

The Alberta Carbon Trunk Line

GPAC/PJVA Joint
Conference
Presentation

October 23, 2013

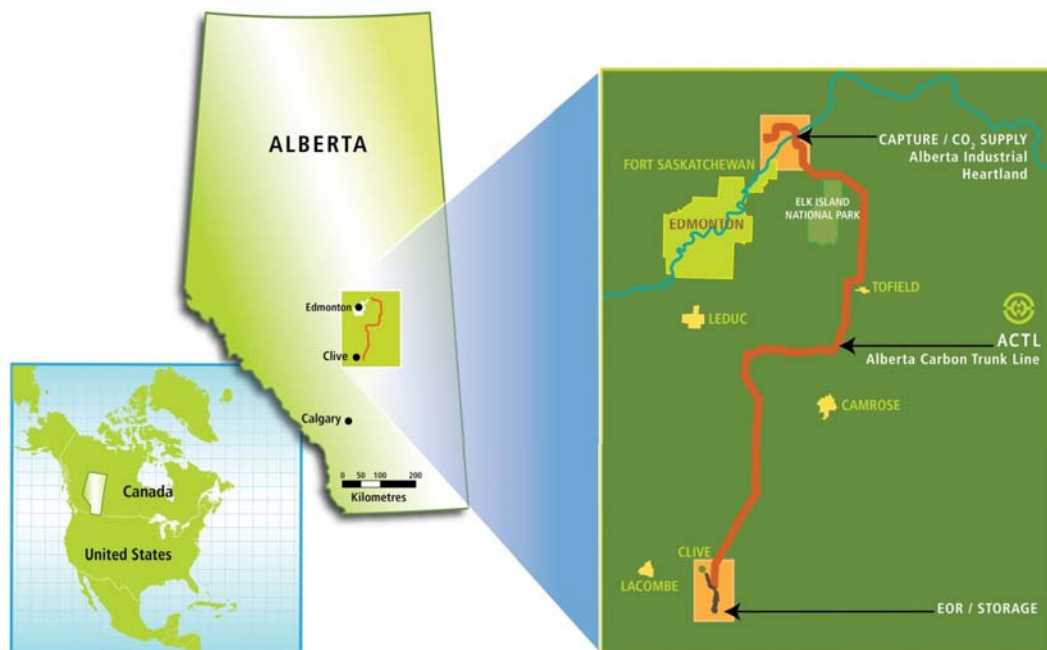


**Government
of Alberta**



Autumn Colour, by Ted Rafferty

The Alberta Carbon Trunk Line (ACTL)



One of two CCS projects supported by the Alberta and Canadian governments

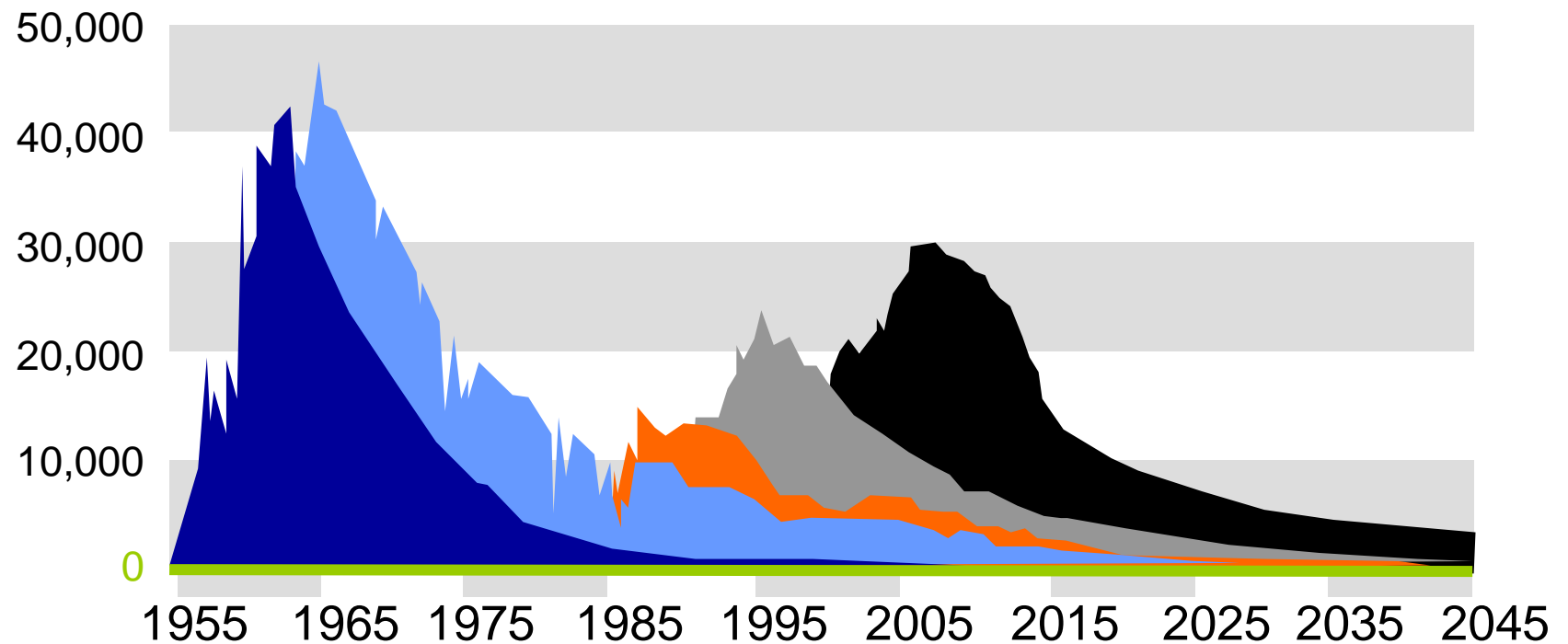
- Pipeline capacity 14.6 million tonnes a year of CO₂
- Able to unlock 1 Billion barrels of light oil
- Storage of 2-3 Billion tonnes CO₂



Weyburn: CO₂ Was the Next Logical Choice

Incremental recovery 155 MMbbls
Sequestration 45 million tonnes CO₂

Weyburn Production
bbl/d



CO₂ for the project comes from coal gasification in North Dakota

Weyburn: A Template for CCS in Alberta



North Dakota to Weyburn: 300km total
Initial injection rate: 5,000 tonnes/day
Source : Gasification facility

Weyburn is currently the largest Carbon Capture and Storage (“CCS”) project in the world

Repeat in Alberta



Redwater to Clive: 240km

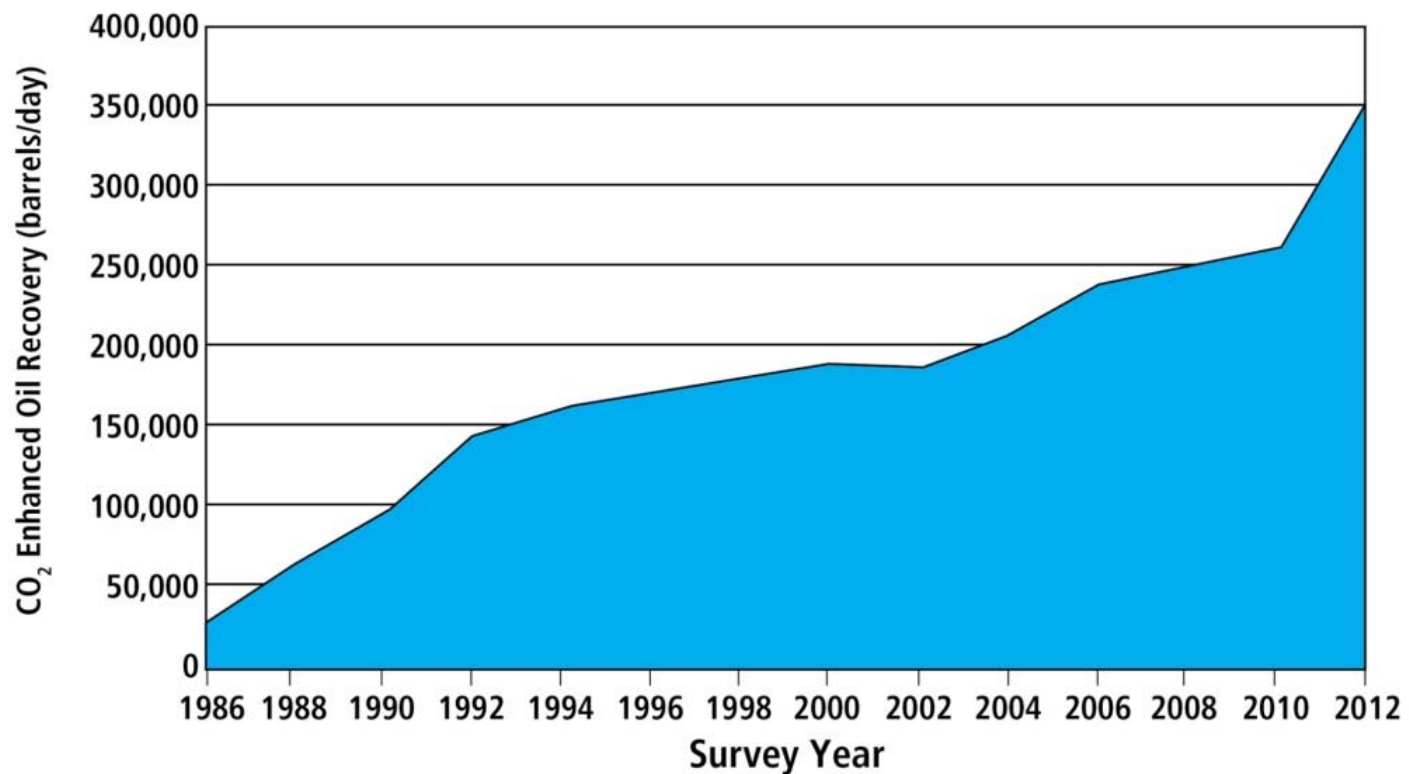
Initial injection: 5,000 tonnes/day

Source : Gasification Facility and Chemical Facility



CO₂ EOR Is Well Established in US

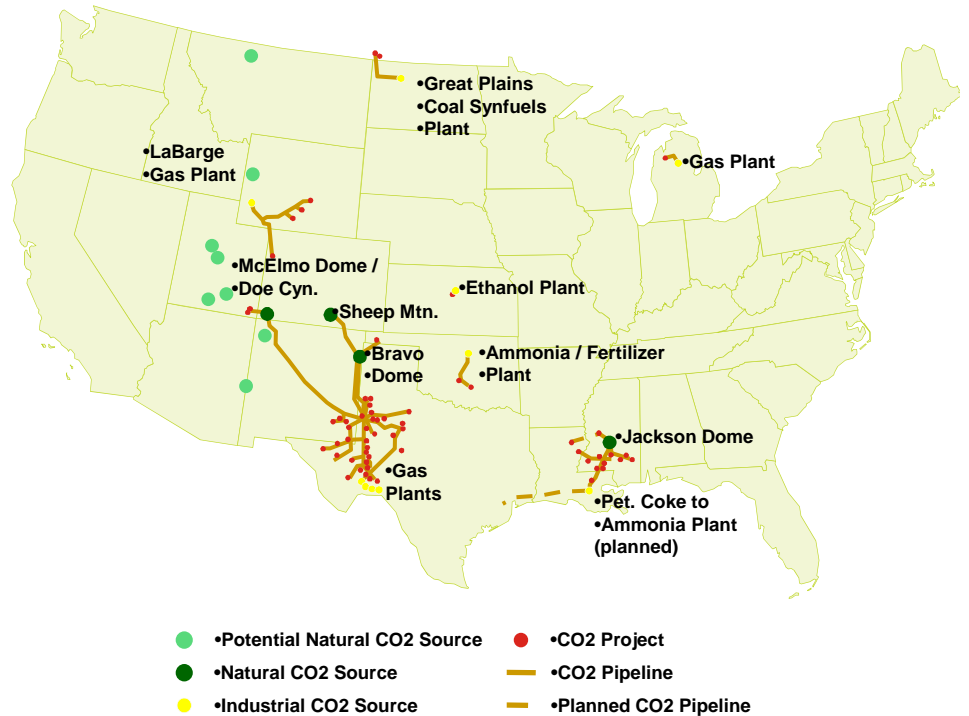
- CO₂ EOR established in early 1970's, more than 110 active floods
- Production 350,000 barrels a day of light oil and growing



Source: Advanced Resources Int'l. and the Oil and Gas Journal, 2012

CO₂ EOR in the US vs. Canadian CCUS

- Abundance of natural occurring CO₂ in US supports larger market
- 600 million tonnes of CO₂ injected
- 51 million tonnes of CO₂ move every year



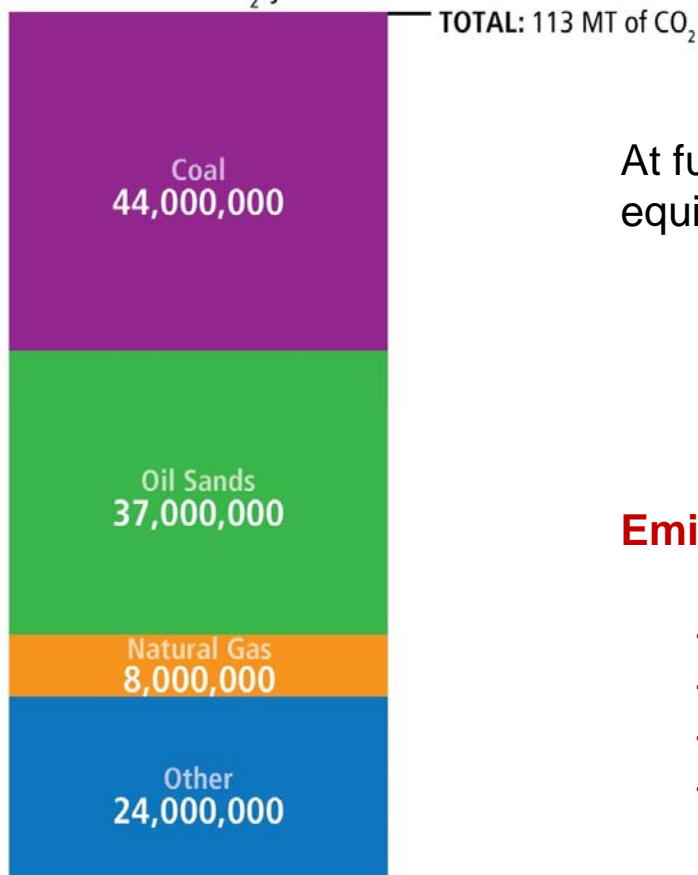
CO₂ is Not New in Alberta

- Pipeline transport and storage of CO₂ is proven technology
- 46 EOR/ gas injection sites
- >100 Million tonnes of CO₂, solvent and acid gas injected to date
- But Canadian sources of CO₂ will generally be waste streams



ACTL – Reducing Alberta's CO₂ Emissions

Alberta Emissions (2009)
Tonnes of CO₂/year



At full capacity the project will store the equivalent amount of CO₂ as:

- Removing every car in Alberta off the road
- The equivalent of producing 3.5 millions barrels a day, or 4 Keystone projects

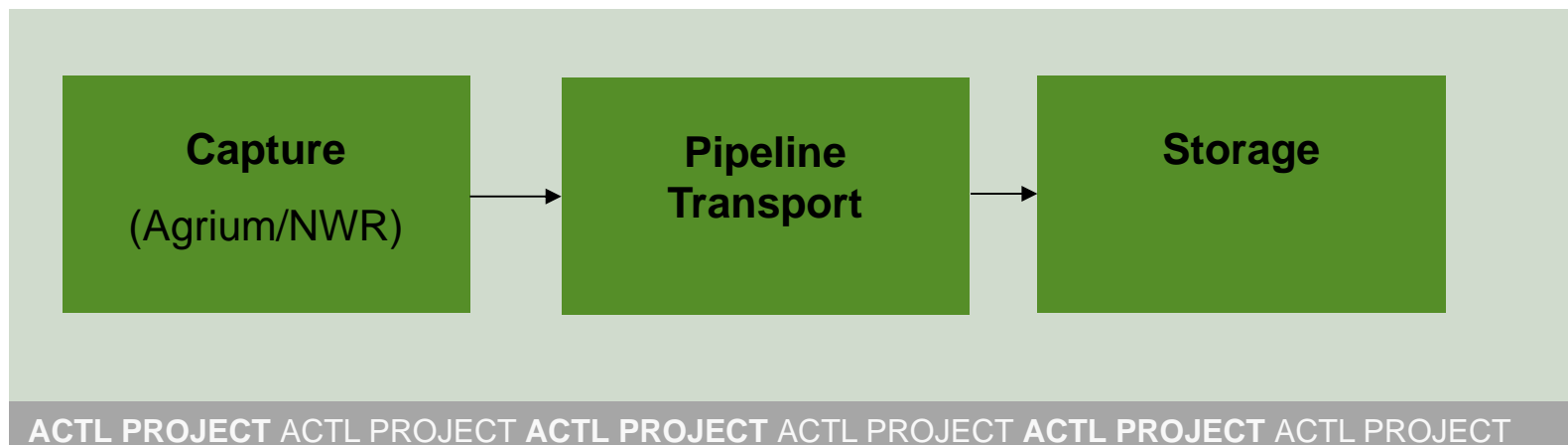
Emissions Breakdown in Alberta

- 39% from coal
- 33% from the oil sands
- 7% from natural gas
- 21% from other sources



The ACTL – Overview

- Carbon capture facilities at:
 - **Agrium Fertilizer Plant** (1,600 tonnes/day)
 - **North West Redwater Sturgeon Refinery** (3,500 tonnes/day)
- CO₂ Pipeline capacity 40,000 tonnes/day (14.6 million tonnes /year)
- Routed to access reservoirs for CO₂ storage and EOR development
 - 2-3 billion tonnes of CO₂ storage
 - 1 billion barrels of light oil production



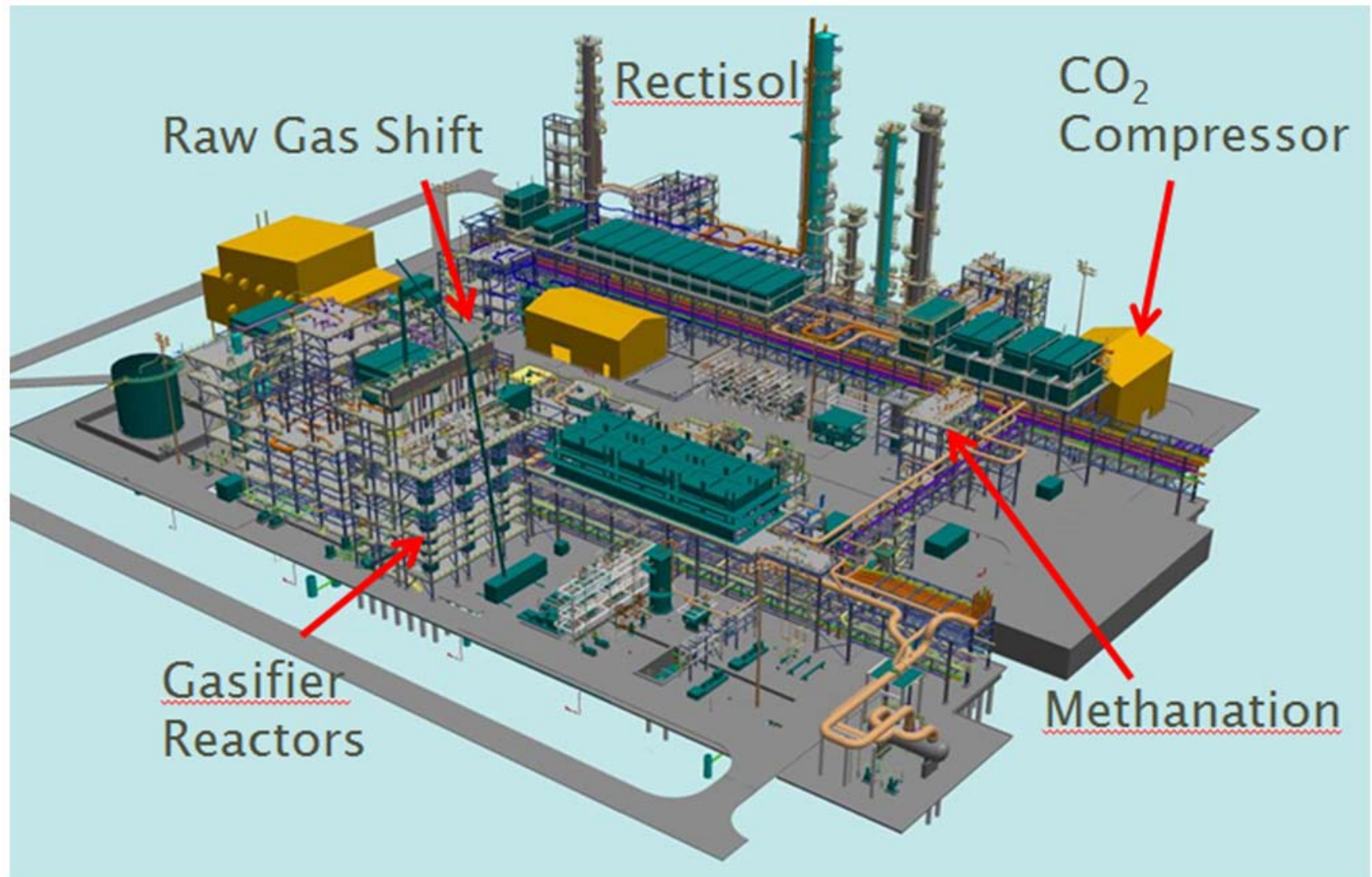
North West Redwater Partnership Sturgeon Refinery

NWR CO₂ Supply

- Dry, low pressure, low temperature
- High purity, no contaminants
- Only requires compression and cooling, no dehydration, refrigeration or pumping required
- CO₂ compression system designed for an average of 3,500 tonnes/day
- Carbon capture designed in from outset reduces process integration challenges and cost



Gasifier – NW View



Civil Earthworks and Deep Undergrounds



Agrium Fertilizer Plant



Agrium is a major retail supplier of agricultural products and a leading global producer and marketer of agricultural nutrients and industrial products

- \$15 Billion Agricultural products company
- The largest global agricultural retailer, with approximately 1,250 facilities
- The Agrium Redwater Facility is the largest fertilizer complex in Canada and North America
 - Produces approximately 680,000 tonnes of ammonium phosphate (MAP) and close to 1.4 million tonnes of nitrogen based nutrients
 - CO₂ production is in excess to the facility's operational needs

Agrium



Agrium Fertilizer Plant

Agrium CO2 Recovery Facility

- 1,600 tonnes a day of wet CO2 at low pressure
- Compression located on perimeter of Agrium site
- Detailed engineering complete
- Major mechanical equipment has been procured
- On-site tie-in to Agrium plant completed



ACTL Equipment Procurement



Dehydration Flash Drum



Inlet Separator



ACTL Compressor Casing



Refrigeration Vessel



ACTL Pipeline

Pipeline is far advanced

- Received regulatory approval and permit to construct
- Pipeline valves and actuators are being manufactured
- Pipe specification finalized
- Survey and construction plans completed
- Purchased pipe for river crossing

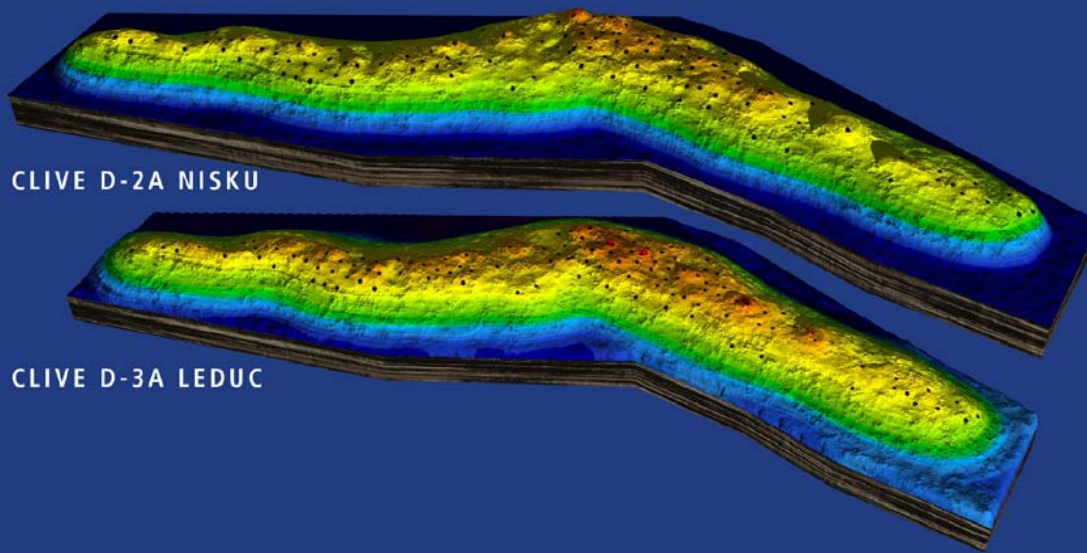


Clive: First CO₂ CCUS Site Acquired

First EOR reservoir

- Most facilities for EOR already in place
- Mature reservoir with established large reserves

Clive Reservoirs



ACTL Pipeline – Stakeholder Engagement

Enhance maintains a comprehensive stakeholder engagement policy

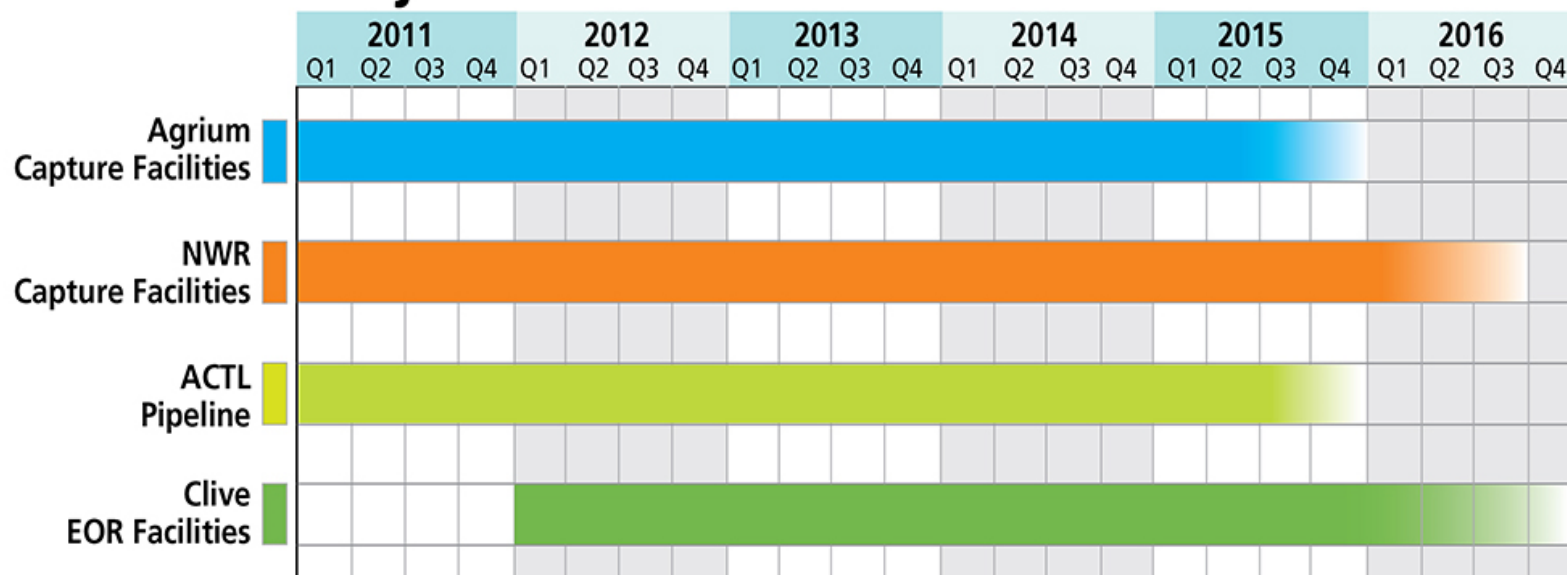


- The pipeline is 240 km long and has a total 1,348 stakeholders along its route
- The project has 100% landowner approval
 - Eight open houses
 - Extensive stakeholder meetings
 - Information brochures
 - Newsletters
- Right of Way finalized (~400 landowners)



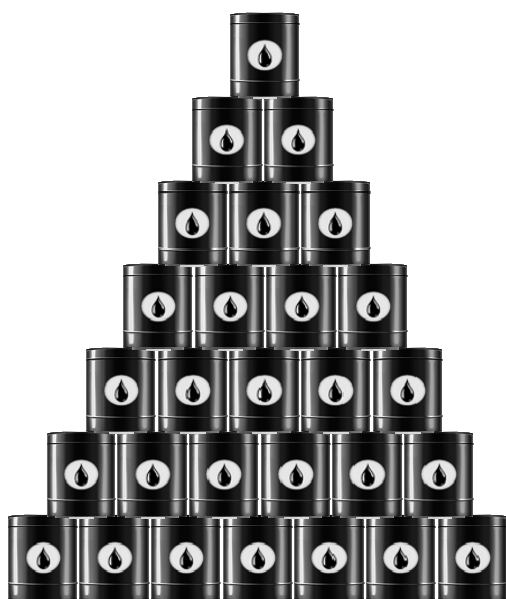
Project Well Advanced

Project Timeline



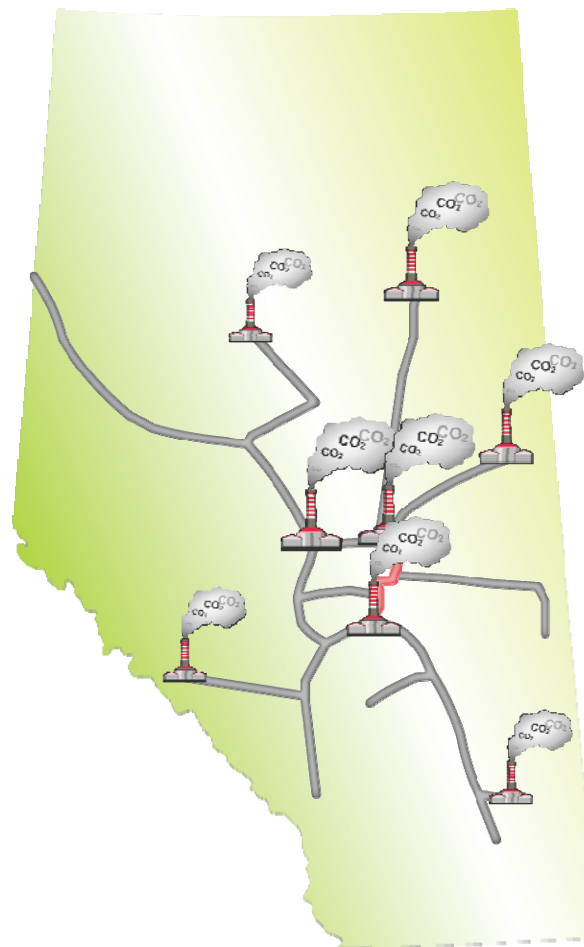
Brave New World: Expanding Markets

The commoditization of CO₂ is fast becoming a new market, and allowing for a new industry of light oil production in the province



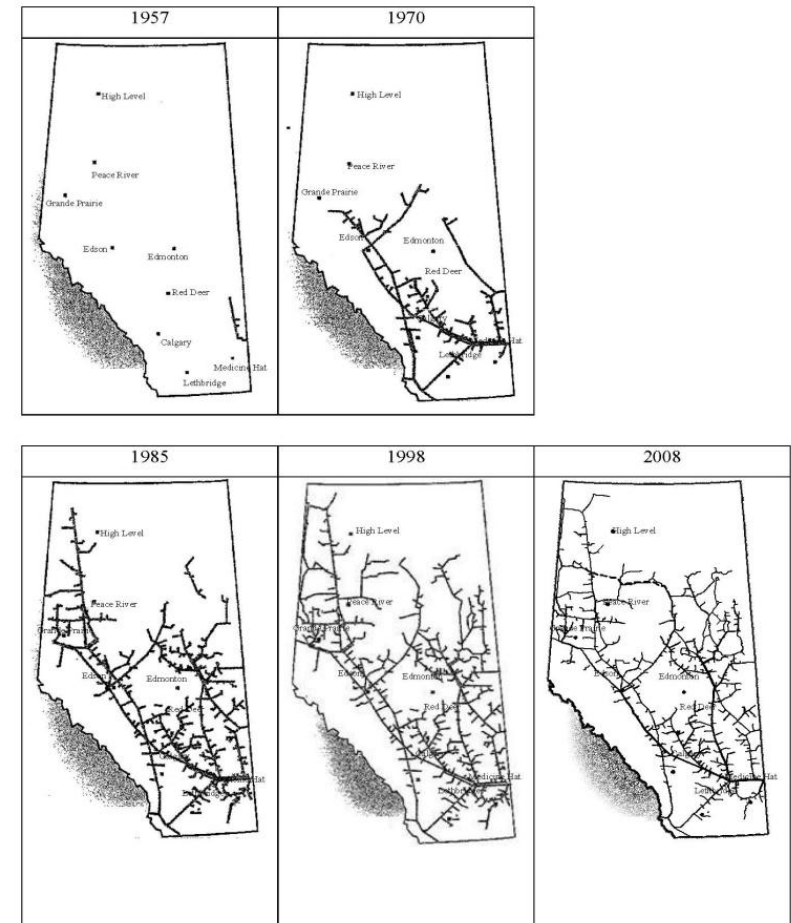
Incremental production

1.4 Billion barrels of oil



Alberta Gas Trunk Line (“AGTL”)

- In 1930's natural gas was a nuisance – gas flared in Turner Valley
- 1954 the Alberta Gas Trunk Line was introduced by the Government of Alberta
- Regulations introduced and previously stranded and flared gas was conserved and sold



Courtesy of TransCanada Pipelines

The Alberta Gas Trunk Line (AGTL - NOVA)

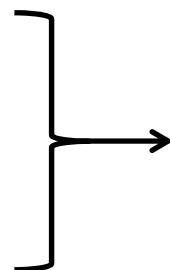


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Positive Impact of AGTL

Impact on Alberta:

- Natural gas industry
- Petrochemical industry



Royalties, Taxes, Jobs

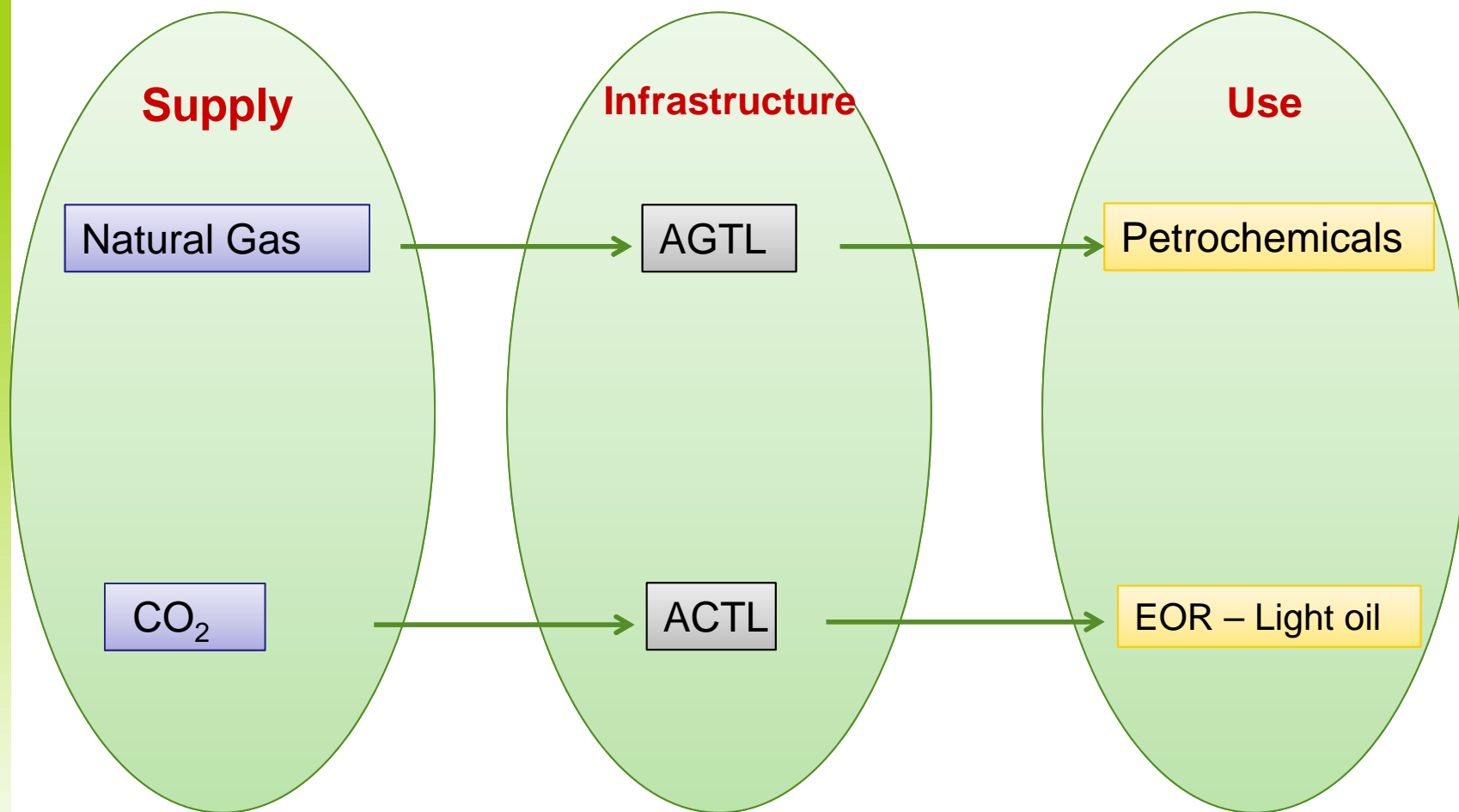


Natural gas and by products royalties (fiscal 2011/12): \$1.30 billion

Number of jobs linked to oil and natural gas producers: 275,000 people employed directly and indirectly in Alberta

Number of jobs linked to petrochemicals: approximately 1,340 in Central Alberta, and each job is estimated to create a spin-off of another 2.5.

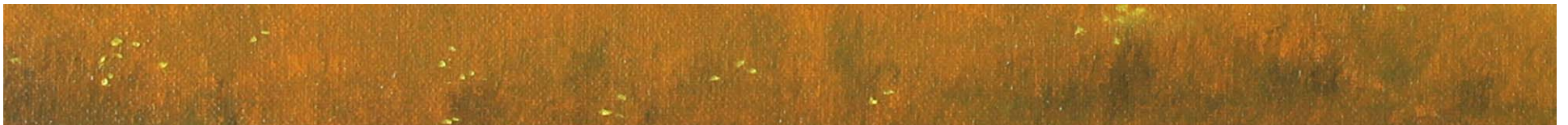
Just Like the AGTL



Build it and They Will Come



We have a solution to industrial CO₂ emissions





**Government
of Alberta** ■

