

Carbon Capture  
and Storage

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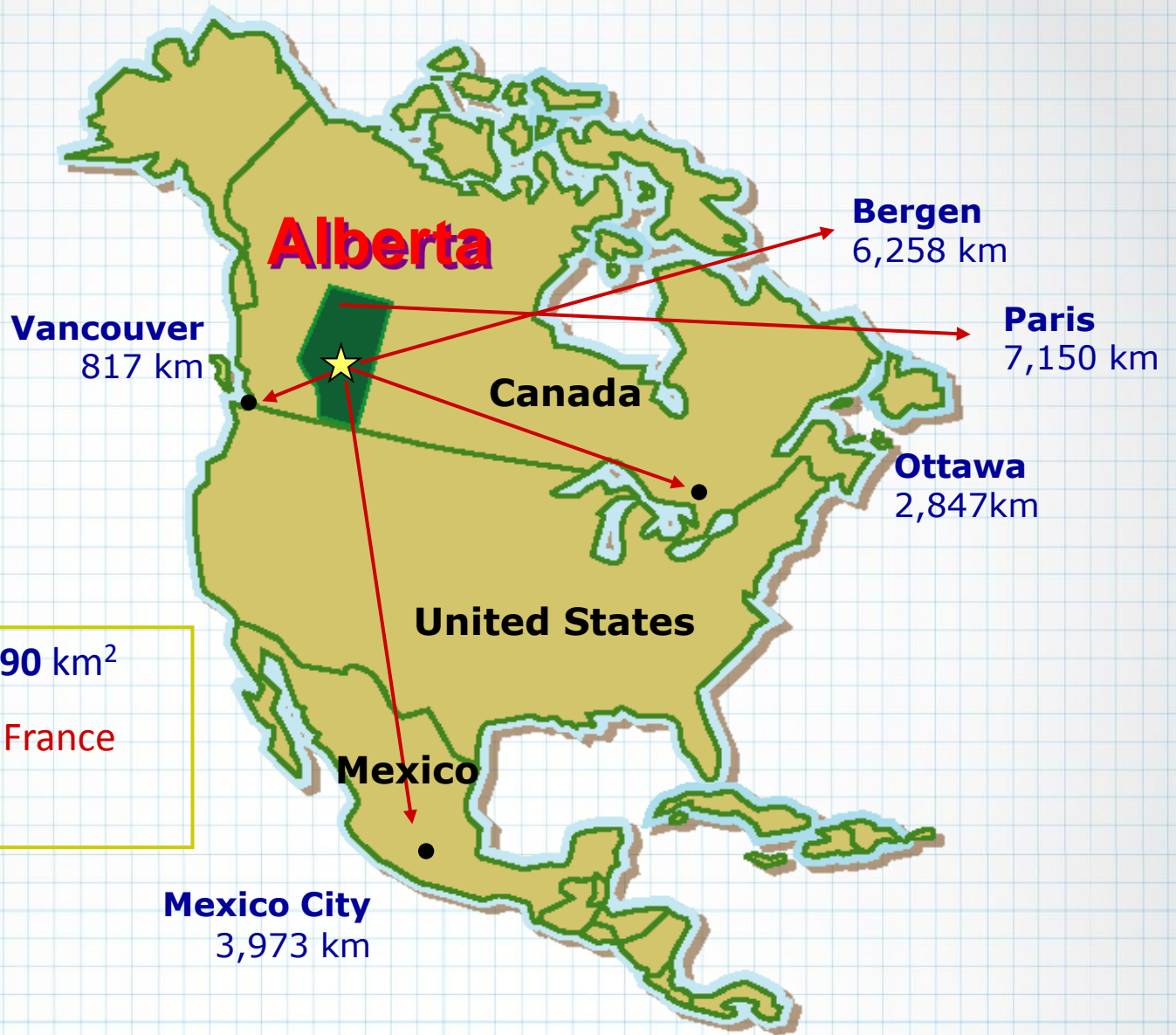
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# Alberta's Regulatory Framework Assessment

May 10, 2012

Mike Fernandez, Alberta Energy





**Alberta**

**Vancouver**  
817 km

**Bergen**  
6,258 km

**Paris**  
7,150 km

**Canada**

**Ottawa**  
2,847km

**United States**

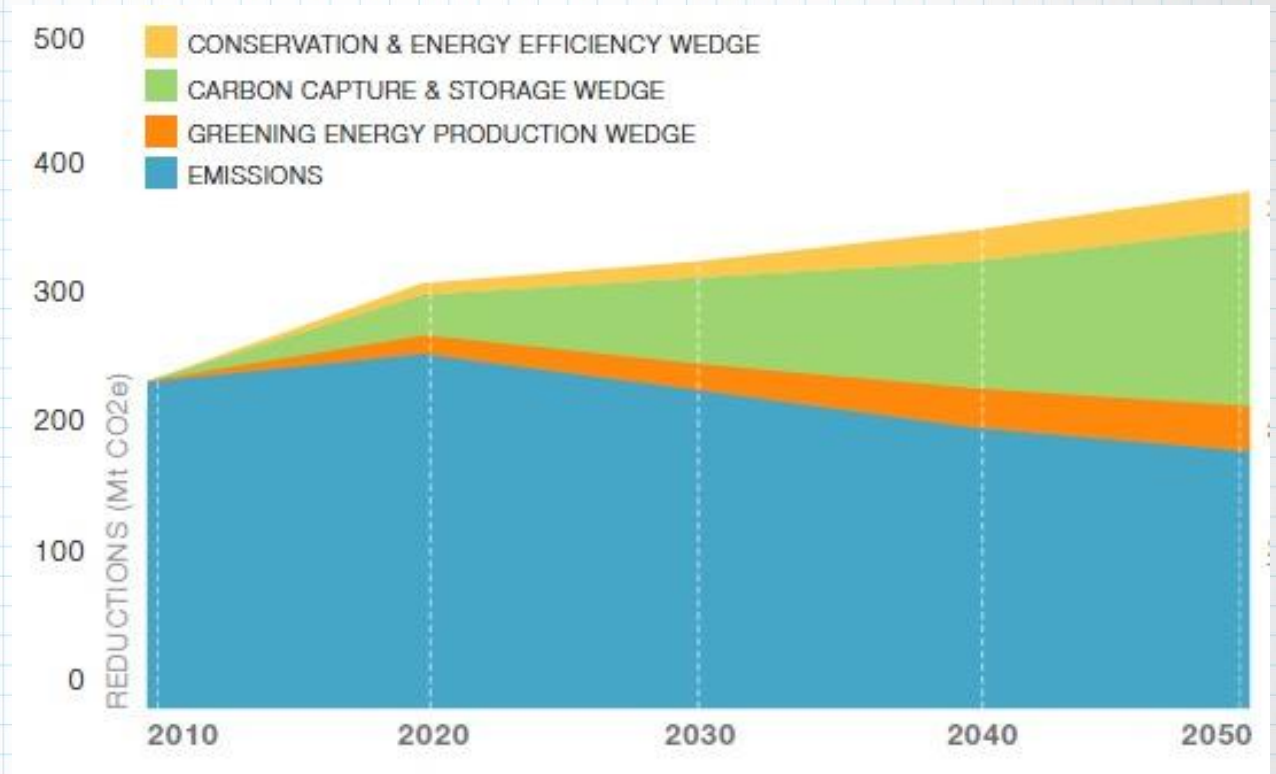
**Mexico**

**Mexico City**  
3,973 km

Alberta covers **661,190 km<sup>2</sup>**

- Slightly larger than **France**
- Similar to **Texas**

# Climate Change Strategy



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## 200Mt

- 2050 -- 200Mt reduction or 50% below projected business as usual and 14% below 2005 levels

# Alberta Projects



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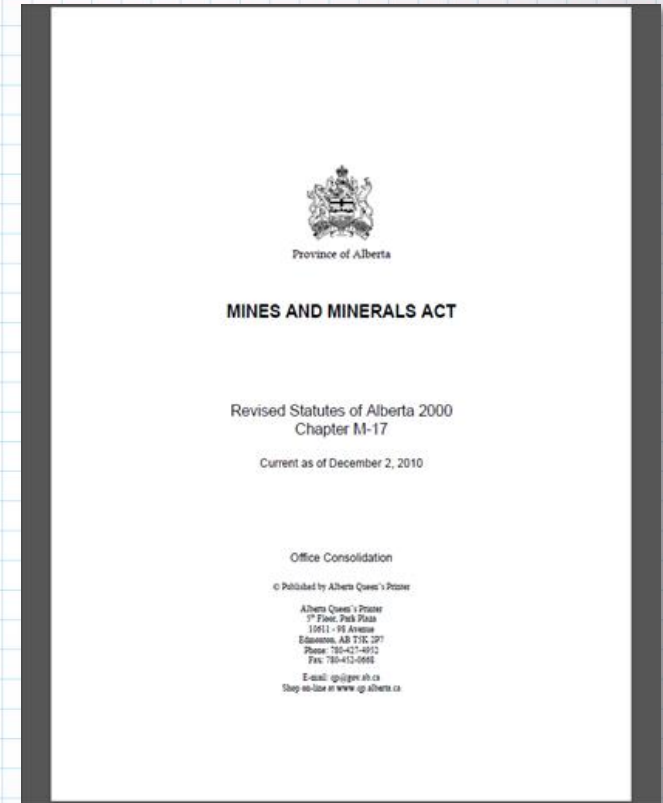
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# CCS Legislation in Alberta

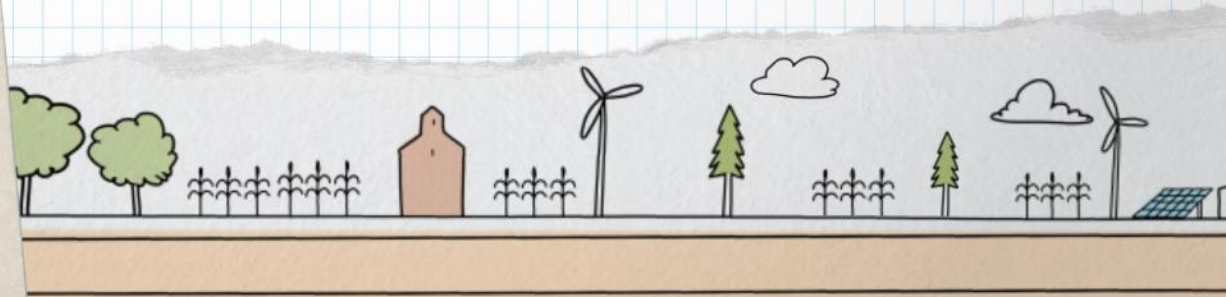
- The *Carbon Capture and Storage Statutes Amendment Act, 2010* was passed in Dec 2010.
  - Pore Space Ownership
  - Long-term liability
  - Post -closure Stewardship Fund
  - Tenure Agreements



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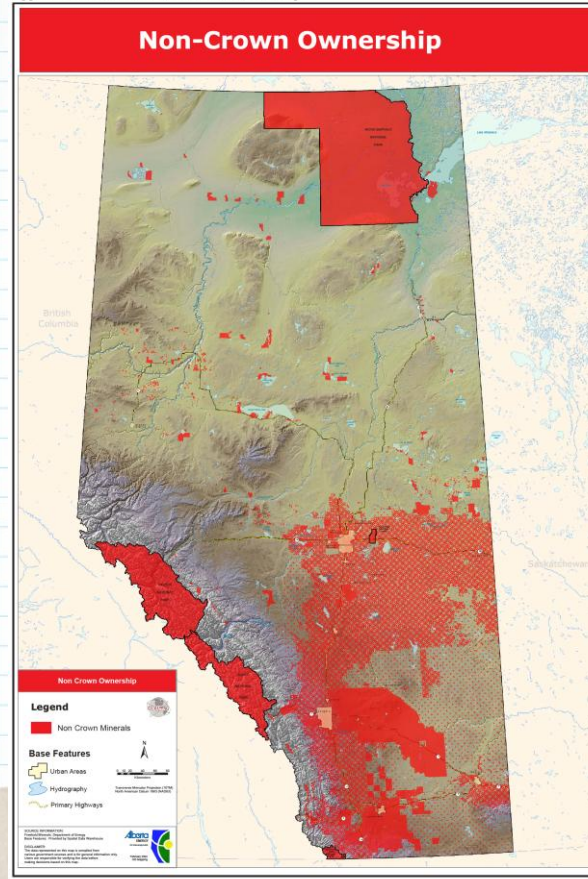
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# Pore Space Ownership

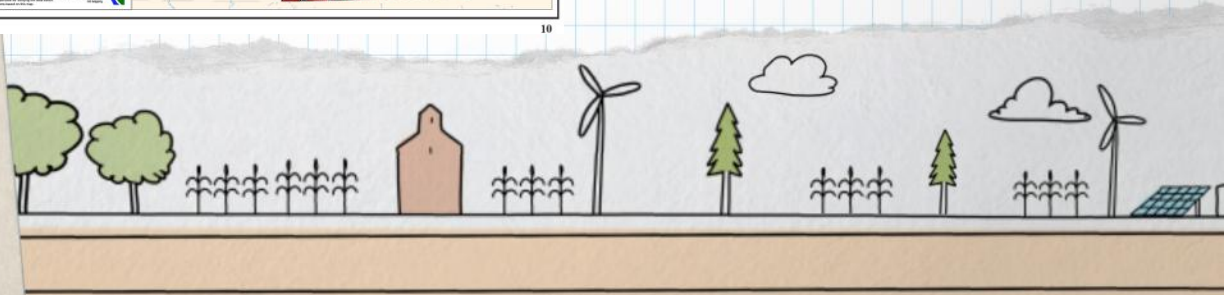
Appendix 1: Crown - Freehold Mineral Ownership



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# Long Term Liability

- Alberta now has the authority to assume the liability.
- After issuing a closure certificate:
  - Alberta becomes owner of CO<sub>2</sub>.
  - Alberta assumes obligations under provincial environmental legislation.
  - Indemnifies lessee against damages.

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# Post Closure Stewardship Fund (PCSF)

- A levy applied per tonne of CO<sub>2</sub> injected.
- The PCSF will be applied toward MMV and other Crown obligations.

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# Pore Space Tenure Agreements

- Allows the Minister to enter into agreements under Part 9 of the *Mines and Minerals Act*.
- Creates two separate agreements:
  - Evaluation Permit
  - Carbon Sequestration Lease

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# Carbon Sequestration Tenure Regulation

- Passed in April 2011 in response to an applications for Carbon Sequestration Lease
- Sets out some administrative details:
  - Maximum area
  - Rent
  - Grouping
  - Closure Plan
  - MMV Plan

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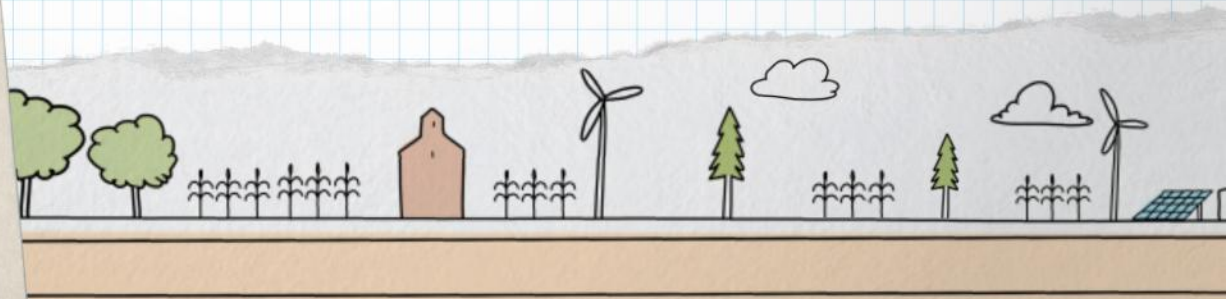
# CCS Regulatory Framework Assessment (RFA)

- A very detailed review of our existing framework
- Also looking at some gaps:
  - Closure criteria.
  - Methodology and rate for the PCSF.
  - Role of risk assessment in CCS.
  - Clarity of roles and responsibilities for Alberta regulators.
  - How stakeholder engagement will take place.
  - Role of Environmental Impact Assessments in a CCS project.
- Recommendations go to the Alberta Government in late-2012.

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# ISSUE - Pore Space Management

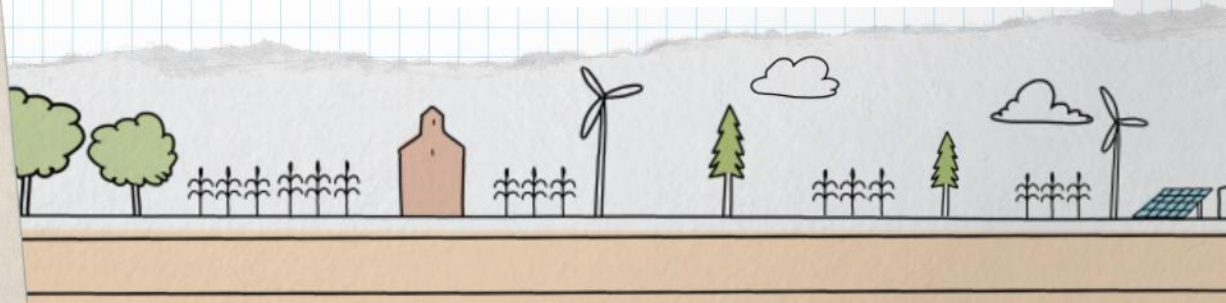
- Management of Pore Space
  - Conservation
  - Pore Space Inventories
    - North American Carbon Storage Atlas
- Pore Space Open Access



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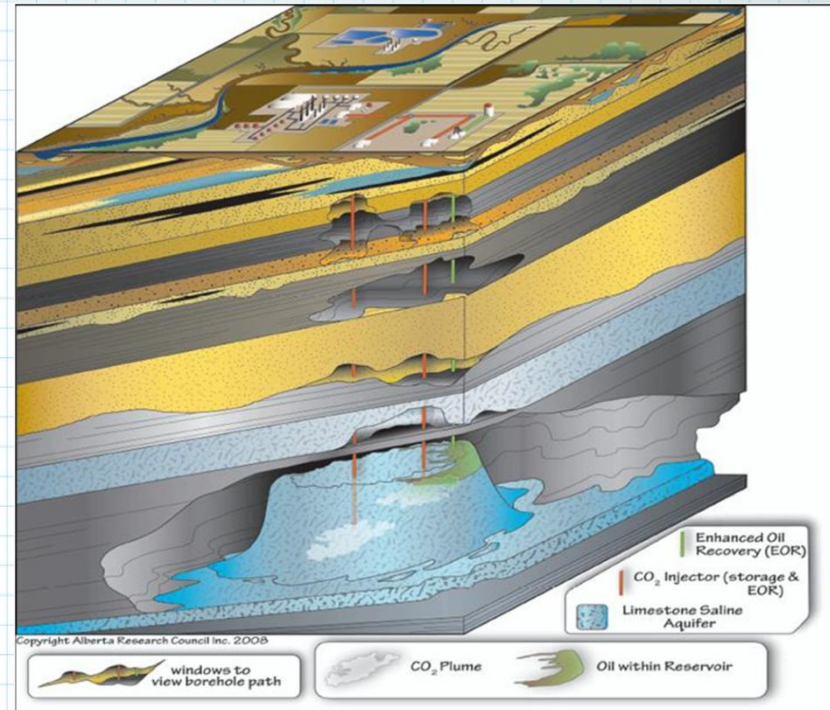
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# ISSUE - Long-term Liability

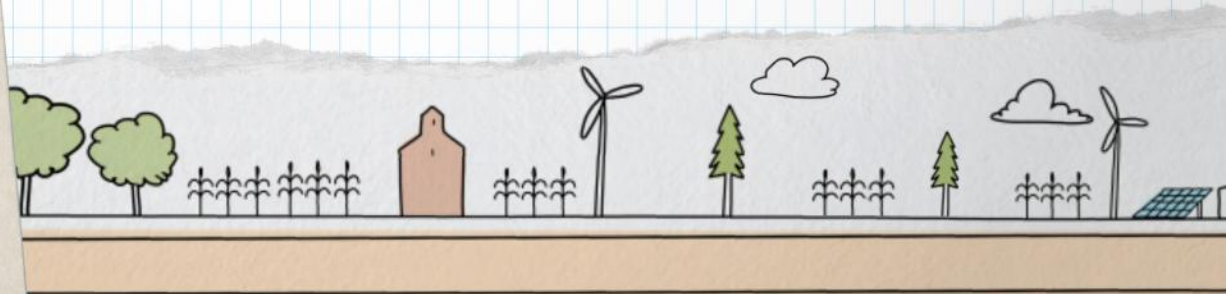
- Closure Plans
- Closure Period
- Closure Certificate



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# ISSUE - What is included in the PCSF rate and how is it calculated?

- Four main components of the PCSF rate:
  - 1) Costs associated with orphaned facilities not currently covered
  - 2) Residual reclamation;
  - 3) Ongoing MMV costs; and
  - 4) Long-term liabilities and risk assumed by the Government.

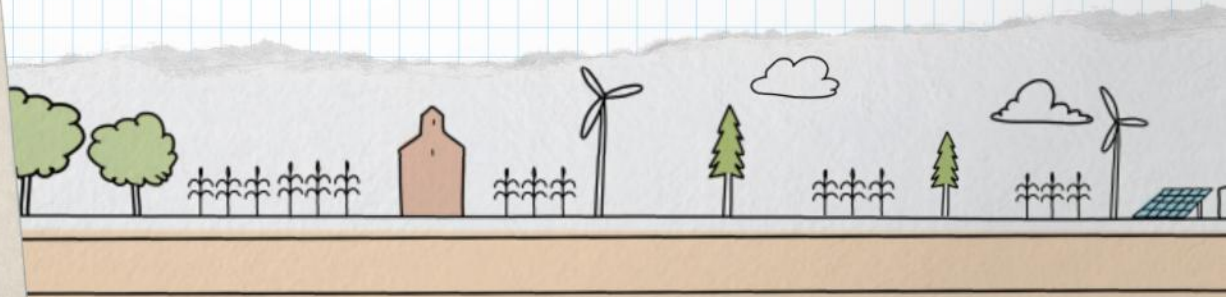
## RFA Draft Recommendation:

- *Rates for covering long-term liabilities and risks should be calculated on a site-specific, risk-based basis by an independent third party.*
- *Rates should reviewed and adjusted every three years.*

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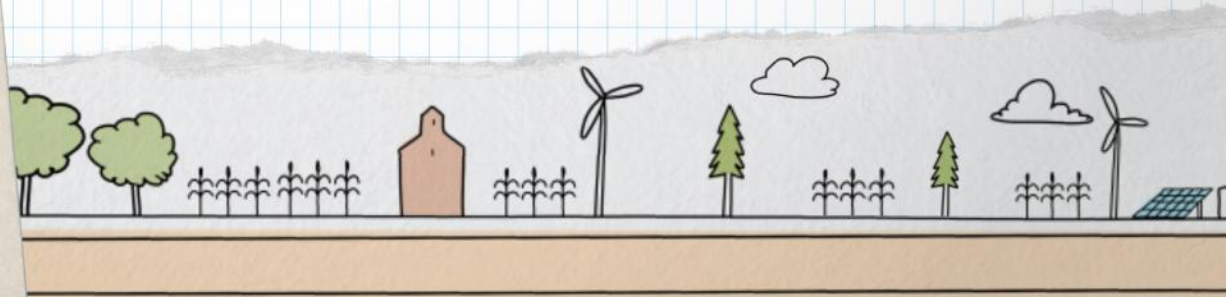
# ISSUE – How much money will we need in the future?

- Industrial Economics Inc.
  - Valuation of the long-term risks associated with CCS.
- Alberta Innovates Technology Futures
  - Estimated future costs of potential future MMV and Remediation activities.

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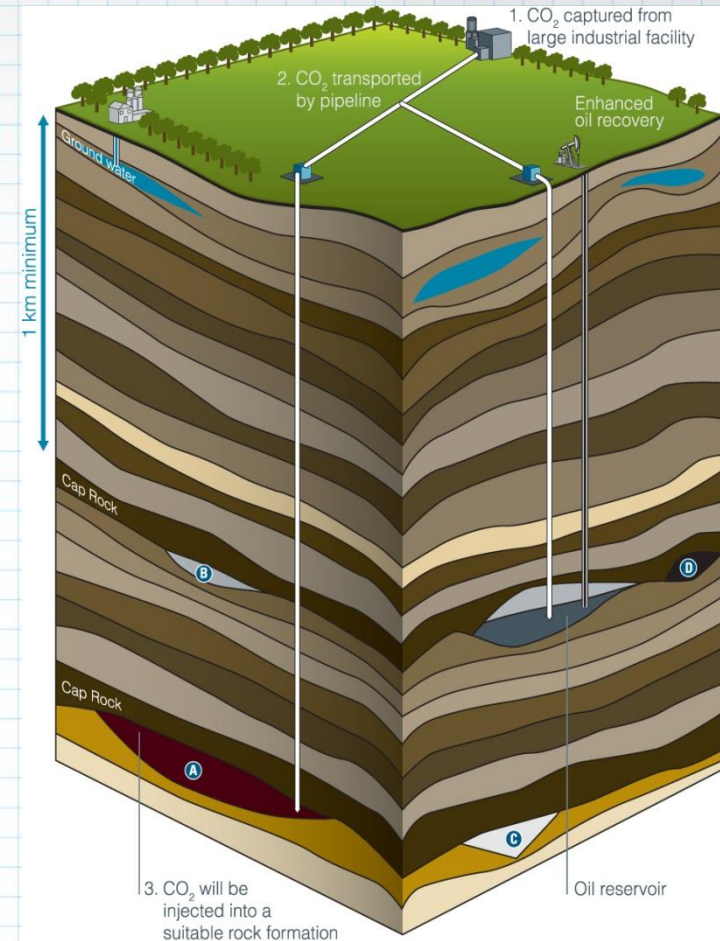
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# What's next?

## ISO CCS Standard:

- Building an integrated CCS standard.
- Commences in June 2012.
- Canada to Chair
- Scope is still being finalized.



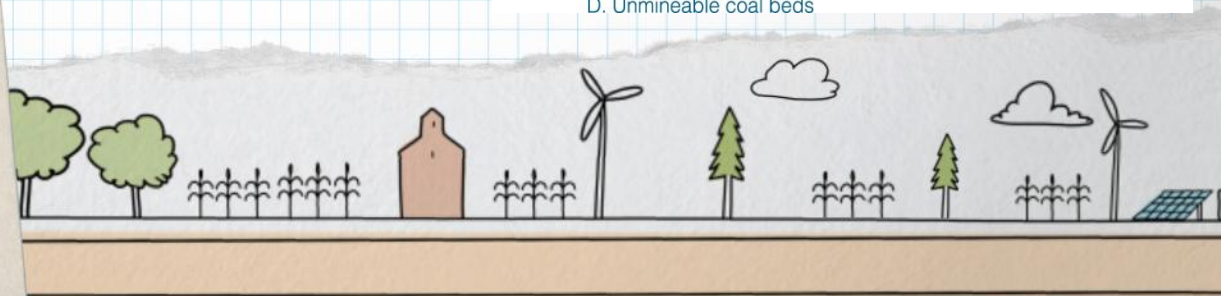
### CO<sub>2</sub> STORAGE OPTIONS:

- A. Deep-saline aquifers
- B. Depleted oil and gas reservoirs
- C. Salt beds or caverns
- D. Unmineable coal beds

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# Thank-you

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(780)-415-6414

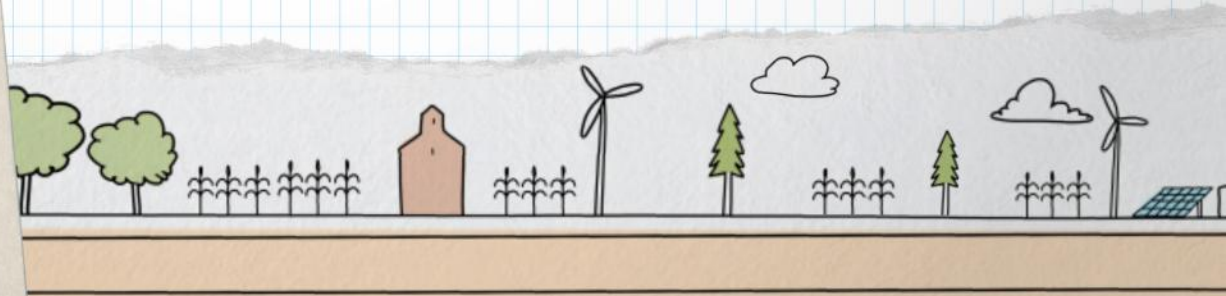


# EXTRA SLIDES

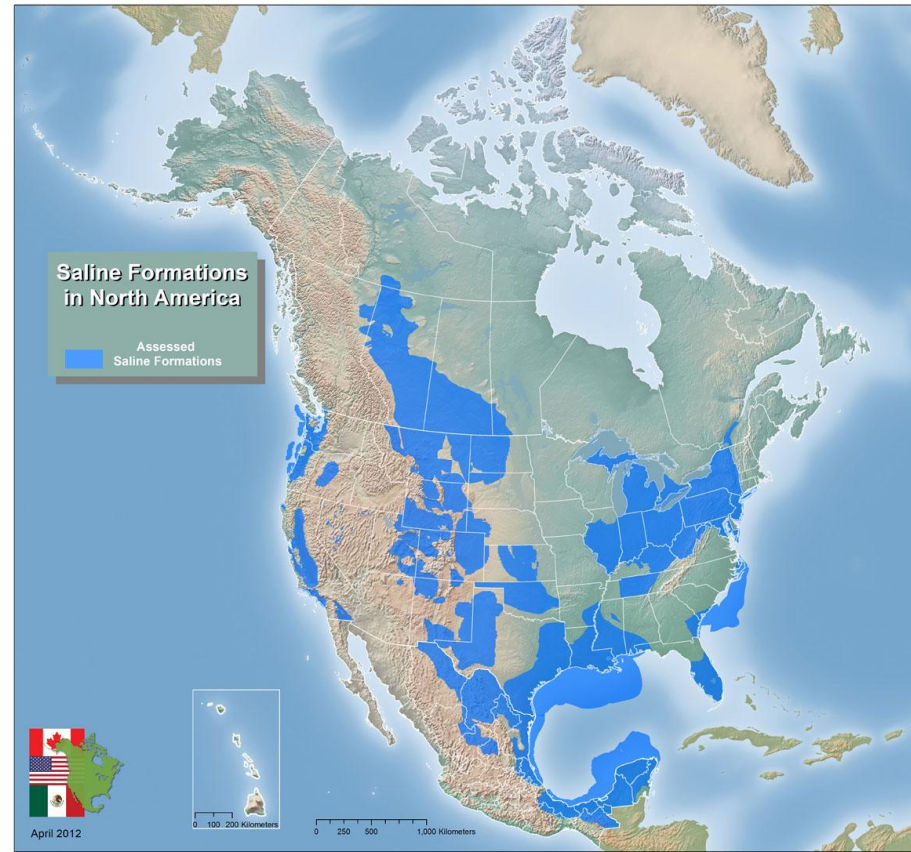
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# NA Storage Atlas



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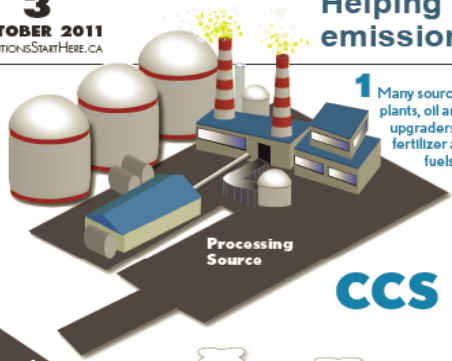
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# Outreach and Education

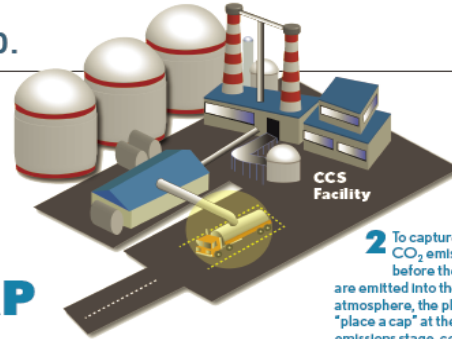
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**3**  
OCTOBER 2011  
SOLUTIONS START HERE.CA

Helping to cut our CO<sub>2</sub> emissions in half by 2050.



**1** Many source facilities — coal-fired power plants, oil and gas operations (i.e. oil sands upgraders and refineries) and chemical, fertilizer and cement plants — use fossil fuels in their operations, producing carbon dioxide, which is emitted into the atmosphere.

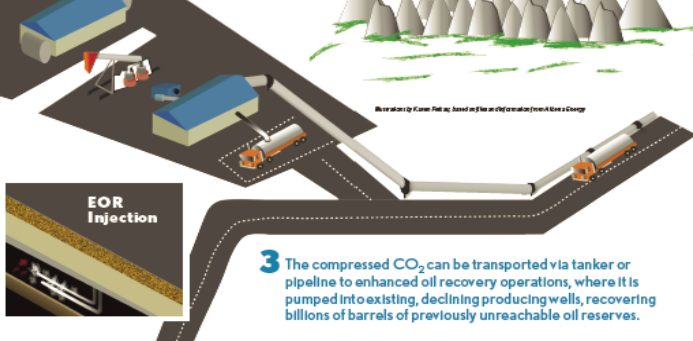


**2** To capture the CO<sub>2</sub> emissions before they are emitted into the atmosphere, the plants "place a cap" at the emissions stage, compress the CO<sub>2</sub> and transport it via pipeline or tanker.

## CCS ROAD MAP

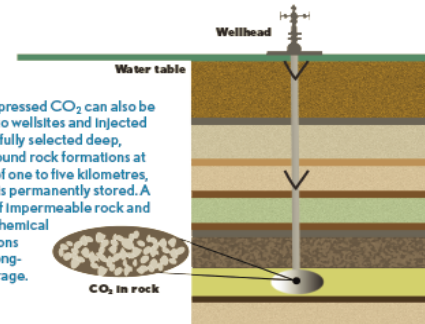
More information online:  
SOLUTIONS START HERE.CA  
WWW.CO2N.COM

**Enhanced Oil Recovery (EOR) Operations**



**3** The compressed CO<sub>2</sub> can be transported via tanker or pipeline to enhanced oil recovery operations, where it is pumped into existing, declining producing wells, recovering billions of barrels of previously unreachable oil reserves.

**4** The compressed CO<sub>2</sub> can also be shipped to wellsites and injected into carefully selected deep, underground rock formations at a depth of one to five kilometres, where it is permanently stored. A barrier of impermeable rock and natural chemical interactions ensure long-term storage.



**BITUMEN**  
The black, oily, thick material that is a naturally occurring byproduct of decomposed organic materials found in the oil sands deposits of Northern Alberta.  
(Government of Alberta)

**CARBON TRUNK**  
The Alberta Carbon Trunk Line is a carbon dioxide pipeline that will carry CO<sub>2</sub> from the Edmonton area to enhanced oil recovery projects near Red Deer.  
(Government of Alberta)

**\$1.2 M TONNES**  
The total tonnage of CO<sub>2</sub> that will be captured each year and injected into saline aquifers as part of Shell Canada's Quest project.  
(Government of Alberta press release Oct. 8, 2009)

**\$15 BILLION**  
The collective cost of the three phases of the North West CCS upgrader enhancement project.  
(Dow Chemical Company)

**\$436 MILLION**  
The amount the Alberta government's CCS Fund will contribute to the Pioneer project, over the next 15 years. The TransAlta Corp. and Capital Power project will also get a \$34.5 million injection from the federal eCO<sub>2</sub>ENERGY Technology Fund.  
(Alberta Government press release Oct. 14, 2009)

**1.3 M TONNES**  
The amount of CO<sub>2</sub> that will be captured each year for use in enhanced oil recovery by the Swan Hills Synthetic In Situ Coal Gasification project.  
(Alberta Government press release July 27, 2010)

**\$1.5 BILLION**  
The total cost of the Swan Hills Synthetic In Situ Coal Gasification and CCS project. Power production is slated for 2015, and the Alberta Government will provide \$2.85 million toward the CCS component of the project.  
(Swan Hills Synthetic In Situ Coal Gasification Project 2011 Alberta Government press release July 27, 2011)

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# PCSF and Financial Security

- Key Questions:
  - 1) What gaps exist between coverage of existing financial security mechanisms and the PCSF?
  - 2) What can the PCSF be used for?
  - 3) What is included in the rate and how is it calculated?
  - 4) How should the PCSF be managed?

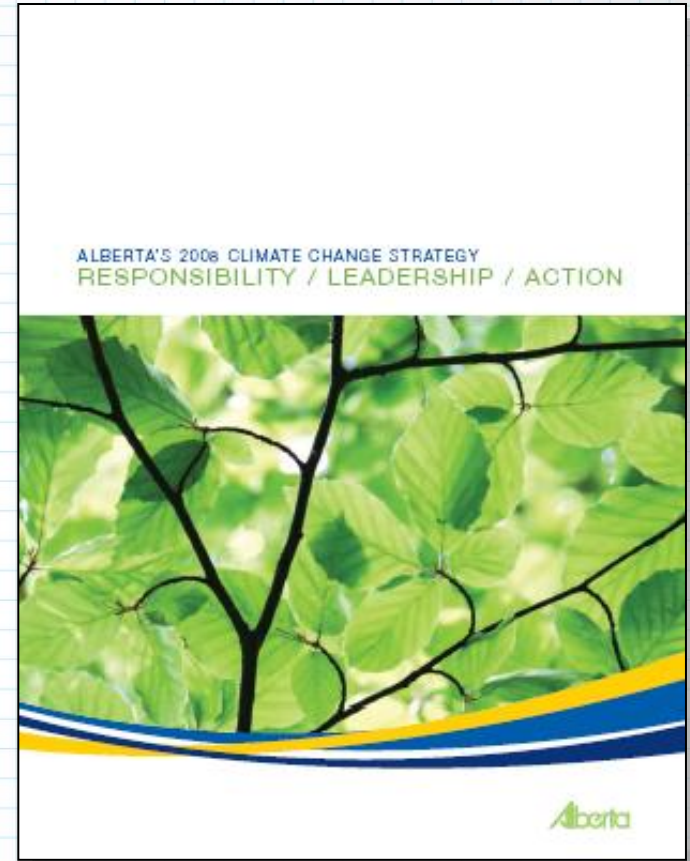
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# Alberta's GHG Compliance Options

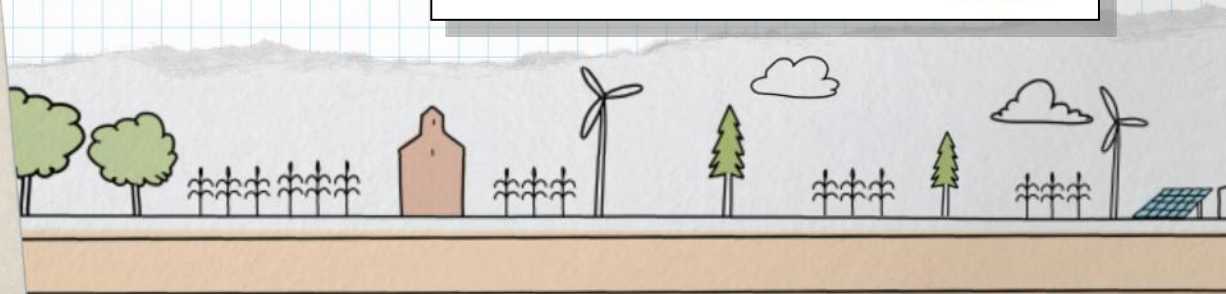
- In 2007, Alberta became the first jurisdiction in **North America** to regulate large industrial emissions.
- Facilities required to immediately reduce per unit GHG output by 12%
- Three compliance options:
  - 1) Physically reduce emissions
  - 2) Purchase accredited Alberta offset
  - 3) \$15 dollar payment per tonne into Technology fund.



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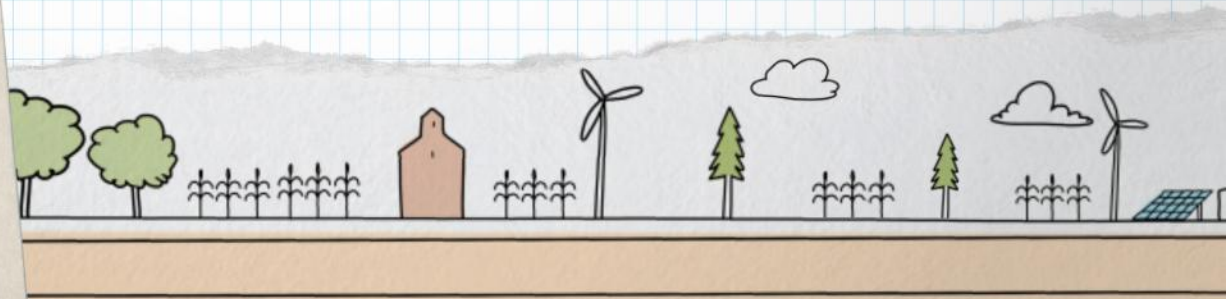
# Gaps between coverage of existing financial security and the PCSF?

- Risk of projects becoming orphaned during the operational phase.
- RFA Draft Recommendation:
  - *Lessees to post financial security sufficient to cover the full expected cost of suspension, abandonment, remediation and reclamation.*

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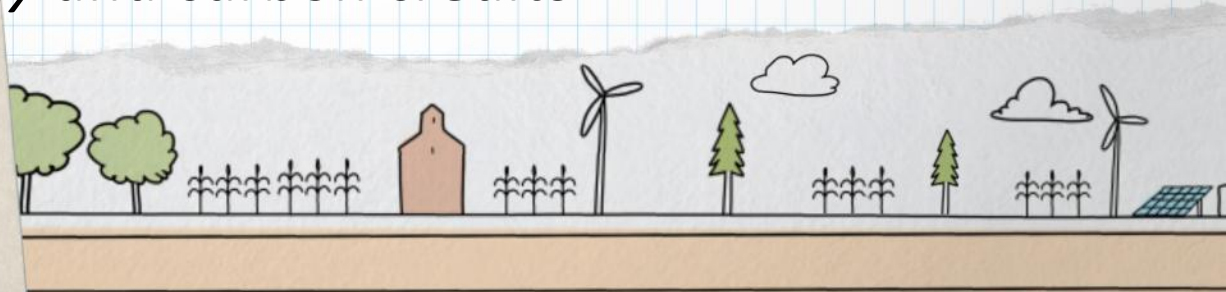
# What can the PCSF be used for?

- Currently, the PCSF can be used for:
  - Monitoring captured CO<sub>2</sub>
  - Fulfilling obligations of being a lessee
  - Paying for suspension, abandonment, reclamation and remediation or orphaned facilities
  - Other purposes prescribed in regulations
- RFA Draft Recommendation:
  - *Allowable uses of the PCSF should be expanded to cover all assumed liability and obligations, including: civil/tort liability and carbon credits*

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# How should the PCSF be managed?

## RFA Draft Recommendation:

- *Funds paid into the PCSF should be pooled amongst all PCSF payees.*
- *No minimum or maximum funding level should be set for the PCSF.*

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