Enhance Energy
Alberta Carbon Trunk Line and Clive CCUS Project

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Alberta’s Green Oil Mega-Project

- Billion dollar integrated CO₂ capture, storage and enhanced oil recovery project
- Alberta Carbon Trunk Line – Alberta’s backbone CO₂ pipeline infrastructure
- Capture and store 1.9 MM tonnes/year CO₂
- Increment Alberta’s proven resource base by revitalizing mature light oil fields
Industry and Government Joint Project

Total Government Funding
$424 million

Provincial Funding
$371 million

Available Prior to and at Commercial Operations
$223 million

Available Post Start-up until 2025
$148 million

Federal Funding
$53 million

EcoEnergy Technology Initiative
$32.9 million

Clean Energy Fund
$20.1 million

40% 60%
Alberta Carbon Trunk Line (ACTL)

- Strategic connection between CO₂ supply and target reservoirs
- 240 km - 12” & 16” open transmission pipeline
- 15,000 T/d licensed capacity
- Expandable to 40,000 T/d
- Regulatory approved
- 2600 PSI max operating pressure
**CO₂ Capture: Agrium**

**Agrium CO₂ Recovery Facilities**

- CO₂ 99%+
- Requires dehydration
- Compression
World’s first refinery with an integrated carbon management solution

- Owned 50% by North West and 50% CNRL
- Process bitumen for Government of Alberta and CNRL
- Planned for 3 identical phases of 50,000 bbl/day capacity
- Currently 5,200 people working on site
- Low sulphur diesel with lowest carbon footprint in the world
- Lurgi gasifier technology will produce hydrogen and pure (99%+) dry CO₂
Field Selection – It’s complicated

Location

Geology

Depth

Ownership

Recovery

Current Pressure

Neighborhood

Gas Cap?

Oil Composition
Clive History

- 13 wells drilled 1952-1953, 6150 ft
- Development standstill until 1963
- Declining reservoir pressure prompted unitization in 1970
- Cumulative voidage replacement of 80% to 1987, however the reservoir pressure declined to 1930 psi
- Enhance acquisition, 2013


- Pool discovered in 1952 drilling well 4-21-40-24 W4M, discovery pressure 2407 psi
- Discovery of southern portion of pool 1963-1967
- Fresh water injection was initiated to supplement bottom water drive
1st order residual illustrating raised rim morphology of Joffre-Clive Bank.
Joffre-Clive Bank shown with an “Atoll” aspect. Also depicted is the shallow inter-bank Clive Channel. Discontinuous organic reefs are drawn only on the windward margin, but their actual occurrence is unknown.

Cartoon suggests steep reef edges, however it is unlikely that the steepest slopes exceed 15°

Jeff Packard
Two Zones: Massive Sandy and Layered Muddy

5-14-39-24W4

MASSIVE SANDY

LAYERED MUDDY

oldest

youngest
Geological Model & Simulation

187 individually analysed logs
Total of 2,800m of log data
3700 core samples
Average porosity = 6.1%
25m x 25m x 1m cellular model
CO₂ Storage

- CO₂ capture
- CO₂ separation
- Produced oil
- CO₂ reinjection
- Wellhead
- Typical Depth of a Water Well
- Impermeable Barriers
- BGWP Base of Ground Water Protection
- Oil and CO₂
- CO₂ injection
- Oil
- Impermeable Barriers
- 0m (0 ft)
- 30m (100 ft)
- 600m (1970 ft)
- 1000m (3280 ft)
- 1900m (6200 ft)
The ACTL Opportunity

**Initial ACTL CO$_2$ Volume:**

- 4 to 8 Mcf/bbl net utilization
- 25,000 to 35,000 bbl/day light oil growth
- 150 to 250 MMbbls
- 50 to 60 million tonnes storage

EOR Production Growth Forecast

2017 2030
ACTL – Kickstart Large Scale CCUS

Potential Industrial CO$_2$ Sources

Potential CCUS Sites

ACTL Phase One

Potential ACTL Growth
The End

Thanks!