



# Tight oil and shale gas geoscience and geo-engineering:

## *Summary of the five regional workshops*

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Natural Resources  
Canada

Ressources naturelles  
Canada

Canada 

# Outline

**Introduction**

**Research and Knowledge Gaps**

**Research and Innovation Barriers and Opportunities**

**Science Communication**



# Introduction

- 5 regional workshops: Halifax, Québec, Winnipeg, Calgary, Vancouver
- About 200 participants
- Looking at knowledge gaps, barriers to innovation and how to better communicate science



# Research and Knowledge Gaps: Reservoir Characterization

## Geological Gaps

- Basin-wide mapping/characterization & aquifer mapping
- Better understand scale effects going from nanoscale to reservoir-scale and everything in between
- Better understanding of the “intermediate zone”



# Research and Knowledge Gaps: Reservoir Characterization

## Oil & Gas Gaps

- Better understanding of subsurface geochemistry
- Fingerprinting of gases



# Research and Knowledge Gaps: Resource Assessment

- Develop models, tools and well logs specifically for measuring and evaluating unconventional resources
- Define “sweet spots” for unconventional resources and determine how they are quantified



# Geo-engineering & Extraction

## Technologies

- Enhanced Oil Recovery
- Modeling of optimal well array for maximum resource recovery
- Development in an “island” context in Quebec
- Permafrost issues North of 60°



# Geo-engineering & Extraction

## Fracturing technologies

- Need for better understanding of induced fracture systems
- Need to understand interaction of formation with fluids, additives etc.
- Water use (fresh, saline, brackish, municipal), re-use, recovery, disposal, remediation, reinjection etc.
- Lack of disposal sites for both fluids and solids in many provinces
- Marine disposal of water in Eastern Canada



# Geo-engineering & Extraction

## Well integrity

- Need to develop better design and materials (casing / cement)
- Need to develop better monitoring tools or sensors (ultrasonic, non-invasive techniques)



# Environment

## General

- Need for baseline and cumulative effect studies with respect to water, seismicity, GHG etc.
- Better understanding and establishment of standardized Best Practices and sample collection for monitoring
- Issues of liability and legacy wells (Western Canada)



# Environment

## Water

- Understanding of complete lifecycle of water usage
- Aquifer mapping below 150 m (i.e. below residential wells) ahead of development
- In Eastern Canada, issues around marine waters
- In Western Canada, water usage or sharing



# Environment

## Seismicity

- Access to data and monitoring
- Understanding fracture systems and fracture propagation (stress regime)
- In Western Canada, “unintentional induced seismicity”



# Environment

## GHG / Health

- Gas leakage from wells
- GHG emissions (CO<sub>2</sub> in Horn River)
- CO<sub>2</sub> storage
- Additional health issues in newly industrialized rural areas (due to e.g. particulate emissions)



# Barriers to Innovation

- Access to data (who does what ?, sharing and availability of data, cost of data acquisition, duplication of research efforts, data platforms etc.)
- Funding
- Lack of researchers
- Compartmentalization of research



# Opportunities to Innovation

- Collaboration for:
  - Data sharing
  - Expertise training / exchanges
  - Leverage of funds
- Research Well Site (national or regional) - should be linked to research communities



# Science Communication

- #1 need is for better communication of science and research results
- Need to find champions or spokespersons
- Social media
  - How to communicate complex science issues in the Twitter-era?
  - How to use it to our advantage
- Energy literacy of the public, the media and politicians etc.
- First Nations engagement

