



# Shaping the future of hydraulic fracturing in the Canadian Arctic through environmental guidelines

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## Outline

- Focus on legislative framework applying to shale gas development on indigenous lands in the Canadian Arctic (north of 60 degrees latitude)
- The role of the federal regulator, the Canadian National Energy Board in these projects
- Do the guidelines address the concerns raised over shale gas development?
- Do the guidelines exceed the best practices adopted by the Canadian shale gas industry?
- The role of environmental impact assessment and public consultation



# Northwest Territories and Nunavut

- No specific territorial legislation applying to shale gas development on indigenous lands in the Canadian Arctic exist
- Under the *Constitution Act* 1985, the federal government regulates oil and gas activities in the northernmost territories (Yukon, Nunavut and Northwest Territories)
- Because much of natural gas deposits in the Arctic are 'new', the governance systems develop as necessary
- Thus, regulators are in a position to institute appropriate measures to avoid/reduce negative impacts on the environment and the public



## Current situation

- Following the release of the 2011 Arctic Offshore Drilling Review, the Board made strengthening the regulatory framework in the Canadian Arctic its strategic priority
- As a part of its mandate under the *Canada Oil and Gas Operations Act* 1985 the Board has developed guidelines which clarify licence requirements for operations involving hydraulic fracturing in Nunavut and Inuvialuit Settlement Region
- In essence, these guidelines outline the Board's needs to assess any future applications in these regions



## Guidelines

- The guidelines address many of the concerns raised by Arctic residents, including fresh water contamination; air quality impacts; induced seismicity and reluctance of industry to disclose chemicals used in hydraulic fracturing
- Rather encouragingly, the Board has recognised that eg groundwater monitoring is a key element of a robust regulatory system
- Notably, the Board also recognises that environmental factors during winter operations (extreme temperatures, limited daylight, and remoteness of the operations) could potentially affect the proposed work or activities
- Thus, operators must describe at the application stage how these factors are likely impact their operations



## Flexibility of guidelines

- The guidelines outline the type of information that must be included in all applications for an operational permit
- No binding effect on the Board. It may thus request additional information to be submitted with each individual application for an approval (eg a well approval, formation flow test approval)
- Similarly the Board may waive certain requirements – if irrelevant to the applied-for activities
- Should be read in association with the *Canada Oil and Gas Operations Act* 1985 and its regulations, particularly the *Canada Oil and Gas Drilling and Production Regulations* 2009 and any related guidelines issued by the Board



## Scientific uncertainty

- The Board recognises that since the scientific knowledge over hydraulic fracturing is evolving, applications must incorporate issues requiring further research
- Applications for operations permit to the Board must include an environmental protection plan which must describe any knowledge gaps regarding the environmental setting of the work or activities and how these gaps will be addressed
- It must also describe how results of ongoing research will be incorporated into the proposed work/activities



## Monitoring and reporting

- Active monitoring and compulsory reporting can be argued to form an essential part of an environmentally sound regulatory system
- Have potentially prevented the occurrence of any large scale environmental accidents, eg in British Columbia where there are no reported incidents of fresh water contamination as a result of shale gas operations
- Even though a link has been identified between the chemicals used in fracturing fluids and groundwater contamination, the exact causes of contamination are uncertain (see eg the Council of Canadian Academies 2014 report)





## Concern: water contamination

- The Canadian report nevertheless identified well-integrity and the prevention of fluid and gas migration as critical for the protection of the environment
- Therefore, guidelines put a lot emphasis on well construction requirements (cementing and steel casing)
- Unlike in many other Canadian provinces, the NEB guidelines highlight the importance of groundwater monitoring and sampling program
- When applying for operations permit the applicant must describe how their groundwater monitoring and sampling program will detect any contamination from hydraulic fracturing operations
- Such programs have also been identified as central in sustainable water management and use practices in relation to hydraulic fracturing (may require a lot of water)



## Adverse impact on water

- Further, adverse impacts of hydraulic fracturing on increased groundwater use have been addressed by the requirement that an operator's Environmental Protection Plan must identify the volumes of water that are likely to be:
  - recycled
  - reused as fracture fluids
  - transported out of the region for disposal and/or
  - disposed by deep well injection



# Well construction requirements

- Surface casing must be designed to protect groundwater zones and permafrost from drilling and hydraulic fracturing (isolation from shale formations and saline water zones)
- Casing program must provide wellbore integrity, particularly in the void between any piping, tubing or casing (casing annuli)
- After operations are ceased well abandonment has been identified to cause environmental problems. Therefore, the application must demonstrate that an abandoned well satisfies the requirements of the federal *Drilling and Production Regulations* 2009 and meets or exceeds industry best practices
- Additionally, effective well barriers (to prevent groundwater contamination from reservoir fluids) must be in place for abandoned wells



## Concern: impact on air quality

- Unfortunately, there are no ambiguous/specific commitments to cut air emissions
- Shale gas operators must provide an air quality assurance plan that describes how they will assess, protect and *monitor* air quality from impacts resulting from planned and unintentional/unauthorised discharges and how the environmental impacts from air emissions are to be minimised.
- This is really problematic feature of the guidelines because hydraulic fracturing operations are considered to have an adverse impact on air quality due to significant fugitive methane emissions and direct carbon dioxide (CO<sub>2</sub>) emissions
- Voluntary commitments and non-binding guidelines are unlikely to solve this problem
- Strict regulatory targets and environmental taxes may be necessary to ensure compliance



## Concern: induced seismicity

- Operators must demonstrate that the best available technology and industry best practices have been considered (not yet legislation in the area)
- Applicants must also provide an interpretation of all faults, especially those potentially connecting shale gas formations and groundwater zones
- Applicants must describe how potential seismic events are monitored during drilling, completions, hydraulic fracturing and formation flow testing operations and provide the Board with a reporting plan and a safety termination plan in case of seismic events
- The requirements for monitoring, reporting and a safety termination plan are essential feature of an effective regulatory system and the Board must be applauded for taking such a rigorous approach towards induced seismicity



## Concern: disclosure of chemicals

- Rather surprisingly, operators are not required to make public the chemicals used in the hydraulic fracture fluids
- Guidelines merely state that an operator must indicate in their application whether they are ‘willing to publically disclose the chemicals used in the hydraulic fracture fluids’
- Regrettably, this is unlikely to make operators disclose their fluid ingredients, whereas there is need for transparency to balance various competing interests of the shale gas industry and social and environmental concerns raised by the public



## Priorities of NEB

- The Board's guidelines further stipulate that the operator's environmental protection plan must describe:
  - i. species sensitive to potential spills or air emissions;
  - ii. how any heritage resources, protected areas & species (eg boreal caribou) are addressed in the proposed activities;
  - iii. identify the sources of fresh and saline water and volumes required and
  - iv. provide an assessment of impacts to the environment and to area residents and communities
- Because of water contamination poses one of the greatest tangible risks to the environment, the effective management of fracturing fluids and waste waters is critical
- Despite their low inclusion rate (0.5–2% of fracturing fluids), the absolute volume of chemicals deployed is likely to be high, given the large volumes of fracturing fluids used



# Environmental impact assessment

- As part of its environmental protection responsibilities, the Board ensures that an environmental impact assessment is conducted for proposed hydraulic fracturing activities in Nunavut and the Inuvialuit Settlement Region before an authorisation under the *Canada Oil and Gas Operations Act* 1985 is issued
- The Board conducts its own environmental impact assessment and may coordinate environmental impact assessments with the territorial boards and committees established by the 1984 Inuvialuit Final Agreement and the 1993 Nunavut Land Claims Agreement





# Environmental impact assessment

- Typically, during the Inuvialuit EIA process includes an extensive consultation (ensures identification of local perspectives and issues)
- The 1984 Inuvialuit Final Agreement addresses the prevention of loss or damage to wildlife and habitat and subsequent compensation (if there is loss of harvesting opportunities)
- The Inuvialuit Final Agreement also requires the Board to wait for a decision by the regional environmental processes before issuing a regulatory authorisation
- The Board considers the regional recommendations before it makes a decision, on the basis of environmental impact considerations, whether or not the activities should proceed and, if so, on what terms and conditions, including mitigative measures



## Conclusions

- The scientific knowledge is increasing and must be taken into account
- Environmental impact assessment is necessary for all projects involving hydraulic fracturing (needed for the environmental protection plan)
- Although there is an extensive consultation with the Inuit, the Board has the final say in whether hydraulic fracturing should proceed in the Canadian Arctic (the former may only make recommendations – despite owning their lands in fee simple – Subsurface rights are retained by the federal government)
- Although the guidelines can be argued to exceed industry best practices in some areas, they only partially address the concerns raised by Inuit (and similar concerns raised elsewhere In Canada)