing Upstream Greenhouse Gas Emissions From U.S. Natural Gas Systems” (2013) (hereafter “WRI Methane Report”), page 2. [http://pdf.wri.org/clearing\\_the\\_air\\_full\\_version.pdf](http://pdf.wri.org/clearing_the_air_full_version.pdf). In September 2013, a collaborative project of academics, the Environmental Defense Fund, and industry published the first in a series of papers based on actual measurements of leakage rates, finding lower than estimated leakage for well completions and higher than estimated leakage from pneumatic controllers and other equipment. For a link to the study and debate over its funding, design, and conclusions, see Andrew Revkin, “Encouraging Results Seen in First Nationwide Look at Gas Leaks from Drilling Boom”, [http://dotearth.blogs.nytimes.com/2013/09/16/encouraging-results-in-first-nationwide-look-at-gas-leaks-from-fracking-boom/?\\_r=0](http://dotearth.blogs.nytimes.com/2013/09/16/encouraging-results-in-first-nationwide-look-at-gas-leaks-from-fracking-boom/?_r=0). Companies will be required to do this kind of reporting under EPA regulations issued in 2012 on greenhouse gas emissions. The regulations list “gas well venting during completions and workovers from hydraulic fracturing” as one of many components of onshore production about which reports should be filed. See <http://www.epa.gov/ghgreporting/documents/pdf/infosheets/OnshorePetroleumNaturalGasSystems.pdf>.
65. Indicator E7 of the IPIECA voluntary industry guidelines, addressing “other air emissions”, discusses the reporting of total emissions by type (e.g., VOCs, NOx or particulate matter); conducting local reporting or providing data that addresses significant impacts at regional, national, and/or local levels; and identifying operations in areas of poor air quality and discussing air management practices. See IPIECA/API/OGP, “Oil and Gas Industry Guidance on Voluntary Sustainability Reporting”, 2d edition, 2010, p. 56, [http://www.api.org/~media/Files/EHS/Environmental\\_Performance/voluntary\\_sustainability\\_reporting\\_guidance\\_2010.pdf](http://www.api.org/~media/Files/EHS/Environmental_Performance/voluntary_sustainability_reporting_guidance_2010.pdf).

## Scores and discussion

Apache scored highest in the air emission reduction section. Other companies similarly report use of reduced emission well pad equipment in one or more, but not all, of their plays. Some companies provide bulleted lists of various technologies they deploy to reduce emissions, but did not receive credit because the lists do not make clear whether the enumerated technologies have been implemented across all plays. Fifteen (15) of the companies surveyed report using pipelines in lieu of moving water via trucks fueled by diesel, in some or all of their plays. Four (4) companies disclose the percentage of their vehicle fleet converted from diesel to lower emission non-diesel fuels. No company provides information on a play-by-play basis for VOC and NOx emissions or emission reductions and therefore no company received credit for this item in this scoring methodology. As noted above, summarizing air emission reductions at the company or country level does not address or resolve the regional and local nature of air emission reductions. No company reports methane emissions from well completion operations.

AIR EMISSIONS								
COMPANY	% green completions <sup>^</sup>	Total methane emissions <sup>^</sup>	Low emission engines pad ops. <sup>^</sup>	Pipelines replace trucks	% low emission vehicle conversion	NOx and VOCs Reporting <sup>^</sup>	NOx and VOC reductions <sup>^</sup>	TOTAL
Apache	1			1	1			3
Devon	1			1				2
Encana				1	1			2
Ultra <sup>66</sup>	1			1				2
Anadarko				1				1
Chevron				1				1
ConocoPhillips				1				1
Exxon				1				1
Shell				1				1
Talisman				1				1
Chesapeake					1			1
Consol			1					1
EOG				1				1
EQT					1			1
Noble				1				1
Range				1				1
Southwestern				1				1
WPX				1				1

Companies that did not receive points for any indicator in this category are not included in this chart. They are BHP, BP, Cabot, Hess, Occidental, and QEP.

<sup>^</sup> = Question requests disclosure by play.

## Recommendations and notable practices

Beyond the specific technologies named in this scorecard, companies should increase their use of and report more systematically on additional emission reduction technologies that are known to substantially reduce emissions on a play-by-play basis. These include, for example, low- and no-bleed pneumatic devices that operate valves and control

66. Certain questions in this section seek play-by-play disclosure. Ultra Petroleum reports that it has active completion operations in only one play in 2012 and 2013.

pressure, flow, temperature, and levels of liquids, and plunger lift systems that reduce sizeable methane leaks that can occur when older gas wells are opened to remove fluid accumulations that have blocked the flow of gas.<sup>67</sup> Companies should also report the details of enhanced monitoring and maintenance programs and estimated emission reductions from such programs. Investors would like to see companies:

- **Reduce emissions from drilling, well completion, and related production infrastructure.**

Some notable company examples include:

- Devon has used green completions on 91% of wells where infrastructure is available.<sup>68</sup>
- Anadarko indicates its use of green completions achieved or is anticipated to achieve annual emission reductions of over 2 billion cubic feet of methane. The company estimates the payback time to be no more than three years.<sup>69</sup>
- Apache has partnered with Schlumberger, Halliburton, and Caterpillar on dual-fuel energy conversions of fracturing fluid pumping engines. The engines use natural gas (CNG or LNG) rather than diesel, thereby reducing emissions. Apache estimates that a dual-fuel engine would lower fuel costs by 40% for a single hydraulic fracturing job in its Granite Wash play.<sup>70</sup>
- Ultra uses a patented SandCastle System for proppant handling, eliminating the need for diesel engines.<sup>71</sup> (“Proppant” describes the sand that goes into the well to keep fractures in rock “propped” open).
- Devon replaced 700 high-bleed valves in Wyoming, reducing methane emissions by about 50 metric tons of CO<sub>2</sub> equivalent per valve. It plans to replace about 2,300 more valves in Wyoming and 700 in Western Oklahoma and the Texas panhandle. Each valve costs about \$300, a cost recovered usually within two months from selling captured gas.
- Noble reports a voluntary maintenance program using specially designed infrared cameras traveling to all Noble-operated on-shore facilities to detect fugitive emissions and reduce or eliminate them. The payback period is from one to three years and Noble estimates annual reductions of 12,979 metric tons of CO<sub>2</sub> equivalent emissions.<sup>72</sup>

- **Reduce emissions from transportation.**

- In 2011, Noble reported reducing truck mileage by approximately 5 million miles in the Wattenberg field, yielding an annual reduction of 59,000 tons of CO<sub>2</sub> emissions, by strategically locating storage ponds and tanks and using pipelines instead of trucks to move water.<sup>73</sup>

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67. According to the World Resources Institute, methane emissions from natural gas operations could be cut an additional 30% by deploying these two technologies and by enhancing leak monitoring and repair. See “Capturing the Fugitives: Reducing Methane Emissions from Natural Gas,” <http://insights.wri.org/news/2013/04/capturing-fugitives-reducing-methane-emissions-natural-gas>.

Similarly, the CDP’s 2013 air emissions survey (OG8.3) for the oil and gas industry asks companies:

“What proportion of the company’s high-bleed controllers have been replaced with low-emission alternatives?”

See <https://www.cdproject.net/CDP%20Questionnaire%20Documents/Investor-CDP-2013-Information-Request-OGSector.pdf>.

68. Devon Energy 2011/2012 Corporate Responsibility Report, <http://www.dvn.com/CorpResp/Documents/DVN-2012CSR-FINAL-REV.pdf>. Where regulators require green completions, two potential exclusions include distance from a gathering pipeline and instances where gas in the formation is at low volume. See “EPA’s Air Rules for the Oil & Natural Gas Industry: Summary of Requirements for Processes and Equipment at Natural Gas Well Sites”, page 2, <http://www.epa.gov/airquality/oilandgas/pdfs/20120417summarywellsites.pdf>.

69. Anadarko 2010 and 2011 CDP Air reports, [http://www.anadarko.com/SiteCollectionDocuments/PDF/CDP8%20Response\\_APC\\_FINAL.pdf](http://www.anadarko.com/SiteCollectionDocuments/PDF/CDP8%20Response_APC_FINAL.pdf) page 9, and [http://www.anadarko.com/SiteCollectionDocuments/PDF/Climate%20Change/CDP9\\_ProgrammeResponse.pdf](http://www.anadarko.com/SiteCollectionDocuments/PDF/Climate%20Change/CDP9_ProgrammeResponse.pdf) (response to question 3.3a).

70. [http://www.apachecorp.com/News/Articles/View\\_Article.aspx?Article.ItemID=2957](http://www.apachecorp.com/News/Articles/View_Article.aspx?Article.ItemID=2957).

71. Ultra 2013 fracturing update, accessible from <http://www.ultrapetroleum.com/Corporate-Responsibility/Hydraulic-Fracturing-150.html>.

72. This disclosure is not limited to its shale plays.

[http://www.nobleenergyinc.com/\\_filelib/FileCabinet/Responsibility/2011\\_Noble\\_Energy\\_CDP\\_Water\\_Disclosure\\_Final.pdf](http://www.nobleenergyinc.com/_filelib/FileCabinet/Responsibility/2011_Noble_Energy_CDP_Water_Disclosure_Final.pdf).

73. Noble Energy 2011 Sustainability Report, page 31. <http://www.nobleenergyinc.com/Responsibility/Sustainability-Report-306.html>.



- Chesapeake has converted 25% of its vehicle fleet to natural gas while Apache has converted 470 vehicles, with a goal to convert 80% of its 1,100-plus U.S. vehicle fleet by 2015.<sup>74</sup>
- **Increase play-by-play or more localized reporting.** All companies should, at a minimum, be reporting on water, air, waste, and community practices on a play-by-play basis where operations are occurring at more than one play. Companies that already implement data management systems for reporting aggregate air emissions to the CDP or that have systems in place for aggregate internal and external reporting on air emissions should use these systems to report data on a disaggregated play-by-play basis.

## 4. COMMUNITY IMPACTS

### Issue

As the extraction of natural gas, gas liquids, and oil from shales has skyrocketed over the last decade, so have the impacts on communities. Consequently, public wariness of and opposition to hydraulic fracturing operations have also grown in many regions, and community opposition has emerged as a fundamental risk to companies' ability to operate. Community activists have framed this as a human rights issue.<sup>75</sup> More than 100 local governments in the U.S. have enacted bans or moratoria on hydraulic fracturing.<sup>76</sup>

These legal restrictions are fueled by numerous operational problems affecting air and water quality and human health, plus major disruptions in community life such as increased neighborhood tensions, traffic congestion, road damage, impacts on community facilities and services, and shortages of affordable housing. The extent to which local communities can limit or even ban hydraulic fracturing operations in their region often depends on whether they have authority to do so under state law. Litigation over the reach of local control has occurred where local communities have sought to regulate or limit hydraulic fracturing operations where they view state regulations as weak.<sup>77</sup>

Given the place-based nature of these issues, play-by-play disclosure of community concerns and corporate responses is imperative. In the recent past, shareholders have suffered losses in their investments when company operations have been curtailed by bans and moratoria. Smaller companies with narrow geographic focuses have been particularly impacted, such as smaller Canadian producers whose market capitalization dropped substantially because of the Province of Quebec's moratorium, or Norse Energy, whose U.S. unit declared bankruptcy because of New York State's moratorium.<sup>78</sup> Larger companies can also be affected, as when Talisman wrote down the value of its Quebec holdings in response to the province's moratorium. Also, Hess and its partner Newfield Exploration announced in July 2013 that they are letting their leases lapse in a portion of the Delaware River Basin in Pennsylvania where a moratorium has been in place for several years. The two companies reportedly spent approximately \$150 million to secure the leases.<sup>79</sup>



CREDIT: M. Daggett, WV Host Farms Program

Well pad construction truck convoy, West Virginia

74. Chesapeake CSR report, page 16, <http://www.chk.com/Media/Publications/Corporate-Responsibility-Report/Documents/pdf/2011CorporateResponsibilityReport.pdf>. Apache Corporation 2013 Summary Sustainability Report 2013, page 1, [http://www.apachecorp.com/Resources/Upload/file/sustainability/APACHE-Sustainability\\_Report\\_2013.pdf](http://www.apachecorp.com/Resources/Upload/file/sustainability/APACHE-Sustainability_Report_2013.pdf).

75. For a report on human rights and fracturing in New York State, see [http://www.earthworksaction.org/files/publications/EHRA\\_Human-rights-hydraulic\\_fracturing\\_operations-FINAL.pdf](http://www.earthworksaction.org/files/publications/EHRA_Human-rights-hydraulic_fracturing_operations-FINAL.pdf). Community activists in Pennsylvania have also pointed to guarantees of clean air and clean water in Pennsylvania's state constitution. For an analysis of how this right has been interpreted in the courts, see [http://blogs.law.widener.edu/envirolawcenter/files/2010/03/PA\\_Citizens\\_Guide\\_to\\_Art\\_I\\_Sect\\_27.pdf](http://blogs.law.widener.edu/envirolawcenter/files/2010/03/PA_Citizens_Guide_to_Art_I_Sect_27.pdf).

76. JISEA Report, Chapter 2, page 61.

77. JISEA Report, page 62.

78. See examples compiled in *Extracting the Facts*, page 28. On the Norse Energy bankruptcy, see "Norse Energy's U.S. Unit Files for Chapter 11", <http://online.wsj.com/article/SB10001424127887323501404578165540473583564.html>.

79. [http://www.huffingtonpost.com/2013/07/16/hess-corporation-newfield-exploration-co-pennsylvania-fracking\\_n\\_3604598.html](http://www.huffingtonpost.com/2013/07/16/hess-corporation-newfield-exploration-co-pennsylvania-fracking_n_3604598.html).



CREDIT: WV Host Farms Program

Road damage from heavy trucks, West Virginia

## Questions

In light of the material importance of addressing community opposition and impacts, the scorecard asks whether a company describes or discloses: major identified community impact concerns and company responses on a play-by-play basis; internal processes for aggregating local concern statistics; internal processes for reporting local concern statistics upward within the company; a clearly stated policy to adjust activity schedules to prevent or reduce traffic congestion from its operations; and a policy to reimburse state and local authorities for road damage caused by its operations. These are just some of the many community impacts that may occur.

## Scores and discussion

Overall, companies are performing least well in disclosing how community concerns are identified and addressed, with only 6 companies receiving any points in this section. It is particularly noteworthy that no company surveyed identifies on a play-by-play basis the concerns communities have raised regarding hydraulic fracturing operations and its response to those concerns.

Three (3) companies have policies to adjust or reduce traffic congestion as a result of operations. This benefits not only the community, but also the company employees and contractors who would otherwise be idled in traffic, while also reducing greenhouse gas emissions. Only 1 company, Hess, states a policy to reimburse state and local authorities for road damage caused by its operations.

Three (3) companies publicly disclose their processes for aggregating statistics on community concerns as well as internal processes to escalate those concerns within the company. This level of transparency is critical for concerned community members to know how their concerns are being dealt with and resolved at appropriate management levels.

No company identifies major community impact concerns and company responses on a play-by-play basis.

## COMMUNITY IMPACTS

COMPANY	Disclose community impact concerns, company response ^	How aggregates statistics on local concerns	Upward reporting of local concern statistics	Traffic congestion policies	Road damage payment policies	TOTAL
Encana			1	1		2
EOG		1	1			2
Hess				1	1	2
BHP		1				1
Cabot				1		1
ConocoPhillips		1				1

Companies that did not receive points for any indicator in this category are not included in this chart. They are Anadarko, Apache, BP, Chesapeake, Chevron, Consol, Devon, EQT, Exxon, Noble, Occidental, QEP, Range, Shell, Southwestern, Talisman, Ultra, and WPX.

“^” = Question requests disclosure by play.

Investors believe it essential that companies begin providing disclosure on how they identify and, particularly, how they are responding to the unique circumstances in different plays that can be major factors in determining companies' "social license to operate." Without play-by-play reporting on how companies manage community concerns, investors do not have adequate data to evaluate the risks of potential moratoria and other disruptions to operations.

## Recommendations and notable practices

- Adopt policies to address community concerns.** Companies must establish measurable metrics in the form of key performance indicators ("KPIs") to address and incorporate stakeholder concerns into their management practices, including concerns from community residents, NGOs, and businesses, among others.<sup>80</sup>
- Publish general policies, guidelines, and decision criteria for addressing local impacts.** Companies should state what measures are routinely taken, beyond any required by applicable regulations, to address community impacts. Such measures could include, for example, policies regarding payments to local governments for extra fire, police, emergency response, healthcare personnel, and equipment; road repair and traffic management, with recognition that legal requirements for such actions may vary from state to state; abatement of light, noise, and other nuisances that impact residential zones and community facilities; or mechanisms for addressing local concerns about water quality and affordable housing. Decision criteria could include a list of circumstances under which measures are taken or payments are made.
  - Chevron's "Partnering in the Marcellus" brochure lists multiple measures it takes to address concerns about truck traffic and safety. These include working with local officials to determine best routes to avoid high traffic or sensitive areas, using GPS devices to verify compliance with routing guidelines, using centralized water facilities and pipelines to reduce truck traffic, and upgrading roads and bridges.<sup>81</sup>
- Provide information on internal systems to identify and track concerns.** Companies should disclose information on their internal tracking mechanisms for identifying and responding to community concerns.
- Publish specific community concerns and actions the company has taken to address these concerns.** This recommendation is highlighted in the IPIECA/API/OGA "Oil and Gas Industry Guidance on Voluntary Sustainability Reporting." The guidance recognizes a growing call for companies to provide "data on the types of concerns raised via engagement or grievance mechanisms, and how concerns have been addressed."<sup>82</sup> One consequence of the industry's minimal reporting on community concerns is that companies' individual reputations and the reputation of the industry as a whole are currently defined principally by high profile complaints about community harms.



CREDIT: Bob Donnan, Marcellus Air via WV Host Farms Program

Compressor station and neighbors, West Virginia

80. In adopting KPIs, companies are encouraged to consider adopting policies and practices that are consistent with human rights policies and reflective of the *UN Guiding Principles on Business and Human Rights*, often referred to as the "Protect, Respect and Remedy Framework." See [http://www.ohchr.org/Documents/Publications/GuidingPrinciplesBusinessHR\\_EN.pdf](http://www.ohchr.org/Documents/Publications/GuidingPrinciplesBusinessHR_EN.pdf).

81. <http://www.chevron.com/documents/pdf/PartneringMarcellus.pdf>.

82. IPIECA/API/OGP, "Oil and Gas Industry Guidance on Voluntary Sustainability Reporting", page 87, Indicator SE1: Local community impacts and engagement, [http://www.api.org/~media/Files/EHS/Environmental\\_Performance/voluntary\\_sustainability\\_reporting\\_guidance\\_2010.pdf](http://www.api.org/~media/Files/EHS/Environmental_Performance/voluntary_sustainability_reporting_guidance_2010.pdf).

## 5. MANAGEMENT AND ACCOUNTABILITY

### Issue

Investors require information demonstrating that company managers are reducing business risks by putting policies and systems in place that address operational hazards. Policies and systems should include metrics for tracking impacts, incentives for good performance on health, environment, and safety metrics, and independent third party assessments of practices and performances.

In the oil and gas industry, companies own, lease, and hold drilling permits, but much of the work itself—development of fracturing fluids, drilling and completing of wells, hauling of materials to and from job sites, and waste storage—is conducted by contractors. Yet, at the end of the day, it is the oil and gas company holding the leases and permits that is publicly held responsible, including being assessed fines for regulatory transgressions. Management and accountability of contractors is therefore critically important.

Fines and notices of violation (“NOV”), including their number and frequency, are an important accountability tool and an indicator of company oversight and quality of operational management. These can reveal, for example, patterns of equipment failures, contractor errors, reporting failures, and episodes of environmental contamination. They also provide insight into company continual improvement processes or lack thereof.



CREDIT: Ed Wade, Jr. via FracTracker.org

Pad Fire, West Virginia

In consideration of these factors, the scorecard’s management and accountability questions ask whether the company reports policies to provide compensation and incentive packages for senior management linked to health, safety, and environment (“HSE”) and social impact performance and results; employs third party independent auditing of HSE functions for its operations; relies on third party databases for information to evaluate potential contractors before hire; discloses NOV numbers or equivalent administrative actions and numbers and amounts of fines related to its operations; and reports reductions, if any, in numbers of NOVs received over the past year.

### Scores and discussion

Seventeen (17) of the 24 companies surveyed (71%) tie executive compensation to health, environment, and safety performance. While not specific to hydraulic fracturing operations, these compensation systems can be an important indicator of the priority companies assign to HSE issues.

In light of a company’s legal and reputational liability for contractor actions, it is noteworthy that only 8 companies report that they use third-party information or databases prior to hiring contractors. Further, just 2 companies disclose on their public website that they use third party auditors to monitor HSE functions for their operations.<sup>83</sup> No companies surveyed report on their websites their NOVs, fines, or any reduction in NOVs by shale play.

83. The federal government requires third party auditing for off-shore operations, beginning June 4, 2015. The audits will focus on how federally required safety plans are implemented, and their potential effectiveness, looking at how various risks are mitigated. The Center for Offshore Safety, an industry group organized following the Macondo well blow-out in the Gulf of Mexico, recently approved three such independent auditing organizations. See “Independent Auditors Approved for Offshore Safety Reviews”, <http://fuelfix.com/blog/2013/10/11/independent-auditors-approved-for-offshore-safety-reviews/>.

## MANAGEMENT & ACCOUNTABILITY

COMPANY	NOVs and fines <sup>^</sup>	NOV trends <sup>^</sup>	Senior management pay tied to HES	3rd party audit for HES	3rd party information prior to hiring contractors	TOTAL
Encana			1	1	1	3
Noble			1	1	1	3
Apache			1		1	2
ConocoPhillips			1		1	2
Consol			1		1	2
Hess			1		1	2
Anadarko			1			1
BHP			1			1
BP			1			1
Chesapeake					1	1
Chevron			1			
Devon			1			1
EOG			1			1
EQT			1			1
Exxon			1			1
Occidental			1			1
Range					1	1
Shell			1			1
Talisman			1			1

Companies that did not receive points for any indicator in this category are not included in this chart. They are Cabot, QEP, Southwestern, Ultra, and WPX.

“^” = Question requests disclosure by play.

### Recommendations and notable practices

In order to mitigate risks, investors would like to see companies:

- Increase due diligence on HSE issues in hiring and evaluating contractors.** For most oil and gas companies, a significant portion of their public persona is in the hands of contractors. Many companies report that injury rates for contractors are higher than for company personnel. Further, amidst the exponential growth of domestic shale development, experienced, expert personnel are in short supply. Under such circumstances, oil and gas companies must have practices and policies in place to hire contractors who adhere to the highest standards. Companies can use independent third parties that specialize in collecting and verifying health and safety data from contractors and suppliers to aid in their hiring decisions. Auditing of contractors on HSE practices will also help assure conditions at drill sites that protect workers and the local community and protect a company's social license to operate.
  - Eight (8) companies report using third party databases, such as ISNetwork, as part of their contractor qualifying process.
- Quantitatively report on NOVs, fines, and reductions in numbers of violations.** Companies should comply with the Global Reporting Initiative's ("GRI") Oil and Gas Sector Supplement sustainability reporting

guidelines, which call upon companies to disclose the “monetary value of significant fines and the total number of non-monetary sanctions for non-compliance with environmental laws and regulations.”<sup>84</sup> Regulations and enforcement practices, as well as operational practices, vary among states. Play-by-play reporting on NOV provides investors with information on how effective corporate management policies and practices are, on the ground, in avoiding problems that lead to enforcement actions.

- Talisman offers more robust, useful disclosure and discussion of its NOV than any other company, though this disclosure is limited to Pennsylvania.<sup>85</sup> On its website, Talisman offers a three-column table providing the legal terminology pertaining to the violation, a clear, easily understood description of what happened, and discussion of how the company responded. Talisman stated a 65% year-over-year decrease in NOV in its U.S. operations in its 2012 CSR report.<sup>86</sup>
- Consol also reports a 53.3 percent reduction in NOV in its CSR report.<sup>87</sup>



CREDIT: WV Host Farms Program

**Chemical tanker in creek, West Virginia**

- **Tie executive and management compensation to health, environment, and safety performance.**

At present, companies generally cite data on worker health and operational spills as factors in compensation and many companies have established detailed tracking systems for this limited data set. Yet, this is only a starting point. In an age of investor concern about issues such as pollution, water risk, climate change, and community impacts, companies should consider tying executive compensation to HSE criteria, or expanding the range or specificity of criteria upon which executive compensation determinations are based.

- Devon devotes 10% of its executive compensation to HSE measures, including such indicators as employee and contractor recordable incident rates, preventable vehicle incident rate, and spill rate.<sup>88</sup> Uniquely among the companies in the sample, Devon also assigns 10% of compensation to a category called “Maintain Social License to Operate.”
- Anadarko reports that safety, as measured by total recordable incident rates, is one of 3 core performance goals underlying executive compensation decisions.<sup>89</sup>

84. GRI Oil and Gas Sector Supplement Guidelines, indicator EN28 and SO8.  
See: <https://www.globalreporting.org/resource/library/OGSS-G3.1-Complete.pdf>.

85. Pennsylvania’s Department of Environmental Protection is the only state agency publishing a readily accessible database on its website that allows users to independently examine NOV and use them to raise issues with companies. For an NGO report ranking companies’ NOV per drilled well, see PennEnvironment Research and Policy Center: “Risky Business: An Analysis of Marcellus Shale Gas Drilling Violations in Pennsylvania” (2012), [http://pennenvironmentcenter.org/sites/environment/files/reports/Risky%20Business%20Violations%20Report\\_0.pdf](http://pennenvironmentcenter.org/sites/environment/files/reports/Risky%20Business%20Violations%20Report_0.pdf).

86. Talisman Energy 2011 Corporate Responsibility Report, page 38, [http://www.talisman-energy.com/upload/report\\_link/20/02/talisman-2011-cr-report\\_web.pdf](http://www.talisman-energy.com/upload/report_link/20/02/talisman-2011-cr-report_web.pdf).  
See also [http://www.talismanusa.com/upload/media\\_element/85/01/2012\\_teusa\\_nov\\_dep\\_what-are-we-doing.pdf](http://www.talismanusa.com/upload/media_element/85/01/2012_teusa_nov_dep_what-are-we-doing.pdf).

87. Consol Corporate Responsibility Report 2012, page 40, <http://www.consolenergy.com/CorporateResponsibilityReport/2012New/index.html>.

88. Devon April 24, 2013 Def14a Proxy Statement, page 40, <http://phx.corporate-ir.net/phoenix.zhtml?c=67097&p=irol-sec&leftnav=5>.

89. Anadarko 2013 Proxy statement, page 47, <http://www.anadarko.com/SiteCollectionDocuments/PDF/SEC%20Filings/APCProxyStatement03252013.pdf>.

## CONCLUSION

This first scorecard benchmarking oil and gas industry disclosures on the use of best management practices has found that publicly available information on corporate practices is insufficient for investors to meaningfully assess company progress. While disclosure in the industry has improved during the last four years, that disclosure has been largely reported as broad policies in narrative form. This is certainly a first step in addressing impacts and risks, but absent quantitative reporting, investors have no way of measuring the effectiveness of company policies. Further, the unique characteristics of hydraulic fracturing operations require that investors have access to play-by-play quantitative data in order to assess the risks facing their holdings and best assure that human health and safety and the environment are being protected through all stages of operations. We conclude that companies should expand play-by-play disclosure of practices currently used that address key areas of investor, community, and regulatory concern as discussed above. At the same time, companies should strive to adopt new technologies and processes and improve management practices in order to reduce their health, environment, and safety impacts. We believe companies implementing best practices in operations and providing thoroughly transparent information will reduce regulatory and reputational risks; enhance their likelihood of securing and maintaining their social license to operate; reduce liabilities associated with poor performance, spills, contamination, and lawsuits; and thereby increase their access to capital.

Finally, this scorecard report reflects a first attempt to provide a comparison of companies on relevant metrics associated with the environmental and social impacts of hydraulic fracturing activities. We look forward to continued dialogue with the industry concerning our scoring system.

“ We believe companies implementing best practices in operations and providing thoroughly transparent information will reduce regulatory and reputational risks; enhance their likelihood of securing and maintaining their social license to operate; reduce liabilities associated with poor performance, spills, contamination, and lawsuits; and thereby increase their access to capital. ”

# APPENDIX A: RECOMMENDATION CHART

<b>TOXIC CHEMICALS</b>	<i>Reduce the toxicity of fracturing fluids.</i>	Companies should dedicate staff or consultants to continually evaluate chemical additive use and industry developments and should ask their contractors to provide reduced toxicity options in requests for proposals and other procurements.
	<i>Report quantitatively on progress in toxicity reduction.</i>	Companies should publicly report progress via available chemical toxicity scoring methods or by naming major chemicals of concern eliminated.
	<i>Clarify when CBI claims prevent full disclosure of chemicals used.</i>	Where CBI claims prevent the disclosure of certain chemicals, it is incumbent on companies to make that limitation clear on their website. Further, energy companies should have knowledge of all chemicals used in their wells, executing nondisclosure agreements if necessary with their suppliers to learn chemical identities.
<b>WATER AND WASTE MANAGEMENT</b>	<i>Reduce overall water use and provide metrics on the efficiency of water use.</i>	Companies should make every effort to recycle water from their operations, taking into consideration increased potential for storage and transport complications.
	<i>Reduce fresh water withdrawals.</i>	Companies should increase sourcing of non-potable waters such as treated industrial wastewater and saline waters to reduce the need for fresh water.
	<i>Increase water quality monitoring and conduct more detailed site assessment.</i>	Companies should increase disclosure of their water quality monitoring practices. They should also report steps taken to identify nearby wells that could be a conduit of groundwater contamination; repair or avoid such offset wells; and verify the location of aquifers.
	<i>Assure well integrity.</i>	Companies should adopt practices that ensure adequate casing and cement jobs.
	<i>Adopt closed loop management of drilling wastes and eliminate open storage pits.</i>	
	<i>Conduct play-by-play reporting on water use and water management practices.</i>	
<b>AIR EMISSIONS</b>	<i>Reduce emissions from drilling, well completion, and related production infrastructure.</i>	
	<i>Reduce emissions from transportation.</i>	
	<i>Increase play-by-play or more localized reporting.</i>	
<b>COMMUNITY IMPACTS</b>	<i>Adopt policies to address community concerns.</i>	Companies must establish measurable metrics in the form of key performance indicators (“KPIs”) to address and incorporate stakeholder concerns into their management practice.
	<i>Publish general policies, guidelines, and decision criteria for addressing local impacts.</i>	
	<i>Provide information on internal systems to identify and track concerns.</i>	
	<i>Publish specific community concerns and actions the company has taken to address these concerns.</i>	
<b>MANAGEMENT AND ACCOUNTABILITY</b>	<i>Increase due diligence on health, environment, and safety issues in hiring and evaluating contractors.</i>	Companies should create practices and policies to hire contractors who adhere to the highest standards; use independent third parties that collect and verify health and safety data from contractors and suppliers to aid in hiring decisions; and audit contractors on health, environment, and safety practices.
	<i>Quantitatively report on notices of violations, fines, and reductions in numbers of violations.</i>	Companies should comply with the Global Reporting Initiative’s Oil and Gas Sector Supplement sustainability reporting guidelines that call upon companies to disclose the “monetary value of significant fines and the total number of non-monetary sanctions for non-compliance with environmental laws and regulations”.
	<i>Tie executive and management compensation to health, environment, and safety performance.</i>	



# APPENDIX B: SCORECARD QUESTIONS

## Toxic Chemicals

1. Does the company provide quantitative reporting on progress in reducing the toxicity of hydraulic fracturing additives?
2. Does the company state a practice to not use diesel in its fracturing fluids?
3. Does the company state a practice to not use BTEX in its fracturing fluids?
4. Does the company clearly state on its website that FracFocus reports may exclude chemicals protected by claims of confidential business information?

## Water management: sourcing, well integrity, waste management, and monitoring

1. Does the company report the principal practices it uses to test well integrity beyond pressure testing (e.g., temperature, acoustic, or ultrasonic methods)?
2. For each shale play, does the company disclose whether it routinely assesses groundwater quality before it drills?
3. For each shale play, does the company disclose whether it routinely assesses groundwater quality after it drills?
4. For each shale play, does the company disclose the percentage of flowback water managed and reused for subsequent well completions?
5. For each shale play, does the company report the aggregate quantity of water used for operations?
6. For each shale play quantity reported in response to the question immediately above, does the company report the share of water sourced from various water types (e.g., x% groundwater, y% surface water, z% flowback water, etc.)
7. Does the company state it has a policy of using non-potable water sources to the fullest extent technically practicable?
8. For each shale play, does the company report the intensity of its water use -- the amount of water required to produce measurable units of energy (e.g., gallons/million BTU [MMBTU])?
9. Does the company disclose a policy to store flowback water in closed tanks for its wells in all shale plays?
10. For each shale play, does the company report whether it routinely uses closed loop systems for the management of drilling residuals?
11. Does the company report its practices for identifying and managing the hazards from naturally occurring radioactive materials (NORMs)?

## Air Emissions

1. For each play, does the company report the percentage of wells for which it used green completions?
2. Does the company disclose total methane emissions data or estimates from well completion operations?
3. For each play, does the company report whether it uses any of the following—natural gas, low emission diesel engines, or other reduced-emission methods to power well pad operations?
4. Does the company report when pipelines have been used to replace trucks in transporting water used for fracturing operations?

5. Does the company report the percentage of its vehicle fleet converted from diesel to lower emission non-diesel fuels?
6. For each play, does the company disclose data or estimates for NOx and VOCs emitted from well drilling and completions?
7. For each play, does the company report reductions in NOx and VOC emissions from emission reduction efforts?

### **Community Impacts**

1. For each play, does the company describe major identified community impact concerns and its response?
2. Does the company disclose its internal processes for aggregating local concern statistics?
3. Does the company disclose its internal processes for reporting local concern statistics upward within the company?
4. Does the company disclose a clearly stated policy to adjust activity schedules to prevent or reduce traffic congestion from its operations?
5. Does the company have a clearly stated policy to reimburse state and local authorities for road damage caused by its operations?

### **Management and Accountability**

1. Does the company report it provides compensation and incentive packages for senior management linked to HSE and social impact performance and results?
2. Does the company require third party independent auditing of health safety, and environmental functions for its operations?
3. Does the company rely on third party databases for information to evaluate potential contractors before hire?
4. For each play, does the company disclose notices of violation numbers (or equivalent administrative actions) and numbers and amounts of fines related to its operations?
5. For each play, does the company report reductions, if any, in numbers of notices of violations received over the past year?

# APPENDIX C: METHODOLOGY

## Scorecard Goals

The scorecard had three goals: 1) assess the overall state of industry disclosure; 2) identify those issues about which most disclosures are made; and 3) distinguish industry disclosure leaders from laggards.

## Company Selection

The 24 oil and gas companies selected for evaluation are publicly owned companies in the United States producing the largest amounts of natural gas in the U.S. in mid-2012, the largest gas producers in the Marcellus Shale in mid-2012, and two gas producers historically engaged by investors on shale development issues. They reflect the energy industry's diversity—they differ substantially in size, geographic activity, and number of plays in which they are conducting hydraulic fracturing operations. Some are U.S.-based companies and others not.

## Geographic Coverage

The scorecard addresses onshore operations in the U.S. and Canada.

## Chronological Coverage

The scorecard addresses reporting on specific identified metrics from January 1, 2012 through August 31, 2013.

## Indicator Selection

Indicators were derived from *Extracting the Facts*, as stated therein or adapted for scoring purposes. They are both qualitative and quantitative. The goal was to select indicators that would enable clear “yes/no” answers with minimal interpretation.

## Company Scoring

Each company was scored based solely on documents and information available through its public website, including SEC proxy and annual report filings; air and water management reports to the CDP posted directly on the company website; and sustainability/social responsibility reports, among others. Companies were scored independently by two project staff. Companies received a copy of the questions on which they would be scored and citations pertinent to the questions. This was done to give companies the opportunity to provide feedback on the accuracy of the scorecard information and to update their public disclosures. Final scoring was based on staff reviews of corporate disclosures published by August 31, 2013.

The report text cites examples of exemplary disclosures by numerous companies even where particular disclosures did not earn credit on the scorecard. Some low-scoring companies may in fact be broadly implementing best management practices to manage and reduce risks, but absent play-by-play disclosures sought by the scorecard, investors and communities have no way of knowing this.

## Areas Meriting Dialogue and Additional Refinement in the Scoring System

This scorecard report reflects a first attempt to provide a comparison of companies on relevant metrics regarding management of risks posed by hydraulic fracturing operations. Future editions of the scorecard report may refine the criteria and scoring system. We particularly invite dialogue on three complex and challenging issues: the geographic scope of reporting, the timing of reporting, and the consideration of non-quantitative narrative reporting which gives investors critical insight into company operations.

- This report places special emphasis on “play-by-play” reporting. Companies and agencies frequently describe reserves, production, and activities on a “play-by-play” basis. Individual plays present unique air, water, and community challenges, as discussed more fully in this report. But, because some plays are so large, there may be sizeable variations in risks *within* plays that warrant reporting at an even more granular, sub-play level. Moreover, companies may have organized their practices and internal data and reporting systems to reflect

these or other differences. We welcome dialogue regarding the appropriate framework for disaggregated metrics on a regional basis.

- The timing of reporting by companies within geographic areas also merits further analysis. Investors expect that companies are managing the risks and impacts of operations as soon as they initiate operations in an area. However, we recognize that reporting systems take time to put in place. In such cases, investors expect that companies will inform investors as to when they can expect reporting to begin and on what metrics they can expect reporting. For instance, it may be appropriate to develop criteria for materiality regarding level of involvement in a play that would trigger disclosure obligations.
- As the focus of this report is on quantitative metrics that are comparable from company to company, it does not provide points for companies that have done outstanding narrative reporting. Evaluating narrative disclosures would require a more subjective rating system. Nevertheless, we invite additional input as to how future reports might better capture this information.

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