

# International Environmental and Resources Law Committee Newsletter

A joint newsletter of the International Environmental and Resources Law Committee and Australia's National Environmental Law Association, the Canadian Bar Association's National Environmental, Energy and Resources Law Section, and the United Kingdom Environmental Law Association.

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## MESSAGE FROM THE CHAIRS

Charles J. Birchall, Tim Clare,  
Amanda Cornwall, J. Brett Grosko, and  
Jennifer Wills

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This newsletter is the second product this year of extensive collaboration among the American Bar Association Section of Environment, Energy, and Resources' International Environmental and Resources Law Committee, the Canadian Bar Association's National Environmental, Energy and Resources Law Section, Australia's National Environmental Law Association (NELA), and the United Kingdom Environmental Law Association (UKELA). What makes this cooperative venture even more meaningful is that it concerns an issue that is at the forefront of emerging environmental policy and law across the globe—the regulation of unconventional oil and gas exploration.

Globalization ensures that as new energy reserves sources and extraction techniques come online, people the world over will take notice. The factors that propelled development of unconventional reserves of fossil fuels in the United States—cost advantages, abundance of secure domestic supplies, and a greener image than coal—have more recently led Australia, Canada, the United Kingdom (UK), and other European Union (EU) countries to assess and begin developing their own reserves. And the trend is strong worldwide. For example, China has immense undeveloped oil shale deposits, which could serve as an alternative to the coal that currently is the source of significant air pollution.

Hydraulic fracturing—the practice of releasing natural gas from shale by fracturing the shale using pressurized water and chemicals—was used in commercial application as early as the mid-twentieth century. However, it was only recently that horizontal drilling was perfected so that “hydraulic fracturing” could be used profitably, to access much larger underground areas using a single well. Today, approximately 90 percent of all new wells in the United States are hydraulic fractured. This accounts for a little over a quarter of U.S. natural gas production and that share is growing rapidly.

While the global trend toward hydraulic fracturing is strong, so too are the concerns about greenhouse gas emissions of fugitive methane from the hydraulic fracturing process, the amount of water used, disposal of wastewater, groundwater contamination, and the potential to induce seismic activity. The articles in this issue indicate that, generally speaking, our countries are attempting to address these environmental concerns, though regulatory approaches vary widely. Hopefully, just as successful drilling techniques are gaining acceptance in faraway places, so will regulatory approaches that best safeguard human health and the environment.

We start our issue with James Rubin's introduction, which focuses on the common threads in our attempts at balancing environmental protection and market forces. Next, Nigel Bankes lays out the preponderant role of the provinces and the corresponding assortment of regulatory responses to be found in Canada. James Rubin next provides in an overview of

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*Peter Murtha, Editor*

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key state approaches and recent developments at the federal level. John Ware follows with a piece in which he depicts regulation that is state-centric with a relatively gentle federal level hand. Finally, Louise Moore and Kevin O'Connor portray a UK government that is relatively new to hydraulic fracturing, but rapidly developing its regulatory regime, as well as an EU that is determined to ensure a reasonably uniform approach to regulation through a series of new initiatives.

We think that you will find these articles instructive and that they will help inform discussion in all of our members' countries. We would like to express our gratitude to Peter Murtha, co-editor of the American Bar Association's International Environmental and Resources Law Committee Newsletter; Katia Opalka, newsletter editor of the Canadian Bar Association's National Environmental Energy and Resources Law Section; and Tim Clare who collaborated on the editing of this joint issue. Please contact Andrew Long at [e.andrew.long@gmail.com](mailto:e.andrew.long@gmail.com), if you would like to contribute to future issues of the ABA's International Environmental and Resources Law Committee's newsletter.

**Charles J. Birchall** is the chair of the National Environmental Energy and Resources Law Section, Canadian Bar Association. **Tim Clare** is trustee and the former vice chair, United Kingdom Environmental Law Association. **Amanda Cornwall** is president, National Environmental Law Association of Australia. **J. Brett Grosko** is co-chair, International Environmental and Resources Law Committee and works at the U.S. Department of Justice, Environment and Natural Resources Division. **Jennifer Wills** is co-chair, International Environmental and Resources Law Committee and works at the U.S. Environmental Protection Agency.

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## INTRODUCTION—A COMPARATIVE VIEW OF HYDRAULIC FRACTURING

James Rubin

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The recent and rapid development in the United States of natural gas and oil from unconventional sources, including shale, has completely transformed the domestic energy sector as well as industries benefiting from a relatively cheap and stable source of these fuels. Indeed, the United States stands poised to become a significant exporter of natural gas. All this has been made possible by advances in the decades-old practice of hydraulic fracturing and, relatively more recently, horizontal drilling technology. As debate in the United States focuses on weighing the benefits and potential risks of increased hydraulic fracturing across the nation's major shale plays, other countries with significant and newly accessible reserves are facing similar issues, confronting the potential of both plentiful resources and damaging environmental impacts.

This month's newsletter will examine how four countries—the United States, Canada, the United Kingdom, and Australia, as well as the European Union—are seeking to balance desired resource development with responsible environmental management. Clearly and not unexpectedly, this comparison shows there are many common themes. For example, in each case, governmental authorities are recognizing the tremendous potential for resource extraction, especially in new areas of development, while analyzing whether hydraulic fracturing presents significant risks to groundwater, surface waters, the surrounding atmosphere, and seismic stability. Further, in each case these authorities are seeking to determine through detailed studies whether existing programs for conventional oil and gas drilling are sufficient to address these risks or whether new requirements are warranted to address increased development of unconventional sources, with related issues about whether such regulation should be at a local, provincial or federal level. Even the potential areas of regulation are similar: disclosure of chemicals, impact on water quality and water use, waste disposal, well integrity and communication with other wells, fugitive releases of methane, and monitoring and reporting. In each case,

industry groups anxious for further development have taken a leading role in developing standards and best practices but are met by citizen and environmental groups wary of significant increases in drilling activity, especially in areas where conventional development has not been common. Finally, there are frequently great differences within each country/regions, states, or provinces with regard to development and the degree of regulation, ranging from those building upon or refining established oil and gas programs to encourage development to those temporarily withholding authorization pending further study or outright banning the practice.

At the same time, there are major differences among these countries and regions that must be considered in terms of stages of development of unconventional sources (the United States and Canada are probably furthest along, but Australia has significant experience with coal seam gas), the potential for broad national controls (federal-level regulation most likely in the UK, a mix of federal and state in the United States, and mainly at the state level in Australia and Canada) and the types of regulatory options available (the UK/EU, Australia, and Canada have strong environmental impact or risk assessment laws applicable to private conduct, whereas the U.S. federal law applies only to major federal actions, although, that said, environmental review laws in states like California play a major role). Ultimately, how these countries choose to define their goals and address their concerns will have significant impact beyond their borders as other countries around the world, beginning to assess their own development potential and attendant risks, look for precedents, successes, and experience.

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## NON-CONVENTIONAL OIL AND GAS RESOURCES AND THE LEGAL ISSUES ASSOCIATED WITH HYDRAULIC FRACTURING IN CANADA

Nigel Bankes

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Canada is a federal state. The regulation of the onshore oil and gas industry in Canada has always been a provincial responsibility. The result is significant diversity in regulatory approaches. In the offshore (i.e., marine areas beyond the boundaries of the provinces), responsibility for oil and gas regulation is shared between the federal and provincial governments. Canada has no equivalent of the U.S. federal Safe Drinking Water Act; provincial regulation of well drilling activities and associated hydraulic fracturing (hydraulic fracturing) activities is essentially exclusive. The federal government does, however, regulate oil and gas activities (onshore and offshore) in two of Canada's three territories: Nunavut and the Northwest Territories. Yukon was granted authority to regulate oil and gas activities in 1998.

The main onshore oil- and gas-producing provinces in Canada have been Alberta, Saskatchewan, and British Columbia. There has also been some production in southern Manitoba and southern Ontario, in the Northwest Territories (NWT)—especially from the Norman Wells project and in the Liard Basin in the southwest corner of the NWT—and in the southeast corner of Yukon.

Hydraulic fracturing has always been an important part of conventional oil and gas completion and production activities. What is new is the application of multistage fracturing in horizontal wells, to allow the exploitation of so-called non-conventional hydrocarbon resources—shale oil and shale gas, tight oil and tight gas. In some cases these activities focus on shallow formations while in others the formations are deeper. What is also new is that while some of these developments are occurring in areas in which the oil and gas industry has been operating for decades, others are located in regions that have seen little if any oil and gas exploratory activity. It is in these “new” areas that there is perhaps heightened

concern amongst communities and landowners with respect to these industrial activities. Similarly, government resource ministries and regulators in these regions need to staff-up to deal with the challenges of regulating what is to them a new industry. This is not to say that civil society has not expressed concerns about the new wave of hydraulic fracturing activities in some of the more traditional areas in which the industry has operated. It is simply to emphasize that there is heightened concern in places such as southern Quebec and New Brunswick.

This note on the legal issues associated with hydraulic fracturing in Canada covers five subjects: (1) the development of a new “directive” on hydraulic fracturing by the Energy Resources Conservation Board (ERCB) of the province of Alberta, (2) developments in British Columbia (BC), including a report of the BC Oil and Gas Commission on induced seismicity associated with hydraulic fracturing operations in the Horn River Basin, (3) developments in Quebec, (4) developments in the Atlantic provinces of Nova Scotia and New Brunswick, and (5) the work of industry associations in adopting principles and detailed technical guidance to establish best practices in relation to hydraulic fracturing.

### **Alberta’s Proposed New Directive on Hydraulic Fracturing**

The ERCB is Alberta’s main oil and gas regulatory authority and is responsible for all well licensing activities. While operating under a provincial statute and regulations (principally the *Oil and Gas Conservation Act* and the *Oil and Gas Conservation Regulations*), the board imposes more technical requirements on the industry through what it refers to as directives. Existing directives relevant to well control and the protection of potable groundwater include Directive 008: Surface Casing Depth Requirements; Directive 009: Casing Cementing Requirements; Directive 020: Well Abandonment; Directive 027: Shallow Fracturing Restricted Operations; Directive 035: Baseline Water Well Testing; Directive 056: Energy Development Applications; and Directive 059: Well Drilling & Completion Data Filing Requirements. There are

approximately 18,000 to 20,000 wells drilled in Alberta each year.

The ERCB has recently completed a review of its existing requirements in light of the increased use of hydraulic fracturing to tap unconventional resources. The board identified three areas in which it needed to strengthen its existing regulatory approach: (1) maintaining well integrity, (2) interwellbore communication, and (3) hydraulic fracturing operations at shallow depths. Its draft directive addresses each of these concerns in some detail. See [http://www.ercb.ca/directives/Draft\\_Directive\\_Hydraulic\\_Fracturing.pdf](http://www.ercb.ca/directives/Draft_Directive_Hydraulic_Fracturing.pdf) (released Dec. 6, 2012).

The maintenance of well integrity refers, inter alia, to the importance of ensuring that the barrier between the well and the surrounding subsurface environment is not breached in a way that results in subsurface impacts or the release of fluids to the surface. This objective may be attained by using a dual-barrier or single-barrier system. A dual-barrier system offers greater protection and may consist of a combination of intermediate casing, production casing, production liners, and tubing. A single-barrier system will consist of casing. The board has observed increased use of single-barrier well systems being used in hydraulic fracturing operations. The board has not elected to ban such practices but instead to require a licensee to “apply increased diligence in designing a single-barrier system, monitoring hydraulic fracturing loads to ensure that adequate margins of safety are maintained.” To that end, the draft directive imposes a number of prescriptive requirements on a licensee. In particular, the draft directive will, when implemented, require the licensee to “document the load capacity and the safety factors it has used in the design of its casing relative to the loads (internal pressure, bending, thermal) and the well environment that the casing will be exposed to” and to set surface casing to cover the base of groundwater protection.

The board has recorded 21 instances of unintentional communication between the subject well (where hydraulic fracturing is being conducted) and offset wells (wells on contiguous/adjacent properties), resulting, in at least one case, in an uncontrolled release

of fluids at the offsetting well. *See* <http://www.ercb.ca/about-us/media-centre/news-releases/2012/nr2012-12>. In order to address this issue and to maintain well control at offsetting wells in the event of communication, the board is proposing that a well licensee be required to prepare a hydraulic fracturing risk assessment and risk management plan (RARMP), which is to include determining a fracture planning zone (FPZ), and to identify all offsetting wells within the FPZ as well as offsetting wells beyond the FPZ that may be impacted due to the uncertainties in determining FPZs. The management plan should address well integrity and provide a risk assessment as well as control and mitigation measures for each well, and a monitoring plan. In order to do all of this the licensee must inform offsetting licensees of its planned program and must engage those licensees “and make all reasonable efforts to develop mutually acceptable control and mitigation measures and monitoring and response plans.” Offsetting licensees are expected to cooperate.

Although the summary of the draft directive talks about “fracturing operations at shallow depths,” the underlying issue is the risk that these fracturing operations may pose to nonsaline aquifers. Recognizing that “nonsaline aquifers are an important natural resource” which should trigger a “conservative and precautionary approach to ensure their protection,” the board proposes to regulate with a view to “prevent[ing] impacts to nonsaline aquifers” (NSAs) and thus establishes the general requirement that hydraulic fracturing “must not impact the water quality or quantity of a nonsaline aquifer.” In order to achieve this laudable and commonsense objective, a licensee that proposes to conduct a hydraulic fracturing operation at depths shallower than 100 meters below the base of ground water protection (GWP) must, in its RARMP: (a) identify the NSAs within the FPZ (as well as any additional NSAs that may be impacted), (b) identify measures to minimize the risk of impacts on NSAs, and (c) include “evidence confirming” that the proposed hydraulic fracturing fluids “do not contain anything that may cause deterioration in the water quality” of NSAs.

The board has also included additional “conservative and precautionary measures” to prevent impacts on

water wells. In particular, the directive prohibits a licensee from engaging in hydraulic fracture operations within a zone that is within 100 meters vertical and 200 meters horizontal from an existing water well. There are also special requirements relating to hydraulic fracturing operations close to the top of bedrock and for nitrogen hydraulic fracturing operations in coal seams.

Throughout its draft directive the board emphasizes that a licensee should use a documented procedure based on industry standards in developing its RARMPs and in aiming to continually improve its planning and procedures for hydraulic fracturing. One such standard is that developed by Enform, the Safety Association for Canada’s Upstream Oil and Gas Industry, which is discussed further below.

## **British Columbia**

There has been significant interest in shale gas deposits in northeastern British Columbia in both the Horn River Basin (north of Fort Nelson) and the Montney area in the vicinity Fort St. John and Dawson Creek. Local concerns have included water use, induced seismicity, and instances of communication between multistage hydraulic fracturing operations and ongoing drilling operations resulting in “kicks” during the drilling operations, and concerns as to the contents of the hydraulic fracturing fluids used by operators. The principal provincial regulator, the BC Oil and Gas Commission (OGC), has responded to each of these concerns. For example, it has tightened up on water authorizations, issued a safety bulletin in relation to the communication issue between adjacent operations, and, as of January 1, 2012, it requires disclosure of the contents of hydraulic fracturing fluids.

The concerns as to induced seismicity led the OGC to conduct a more formal investigation. In its report, the OGC concluded that observed seismicity did result from hydraulic fracturing operations; only one event was “felt” at surface (rather than detected by seismographs) and no injuries or property damage was reported. *See* Investigation of Observed Seismicity in the Horn River Basin, BCOGC, August 2012, available at <http://www.bcogc.ca/publications/reports>.

The commission made a number of recommendations as a result of its investigations: (1) improve the coverage and accuracy of the National Seismographic Network in that part of British Columbia so that it could detect smaller seismic events as well as large, conventional earthquakes, (2) perform geological and seismic assessment to identify preexisting faulting, (3) establish monitoring and reporting procedures for seismic events and require immediate suspension of operations upon detection of a seismic event of 4.0 or above on the Richter scale, (4) gain a better understanding of ground motion caused by induced seismicity, (5) consider deploying portable, dense seismic arrays to gain a better understanding of seismic events caused by hydraulic fracturing, (6) require reporting of micro-seismic events, and (7) study the relationship between hydraulic fracturing operations, pumping rates, and seismicity.

## Quebec

There has been very little conventional oil or gas production historically in Quebec but over the last five years or so there has been significant interest in exploring and exploiting the Utica shale gas basin. The Utica shale underlies most of New York, Pennsylvania, Ohio, and West Virginia and extends into parts of Ontario and Quebec. There is considerable public resistance to this development and as a result the government has proceeded very cautiously—mounting a number of environmental reviews and declaring a moratorium on hydraulic fracturing until the reviews are complete, and in one case (discussed below) actually revoking existing permits. The environmental reviews include a report of the *Bureau des audiences publiques sur l'environnement* (BAPE) on the sustainable development of the shale resource of Quebec. Among its other recommendations the BAPE report (March 2011) recommended a moratorium on hydraulic fracturing pending the outcome of a strategic environmental assessment (SEA) on the exploitation of shale gas. This recommendation was accepted and a SEA panel struck shortly afterwards. The process is expected to take several years and is still ongoing. The uncertainty engendered by this review has caused at least one operator, Talisman, to suspend its operations in Quebec pending the outcome of the review.

In May and June 2011 the Quebec government introduced, passed, and proclaimed “An act to limit oil and gas activities.” See <http://www2.publicationsduquebec.gouv.qc.ca/dynamicSearch/telecharge.php?type=5&file=2011C13A.PDF>. The act revoked existing oil and gas permits for lands underlying a part of the Saint Lawrence River and explicitly stipulated that there would be no right to claim compensation. Perhaps not surprisingly, one company, Lone Pine Resources Inc. (formerly Forest Oil), which had farmed on a number of oil and gas permits including one underlying the river, has taken the view that this law breaches Canada’s obligations under chapter 11 of the North American Free Trade Agreement, specifically the duties under article 1110 (expropriation) and article 1105 (the minimum standard of treatment). Lone Pine has filed a notice of intent to submit a claim to arbitration (November 8, 2012), in which it suggests that Canada is in breach of three elements of article 1110 in that, allegedly, (1) there is no valid public purpose for the expropriation, (2) the manner in which Bill 18 was enacted violates international standards of due process, and (3) there is no compensation whatsoever. See <http://www.italaw.com/>.

## The Maritime Provinces

Parts of the maritime provinces of New Brunswick and Nova Scotia are also prospective for shale gas and, much like Quebec, are also areas that have seen little oil and gas activity in the past. Consequently, both provinces have proceeded cautiously, recognizing that they need to build community understanding and support. For example, the government of New Brunswick has commissioned various reports under the heading of the responsible environmental management of oil and gas activities in the province. The chief medical officer of health has also weighed in with a report of her own (the reports are *available at* [http://www2.gnb.ca/content/gnb/en/corporate/promo/natural\\_gas\\_from\\_shale.html](http://www2.gnb.ca/content/gnb/en/corporate/promo/natural_gas_from_shale.html)). Similarly, the neighboring province of Nova Scotia has embarked on an ambitious review of international practice in relation to hydraulic fracturing, including a useful “Jurisdictional Review” of hydraulic fracturing: <http://www.gov.ns.ca/>

nse/pollutionprevention/consultation.hydraulic.fracturing.asp. That review, initially scheduled to be completed in 2012, has now been extended to 2014. Both initiatives show that the two governments are being both politically cautious and environmentally precautionary.

## The Work of Industry Associations

Industry associations have heard the concerns that civil society has voiced about hydraulic fracturing and have in some cases responded proactively and in advance of the relevant regulatory authorities by developing industry codes of conduct as well as more detailed technical guidance. One example of this in Canada is the work of the Canadian Association of Petroleum Producers (CAPP), the leading industry organization for the upstream oil and gas sector. CAPP adopted a set of five “Guiding Principles for Hydraulic Fracturing” in September 2011: <http://www.capp.ca/canadaIndustry/naturalGas/ShaleGas/Pages/default.aspx#operating>. They are: (1) safeguard the quality and quantity of regional surface and groundwater resources, through sound wellbore and construction practices, sourcing freshwater alternatives where appropriate, and recycling water for reuse as much as practical; (2) measure and disclose water use with the goal of continuing to reduce “our effect on the environment”; (3) support the development of additives with the least environmental risk; (4) support the disclosure of additives; and (5) continue to advance, collaborate on, and communicate technologies and best practices that reduce the potential environmental risk of hydraulic fracturing.

CAPP has further particularized these principles with a set of operating practices. However, adherence to the principles and practices is not compulsory. CAPP merely “strongly encourages its use by member companies.” An example of an operating practice CAPP has adopted relates to “baseline groundwater testing” and is intended to be responsive to guiding principles (1) and (5). The operational requirements address both domestic water well testing and regional groundwater monitoring. As to the first, companies are required to test wells and natural springs within 250 meters of the wellhead prior to drilling shale gas and

tight gas wells. The testing should adopt relevant federal/provincial guidelines and also include a water deliverability test. Companies should also put in place a procedure for dealing with the concerns of members of the public. The expectation with respect to regional groundwater monitoring is that industry will participate with government in the development of an appropriate program the extent and intensity of which should reflect “good judgment and sound scientific analysis.” Monitoring wells should be instrumented to provide some means of periodic water level monitoring.

At a more technical level, the Drilling and Completions Committee of Enform Canada has been working on the development of an industry recommended practice (IRP) on hydraulic fracturing, released as Interim IRP 24: Fracture Stimulation: Interwellbore Communication, Rev 15 on 28 September 2012. See <http://www.enform.ca>. While focused at the moment on interwellbore communication between energy wells, the group intends to expand its work to explicitly address communication with water wells. The IRP takes a risk-based approach that seeks to balance risk mitigation and risk exposure such that the risk is reduced to “as low as reasonably practicable.” The IRP emphasizes the importance of determining a fracture planning zone and then identifying both wells within the zone and wells outside the zone that require special consideration due to factors such as historical experience and the age and condition of the wellbore. The IRP posits that each well within the scope should be subject to a risk assessment that focuses on “barrier analysis”—the barriers including tubing strings, isolation equipment, casings strings, and cementing. The assessment should be designed to assess whether existing barriers will be adequate to withstand the pressures resulting from the hydraulic fracturing operation.

The IRP is useful in reminding the non-technical reader that the systems in question have generally been engineered on the assumption that “wells are not usually designed to manage high pressures during the production phase.” As with the ERCB’s draft directive, the IRP anticipates communication between well operators in its implementation.



## Conclusions

There is considerable interest in exploiting shale and tight oil and gas deposits in Canada, in both traditional geographical regions of activity and new regions. The large-scale use of multistage hydraulic fracturing as part of this development has led to significant public concern. Regulatory responses include significant public engagement exercises and intensive studies (Quebec, New Brunswick, and Nova Scotia), a moratorium (Quebec), and the development of new directives, regulations, and working practices (Alberta, British Columbia, and industry). In general, the “new” oil and gas jurisdictions have proceeded very cautiously whereas the senior jurisdictions have focused on making adjustments to existing regulations to deal with industry issues such as interwell communication but also to assuage legitimate public concerns with respect to potable water.

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## U.S. REGULATORY DEVELOPMENTS IN HYDRAULIC FRACTURING

James Rubin

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### Introduction

The recent emergence of large volumes of low-priced natural gas in the United States has transformed domestic power generation, manufacturing, and overall energy security. The technology that has made this all possible, hydraulic fracturing of gas and oil-bearing shale, is not new. Rather, the combination of this technique with newer horizontal drilling methods and other advances has unlocked access to vast domestic shale gas and oil supplies, leading to an exponential growth in drilling and development across the known shale plays in the United States. Yet while this growth has generally been considered economically positive, it has also raised significant environmental, health, and safety concerns. Hydraulic fracturing may be the key to long-term lower-carbon energy sustainability, but it is also an extractive industry heavily dependent on water and associated with spills, chemical constituents, air emissions, and potentially toxic wastes.

Until recently, hydraulic fracturing has been nearly exclusively a matter of state regulation, and even now, states are continuing to adopt stronger, more comprehensive regulatory programs to address the issues raised by the growth in drilling. The federal scheme, by contrast, has been slower to develop, but steps are under way to change this as well. This article will briefly describe the types of regulatory structures being developed for hydraulic fracturing at the state and federal level in the United States to protect public health, safety, and the environment, and then will suggest what may lie ahead for the industry in the future.

### State Regulation

Hydraulic fracturing to stimulate gas and oil production in wells is not itself new, and techniques to address well integrity, prevent blowouts, and minimize contamination have existed in states where such drilling has occurred in the past, including Wyoming, Colorado, Texas, and

Pennsylvania. But the rapid expansion in these and other states less accustomed to the practice, coupled with growing public concerns, has led to a correspondingly rapid increase in regulatory actions and standards in states with large, newly accessible shale resources and even those with marginal resources or no realistic expectation of development. For example, California, with considerable experience in conventional oil drilling, has considered enacting a series of strict rules on notice, testing, and chemical disclosure. Illinois has recently adopted many such measures, introducing some of the first comprehensive controls on hydraulic fracturing in the country. Below are some recent state-level developments:

### **Bans on Hydraulic Fracturing**

To date, only a few states have instituted outright bans on the practice, such as Vermont, Maryland, and New Jersey (where the governor vetoed the banning legislation but allowed a one-year moratorium). No state with significant and commercially exploitable resources has yet to impose an outright ban. New York has banned the practice temporarily while completing detailed studies and considering a detailed regulatory program. Some municipalities have adopted ordinances against the process but it is unclear whether those bans can trump state law allowing exploitation, and several have been struck down.

### **Disclosure of Drilling Constituent**

More common is the requirement that drilling companies disclose the identity of chemicals and constituents of their hydraulic fracturing fluids either publicly or to state agencies, and generally after drilling. Some states offer protections for confidential information while others require full public disclosure. To date, more than a dozen states have adopted some form of disclosure laws, including most recently Illinois, Utah, Indiana, Colorado, Ohio, and Louisiana. Illinois requires such disclosure before *and* after fracturing. Texas was among the first to require disclosure of both chemicals and water use, and many in the industry already voluntarily disclose their chemical use through FracFocus.org.

### **Drilling Requirements**

Several states that have seen a significant increase in drilling have recently updated their broader oil and gas

regulatory programs to include specific requirements for hydraulic fracturing. For example, Pennsylvania, where most of the Marcellus shale play is located, recently instituted requirements for drilling, casing, cementing, testing, monitoring, and closing of oil and gas wells. The state also imposed a drilling impact fee. Ohio, home of the Marcellus and Utica shale plays, recently enacted similar rules on cemented wall completions for hydraulic fracturing wells and issued a new model general permit for the production phase of operations.

### **Use of Water and Wastewater**

States are beginning to focus more on the use of water and potential impacts to surface and groundwater from hydraulic fracturing. Pennsylvania requires treatment of spent drilling fluids to safe drinking water standards for total dissolved solids and imposes other conditions on drilling to protect water supplies. Illinois requires wastewater to be stored above ground and reused or properly disposed of at a wastewater treatment facility or approved injection well. Pennsylvania, Illinois, Colorado, and Ohio require water sampling near proposed well sites, and Colorado and Illinois require such testing *after* drilling as well. Texas and New York have proposed or considered rules to protect groundwater, especially in sensitive areas.

### **Waste Disposal**

Ohio has studied the link between disposal of drilling fluids in deep injection wells and recent seismic activities, and is pursuing changes in its deep well disposal program. The New Jersey legislature passed a law, also vetoed by the governor, which would ban wastewater storage and disposal from hydraulic fracturing.

### **Air Emissions**

Several states, including Colorado and Wyoming, require the use of reduced emission completion (REC) devices to capture emissions of volatile organic compounds (VOCs) and methane during drilling. Illinois requires emissions testing and control measures, with limited allowance of flaring.

One would expect more state regulation in the near future as drilling increases and states come to terms

with the new impacts and demands on their resources. Of course, each state faces its own unique circumstances. As a result, their regulatory programs can vary considerably. To date, however, leading industry groups have preferred state regulation to federal standards, which they allege would be more costly, heavy-handed, and duplicative.

## **Federal Regulation**

There is a widely held but inaccurate belief that hydraulic fracturing is exempt from regulation under federal law. To be sure, oil and gas drilling are exempted from parts of some federal environmental laws, such as hazardous waste regulation. But generally, these practices remain subject to a number of current laws, including the Clean Water Act (CWA) for surface water discharges; the Safe Drinking Water Act (SDWA) underground injection control program for drilling with diesel and for disposal of drilling wastes; the National Environmental Policy Act for drilling conducted on federal lands; and the Comprehensive Environmental Response, Compensation, and Liability Act for hazardous substance contamination from drilling practices and actions to address endangerment of water sources.

But the federal government has yet to establish a comprehensive federal regime specifically for hydraulic fracturing. Only recently, the Environmental Protection Agency (EPA) and the Department of the Interior (DOI) have issued final or proposed regulations similar to some of the state regulation described above. In President Obama's second term, it is quite likely that EPA and other agencies will move ahead on filling the gaps to develop a fuller federal scheme. These efforts will no doubt be controversial with industry, which will likely argue such standards are unnecessary and costly, and with environmental organizations who will claim the regulations are not strong enough. Below is a short list of current and expected actions

### **EPA Clean Air Act Rules for Oil and Gas Industry**

In August 2012, EPA published its first regulation specifically applicable to hydraulic fracturing. It required all new or refractured gas wells after 2015 to capture air emissions (methane and volatile organic

compounds) through the use of REC technology during the initial days of well completion. New or refractured wells before that date (as well as delineation and low-pressure wells) must either use RECs or combustion control devices (e.g., flaring). The rules also require prenotification of drilling and annual record keeping. The rules remain in effect but have been challenged in court and EPA is reportedly reconsidering several components. For example, it has already determined it will reconsider rules related to storage tanks and recently finalized changes to add some flexibility.

### **EPA Guidance on SDWA Underground Injection Control for Diesel Injection**

In spring 2012, EPA proposed guidance on how drillers may be permitted by the agency under the SDWA to use diesel fluids in hydraulic fracturing. The guidance is controversial for its broad definition of diesel. It also includes detailed requirements for well construction, operation, mechanical integrity, monitoring and reporting, financial assurance, and public notification. Though only applicable to instances where EPA is the permitting authority, the proposal gives some indication of the broad scope and specific details EPA may seek to impose in future regulations under other statutory authority.

### **Toxic Substances Control Act (TSCA)**

Responding to an environmental group petition, EPA announced in the fall of 2012 that it would soon begin rulemaking under TSCA on disclosure of chemicals used in the drilling process, including an identification of risk. Concerns have been expressed by some about how such regulations may interact with other similar federal and state requirements. EPA has more recently denied petitions to establish broader testing and reporting requirements for chemicals used in oil and gas exploration, but plans to proceed with rulemaking requiring more tailored reporting of data on chemical substances and mixtures used in hydraulic fracturing, including their health and environmental effects. What EPA learns from this reporting may result in further regulations under TSCA.

### **EPA Study on Impacts to Water**

How hydraulic fracturing may impact surface and groundwater sources, including from use and potential

contamination, has been one of the key drivers of environmental concern to date. To address these concerns, EPA has been analyzing the life cycle of water and impacts at various stages of the process, including water withdrawal, handling of chemicals and return flows, and underground and surface contamination. The study will not cover air, seismic, economic effects, or worker safety and hazard issues that also have been raised.

EPA was to present initial conclusions in early 2013 and a final peer review report in 2014. However, in late 2012, EPA merely provided a report on the progress of its studies and no findings or conclusions. Several months later EPA extended its deadline for submissions of data and scientific literature. EPA is now suggesting it will not provide final results until 2016. It is quite likely EPA will conclude that hydraulic fracturing poses significant risks to such water resources. The question will be, depending on the results of the study, how comprehensively and strictly EPA might regulate water and wastewater issues, and what is technically and economically feasible. Any EPA action in this area is likely to be extremely controversial. EPA is already considering wastewater treatment rules and effluent guidelines for the process under the CWA. EPA's continued delay of its timeline for its study suggests the agency is finding the issues far more complex than anticipated—and perhaps is feeling the pressure of industry and congressional critics.

## **DOI**

In addition to EPA, DOI's Bureau of Land Management (BLM) repropoed regulations in May 2013 for hydraulic fracturing on public and Indian lands. These regulations were originally proposed in 2012 but withdrawn among a deluge of stakeholder and congressional concerns. The repropoed rule strongly suggests that the BLM has paid attention to complaints from operators that it should not micromanage hydraulic fracturing or displace state rules. Thus, the new proposal provides greater flexibility to industry than its original plan, and seeks to integrate state standards more fully. Among other things, the proposal requires disclosure of chemicals in drilling fluids but only after fracturing is completed, authorizes disclosure through the industry-favored

FracFocus, and streamlines rules for seeking protection of trade secrets based on Colorado's model program. It also provides an expanded set of tools to ensure well integrity, authorizing the use of state-mandated technology the BLM considers at least as effective. Finally, the proposal allows the BLM to grant variances that would apply to all lands within boundaries of states where the bureau has determined existing state regulations would meet or exceed the effectiveness of the proposed rule.

At the same time, the BLM has kept provisions designed to address significant environmental concerns such as ensuring operators demonstrate well bore integrity with pressure tests on all wells, setting stricter standards regarding usable water, and adding new data gathering and analysis requirements related to water management. These provisions demonstrate that the BLM is concerned that there be some federal backstop to state regulation. The BLM recently expanded the deadline for public comments on the rule, which still remains controversial, to August 23, 2013.

## **Non-regulatory Steps**

In addition to these regulatory actions, EPA has taken steps on some specific disposal and contamination issues on a regional basis. For example, EPA conducted a preliminary study in Pavilion, Wyoming, regarding potential contamination of groundwater from hydraulic fracturing, resulting in an initial controversial conclusion that the contamination there is consistent with hydraulic fracturing chemicals. EPA stopped short of saying that the practice specifically caused the contamination. Its initial findings, however, were touted by some as showing a "smoking gun" for drilling contamination. Then, in late June 2013, EPA abruptly ended its work and indicated the study would continue at the state level instead. EPA has also used its SDWA emergency authority in Pennsylvania and Texas to require provision of drinking water by drilling companies, where it perceived threats to supplies from hydraulic fracturing. EPA has since determined there is no longer a threat at the Pennsylvania site, and it withdrew its order in Texas in face of litigation over its authority to issue such orders.

EPA regions have also used information requests to companies to disclose chemical and wastewater use and have pushed states to take action on wastewater disposal. The Securities and Exchange Commission has also gotten into the act, sending letters regarding chemical use and quantification estimates to ensure accurate public disclosure.

### Likely Next Steps

President Obama has been clear in his encouragement of shale oil and gas development as part of his “all of the above” energy program, but has reiterated such development should ensure environmental and public health protection. Meanwhile, a growing segment of environmental groups has expressed concern that shale gas and oil development will set back efforts to reduce carbon-emissive fossil fuel consumption and promote renewable energy. They have filed additional petitions seeking regulation of hydraulic fracturing chemicals and wastes under a number of other federal laws. Congress can also be expected to remain in the fray. Legislation has already been introduced to limit EPA enforcement authority and to require congressional review of any federal actions. Numerous hearings have been held on how the administration is addressing the practice, and a leading industry supporter now heads the House Energy and Commerce oversight committee.

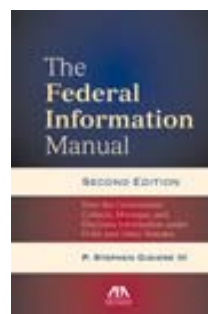
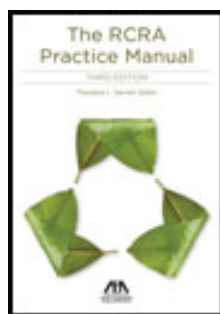
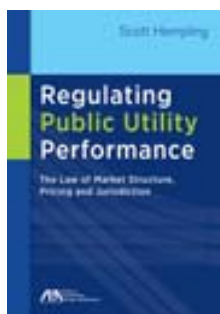
In his second term, President Obama and his agencies face the task of ensuring shale-derived gas and oil continue to drive the country’s economic engine and promote energy self-sufficiency but do not lead to

unacceptable environmental costs or overdependence on fossil fuels. Given the economic and energy security importance of abundant low-cost gas, it is unlikely the administration will regulate the practice out of existence. Indeed, the continued abundance of low-priced gas helps the Obama administration achieve other important environmental goals, such as weaning the country off coal as the primary fuel for power generation and manufacturing. Thus, the administration has further reason to ensure it does not overregulate shale gas development or raise gas prices too high. The administration also is considering applications to allow new exports of liquefied natural gas, which will also impact gas prices. To date, the administration is clearly pursuing a cautious approach, showing deference to industry concerns and state regulatory authority, while at the same time setting the stage for more comprehensive federal regulation by EPA and the BLM.

Clearly, tough decisions still lie ahead. The administration must achieve a delicate balance on all these issues to keep the price low and supply of gas steady, while not having too great an impact on the environment. We shall see within the next few years if the administration can achieve this balance.

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## AUSTRALIAN REGULATORY DEVELOPMENTS IN HYDRAULIC FRACTURING

John Ware

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### Introduction

Due to a decline in the availability of natural gas from conventional sources, the increasing demand for cleaner energy, Asian demand, and the advancement of technology, there has been a rapid increase in unconventional onshore gas exploration and production in Australia.

Coal seam gas (CSG) has led the way. CSG exploration and production have experienced exponential growth in recent years and are now well established as a source of domestic gas. From 2014, it will be exported as liquefied natural gas (LNG).

Conversely, shale gas exploration and production are still in their infancy in Australia. However, Australia has large shale gas resources and they are expected, in the longer term, to be an important part of its energy future.

Hydraulic fracturing, along with other technological advancements, such as horizontal drilling, have played an important part in unlocking these unconventional gas opportunities. The regulation of this activity, like the technology and unconventional gas industry itself, is evolving. This evolution has not been even or consistent across the various jurisdictions in Australia and is largely reflective of stakeholder concerns, both real and perceived.

### “Around the Grounds”: Setting the Regulatory Scene in the States and Territories

The primary environmental regulators for onshore petroleum in Australia are the individual states and territories.

Each of the states takes a different position on unconventional gas and, more specifically, the overseeing of hydraulic fracturing. Recent regulatory

developments have seen a move toward a more consistent approach, particularly in relation to CSG, but significant differences still remain.

### Victoria

Victoria does not have particularly large economically recoverable unconventional gas resources at this point in time.

It has taken a hard-line approach by putting a hold on all approvals for hydraulic fracturing activities associated with onshore gas exploration until a consistent approach is settled across a national framework and it has had time to consider and respond to this. The national framework for coal seam gas regulation has recently been settled and is considered later in this article.

The Victorian government has also banned the use of BTEX (benzene, toluene, ethylbenzene, and xylene) chemicals in hydraulic fracturing in Victoria.

### South Australia

By comparison, South Australia has significant shale gas resources in the Cooper Basin. It is ideally positioned to be the first state to develop a shale gas industry due to the infrastructure, which is already in place to serve the existing conventional gas reserves in that area.

South Australia permits hydraulic fracturing but regulates this through its usual environmental approval processes, namely the requirements for an approved statement of environmental objectives based on an environmental impact report.

Although only a policy document, South Australia has also developed a Roadmap, which includes a large number of recommendations to facilitate the efficient deployment of capital, technologies, and infrastructure for the development and export of unconventional petroleum gas and liquids from that state. Additionally, the Roadmap recommends areas of focus to ensure regulators have relevant and up-to-date capabilities

with management systems to identify risks associated with regulatory capture and environmental harm.

## Queensland

In Queensland, regulation of hydraulic fracturing has been much more active due to the majority of coal seam gas development occurring in this state, largely to feed three LNG export plants currently under construction on Curtis Island just off the Queensland coast near Gladstone. While most CSG wells do not need to be hydraulically fractured, the overall number of CSG wells being drilled and developed has led to an increase in hydraulic fracturing in Queensland, and with it, an increase in public concerns about the practice.

The primary regulation of hydraulic fracturing in Queensland has occurred through the existing approval structure. The *Environmental Protection Act 1994 (Qld)* requires the issuing of an environmental authority before petroleum activities, including CSG, can be undertaken. Conditions of these environmental authorities have been the major source of regulation of hydraulic fracturing across the state. Environmental authorities issued some time ago may have little prescriptive regulation of hydraulic fracturing while more recent environmental authorities impose quite detailed requirements. In particular, the more recent environmental authorities require:

- A detailed hydraulic fracturing risk assessment to be undertaken for each well prior to it being fractured
- Restrictions on hydraulic fracturing fluids containing BTEX and polycyclic aromatic hydrocarbons
- Prohibitions on negative impacts from hydraulic fracturing on groundwater other than within the target formation.

However, Queensland has also introduced some uniform regulations applying to all hydraulic fracturing activities.

The *Petroleum and Gas (Production and Safety) Regulation 2004* requires all petroleum tenure holders to disclose the details of any hydraulic fracturing to be undertaken and the composition of the hydraulic fracturing fluid to the Department of Environment and Heritage Protection and affected landowners and occupiers. This must be done by way of a notice before and after hydraulic fracturing has been carried out.

Also, on 20 September 2010, the Queensland government announced a “zero BTEX” requirement for all hydraulic fracturing fluids. However, the actual legislation to regulate BTEX (amendments to the *Environmental Protection Act 1994* and the *Environmental Protection Regulation 2008*) did not commence until July 2011. It prescribes BTEX limits for hydraulic fracturing fluids, which are related to drinking water standards.

## Western Australia

Western Australia has traditionally had a significant offshore gas industry through the development of the North West Shelf and the current Pluto and Gorgon developments. However, the development of a significant onshore gas industry is now a reality with the discovery and exploration of potentially significant unconventional resources on the Western Australian mainland.

As a result, the Western Australian Department of Mines and Petroleum commissioned a report from Dr. Tina Hunter entitled *Regulation of Shale, Coal Seam and Tight Gas Activities in Western Australia—Final, 2011*. It analysed the capacity of the existing Western Australian legislation to regulate onshore shale gas activities. The report indicated the existing framework was adequate for this purpose subject to a number of recommended changes. Most of these changes were then included in the *Petroleum and Geothermal Energy Resources (Environment) Regulations 2012 (WA)*.

These new regulations require the operator of a petroleum activity to submit an environmental plan for the minister’s approval, prior to any petroleum activity

being carried out, which must include an implementation strategy containing details of any chemical that may be used during hydraulic fracturing activities as well as drilling activities or otherwise introduced into the well. This must be submitted in summary form for public disclosure, although the summary must still include details of the chemicals.

Details of the requirements for environment plans and chemical disclosures are contained in the following policy documents:

- Environmental Assessment Processes for Petroleum Activities in Western Australia
- Petroleum Guidelines: Drilling Fluids Management
- Guidelines for the Preparation and Submission of an Environment Plan
- Information Sheet: Chemical and Other Substances Disclosure Details.

These documents are not legally binding but are indicative of the information required for an environmental plan to be approved. In relation to hydraulic fracturing fluids, the information sheet indicates that:

- The environmental plan must include full details of chemical ingredients of the fluid, and ecotoxicity information may be required as well
- The use of BTEX in “down hole” activities, including hydraulic fracturing, has been restricted by the Western Australian government although recognition is given to the fact that trace amounts of BTEX are present in all substances, including drinking water.

## **New South Wales**

Other than Queensland, New South Wales is the only other state in Australia, which currently has significant commercially recoverable CSG reserves.

The New South Wales government put in place a moratorium on hydraulic fracturing from April 2011 until September 2012. The moratorium was lifted with the introduction of the government’s strategic land use policy, which included two codes of practice:

- The Fracturing Stimulation Activities Code of Practice
- The Code of Practice for Well Integrity.

Both codes only apply to CSG.

The fracture stimulation activities code requires a title holder to prepare an approved fracture stimulation management plan (FSMP). This includes a requirement for a risk assessment to be carried out prior to each proposed hydraulic fracture. It also requires the disclosure of comprehensive details of all chemicals to be used in hydraulic fracturing activities. The FSMP is a public document that may be published on the government’s Web site.

New South Wales has also banned the use of BTEX in chemicals used in hydraulic fracturing.

## **Northern Territory**

The Northern Territory has potential shale gas resources, which are attracting increasing interest from gas exploration companies.

An application to conduct hydraulic fracturing must provide details on water management, use of chemicals in hydraulic fracturing, well integrity, and communication and reporting, which must be considered and approved before hydraulic fracturing can take place.

The Department of Mines and Energy is currently developing a guideline regarding disclosure of chemicals used in hydraulic fracturing.

## **Federal**

The federal government will generally only become involved in the environmental regulation of petroleum



projects through the need to approve any project, which is likely to have a significant impact on a matter of national environmental significance under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act). The matters of national environmental significance include:

- Listed threatened species and communities
- Listed migratory species
- Wetlands of international importance
- World Heritage properties
- National heritage places.

Conditions of a recent approval granted for such a project required details of hydraulic fracturing chemicals to be provided to, and approved by, the minister for environment and included in an annual report to be published on the proponent's Web site.

The federal government also regulates the manufacture and importation of industrial chemicals, including those used for hydraulic fracturing.

In response to public concerns regarding the CSG industry (and the coal mining industry), the federal government has moved to increase its involvement in the regulation of CSG (and coal mining), which includes associated hydraulic fracturing activities.

It has established the Independent Expert Scientific Committee on Coal Seam Gas and Coal Mining (IESC) to:

- Provide advice on CSG (and large coal mining) development proposals
- Oversee bioregional assessments in areas where CSG (or large coal mining developments) are under way or planned
- Oversee research on the water-related impact of CSG (or large coal mining developments).

The minister must obtain and consider advice from the IESC before deciding whether or not to approve a development proposal if the minister considers that the development is likely to have a significant impact on water resources and may have an adverse impact on a matter of national environmental significance.

Also, an amendment to the EPBC Act, which commenced on 22 June 2013, includes "water resources" as a new matter of national environmental significance for CSG (and large coal mining) projects under the EPBC Act. The amendment requires the impacts of "large coal mining" and "coal seam gas projects" on water resources to be assessed under the EPBC Act, in cases where those projects may not otherwise have required assessment or approval under the EPBC Act. The amendments enable the minister to impose water-specific conditions on large coal mining and coal seam gas projects.

On another front, the federal regulator of industrial chemicals, the National Industrial Chemicals Notification and Assessment System, is currently identifying and assessing the hydraulic fracturing chemicals used in Australia and how they are used. It has a program in place to prioritise the assessment of existing industrial chemicals in Australia, including certain hydraulic fracturing chemicals.

## **Harmonization of Coal Seam Gas Regulation**

Given the disparity in environmental regulation of unconventional gas across Australia, it is not surprising that efforts are being made to move to a more standardised approach. The Standard Committee on Energy and Resources (SCER) comprises the energy and resources ministers from each of the states and territories as well as the Commonwealth. In December 2011 the SCER announced it would develop a national harmonised framework for coal seam gas regulation. In May 2013 it endorsed the National Harmonised Regulatory Framework for Natural Gas from Coal Seams (the framework).

The framework is intended to be:

... a suite of leading practice principles, providing guidance to regulators in the management of natural gas from coal seams and ensuring regulatory regimes are robust, consistent and transparent across all Australian jurisdictions.

The four key areas covered by the framework are:

- Well integrity
- Water management and monitoring
- Hydraulic fracturing
- Chemical use.

The document is necessarily high level. It does not advocate the development of new, specific legislation and recognises that many states and territories already have relevant legislation and regulation in place. Rather, it encourages this existing legislation or regulation to be changed or adapted, if necessary, to be consistent with these leading practices. The extent to which this invitation is taken up by the states and territories is yet to be seen.

The framework also indicates that some of the leading practices may have applicability, and could be adopted for other oil and gas activities like shale and tight gas.

The framework is therefore a small step toward the harmonisation of regulation of the unconventional onshore gas activities across Australia. However, for the foreseeable future, the key regulation of these activities, including hydraulic fracturing, remains with the individual states and territories. Local environmental, social, geological, and political issues will most likely continue to shape the direction of these regulations.

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## UK AND EU POLICY AND REGULATORY DEVELOPMENTS RELATING TO SHALE GAS AND HYDRAULIC FRACTURING

Louise Moore and Kevin O'Connor

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### Introduction

The potential opportunity for the exploitation of shale gas in the United Kingdom (UK) is substantial. The U.S. government's Energy Information Administration has recently published a report analyzing global shale gas reserves, which estimates that the UK has technically recoverable reserves of 26 trillion cubic feet (tcf), equivalent to nine times the UK's current annual gas consumption. In 2010, the British Geological Survey estimated the UK's onshore shale recoverable reserves at just 5.3 tcf, but it is set to revise this figure substantially upward, having now estimated reserves in the north of England alone to amount to 11.3 tcf although it was unable to confirm how much might be recoverable. In May 2013, the Institute of Directors published a report suggesting that shale gas development could become a "new North Sea" contributing up to £4 billion a year to the UK economy and creating more than 70,000 jobs.

Despite this considerable promise, shale gas development has had a troubled start in the UK; hydraulic fracturing operations undertaken by Cuadrilla Resources in the Bowland Basin in Lancashire were suspended in 2011 after being linked to seismic activity. But political, scientific, and industry support has strengthened significantly since the UK government lifted its moratorium on hydraulic fracturing at the end of last year. Whilst a number of additional regulatory controls on hydraulic fracturing will be introduced, the government has proposed a number of significant tax and other incentives for the sector. But tensions with those opposed to hydraulic fracturing are beginning to become more apparent, with campaigners and local residents recently protesting and mounting road blockages against test drilling in Sussex just 40 miles south of London. Continuing industry optimism is, however, perhaps best reflected in Centrica's recent acquisition of a 25 percent interest in Cuadrilla's existing exploration licenses.

Meanwhile at a EU policy level, there is ongoing consideration as to the adequacy of existing regulation and the need for further shale specific regulation. Currently, there is no shale-specific UK or EU regulation, but existing oil and gas, planning, environmental, and safety regimes have provided the necessary framework for hydrocarbon exploration and production (onshore and offshore) for a considerable period.

This article considers these domestic and EU policy and regulatory developments, as well as the prominent role taken by industry itself in leading these developments. In particular, extensive guidelines for hydraulic fracturing issued earlier this year by the UK's Onshore Operators Group recommend additional precautions to those under current and proposed UK regulation in order to help grow public confidence in the protective measures the industry wants to implement.

## UK Policy Developments

Recent UK policy has been heavily influenced by links between the exploratory hydraulic fracturing undertaken by Cuadrilla and two earth tremors in 2011, and subsequent scientific investigations. An independent study commissioned by the government concluded in April 2012 that the seismic activity had in all likelihood been caused by hydraulic fracturing, but the risk posed by tremors was low and the scale of such tremors would not cause significant property damage, even though they might cause public alarm.

A further report by the Royal Society and Royal Academy of Engineering in June 2012 concluded that the health, safety, and environmental risks associated with the technique could be effectively managed. In response to these reports and the emerging scientific consensus, the UK government announced in December 2012 that exploratory hydraulic fracturing for shale gas would be allowed to resume subject to additional regulatory controls. The Secretary of State for Energy and Climate Change, Ed Davey, said:

So far as the UK is concerned . . . the industry has a good record, and . . . there are already in place

robust regulatory controls on all oil and gas activities . . . I believe the existing regulatory framework already provides the means to ensure that the industry does apply good practice throughout its operations; and that it will do so consistently. But we are taking further steps to reinforce the regime.

## Existing and Proposed UK Regulation

Shale gas operations are already regulated under a number of different UK regulatory regimes applicable to oil and gas operations generally. Under existing UK regulations, shale gas operators are required to obtain a number of regulatory approvals including:

- Planning permission from the local minerals planning authority for onshore surface operations
- An onshore or offshore petroleum exploration and development licence from the secretary of state
- Environmental permits issued by the Environment Agency, Environmental Resources Wales, or the Scottish Environmental Protection Agency for onshore activities, or by the secretary of state for offshore activities, covering water abstraction, management of radioactive substances, and wastes.

The existing regulatory framework will in most cases require operators to carry out and submit to the appropriate regulator environmental impact assessments and other environmental and safety appraisals. Operators will also need to engage with statutory consultees such as Natural England, Countryside Council for Wales, and the Health Protection Agency. The development and operation of exploratory and production boreholes and wells are also covered by extensive regulations applicable to onshore and offshore oil and gas developments generally.

When it lifted the moratorium on hydraulic fracturing, the government announced that exploratory drilling

would be subject to new controls including requirements to:

- Assess the seismic risk and the existence of faults before exploratory hydraulic fracturing begins
- Submit a hydraulic fracturing plan showing how seismic risks will be managed
- Monitor seismic activity before, during, and after hydraulic fracturing
- Implement a new “traffic light” system categorising seismic activity and setting out appropriate responses, including a trigger mechanism to stop hydraulic fracturing operations in some circumstances.

Licensees will also be required to carry out a comprehensive high-level assessment of environmental risks, including risks to human health, covering the full cycle of the proposed operations, including well abandonment. This is in addition to any environmental impact assessment carried out as part of the planning process or assessments carried out as part of the environmental permitting process. Cuadrilla has confirmed that it will undertake a full environmental impact assessment for all its exploration activities in the UK even if not required by law. In July 2012, the government released technical guidance to clarify how the planning regime applies to shale gas exploration and addresses whether operators need to provide environmental impact assessments, how planning authorities will interact with other regulators, and site restoration requirements. The Environment Agency has recently warned that public consultation requirements may be so significant that it could take up to six months to secure approvals, which seems to contradict commitments from central government to streamline the process. Knowledge of the detailed requirements of existing and proposed regulatory requirements and proper community engagement processes will reduce the risk of successful legal challenges to future UK projects.

The flaring of unwanted gas is currently regulated through conditions in onshore and offshore exploration

and development licenses, but there have been concerns over the likely level of flaring from shale gas developments and consequent air emissions (particularly carbon dioxide), particularly during the exploration phase when the capture of gas for use as fuel is not viable. The government’s policy is to eliminate all unnecessary or wasteful flaring of gas, but there is no general prohibition as there is in certain jurisdictions. In December 2012, a parliamentary select committee recommended that the Environment Agency should be given new powers to prohibit the flaring of gas onshore for any extended period of time.

## **UK Incentives for Industry and Communities**

In the 2013 UK budget, the government announced that it would introduce a new field allowance similar to that for North Sea fields. The government is currently consulting on the detail of the pad allowances (“pad” being the term used to describe the drilling and extraction site), which would reduce the effective tax rate on shale gas production from 62 percent to 30 percent of income based on current tax rates.

The budget also proposed extending the ring fence expenditure supplement from six to ten years meaning that expenditure on shale gas projects could benefit from an uplift for tax calculation purposes of up to 259 percent of the original expenditure. The government is also currently consulting on this measure with legislation expected to be introduced in 2014.

The budget included an announcement that proposals will be released in the summer for incentives for local communities to support exploration and production. In June, the government proposed that licensees would be required to provide a package of benefits including £100,000 per well site at the exploration stage and 1 percent of revenues once production begins, and a community engagement charter setting out commitments for open consultation at all stages.

## **Industry Developments**

In February 2013, industry guidelines for hydraulic fracturing were released by the UK’s Onshore Operators Group (UKOOG) to clarify operational risk

management steps, in particular when high volume hydraulic fracturing is being carried out. In addition to particular operational risk management steps, the guidelines recommend specific ways to promote increased public confidence, awareness, and understanding. These include early stakeholder engagement and the public disclosure of hydraulic fracturing fluid composition. The guidelines were developed with input from key regulators and recognize that best practice will continue to evolve. Key aspects of the guidelines include:

- **Groundwater isolation:** Operators should ensure groundwater is adequately isolated through well design, which incorporates adequate cement design and casing depth, and which takes into account the risk of deformation due to seismic activity. Groundwater quality and well integrity should be monitored throughout operations, and decommissioning plans for the well should be prepared at the well planning stage.
- **Fracture containment:** Operators should develop a hydraulic fracturing programme describing the control and mitigation measures to ensure the integrity of the well bore during fracturing operations and to address any potential induced seismicity, taking into account local geology, aquifers, and well features.
- **Monitoring seismic activity:** Site-specific surveys should be carried out prior to hydraulic fracturing and seismic activity monitored throughout operations in accordance with seismicity risk assessment and mitigation measures. A traffic light system similar to that proposed by the UK government categorising seismic activity and setting out appropriate responses should also be implemented. This system should be triggered by smaller induced seismic events, which may be an indication of, or precursor to, a larger induced seismic event.
- **Hydraulic fracturing fluids:** Water usage should be carefully monitored, and water from flow-back fluids reused where practicable.

Operators should collaborate on the development of best practices in this area, particularly with a view to the development of hydraulic fracturing fluids and additives with the least environmental risks.

When announcing the guidelines, UKOOG noted that they were part of a wider bid to reassure the public about the safety of hydraulic fracturing. The government has already emphasized the need for early engagement with local communities. The guidelines provide that this should begin in advance of operations, and where possible before any application for planning permission, and involve a broader engagement with stakeholders than is required by the current planning process.

The guidelines exhort operators to publicly disclose (through UKOOG's Web site) all chemical additives to hydraulic fracturing fluids on a well-by-well basis, as well as regulatory authorizations for hydraulic fracturing fluids and whether or not they are hazardous, chemical safety data and maximum concentrations and volumes, and the reason for using those additives in the fracturing process. The guidelines also provide for the collection, and availability for public disclosure, of information relating to water supply and use, flow-back water storage and disposal methods, geology, well fracturing design, induced seismicity levels, and also for post-fracturing reports produced by the operator. They also recommend disclosing volumes of shale gas recovered and the associated emissions.

In some areas the guidelines also recommend additional new precautions. For example usual practice for independent oil and gas well examination is for an examiner to use primarily documentary evidence, whereas UKOOG recommends that operators should arrange for the well examiner to carry out on-site inspection during certain well integrity and hydraulic fracturing operations and especially during the early stages of a development.

## **EU Policy and Regulatory Review**

A number of EU measures already in place will apply to shale gas as they do to onshore conventional gas

operations, including the Environmental Impact Assessment Directive, the Water Framework Directive, and the Waste Framework and Mining Waste Directives. The European Commission's 2011 preliminary assessment of the application of the existing EU environmental legislative framework to shale gas practice concluded that such measures already covered the entire shale gas extraction life cycle from planning to cessation.

Nonetheless, the commission is now consulting on an assessment framework for unconventional gas production, which considers the adequacy of existing legislation and whether it needs to be clarified, adapted, or complemented by new measures to manage specific environmental risks. An announcement on the need for a specific risk management framework for EU shale gas developments (and, if so, what form it should take) is expected later this year.

The commission is keen to diversify energy resources but is careful to acknowledge the restrictions on its competence with regard to member states' choice of energy sources and mix. However, this is subject to compliance with the requirements of the EU constitutional treaties to ensure a high level of protection for human health and the environment. In this context, the commission has justified its close monitoring of developments throughout the EU and is considering whether there is adequate EU-wide protection in place.

The areas of existing EU legislation that apply to shale gas extraction (and that are likely to be the focus of scrutiny and possibly revision) include:

- **Environmental Impact Assessment:** The EIA Directive currently requires operators of natural gas extraction projects producing 500,000 cubic metres or more per day to undertake an EIA. Member state authorities must also decide whether certain other projects should undertake an EIA, including natural gas projects involving extraction of volumes below 500,000 cubic metres but involving surface infrastructure or deep drilling (or where surface storage of the extracted gas is included). The EU is currently considering

reforms to the EIA Directive (including requirements to consider underground extensions of projects, which may catch shale gas developments), and some members of the European Parliament have called for EIAs to be mandatory for all activities at both the exploration and extraction stages.

- **Water Framework Directive:** The Water Framework Directive requires member states to prohibit the release of pollutants directly into groundwater. As hydraulic fracturing fluids are injected into shale formations below the water table, this should not occur during operations (absent a rupture in the well casing) but it may be an issue with respect to disposal of flow-back water. A specific exception to the ban exists allowing member states to authorise reinjection into groundwater of water containing substances resulting from operations for exploration and extraction of hydrocarbons or mining activities. The EU Commission has indicated that it does not consider that this applies to flow-back waters but it may yet clarify this in legislation, whilst the industry is of the view that the prohibition in the directive is not applicable in the first instance because hydraulic fracturing involves no intentional direct release into groundwater. Chemicals used in the hydraulic fracturing process are also regulated and risk assessed under the EU's existing Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) chemicals regime.
- **Waste:** The application of the various components of the existing EU waste regime to shale gas is relatively straightforward (apart perhaps from in relation to reinjection of hydraulic fracturing fluids in disposal wells, should that be considered a desirable disposal route). The Mining Waste Directive already applies to wastes that result directly from prospecting, extraction, treatment, and storage of mineral resources, e.g., not domestic waste from staff facilities, and requires that certain environmental protection measures apply to mining waste facilities. The small scale of

facility associated with individual shale gas drilling sites means that the more onerous provisions of the Mining Waste Directive with regard to emergency planning and preparedness applicable to large waste facilities are thought unlikely to apply. But if the Mining Waste Directive does not apply to wastes generated from hydraulic fracturing, then the Waste Framework Directive should still apply.

- Major accident prevention: Under the Extractive Industries Directive, shale gas operators need to have in place an approved “safety case” document covering their management of potential impacts on workers. The Hydrocarbons Licensing Directive also requires that member states’ hydrocarbons licensing authorities assess applicants’ technical capacity. The Seveso Directive on control of major accident hazards does not apply to the activities of the extractive industries concerned with exploration for, and the exploitation of, minerals in mines and quarries or by means of boreholes.
- Soil contamination: EU environmental law does not currently impose liability for remediation of soil contamination unless it poses a risk of significant harm to human health by reason of environmental damage to land under the Environmental Liability Directive (although many national regimes are more stringent). The prospect of a EU Soil Directive is receiving renewed attention in Brussels and if ever adopted may serve to supplement existing domestic regimes. Obligations to remediate significant pollution to soil and groundwater may arise on site closure if shale gas facilities fall within, for example, the waste management activities listed in the Industrial Emissions Directive, which require an integrated pollution permit.
- Fugitive emissions: The potential for uncontrolled losses of natural gas (methane) into the atmosphere is controversial—particularly in view of the wider climate change

debate concerning shale gas hydraulic fracturing. Carbon emissions may be controlled via integrated permits issued under the Industrial Emissions Directive, but small-scale gas extraction is not obviously included in the categories of industrial operation that are required to hold such a permit. For similar reasons, shale gas facilities will not always be covered by the requirement to hold and surrender emissions allowances under the EU’s carbon emissions trading regime. However, the commission’s Climate Change Committee recently issued a draft decision that would require member states to limit greenhouse gas emissions falling outside that scheme, and it is therefore possible that shale gas operations will be made subject to other controls at the EU or national level.

The outcomes of the commission’s assessment of the need for further measures, whether mandatory or voluntary, are keenly awaited as member states continue to deliberate on their position. Although clarity can help operators determine their obligations and liability better, any especially onerous proposals are likely to meet opposition from industry and those member states that are keen to exploit their shale gas. In Poland, some shale gas operators have exited the country, citing regulatory uncertainty. Others have formally opposed new legislation that they consider unfit for the cited purpose and which would allow the government to claim capital stakes and participate in decision making in production concessions. In any event, the controversial nature of the issues and the polarized political landscape will make it challenging to obtain agreement between opponents and proponents on new EU legislation, and litigation and other legal challenges to hydraulic fracturing will no doubt continue.

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- **Janet McCabe**, Acting Assistant Administrator for the Office of Air and Radiation at EPA, who is the point person on the Agency’s latest rulemakings and court challenges under the Clean Air Act;
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