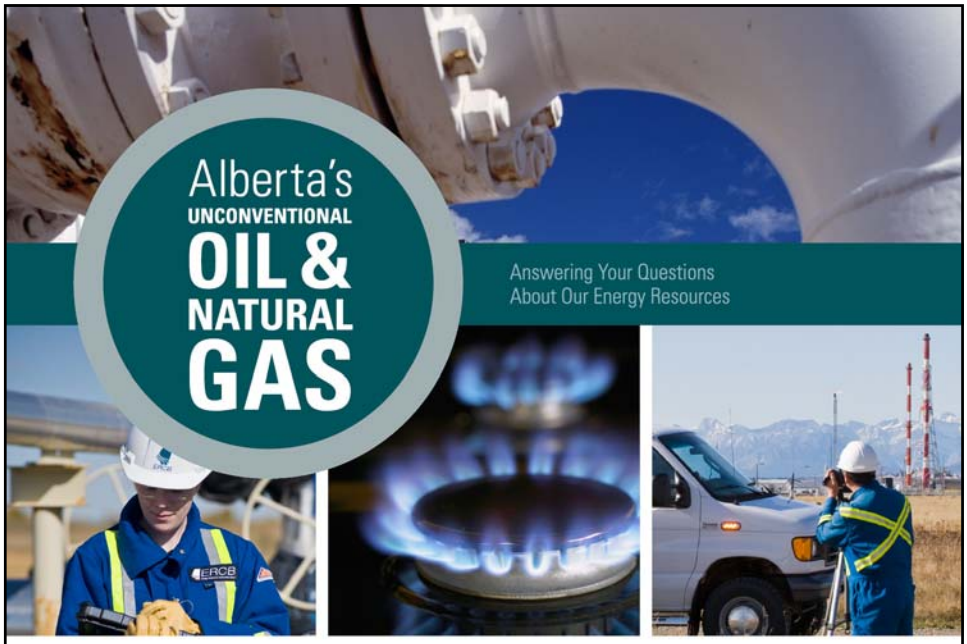
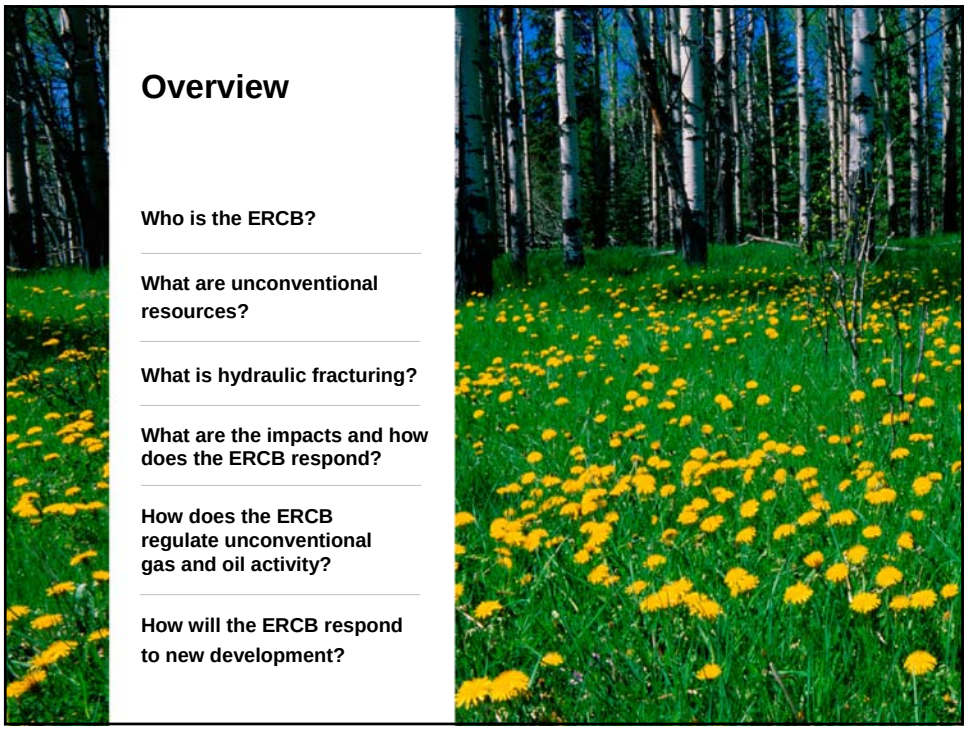


Month Day, 2011

ERCB Energy Resources Conservation Board



Overview

Who is the ERCB?

What are unconventional resources?

What is hydraulic fracturing?

What are the impacts and how does the ERCB respond?

How does the ERCB regulate unconventional gas and oil activity?

How will the ERCB respond to new development?

The Energy Resources Conservation Board (ERCB)

“A quasi-judicial, independent body created by the Alberta Government to ensure that the discovery, development and delivery of Alberta's energy resources take place in a manner that is fair, responsible and in the public interest”

The ERCB Across Alberta

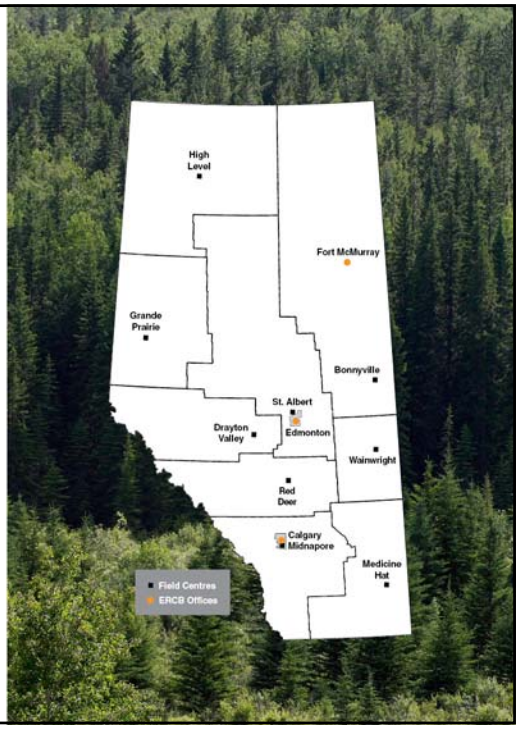
9 Field Centres

Head Office (Calgary)

Core Research Centre (Calgary)

Alberta Geological Survey (Edmonton)

Fort McMurray Oil Sands Regional Office



How the ERCB Operates

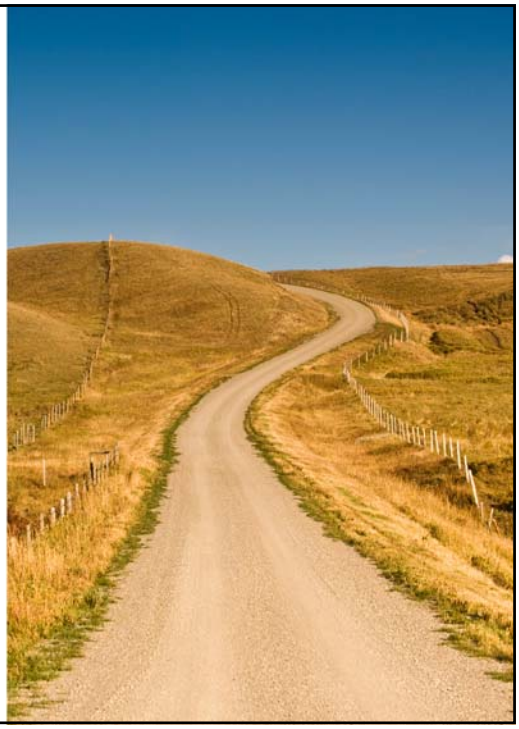
Regulations

Application Process
- Appropriate Dispute Resolution (informal)
- Hearings (formal)

Surveillance, Enforcement, Incident Response

Stakeholder Engagement

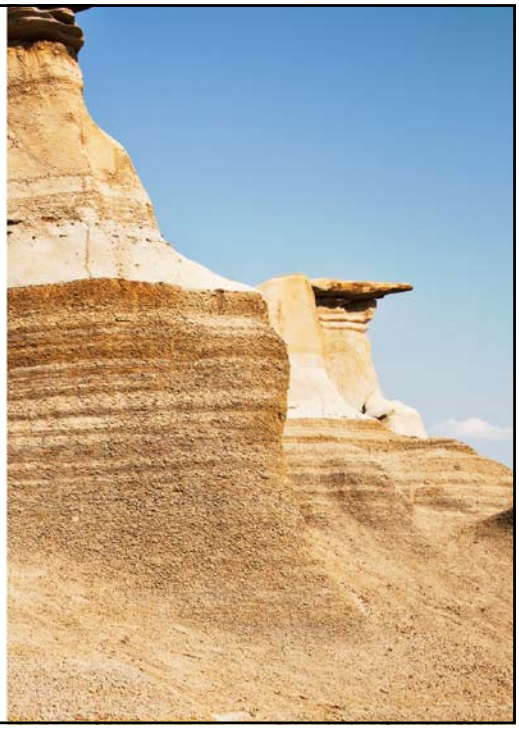
Data Collection and Information Dissemination



Regulations

The ERCB regulates Alberta's energy resources:
- Natural gas
- Oil
- Oil sands
- Coal

What are Unconventional Resources?



What is Natural Gas?

Colorless, odorless, and clean burning

It is a mixture of hydrocarbon gases

- Methane
- Ethane
- Propane
- Butane

In Alberta, raw natural gas is about 92% methane

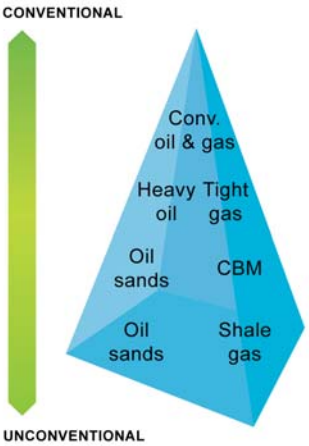
What is Crude Oil?

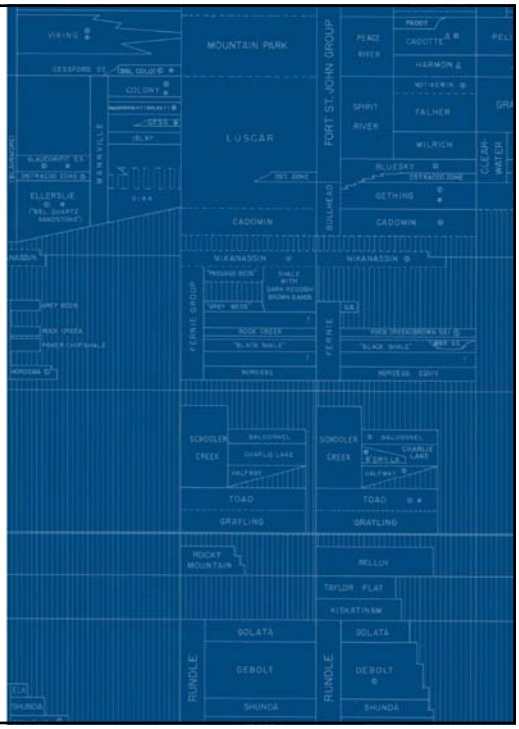
Naturally occurring flammable liquid

It is a mixture of heavier hydrocarbons

In Alberta, ranges from light oil (easy to pour) to very heavy tar-like oils

Conventional vs. Unconventional





Examples of Unconventional Resources

- Coalbed methane (CBM)
- Tight gas
- Tight oil
- Shale gas

*Oil sands are not included

Coalbed Methane

Is natural gas in coal; >95% methane in raw form

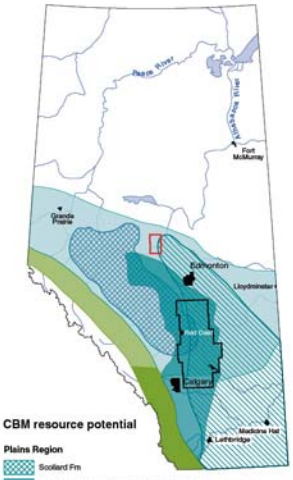
First commercial CBM project announced in 2002

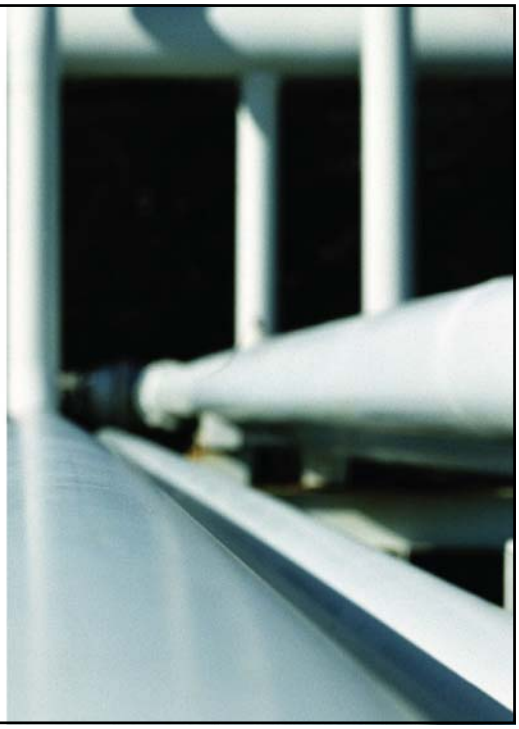
More than 15,000 CBM wells producing in 2010

More than 32.9 billion cubic meters total Alberta production

24.4 thousand cubic meters produced in 2010

CBM Areas



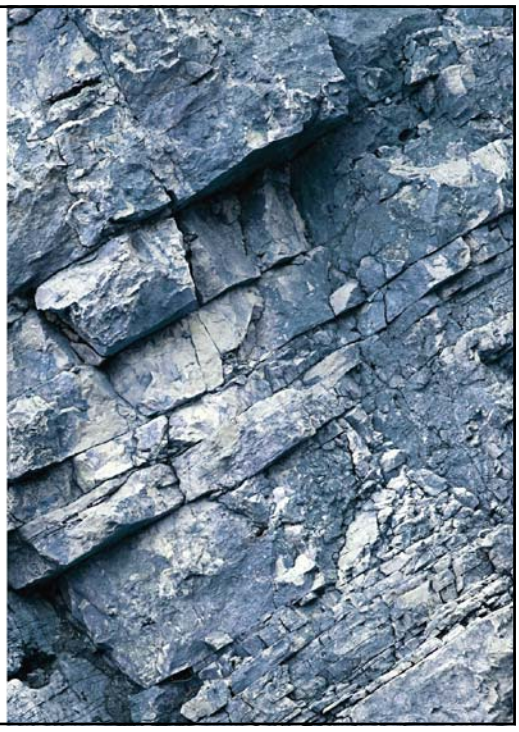


Tight Gas

Natural gas found in low permeability rock including sandstone, siltstones, and carbonates

Requires “stimulation” such as hydraulic fracturing to create pathways in the rock for the gas to move through to the wellbore

Reserves and production not separated from “conventional” gas



Tight Oil

Oil found in low permeability rock including sandstone, siltstone, and carbonates

Requires “stimulation” such as hydraulic fracturing to create pathways in the rock for the oil to move through to the wellbore

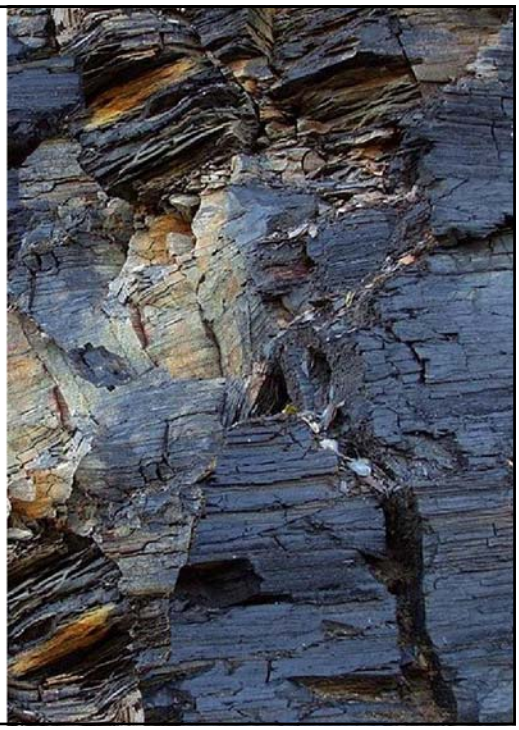
Reserves and production not separated from “conventional” oil

Shale Gas

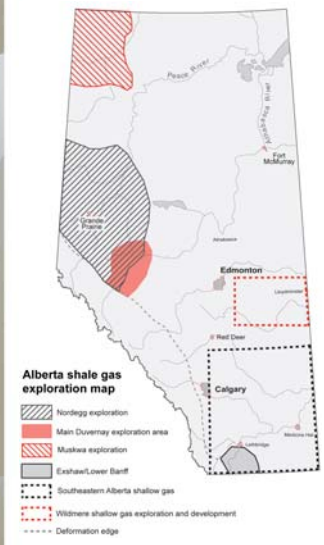
Natural gas locked in fine-grained, organic-rich rock

Not all shales are the same

- High (source rock) to low organic content
- Ductile to brittle
- Clay types and amounts variable



Shale Gas in Alberta



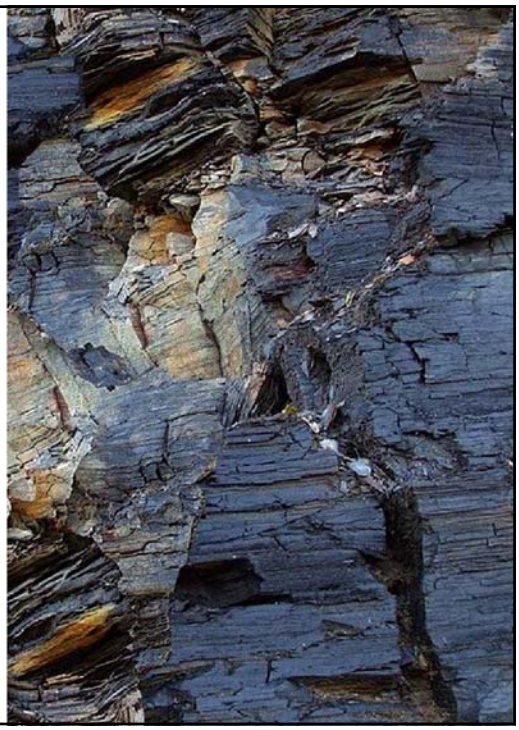
What is Hydraulic Fracturing?

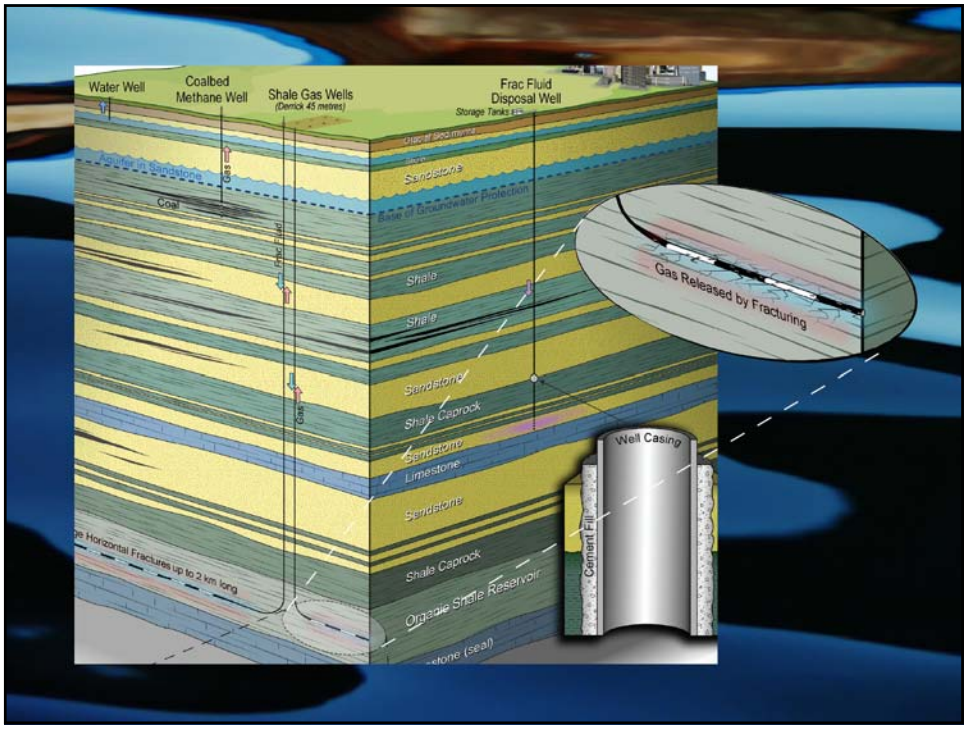
Fluid is pumped into wellbore to create enough pressure to crack, or fracture, the rock layer

The fluid usually contains a "proppant", like sand, that helps prop the fractures open to allow oil and gas to be produced to surface

Can be one "stage" in a vertically drilled well or "multi-staged" in a horizontally drilled well

More than 167,000 wells have been fractured in Alberta





Impacts and ERCB Response

Water

Surface disturbance

Noise, dust, traffic

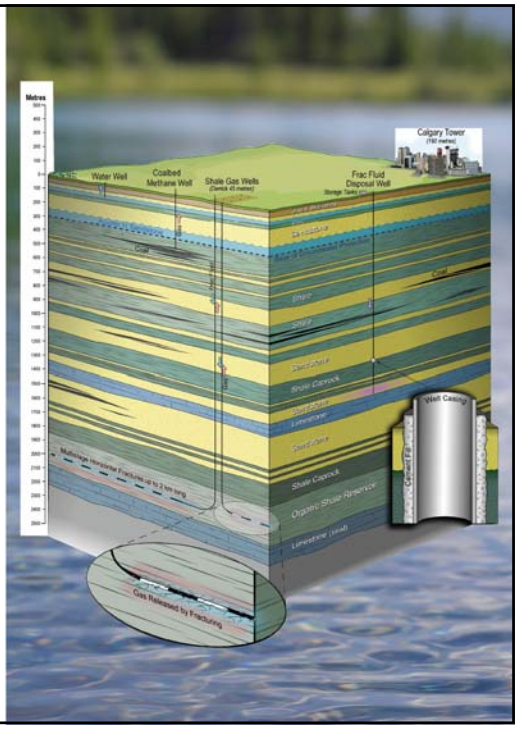
Impact of Hydraulic Fracturing

Scale diagram

Very deep formations >1500 m

Significant separation from non-saline aquifers

Horizontal lengths 1200 – 2000 m



Impacts on Groundwater

ERCB regulations protect groundwater

- Strict regulations for cement casing of wellbores
- Most fracturing operations conducted well below useable aquifers – often more than 1500 m

Frac Fluids

Storage of produced fluids on the well site have strict requirements to mitigate accidental release.

Disposal fluids that can not be reused must be injected into disposal wells, far below groundwater sources

Impacts of Development

Density and scale of development

Alternative land use impacts

Opportunities

Other Impacts

- Truck traffic – impact on roads
- Noise
- Duration of wellsite activity
- Dust
- Emissions
- Light pollution


Surge Tanks
Diesel
Electrical
Wireline Units
Well Test
Equipment
Command
Centre
Frac Sand
Frac Pumps
Coiled Tubing
Wellheads
Frac Line

Reducing Surface Impacts

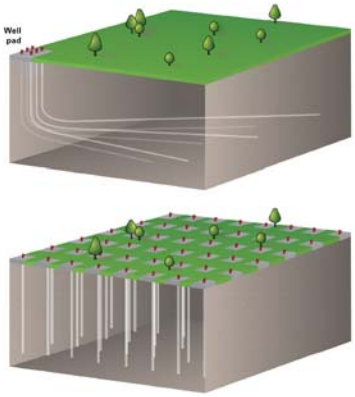
Horizontal Well

- 6-well lease area (180 m x 180 m) = 32 400 m^2
- 6 horizontal wells (8 fracs/well) = 48 total fracs per section

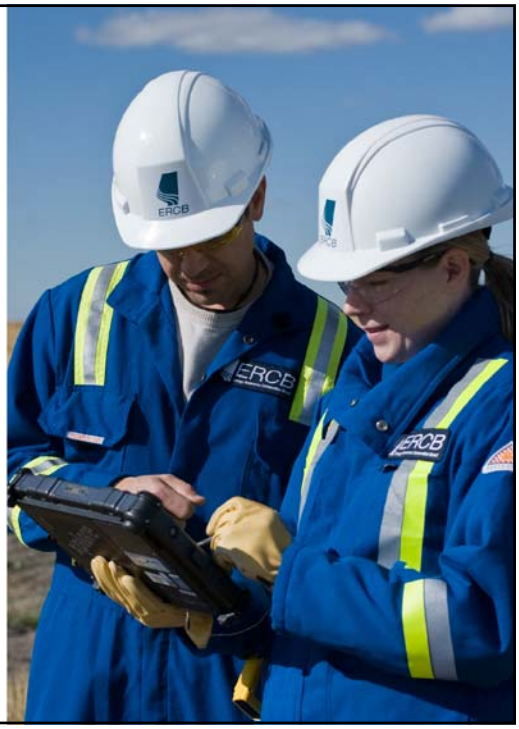
Vertical Well

- Single well lease area (120 m x 120 m) = 14 400 m^2
- Equivalent 48-frac lease area = 691 200 m^2

Same development would require 48 vertical wells, each on a separate 100 m x 100 m pad



How does the ERCB Regulate Unconventional Gas and Oil Activity?



ERCB Requirements

Examples:

- Directive 8: Surface Casing Depth Requirements
- Directive 9: Casing Cementing Requirements
- Directive 20: Well Abandonment
- Directive 27: Shallow fracturing Operations- Restricted Operations
- Directive 29: Energy and Utility Development Applications and the Hearing Process
- Directive 31: Guidelines for the Energy Proceeding Cost Claims
- Directive 35: Baseline Water Well Testing
- Directive 38: Noise Control
- Directive 44: Surveillance of Water Production in Hydrocarbon Wells
- Directive 50: Drilling Waste Management
- Directive 51: Injection and Disposal Wells
- Directive 55: Storage Requirements
- Directive 56: Energy Development Applications
- Directive 58: Oilfield Waste Management Requirements for the Upstream Petroleum Industry
- Directive 59: Well Drilling & Completion Data Filing Requirements

Communication

Data, information and knowledge of Alberta situation

Measurement and reporting of used water volumes

Disclosure and understanding of chemicals used

Facts about other jurisdictions

How is the ERCB Responding to New Development?

ERCB Unconventional Regulatory Framework (URF)

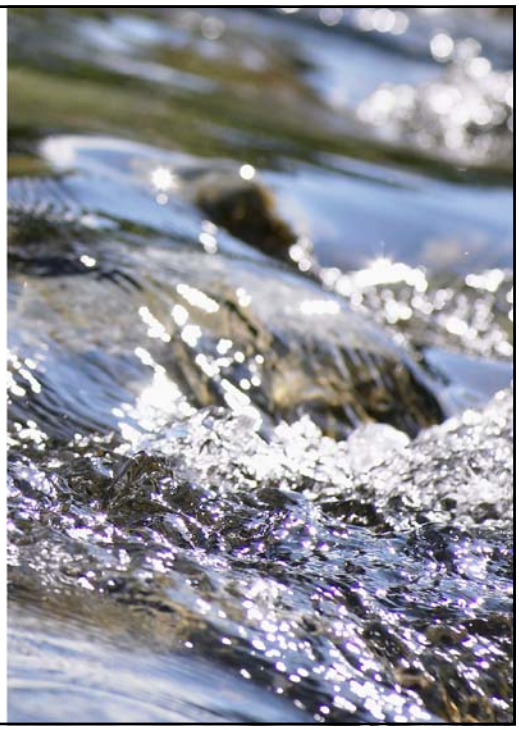
Effective and efficient regulatory framework for unconventional gas that mitigates risk to conservation, public safety and the environment, and ensures orderly development while using the least intrusive regulatory tool to mitigate risks.

URF Objectives

- **Risk assessment**
- **Jurisdictional review**
- **Regulatory outcomes**
- **Framework design**
- **Risk mitigation options**
- **Performance measures**

Key Outcomes

- **Minimize water use**
- **Protect groundwater and surface water**
- **Optimize resource recovery**
- **Ensure well casing and cement integrity**
- **Maintain caprock integrity**



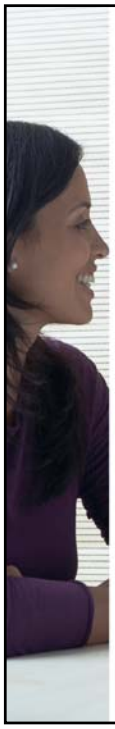
Key Outcomes

Completion operations pose no significant public risk

Appropriate type and amount of data collected for resource appraisal and resevoir management

Stakeholders receive timely, useful, and quality information

Surface infrastructure is well planned and controlled to minimize regional impacts



Key Attributes of URF

Science base approach to organizing risks

Recognizes regional impacts

Responses at play level (rather than well by well or pool by pool)

Risk and response can vary by play

Surface Owner Rights

ERCB well licensing requirements must be met to drill a well

Directive 56 notification and consultation

Surface well siting issues discussed with landowner

ERCB hearing if necessary

What Does it All Mean?

Tremendous potential resource

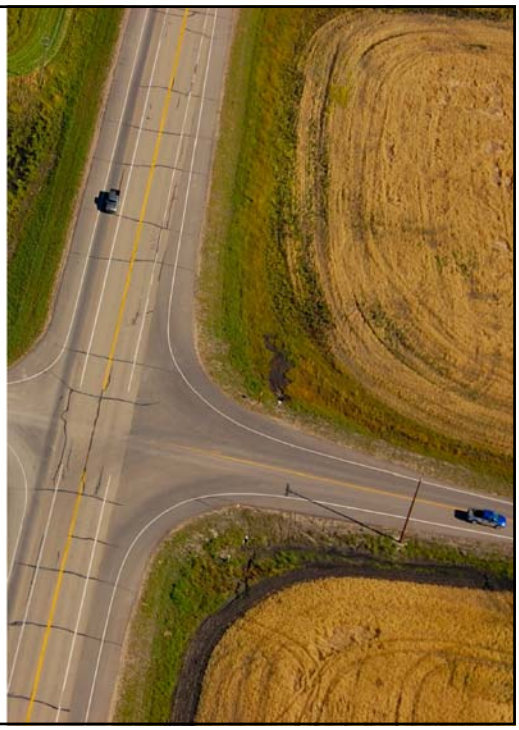
Technologies being applied now for tight oil targets

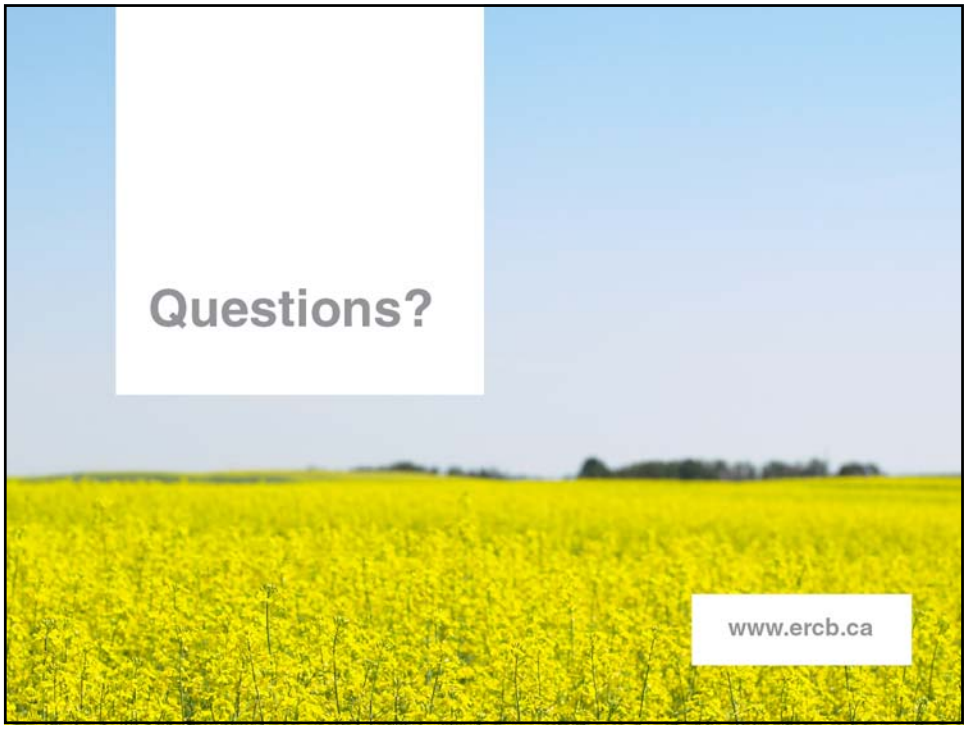
Current regulations apply to all development

As technology evolves, the ERCB will have regulatory system in place to respond

ERCB will adapt regulations to new developments

Keeping up with the pace of change




Questions?
www.ercb.ca