The Alberta Carbon Trunk Line

Carbon Sequestration Leadership Forum (C SLF); Application Presentation

Cover Artwork: *Sun Ray Reflection*, by Mathew Wong, a local Alberta painter
The Alberta Carbon Trunk Line (ACTL)

- One of two Carbon Capture and Storage (CCS) projects supported by the Alberta and Canadian governments
  - Designed pipeline capacity 14.6 Mt/year of CO₂; licensed for 5.5 Mt CO₂/year
  - Able to unlock 1 Billion barrels of light oil (initially 30 Mt in Clive oil field)
  - Storage of 2 Gt CO₂
This is a completely integrated CO\textsubscript{2} Capture, Transport, Utilization and Storage (CCUS) project that takes CO\textsubscript{2} from industrial CO\textsubscript{2} sources and brings it to old oil fields for enhanced oil recovery and CO\textsubscript{2} storage (“cradle to grave”)

Furthermore, unlike the Sleipner, Gorgon, In Salah and Quest projects, ACTL involves the participation and commercial transactions between several companies rather than being constructed and operated under a “single roof”
Government Funding

Allocation of Provincial Funding

Provincial Funding: CAD$495 million

Federal Funding: CAD$63.2 million
Alberta Emissions Reduction Targets

Projected Alberta Emissions 2020
Tonnes of CO₂/year

TOTAL: 300 MT of CO₂

Reduction Target by 2020:
50 MT of CO₂

Projected Alberta Emissions 2050
Tonnes of CO₂/year

TOTAL: 400 MT of CO₂

Reduction Target by 2050:
200 MT of CO₂
Let’s Not Forget …

Large Global Emitters 2010
(Million tonnes CO₂/year)

- Asia Coal Emissions: 5,726
- US Coal Emissions: 1,156
- Europe Coal Emissions: 1,055
- Canada Coal Emissions: 78
- Canada Oil Sand Emissions: 49
Weyburn: CO$_2$ Sequestration in Oil Reservoirs

Incremental recovery 155 million barrels
Sequestration 45 million tonnes CO$_2$

CO$_2$ 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: 5,000T/d
Source: Gasification facility

Weyburn is currently the largest CCS project in the world
Repeat in Alberta

Redwater to Clive: 240km
Initial injection: 5,000T/d
Source: Steam Methane Reforming and Bitumen Gasification
Location of Initial CO₂ Sources

- NWR
- Agrium
- SHELL QUEST
- ACTL

Map showing the location of initial CO₂ sources with the North Saskatchewan River and a pipeline to Clive.
Agrium is a major retail supplier of agricultural products and a leading global producer and marketer of agricultural nutrients and industrial products

- $15 Billion Agricultural products company
- The largest global agricultural retailer, with approximately 1,250 facilities
- The Agrium Redwater Facility is the largest fertilizer complex in Canada and North America
  - Produces approximately 680,000 tonnes of ammonium phosphate (MAP) and close to 1.4 million tonnes of nitrogen based nutrients
  - Process CO$_2$ is currently vented to atmosphere
**Agrium CO₂ Recovery Facility (CRF)**

- 800 tonnes a day of **wet, low pressure, high purity** CO₂
- CRF located on perimeter of Agrium site
- Detailed engineering complete
- All of the major mechanical equipment has been procured
- Modular package design to minimize onsite construction
- On-site tie-in to Agrium plant completed
World’s first upgrader and refinery with an integrated carbon management solution

• Processing 50,000 barrels per day of bitumen in 1st of 3 phases

• Producing refined products such as ultra low sulphur diesel with lowest carbon footprint in the world

• Using Lurgi gasifier technology to produce hydrogen and pure (99%+) dry CO₂ from bitumen bottoms (with no coke by-product)
NWRPSR CO₂ Supply

- Dry, low pressure, low temperature
- High purity, no contaminants
- Process more straight forward than Agrium design
  - Only requires compression and cooling, no dehydration, refrigeration or pumping required
- CO₂ compression system designed for 4,200 T/day
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, involving ~400 landowners
Pipeline is Far Advanced

• Received regulatory approval and permit to construct

• Pipeline valves and actuators were manufactured and are in a secure storage facility (photos on slides 16 – 17)

• Finalized pipe specification

• Purchased 12” pipe for river crossing

• Survey and construction plans finalized South of Highway 15 (220 km out of 240 km)

• Acquired 100% of the right of way (ROW) South of Highway 15 without requiring any surface rights or regulatory hearing

• The ROW through the Alberta Industrial Heartland area has been finalized and we will be acquiring the remainder of that portion of the right of way in 2013

• Clearing of ROW began February 19th, 2013 (photos on slide 18)
ACTL Pipeline – Valves

AGRIUM and NWR CO₂ RECOVERY FACILITIES

MAIN LINE BLOCK VALVES
AGRIUM and NWR CO₂ RECOVERY FACILITIES

TIE-IN VALVES

VENT VALVES
Right of Way Clearing Began February 19th, 2013
First EOR Site – Clive Oil Reservoirs

Clive Reservoirs (Leduc and Nisku)

*Depth*: approximately 1,800 meters

*Current Pressure*: 1,813 psig
Project Timing

Project Timeline
Calendar Quarters

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ACTL – Enabler towards Large Scale CCS

Potential Industrial CO₂ Sources

Potential CCS Sites

ACTL Phase One

Potential ACTL Growth
The Alberta Carbon Trunk Line

Enhance Energy Inc.
www.enhanceenergy.com