Redwater - Overview

• Redwater is one of the largest oil pools in Canada, with 1.3 billion barrels of Discovered Petroleum Initially In Place

• Discovered in 1948 and drilled up to 40 acre spacing by 1955. Field produced in excess of 150,000 boe/d during the 1960s

• Field is adjacent to several existing and proposed refineries / upgraders – sources of large CO₂ emissions

• Potential for CO₂ EOR flood

• ARC acquired Redwater in 2005
Preliminary evaluation work throughout 2006 and 2007

- Included laboratory work, testing, reservoir simulations, geology assessment, 3D seismic, etc

- Early conclusion – CO₂ EOR performed as a vertical flood might be technically viable
Redwater – CO₂ EOR Pilot Preparation

- Preparation for CO₂ EOR Pilot commenced in 2007 and continued into 2008
- Located a small isolated structural high to conduct the pilot
- Drilled 3 new wells to create the pilot well configuration
- Prepared and applied for approval of a CO₂ pilot
- Negotiated and contracted for CO₂ supply for the pilot
Redwater – CO$_2$ EOR Pilot Injection Facility

- Injection facility planning commenced in 2007
- Construction was completed in Q2 2008
- CO$_2$ injection commenced on July 29, 2008
Redwater – CO₂ EOR Pilot Production Facility

- Production facility planning began in 2007. Construction underway with completion anticipated in Q1 2009

- Production anticipated to commence shortly and is expected to continue through to Q2 2010

- With an aggressive timeline, the evaluation to determine technical and possible commercial economic viability will be done at considerable expense and will have taken almost 5 years
ARC – Challenges for Commercial CO₂ EOR

- Considerable uncertainty exists over when and even if large scale commercial CO₂ EOR projects will proceed
  - Large scale infrastructure investments required to capture, transport and inject CO₂
  - Long-term supply agreements will be required
  - Economic uncertainly with regards to commodity prices, royalty scenarios and supply costs
  - Some individual projects may not be large enough to justify infrastructure development on their own, consequently cooperation with other developers may be required
  - Environmental regulations of CO₂ emissions are highly uncertain and will dictate whether large scale CO₂ development will occur in Alberta
  - The Alberta Government’s change to royalties has eroded the potential economics of commercial CO₂ EOR schemes in Alberta
The Heartland Area Redwater CCS Project (HARP) is a joint initiative with the Alberta Research Council as well as several industry partners. HARP is investigating the potential to inject and store CO₂ in the saline water bearing portion of the Redwater Leduc formation. It is possible that this one reef could hold over 1,000 megatonnes, which could handle existing and planned oil sands emissions for 20 years.
ARC – Challenges for CO₂ Storage

• Uncertainty also exists over when and how large scale CO₂ storage projects will proceed
  
  – Some issues are similar to the commercial CO₂ EOR Challenges, but there are some additional ones:

  • Emitters prefer the CO₂ EOR alternative as it contains possible revenue while storage will have costs associated with it

  • Pore space rights and ownership for CO₂ storage in saline formations has not yet been defined where no P&NG rights are allocated

  • Liability and responsibility for the long-term storage of CO₂ (emitters, storage site operators, or the province) has not been established