EERC Technology… Putting Research into Practice

The Plains CO_2 Reduction (PCOR) Partnership

Fifth Annual Conference on Carbon Capture and Sequestration

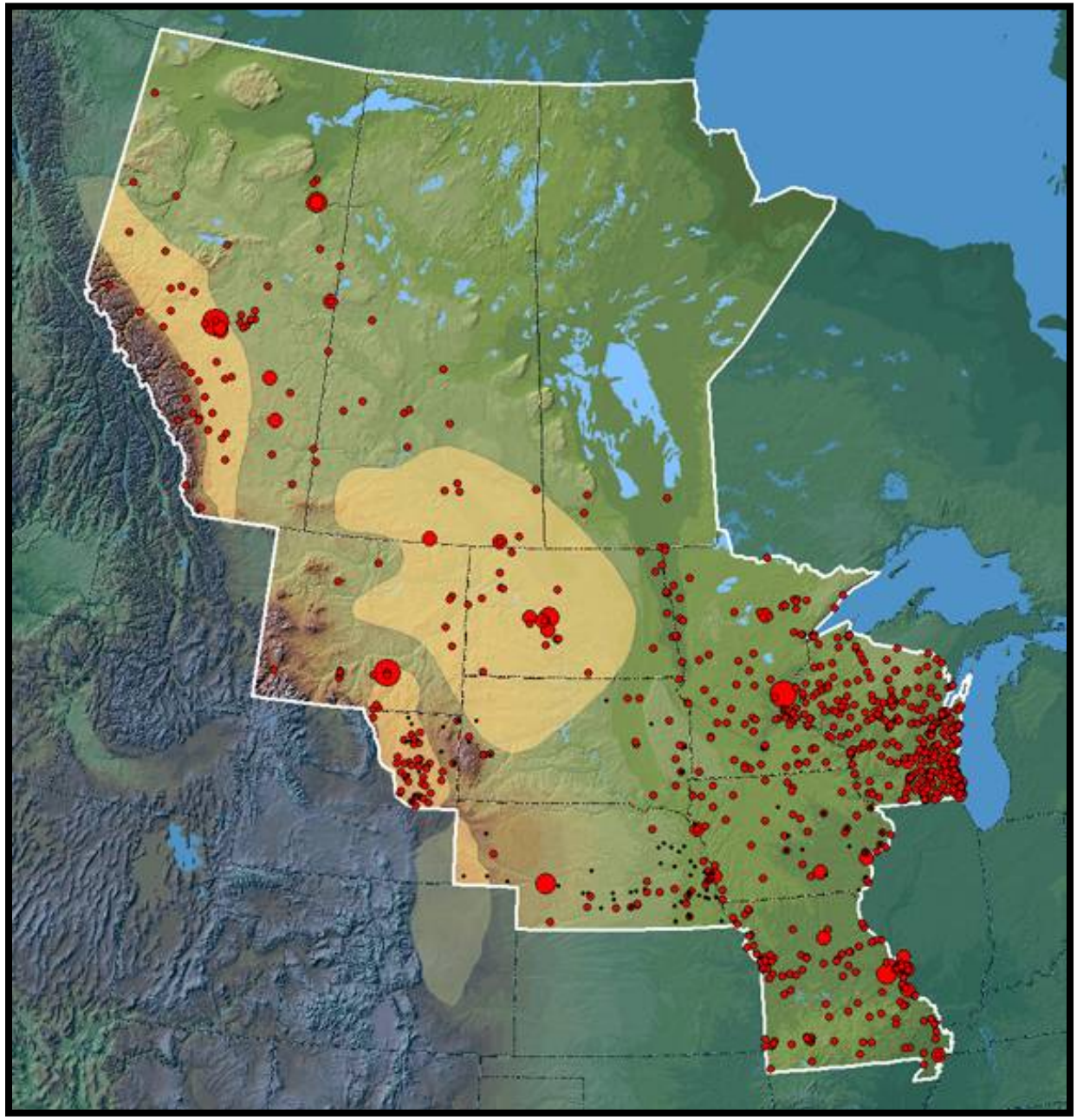
Alexandria, Virginia

May 11, 2006

Phase II Partners

- EERC – University of North Dakota
- EUB – Alberta Energy and Utilities Board
- HESS
- Apache Canada Ltd.
- Basin Electric Power Cooperative
- British Columbia – Ministry of Energy and Mines
- CEED – Center for Energy and Economic Development
- Great Plains Synfuels – Dakota Gasification Company
- Ducks Unlimited Canada
- Ducks Unlimited
- Eagle Operating Inc.
- EICCD
- Encore Acquisition Company
- Environment Canada
- Excelsior Energy
- Fischer Oil and Gas, Inc.
- Great Northern
- Great River Energy
- Interstate Oil and Gas Compact Commission
- DNR
- Lignite Energy Council
- minnesota power
- Minnkota Power Cooperative, Inc.
- Montana-Dakota Utilities Co.
- Minnesota Department of Environmental Quality
- Natural Resources Canada
- Nexant
- North Dakota Department of Health
- North Dakota Geological Survey
- North Dakota Oil and Gas Division
- Industrial Commission of North Dakota – Oil and Gas Research Council
- Industrial Commission of North Dakota – Lignite Research, Development and Marketing Program
- Natural Resources Trust
- North Dakota Petroleum Council
- NDSU – North Dakota State University
- Otter Tail Power Company
- PTTC – Technology Connections
- Prairie Public Television
- Ramgen Power Systems
- Saskatchewan Industry and Resources
- SaskPower
- Suncor Energy
- Department of Agriculture, Trade & Consumer Protection – Wisconsin
- NETL
- USGS – science for a changing world
- Western Governors' Association
- Xcel Energy

Sinks and Sources



Sources

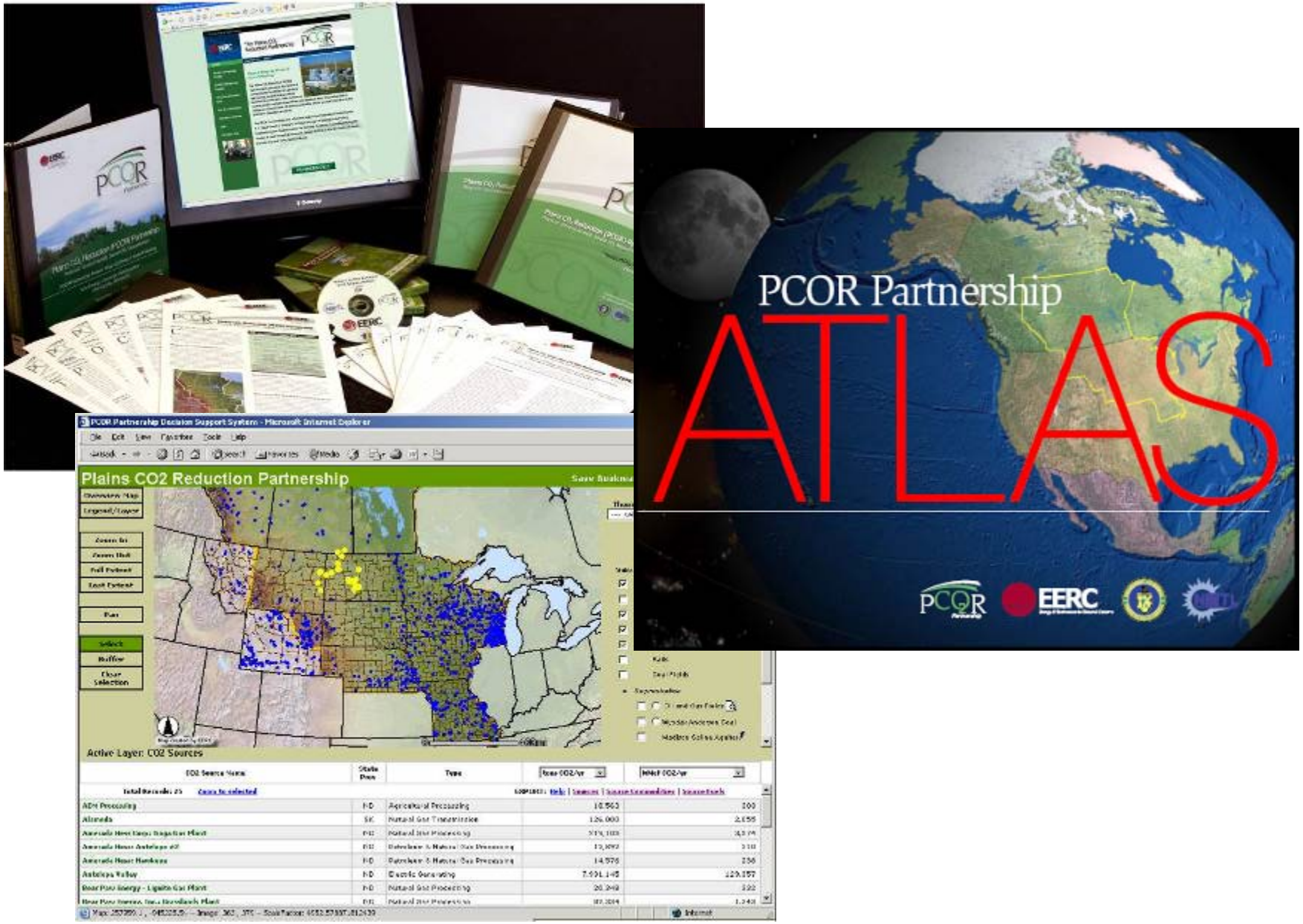
1367 stationary sources

Total CO_2 emissions: 619 million tons/yr

PCOR Partnership Region

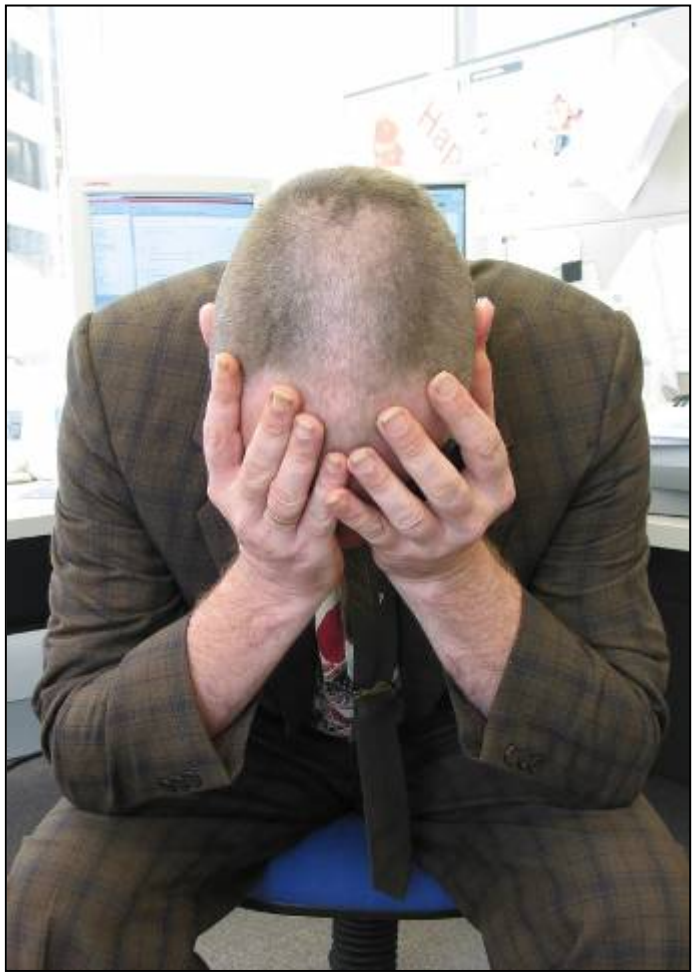
Geological CO_2 sequestration capacity estimated thus far: >218 billion tons

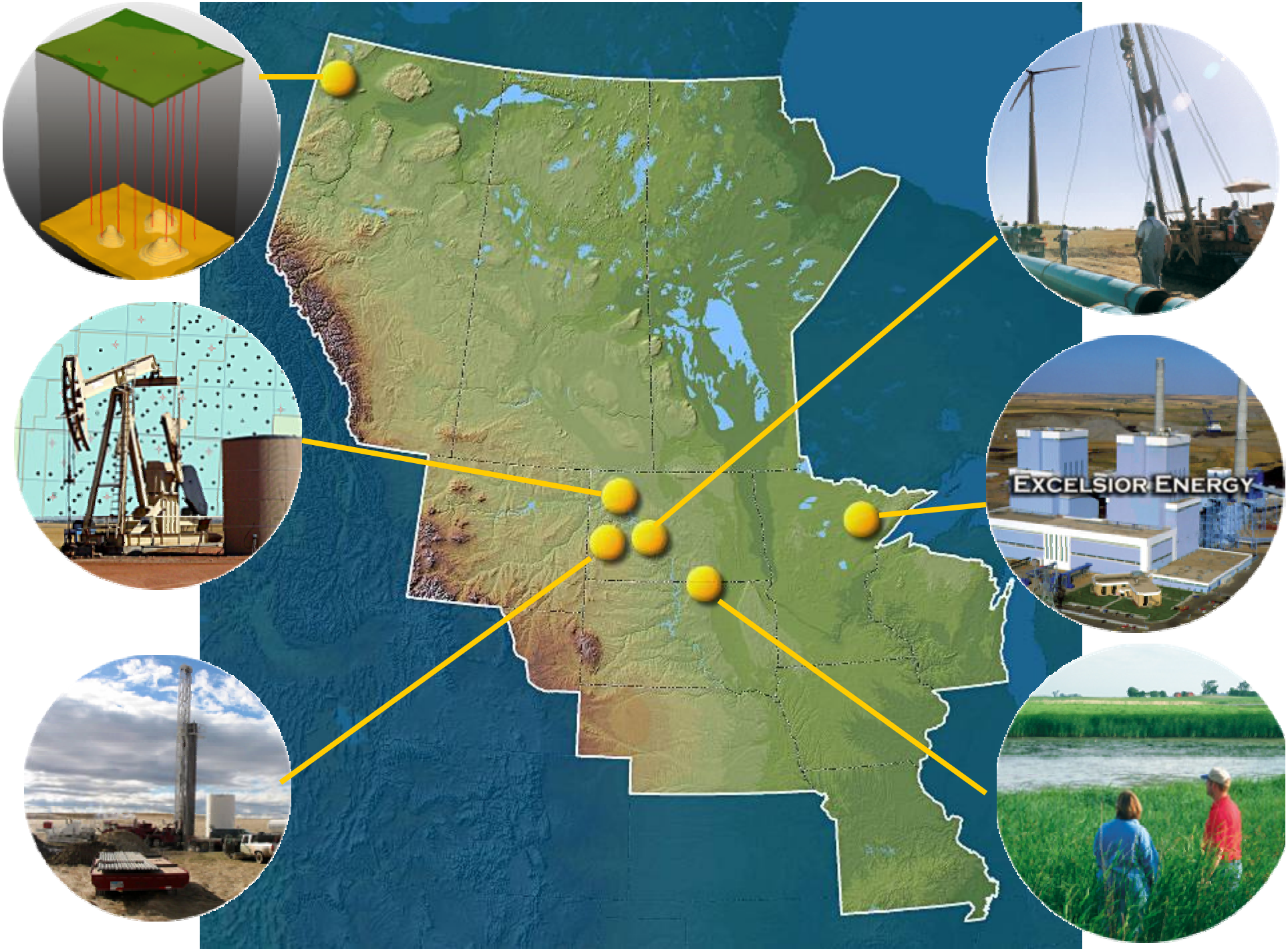
PCOR Partnership Products



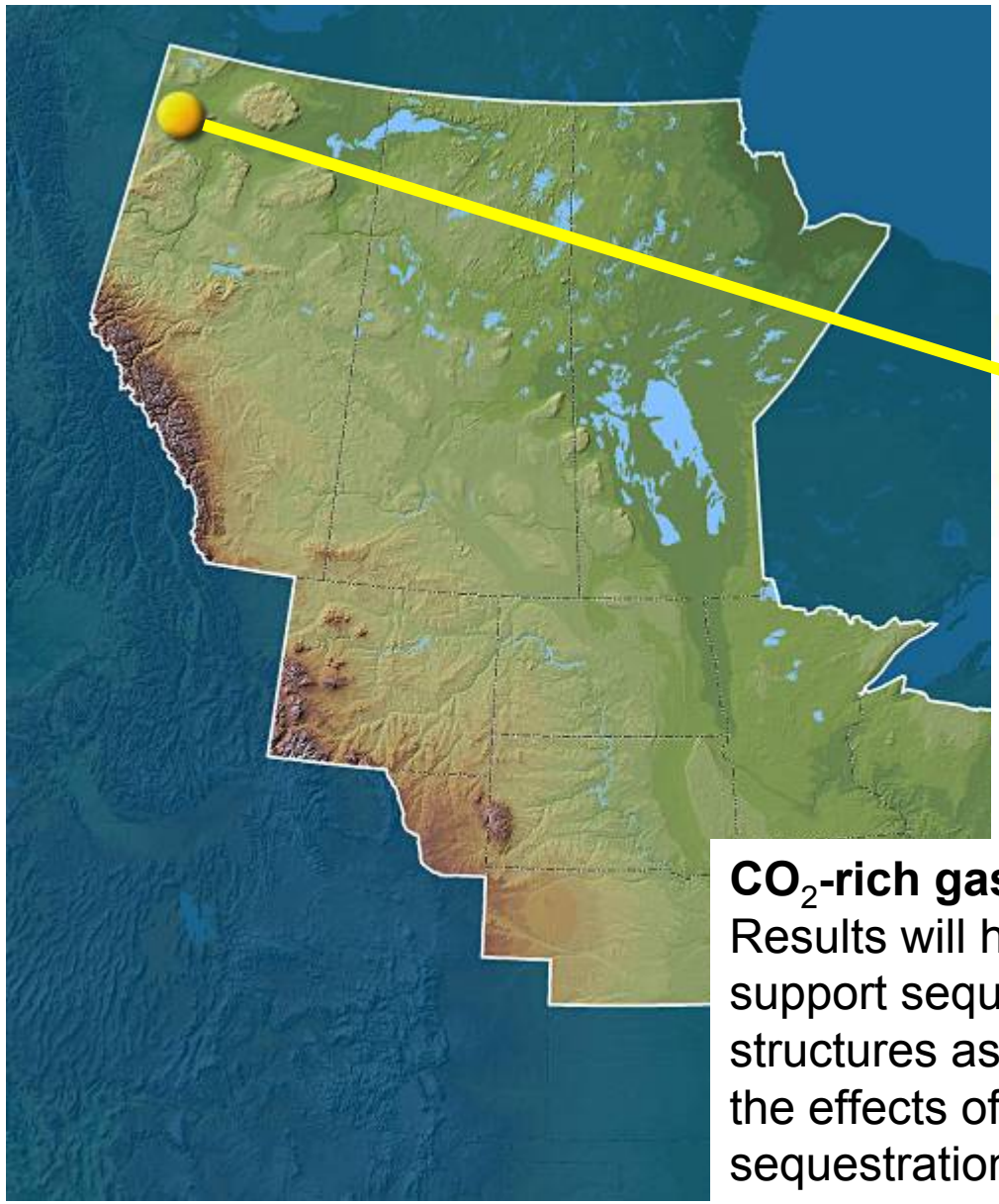
PCOR Partnership Phase II

- Contracts!
- Planning…
- Contracts!



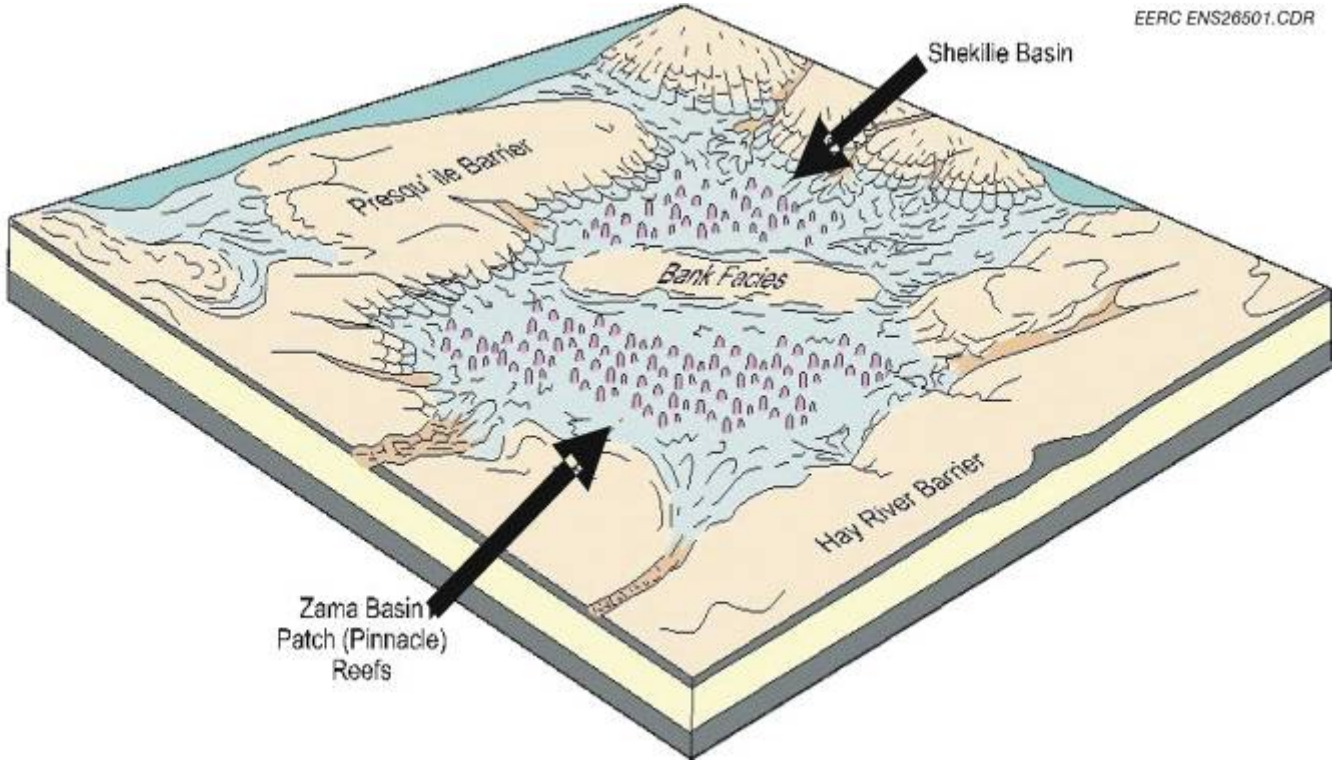

EXCELSIOR ENERGY

Zama, Alberta

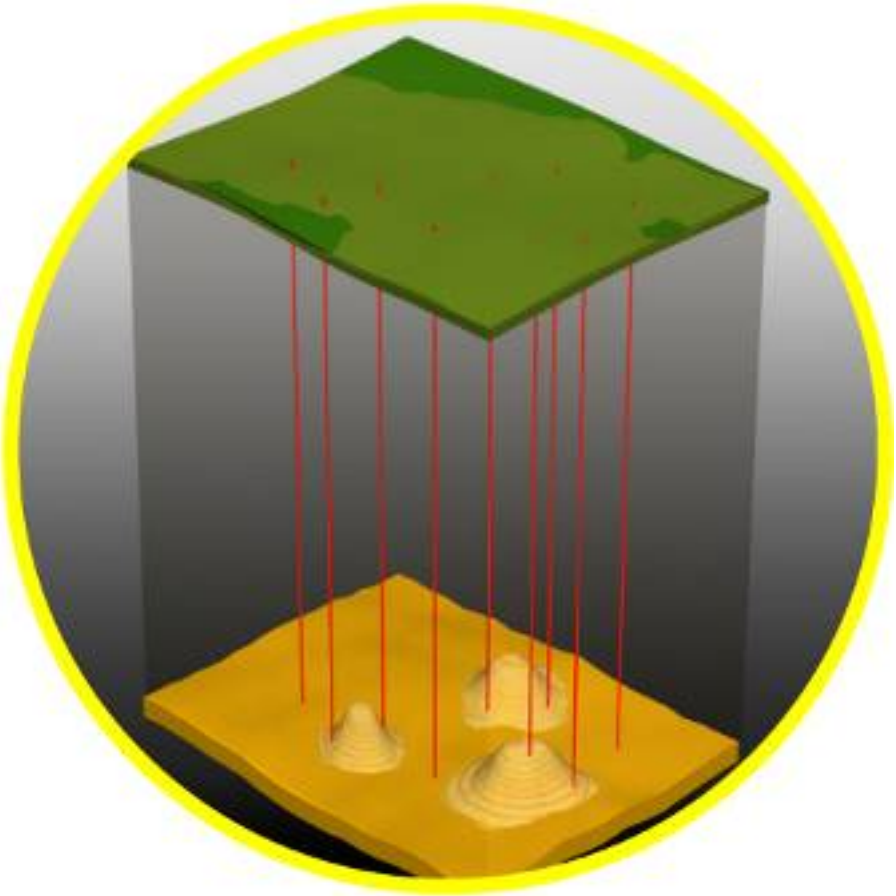


CO_2-rich gas in a pinnacle reef structure – Results will help to determine the best practices to support sequestration in these unique geologic structures as well as further our understanding of the effects of H_2S on tertiary oil recovery and CO_2 sequestration.

Pinnacle Setting



Zama Pinnacle Reef



Injection of acid gas stream from nearby gas-processing plant.

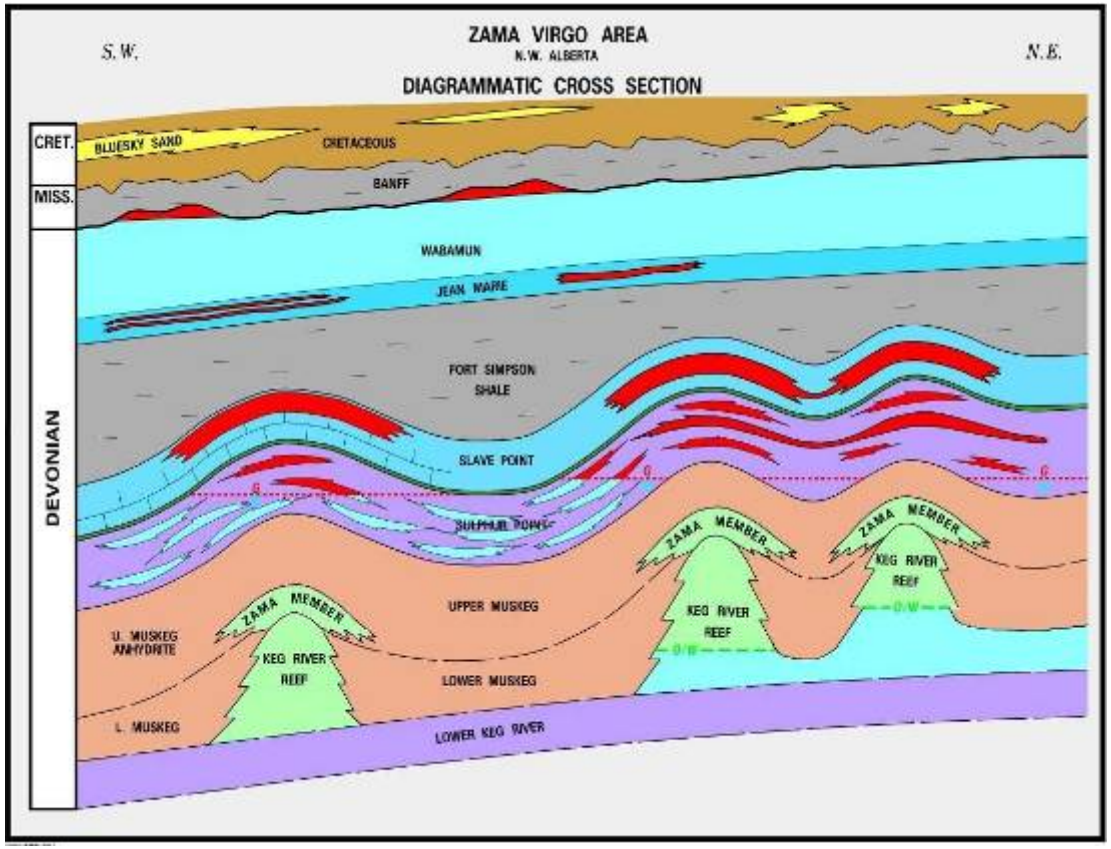
- 60% CO_2
- 40% H_2S

Approximately 200,000 tonnes of CO_2 will be injected during demo period.

Zama Scales of Examination

- Reservoir scale
  - Zama F Pool and immediately underlying and overlying confining units: Lower Keg River Fm limestone and Muskeg Fm anhydrite.
- Local scale
  - Zama F Pool and a few adjacent pinnacle reefs.
  - Entire stratigraphic column from basement to surface.
- Regional or subbasin scale
  - Relevant data from basement to surface over the entire Zama oil field/subbasin.
- Basin scale
  - Flow regime of the underlying Keg River aquifer.

Zama Pinnacle Reef



MMV Operations

- Monitor the CO_2/H_2S plume:
  - Reservoir pressure monitoring.
  - Wellhead and formation fluid sampling (oil, water, gas).
  - Geochemical changes in wells.
- Early warning of reservoir failure:
  - Pressure monitoring of injection well, reservoir, and overlying formations.
  - Geochemical monitoring of overlying formations.

Zama Laboratory Work for MMV

- Using cores from demonstration sites.
- Physicochemical reactions between injected gas, fluids, and rocks.
  - Mineralization
  - Partitioning
    (oil, gas, water, rock)

Beaver Lodge, North Dakota

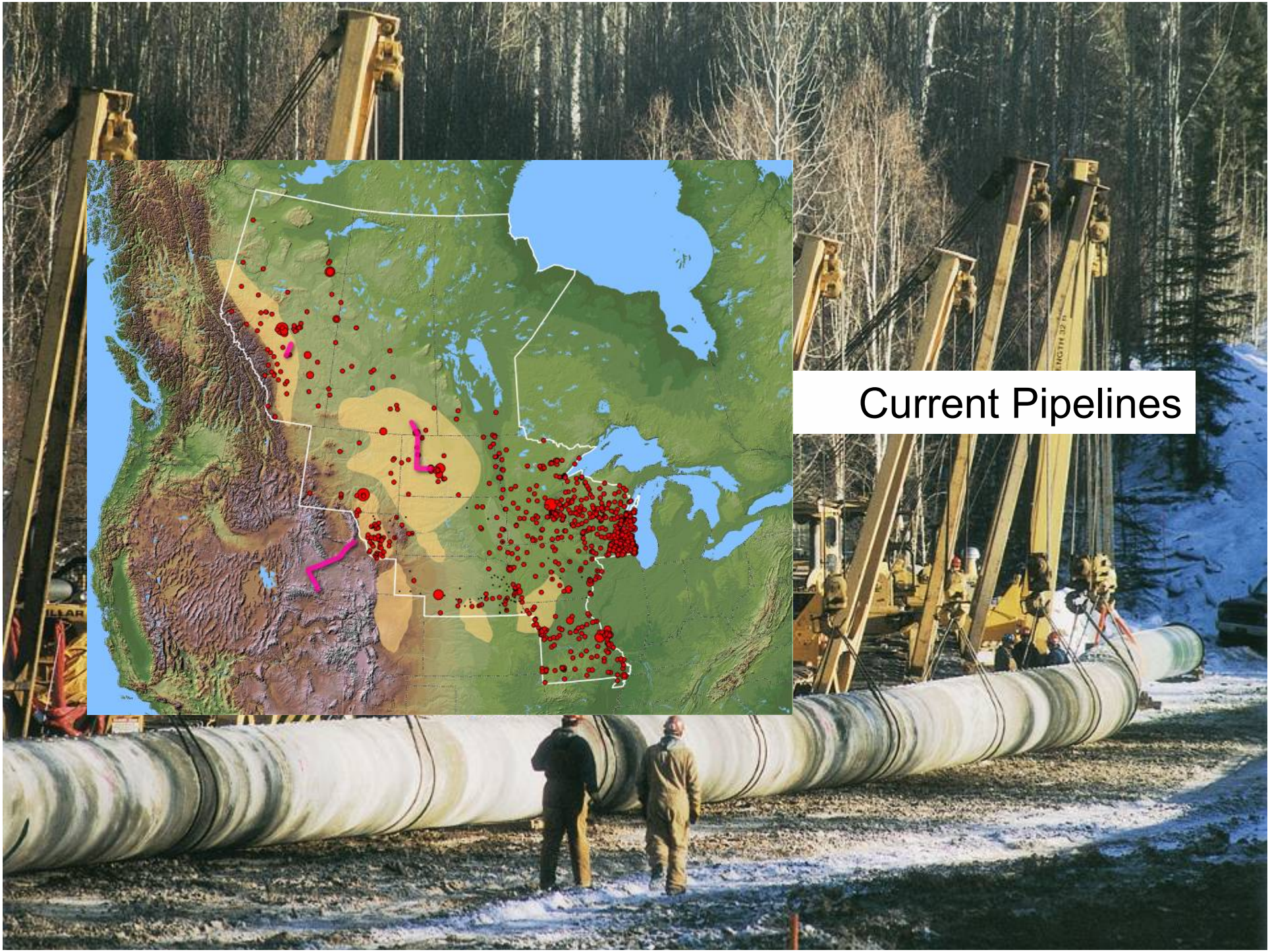
- CO_2 in a deep oil reservoir – CO_2 will be injected into an oil-bearing zone at great depth in the Beaver Lodge oil field.
- Minimum of 3000 tonnes of CO_2 will be injected during demo period.

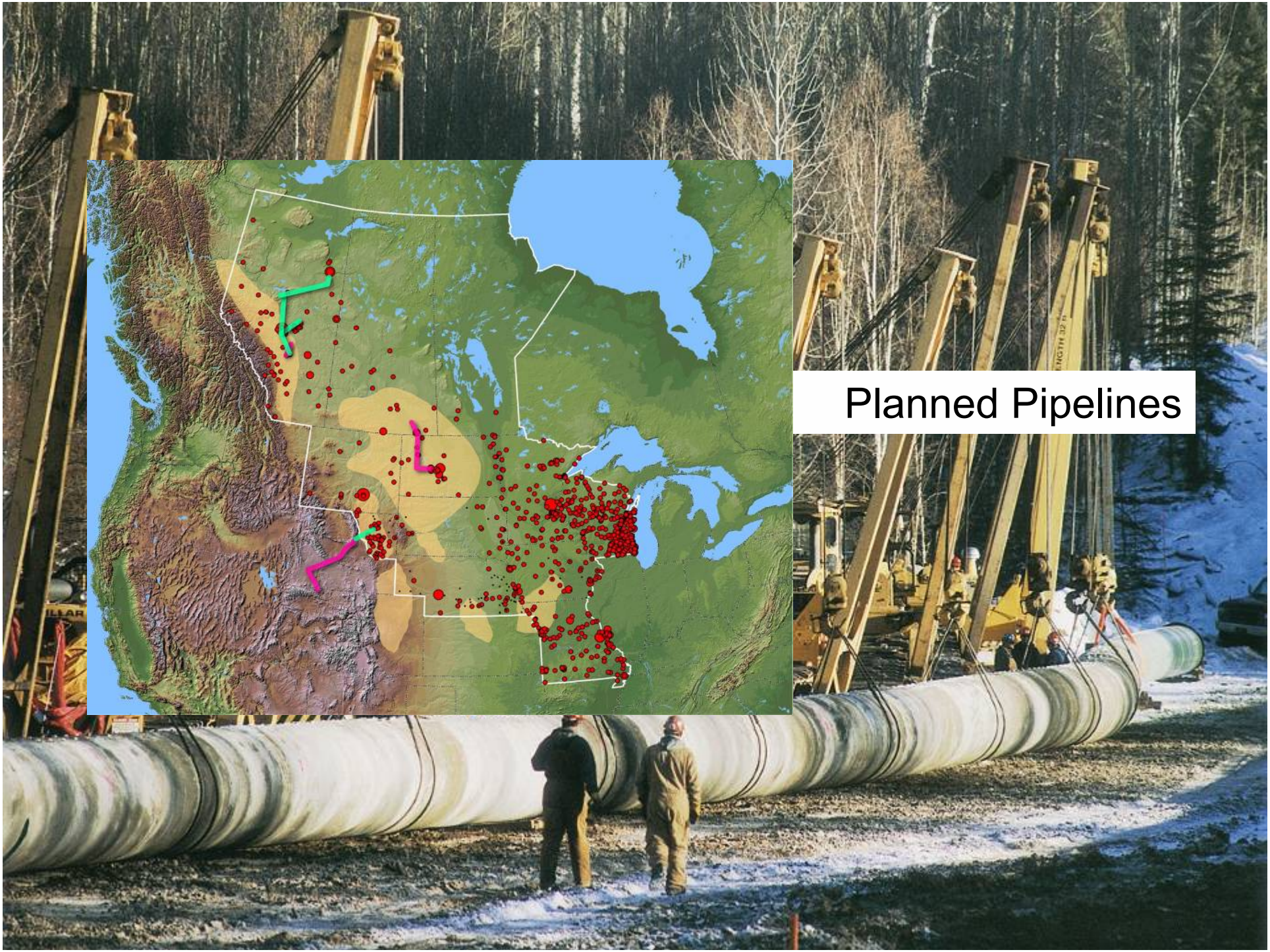
Lignite for CO_2 Sequestration and ECBM

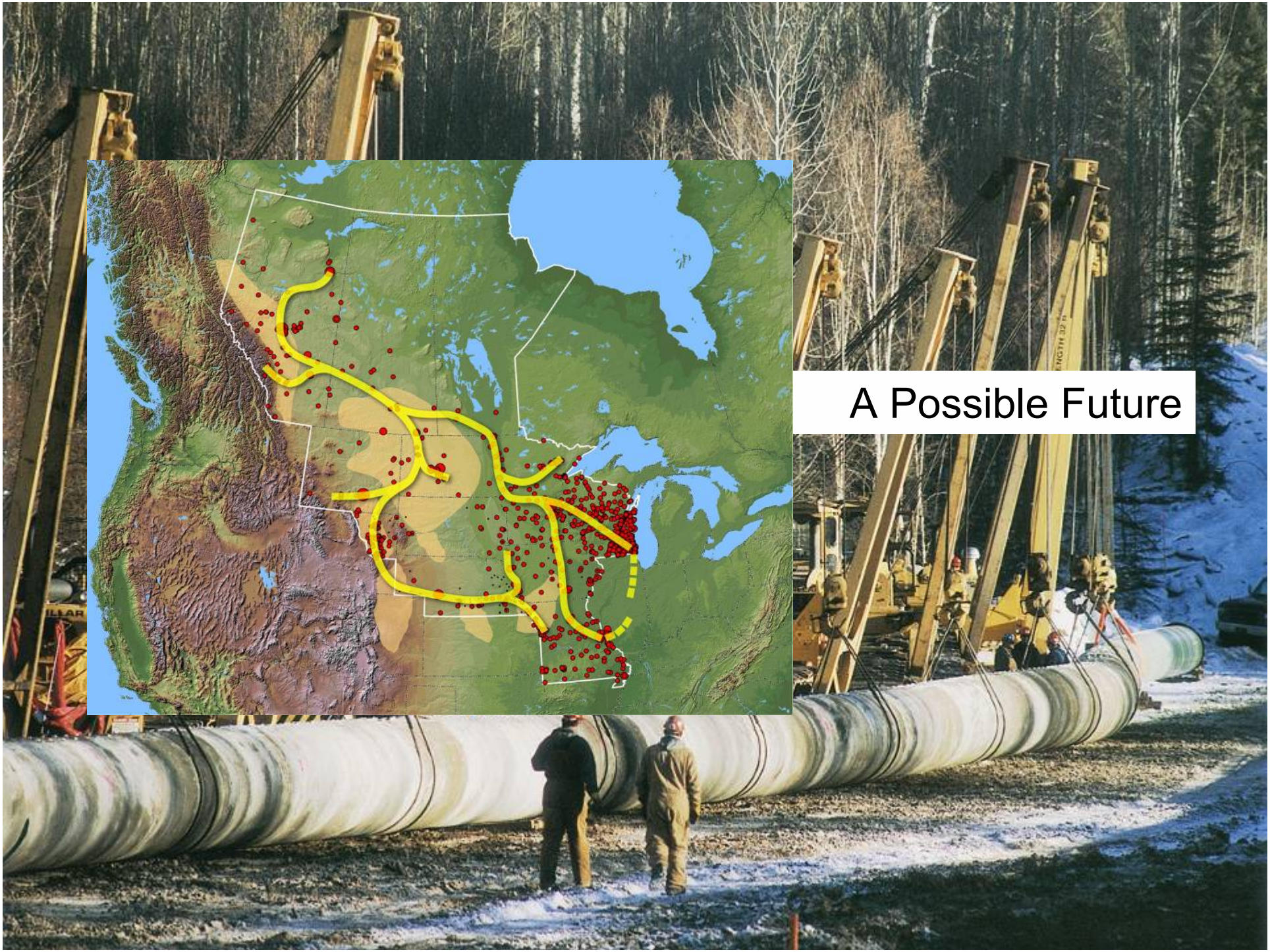
- CO_2 in an unminable lignite seam – CO_2 will be injected for both CO_2 sequestration and enhanced coalbed methane production.
- State of North Dakota is providing surface and mineral rights access; hoping to drill this summer.

Terrestrial Demonstration

Out of the Air – into the Soil – A managed wetland will be implemented in north-central South Dakota to demonstrate practices that will improve CO_2 uptake. The results will help to optimize CO_2 storage, monitoring, and verification methods and facilitate the monetization of terrestrial carbon offsets in the region and elsewhere.


Current Pipelines


Planned Pipelines


A Possible Future

Stay Tuned!