



National Energy  
Board

Office national  
de l'énergie



# **Risks and Prevention Drilling Operations Involving Hydraulic Fracturing**

**National Energy Board**

**1 February 2014**



# Outline

- 1) Hydraulic Fracturing**
- 2) Community Concerns**
- 3) Safety and Environment Risks**
- 4) Regulating Shale Oil and Gas Activities**
- 5) NEB's Role in Regulating Hydraulic Fracturing**

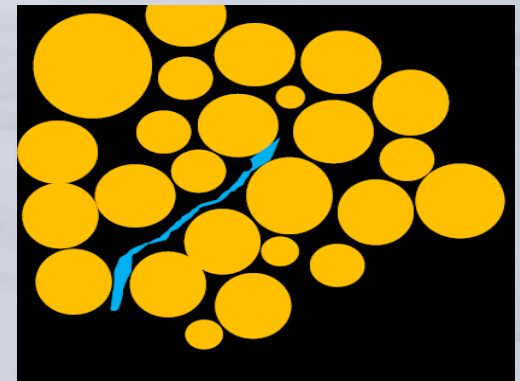


# Hydraulic Fracturing

## Conventional and Unconventional Reservoirs

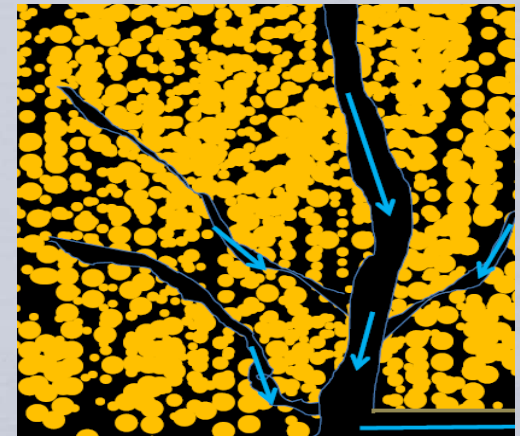
### Conventional Reservoirs usually

- Porous and permeable rocks.
- Hydrocarbons have migrated from their origin.
- Fluids have been trapped by natural seals to form a reservoir.
- Smaller scale hydraulic fracturing may or may not be required.



### Unconventional Reservoirs

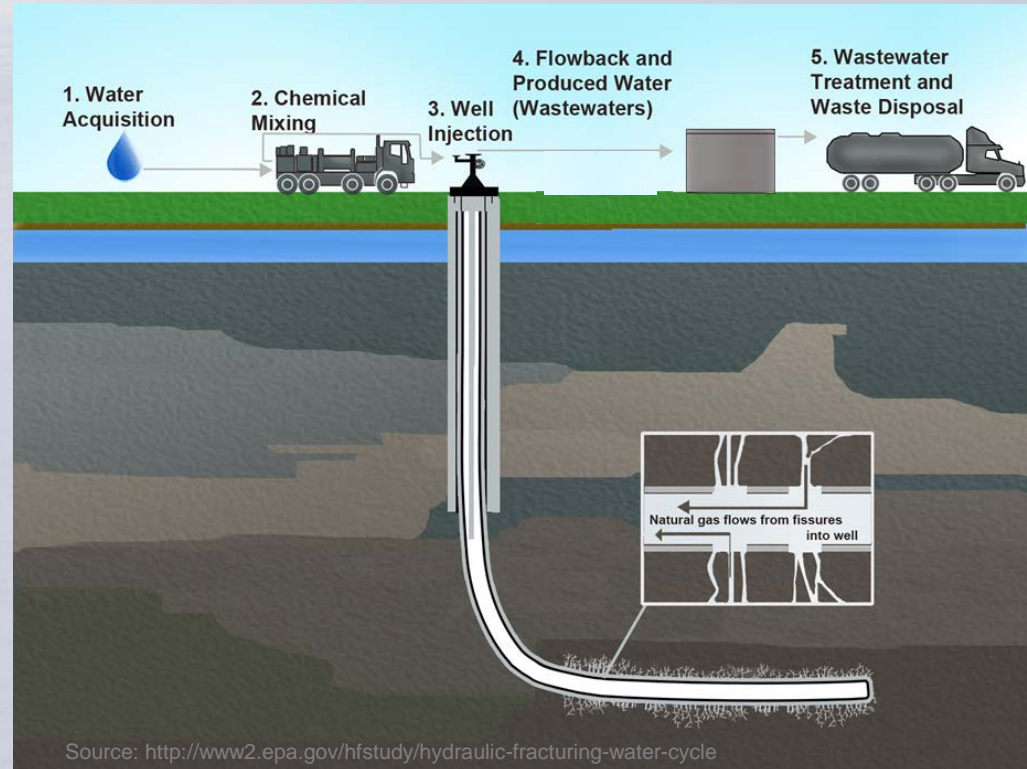
- Low permeability rock; pores are poorly connected
- Require fracture stimulation to create flow path.
- Horizontal drilling and multi-stage hydraulic fracturing are the common technologies used to extract hydrocarbons from tight rock or shale formations





# What is Hydraulic Fracturing?

- Well-stimulation process.
- Involves injection of high pressure fracturing fluids into the rock.
- The fluid contains water/oil, proppant and **additives**.
- The proppant keeps the fractures open and allows hydrocarbons to flow to the wellbore.
- Flowback fluids returns to surface.







# Fracturing Fluids -- a slickwater example

Water, sand (proppant) and **additives**

Typical **additives** (0.5%) may include:

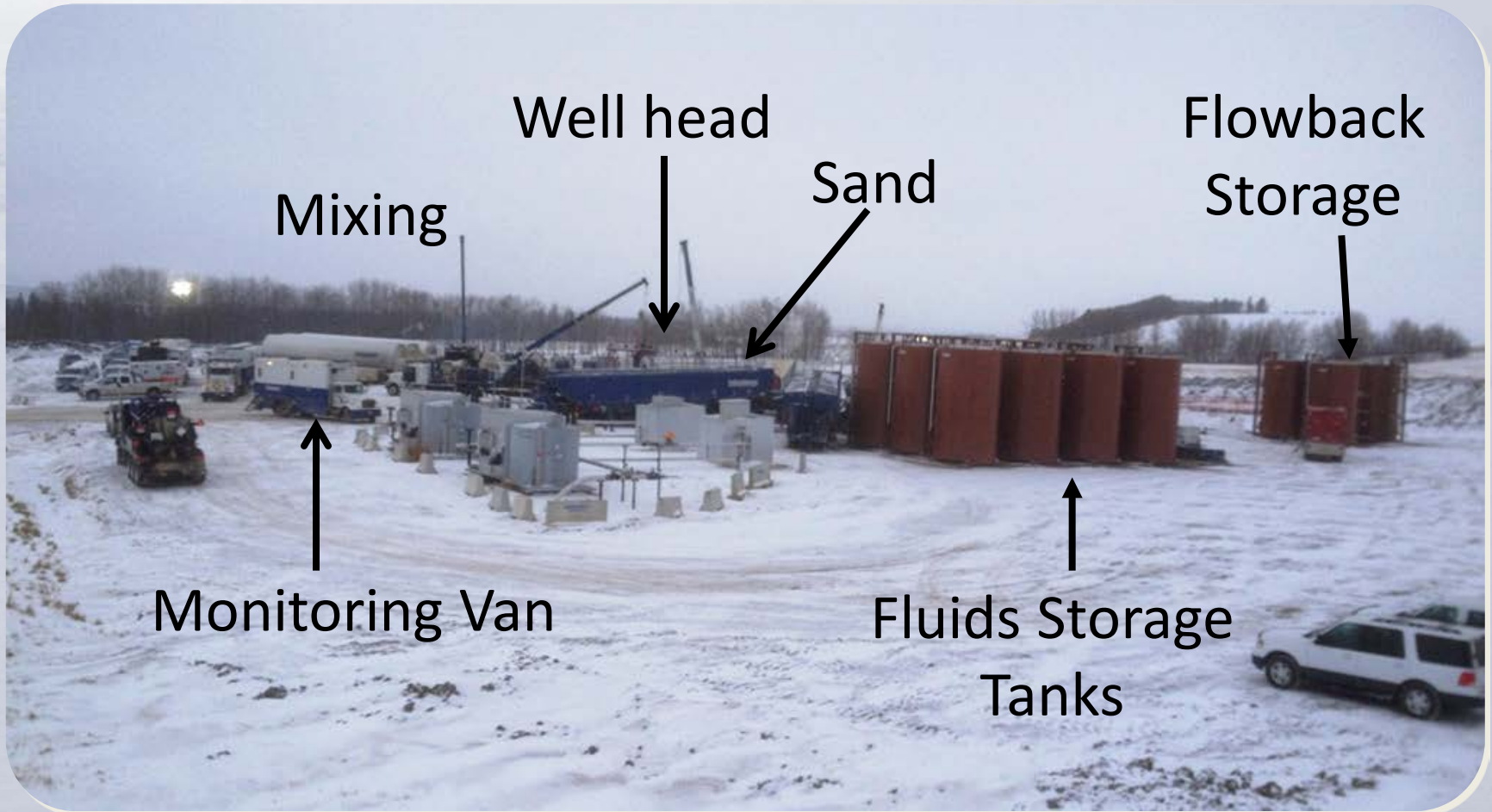
- Friction reducers
- Biocides
- Corrosion inhibitors
- Gelling agent
- Clay stabilizer



Also foam-based and oil-based fracturing fluids may be utilized



# Hydraulic Fracturing Operations



Multi-stage hydraulic fracturing (Montney Play, northeast British Columbia)



# Community Concerns Addressed in the Filing Requirements

## Some of the Concerns:

- Surface water and groundwater contamination
- Volumes of fresh water usage in hydraulic fracturing
- Composition of fracturing fluids and additives used
- Spills of fracturing fluids and flow back fluids
- Hydraulic fracturing-induced earthquakes
- Air emissions
- Environmental footprints





# Safety and Environment Risks involving Hydraulic Fracturing

- Higher pressures equipment involving hydraulic fracturing operations.
- Storage, handling, mixing large volume of stimulation fluids
- Fracturing fluids and it's compositions.
- Fracturing fluids Volume and high pump rate.
- Fracture stimulation pressure on casing integrity
- Extended formation flow testing
- Flow back fluids (Stimulation fluids, wellbore fluids and reservoir fluids)
- Storage and transportation of the oil
- Flaring gas





## Safety and Environment Risk (cont'd)

### Risks on surface:

- Higher pressures equipment failure
- Leaks and spills (storage tank, flow back fluids)
- Number and size of the well pads
- Additional logistics compare to normal drilling



### Possible Impacts:

- Impact on the surface environment
- Surface water contamination
- Larger environmental foot print
- Injuries





## Safety and Environmental Risks (cont'd)

### Subsurface Risks:

- Wellbore integrity may be compromised
- Excessive fracture propagation
- Well control failure - spill of flow back fluids
- Inter-wellbore communication
- Extended formation flow testing and flaring

### Possible Impacts:

- Groundwater contamination from formation fluids and stimulation fluids
- Potential for an induced seismic event



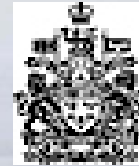


# Regulating Shale Oil and Gas Activities

How the pieces fit together



Aboriginal Affairs and Northern Development Canada  
Affaires autochtones et Développement du Nord Canada



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## Rights Management

- Exploration Licences
- Significant Discovery Licences
- Production Licences
- Benefits Plans
- Royalties

## Land Use Permits

- Land Use Permits
- Water Licences
- Environmental Screenings / Assessments

## Operations Authorization Well Approval

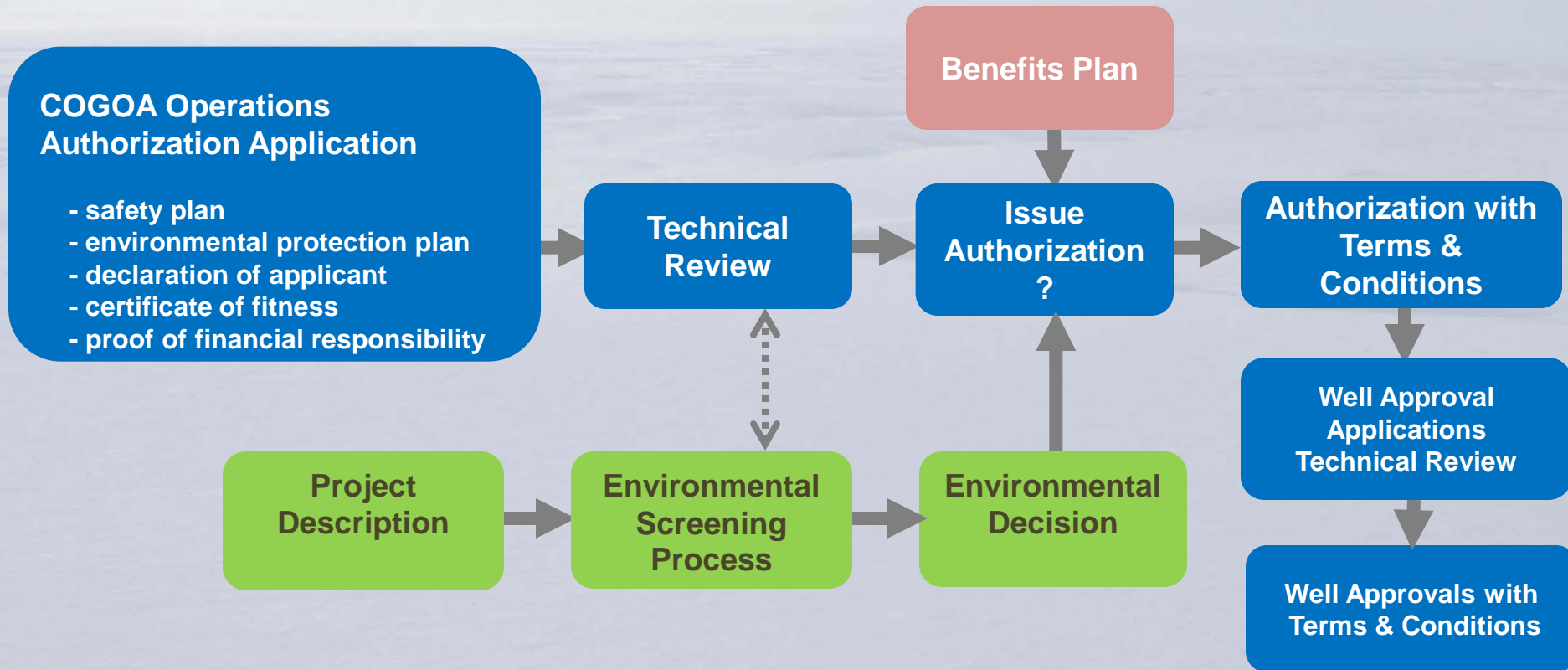
- Exploration and Productions Authorizations
- Geophysical Authorizations
- Well Approvals –drilling and completions
- Significant and Commercial Discoveries
- Development Plans

Separation of oil and gas rights and financial interests from safety and protection of the environment



# Regulating Shale Oil and Gas Activities

## Application Review Process







# Regulating Shale Oil and Gas Activities

The NEB regulates a project from start to finish

Application Phase

Decision Process

Operations Phase

Compliance Verification

Abandonment Phase

Management System

Safety Plan

Environmental Protection Plan

Financial Responsibility

Environmental Screening

Benefit Plan

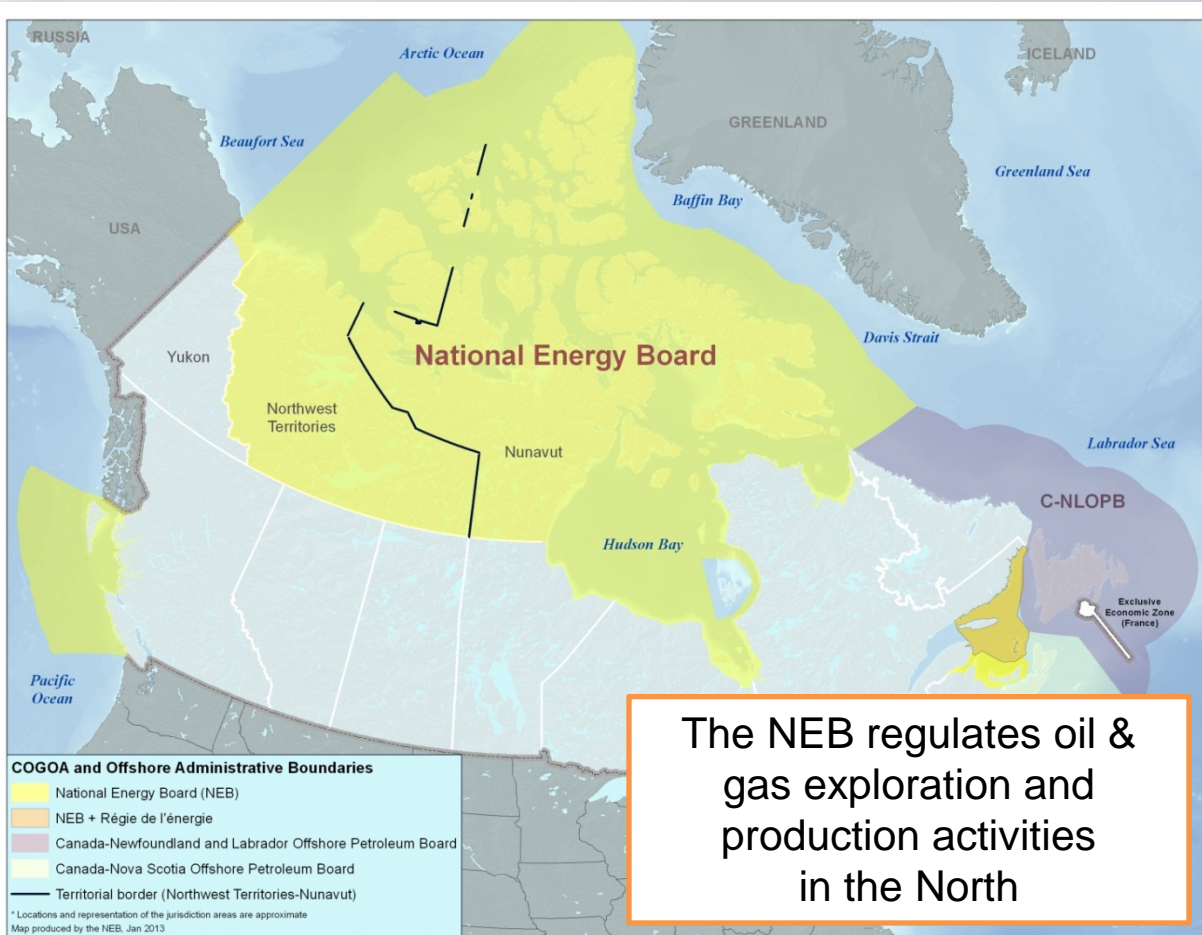
Reports Review

Inspection

Audit



# NEB's Role in Regulating Hydraulic Fracturing



The NEB regulates oil & gas exploration and production activities in the North

**The Canada oil and Gas Operations Act (COGOA)**

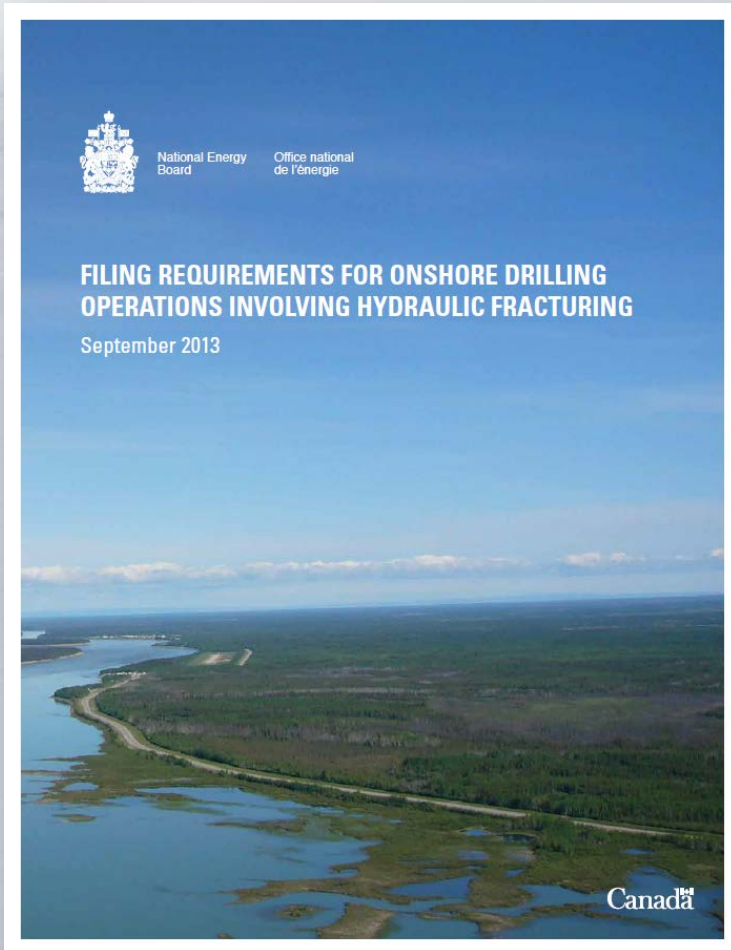
- Safety
- Protection of environment
- Conservation of resources

*Canada Oil and Gas Drilling and Production Regulations*

*Filing Requirements for Onshore Drilling Operations Involving Hydraulic Fracturing*



# NEB's Role in Regulating Hydraulic Fracturing



## Filing Requirements:

- Released September 12, 2013
- NEB's expectation of information to be filed by an applicant for onshore drilling activities involving hydraulic fracturing
- Issues and concerns

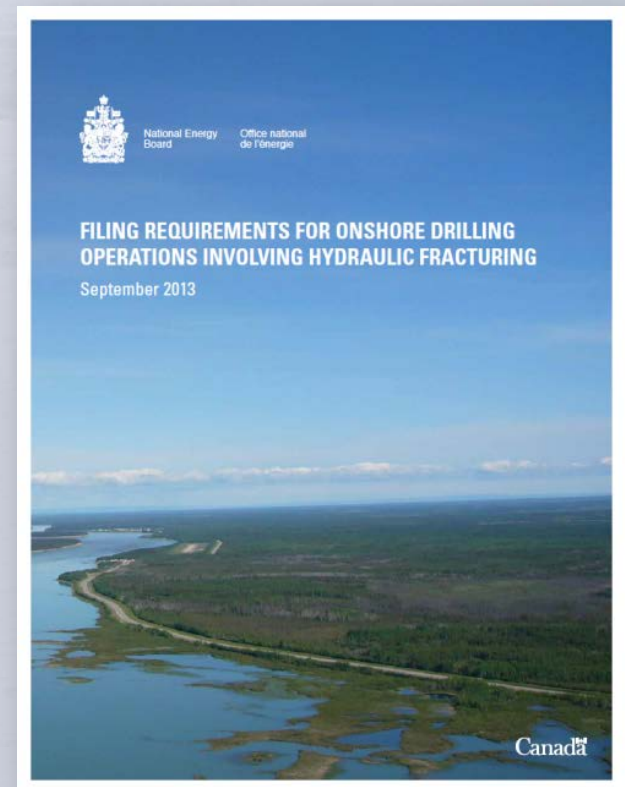




# NEB's Role in Regulating Hydraulic Fracturing

**Regulatory requirements set out in the COGOA and its regulations that includes:**

- Management systems
- Safety plan and environmental protection plan
- Risk Assessment
- Canada Benefits Plan
- Financial responsibility
- Declaration by applicant







# NEB's Role in Regulating Hydraulic Fracturing

## Requirements specific to Hydraulic Fracturing include:

- Identification and protection of groundwater zones
- Well design and Integrity related to hydraulic fracturing
- Hydraulic fracture modeling, execution and evaluations
- Extended formation flow tests
- Chemicals usage, disclosure and waste management
- All-season well pads
- Inter-well distances on multi-well pads



# NEB's Role in Regulating Hydraulic Fracturing

## ***Filing Requirements: Ground Water Protection***

- Identify groundwater and permafrost zones.
- Identify possible groundwater contamination pathways.
- Surface casing is set below all known or reasonably estimated utilizable groundwater and permafrost zones.
- Well control barriers are in place to address the anticipated formation pressure and hydraulic fracturing pressure.
- Demonstrate sufficient well barriers would be in place inside the tubing and casing annuli to prevent contamination of groundwater/permafrost and the environment from the reservoir and/or wellbore fluids.





# The Public Disclosure of Hydraulic Fracturing Fluid Chemicals

- FracFocus.org is a website created by the US-based Ground Water Protection Council (GWPC) and the Interstate Oil and Gas Compact Commission (IOGCC) to allow US oil and gas operators to have their hydraulic fracturing chemicals publically disclosed.
- The BC Oil and Gas Commission (BCOGC), obtained the rights from the GWPC and the IOGCC to create the Canadian version of the website, FracFocus.ca.





# The Public Disclosure of Hydraulic Fracturing Fluid Chemicals

- On 27 November 2013 the NEB signed an agreement with the BCOGC, the GWPC and the IOGCC to participate in the FracFocus.ca website.
- The NEB has requested that all regulated companies publically disclose their hydraulic fracturing fluid chemicals on the FracFocus.ca website 30 days after the completion of their hydraulic fracturing operation.





# The Public Disclosure of Hydraulic Fracturing Fluid Chemicals

- The NEB expects to be fully on-line with FracFocus.ca by late February/early March 2014. This would allow the fracturing fluid chemicals of any hydraulic fracturing operations being conducted this winter in the NWT to be publically disclosed after 30 days on FracFocus.ca.
- Currently in Canada, the BCOGC, the Alberta Energy Regulator and the NEB have joined FracFocus.ca and have operators disclose fracturing fluid chemicals on FracFocus.ca
- In the US, 14 states use FracFocus.org as the official means of public disclosure of fracturing fluid chemicals.



Questions?