Newfoundland & Labrador Basis for Development of Guidance Related to Hydraulic Fracturing: Part 1

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Introduction and Overview

This is the first of a trilogy of papers which have been prepared to address hydraulic fracturing regulation in the context of Newfoundland & Labrador (NL). This paper, Part One of the trilogy, will provide a high level overview of NL's regulatory framework, legislation and regulations, and the scope and authority the Departments of Natural Resources and Environment and Conservation have to implement supplementary regulatory instruments to achieve their regulatory goals respecting hydraulic fracturing. It will also address some of the regulatory challenges posed by hydraulic fracturing and suggest some goals to be considered in the regulation of hydraulic fracturing.

Part Two, the next paper in the trilogy will outline and discuss a number of examples of regulatory approaches used in Canadian jurisdictions to address these regulatory challenges and meet these regulatory goals respecting hydraulic fracturing.

Part Three, the final paper, will be in the form of draft Guidelines that will supplement existing NL legislation and will specifically address potential onshore, including onshore to offshore, hydraulic fracturing operations in NL. Part Three, the most extensive of the trilogy, will provide greater clarity to NL's existing legislative and regulatory framework and seek to ensure that any hydraulic fracturing operations in NL's onshore can be conducted safely, while protecting the environment and meeting resource conservation goals.

The overall goals of these papers are:

- to prepare a guidance document respecting regulatory requirements that can be utilized by a proponent in preparing applications to obtain approvals for oil and gas activities involving hydraulic fracturing operations, and
- to develop a guidance document to be utilized by Ministers and officials in the NL Departments of Natural Resources and Environment and Conservation to assess an application involving hydraulic fracturing operations.

Hydraulic fracturing is just a single component of the entire spectrum of petroleum development activity but it is perceived by the public as among the most controversial. Therefore, this paper will examine government regulatory frameworks that would apply both from the perspective of a proponent in preparing an application and the government in assessing an application involving hydraulic fracturing.

Because of these wide-ranging implications, the regulation of hydraulic fracturing operations can be both:

- inter-departmental – with different departments having jurisdiction over various aspects of hydraulic fracturing operations; and
- cross-jurisdictional – with the use of onshore to offshore drilling, the C-NLOPB regulations would also apply and need to be considered in this assessment. This involves another level of government and a separate independent regulatory board.

Even with the involvement of other departments and the C-NLOPB in the review of hydraulic fracturing applications, the Department of Natural Resources will play a major role as coordinator as well as a major regulator in its own right.

Background

The recent shale gas boom in the USA has had an enormous effect on North American gas markets and prices. This boom was made possible by the application of hydraulic fracturing technology to extremely low permeability reservoirs that were previously not economically viable to develop. Hydraulic fracturing can be defined as "the process of altering reservoir rock to increase the flow of oil or natural gas to the wellbore by fracturing the formation surrounding the wellbore and placing sand or other granular material in those fractures to prop them open"[1]. Applying hydraulic fracturing to light tight oil reservoirs has also been the largest factor in increasing US oil production from a 2008 average of 5 mmb/d to over 7 mmb/d in January 2013[2], resulting in a commensurate reduction in US imports. Canada also has shale gas and light tight oil reservoirs and this has led to increasing use of hydraulic fracturing in Canada. "Recent studies estimate that up to 95% of natural gas wells drilled in the next decade will require hydraulic fracturing. In fact, it is so important that without it, North America would lose an estimated 45% of natural gas production and 17% of oil production within five years"[3]. Currently, two thirds of all natural gas produced in British Columbia (about 2 BCFD) comes from hydraulically fractured shale gas[4].

In June 2013, a US Department of Energy report[5] on technically recoverable shale oil and shale gas resources found that shale oil resources had increased the size of US oil reserves (proven and unproven) by 25%, with shale oil now representing 26% of the total US oil resource, whereas shale gas had increased US gas reserves (proven and unproven) by 38%, to represent 27% of the total US gas resource. Globally, the report stated that tight oil resources, predominantly in shale reservoirs, add approximately 11% to the 3,012 billion barrels of proved and unproved technically recoverable nonshale oil resources identified in recent assessments. The shale gas resources assessed in the report add approximately 47% to the 15,583 tcf of proved and unproven nonshale technically recoverable natural gas resources. Globally, 32% of the estimated total technically recoverable natural gas resources are in shale formations, and 10% of estimated total technically recoverable oil resources are in shale or tight formations.

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[1] *The Modern Practices of Hydraulic Fracturing: A Focus on Canadian Resources*, http://www.ptac.org/projects/142 (referred to hereafter as PTAC), page 8.

[2] http://www.eia.gov/dnav/pet/pet_crd_crpdn_adc_mbbl_m.htm.

[3] PTAC, page 1.

[4] Ken Paulson, Chief Operating Officer, BC OGC, at the NEB Safety Forum, June, 2013.

[5] http://www.eia.gov/analysis/studies/worldshalegas/.

The resource is enormous, and generally involves use of hydraulic fracturing in its recovery. Public concerns associated with hydraulic fracturing include the consumption of fresh water; treatment, recycling, and disposal of produced water; disclosure of chemical additives to fracture fluids; onsite storage and handling of chemicals and wastes; potential groundwater and surface water contamination; air emissions/air pollution; induced seismicity; and increased community impacts such as noise, traffic and drilling "footprints". Perhaps the largest single public concern regarding hydraulic fracturing relates to potential for contamination of groundwater.

While the environmental risks associated with properly regulated and properly conducted hydraulic fracturing operations are small, attention of environmentalists and the popular media have resulted in these risks developing a very high public profile, to the point that use of hydraulic fracturing is prohibited in some jurisdictions, and increasingly tightly regulated in many other jurisdictions. Regardless of the level and basis for public concerns, the risks associated with use of hydraulic fracturing must be reduced and mitigated through the use of sound engineering and mitigation practices that occur as a result of regulatory requirements, guidelines and best management practices.

The level of public concern regarding hydraulic fracturing has placed pressure on regulators to respond, both to ensure their regulations and regulatory approaches are capable of dealing with the issues arising from hydraulic fracturing and to demonstrate to the public that this is the case.

NL Legislation Pertaining to Petroleum Activity

Regulatory Provisions Relevant to Hydraulic Fracturing

The term "hydraulic fracturing" is not explicitly used in the NL petroleum or environmental legislative framework. NL is not alone in this regard; the term hydraulic fracturing is not explicitly used in the legislative frameworks that regulate oil and gas activities in Alberta, BC, Canada's frontier lands or Canada's offshore lands. However, as with these other jurisdictions, there are many provisions in the NL legislative framework that are relevant to the regulation of hydraulic fracturing operations.

NL's *Petroleum and Natural Gas Act* (PNGA) is largely focused on tenure and royalty. It does not address the conduct of petroleum activities very specifically or extensively except to give broad regulation making powers to the Lieutenant-Governor in Council. The Act gives the Lieutenant-Governor in Council ample authority and ample scope to make regulations which address the full range of exploration and production activities, including hydraulic fracturing.

The *Petroleum Regulations* (PR) require the approval of a development plan before a lease can be granted and before production of oil or gas can commence. If hydraulic fracturing is to be used on oil or gas production, the approval of the development plan by the Minister under the PR will provide for the implications of potential hydraulic fracturing operations to be examined, and for the Minister to address these implications on his approval of the development plan, and any terms and conditions he may attach to that approval.

There are number of areas under the *Drilling Regulations* (DR) where the implications of potential hydraulic fracturing operations may be addressed, including:

- approval of a drilling program, which must, among other things, include a description of the anticipated effect the proposed drilling program will have on the environment,
- an operator's duty to have plans formulated and equipment available to cope with any foreseeable emergency situation during a drilling program,
- an authority to drill a well, which requires, among other things, a well prognosis and a geological prognosis of the well, and
- approval of a program for terminating a well, where terminating is defined to include completing, and hydraulic fracturing is a well completion technique.

Although none of the NL environmental legislation explicitly address hydraulic fracturing either, there are many provisions that indirectly relate to and are applicable to hydraulic fracturing. The environmental legislation that is particularly relevant includes:

- the *Environmental Protection Act* which contains many provisions applicable to hydraulic fracturing and addresses such topics as release of contaminants, water disposal, air quality and environmental assessments;
- the *Environmental Assessment Regulations* which set out procedures for conducting environmental assessments and hearings, for project screening and designates undertakings that are subject to environmental assessments;
- the *Water Resources Act* which allocates water rights and protection of water, and addresses considerations such as water testing, water well drilling and licensing and permitting; and
- the *Environmental Control Water and Sewage Regulations* which set standards for sewage discharge and analysis, monitoring and sampling and also set the maximum permissible levels of various chemicals and pollutants.

The legislative authorities to regulate hydraulic fracturing, briefly referred to above, are addressed more completely in the third paper of this trilogy, and key legislative provisions that relate to aspects of hydraulic fracturing are explicitly referenced in that paper.

Key Challenges of Hydraulic Fracturing

The biggest public concern respecting hydraulic fracturing appears to revolve around the risk of water contamination, especially groundwater. Consequently, a key desired outcome and focus for the regulator will be prevention of any contamination of water, in order to protect water quality and to allay public concerns.

The Alberta Energy Regulator has identified the following key challenges that need to be addressed respecting unconventional oil and gas recovery[6]. These challenges are applicable to NL as well in the

[6] See http://www.aer.ca/documents/projects/URF/URF_DiscussionPaper_20121217.pdf.

recovery of its unconventional oil and gas, and to hydraulic fracturing which is commonly used in that recovery:

- *Water management:* protecting and efficiently using water resources.
- *Surface infrastructure development:* minimizing surface infrastructure development and associated impacts such as footprint, linear disturbances, vehicle traffic, dust, emissions, odors and noise.
- *Subsurface reservoir management:* maximizing short- and long-term resource recovery, including early identification of enhanced recovery opportunities.
- *Stakeholder engagement:* involving the local community and other stakeholders throughout the full life cycle of the project, from early in the play development through to abandonment, to determine which issues are of particular concern and how they might be addressed.
- *Life-cycle wellbore integrity:* ensuring wells are drilled, completed, stimulated, produced, suspended and abandoned in a manner that assures wellbore integrity, considering the risks imposed by the unique reservoir characteristics of the play and the technologies being employed.

These key challenges must be addressed by any regulatory regime designed to apply to unconventional oil and gas recovery and to use of hydraulic fracturing in that recovery.

Regulatory Goals Respecting Hydraulic Fracturing

In May of 2012, the International Energy Agency published "*The Golden Rules for a Golden Age of Gas*"[7], a special report on unconventional gas which includes an in-depth analysis of hydraulic fracturing and the procedures used in and associated environmental concerns with hydraulic fracturing process. Its "Golden Rules" can serve as principles to assist policymakers, regulators, operators and others in addressing the environmental, social and resource conservation challenges associated with hydraulic fracturing. The goal of these Golden Rules is to achieve a level of environmental performance and public acceptance that can earn the industry a "social licence to operate" within a given jurisdiction. They provide a good set of goals for NL to consider as it develops regulations, guidelines or best management practices (BMPs) respecting hydraulic fracturing, and these Golden Rules are presented below in their entirety.[8]

Measure, disclose and engage

- *Integrate engagement with local communities, residents and other stakeholders into each phase of a development starting prior to exploration; provide sufficient opportunity for comment on plans, operations and performance; listen to concerns and respond appropriately and promptly.*
- *Establish baselines for key environmental indicators, such as groundwater quality, prior to commencing activity, with continued monitoring during operations.*

[7] http://www.iea.org/publications/freepublications/publication/WEO2012_GoldenRulesReport-1.pdf.

[8] ibid. Pages 13-14.

- *Measure and disclose operational data on water use, on the volumes and characteristics of waste water and on methane and other air emissions, alongside full, mandatory disclosure of fracturing fluid additives and volumes.*
- *Minimise disruption during operations, taking a broad view of social and environmental responsibilities, and ensure that economic benefits are also felt by local communities.*

Watch where you drill

- *Choose well sites so as to minimise impacts on the local community, heritage, existing land use, individual livelihoods and ecology.*
- *Properly survey the geology of the area to make smart decisions about where to drill and where to hydraulically fracture: assess the risk that deep faults or other geological features could generate earthquakes or permit fluids to pass between geological strata.*
- *Monitor to ensure that hydraulic fractures do not extend beyond the gas producing formations.*

Isolate wells and prevent leaks

- *Put in place robust rules on well design, construction, cementing and integrity testing as part of a general performance standard that gas bearing formations must be completely isolated from other strata penetrated by the well, in particular freshwater aquifers.*
- *Consider appropriate minimum-depth limitations on hydraulic fracturing to underpin public confidence that this operation takes place only well away from the water table.*
- *Take action to prevent and contain surface spills and leaks from wells, and to ensure that any waste fluids and solids are disposed of properly.*

Treat water responsibly

- *Reduce freshwater use by improving operational efficiency; reuse or recycle, wherever practicable, to reduce the burden on local water resources.*
- *Store and dispose of produced and waste water safely.*
- *Minimise use of chemical additives and promote the development and use of more environmentally benign alternatives.*

Eliminate venting, minimise flaring and other emissions

- *Target zero venting and minimal flaring of natural gas during well completion and seek to reduce fugitive and vented greenhouse-gas emissions during the entire productive life of a well.*
- *Minimise air pollution from vehicles, drilling rig engines, pump engines and compressors.*

Be ready to think big

- *Seek opportunities for realising the economies of scale and co-ordinated development of local infrastructure that can reduce environmental impacts.*
- *Take into account the cumulative and regional effects of multiple drilling, production and delivery activities on the environment, notably on water use and disposal, land use, air quality, traffic and noise.*

Ensure a consistently high level of environmental performance

- *Ensure that anticipated levels of unconventional gas output are matched by commensurate resources and political backing for robust regulatory regimes at the appropriate levels, sufficient permitting and compliance staff, and reliable public information.*
- *Find an appropriate balance in policy-making between prescriptive regulation and performance-based regulation in order to guarantee high operational standards while also promoting innovation and technological improvement.*
- *Ensure that emergency response plans are robust and match the scale of risk.*
- *Pursue continuous improvement of regulations and operating practices.*
- *Recognise the case for independent evaluation and verification of environmental performance.*

These broad and encompassing goals need to be addressed by each jurisdiction where hydraulic fracturing is occurring or may occur.