CO₂ Capture Project Phase 3 – Demonstration Phase Update

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The CO₂ Capture Project (CCP)

The CO₂ Capture Project (CCP) is an award-winning partnership of seven major energy companies working to advance the technologies that will underpin the deployment of industrial-scale CO₂ Capture and Storage (CCS)

- **Phase 1** – 2001-2004 – completed
  Technology Screening/Proof of Concept
- **Phase 2** – 2004-2009 – completed
  Intensive Development
- **Phase 3** – 2009-2013 – On going
  Demonstration

**Funded by a number of sources over the years, including:**
- Full or Associate membership of the partnership
- Government grants
- In-kind contributions

**Current members:**
BP (Program Operator), Chevron, ConocoPhillips, Eni, Petrobras, Shell & Suncor and associate member EPRI
In order to help make CCS a practical reality and utilised in many different industries and applications around the world, the CCP aims to accomplish the following goals:

**Increase technical and cost knowledge** associated with CO₂ capture technologies and confirm that geological storage of CO₂ is a secure and viable means of reducing greenhouse gas emissions

**Reduce CO₂ capture costs by 20-30%** by supporting the development of improved technologies

**Quantify remaining assurance issues surrounding geological storage** of CO₂ through site assessments, field surveys and numerical approaches; and rapid dissemination of results to stakeholder groups

**Validate cost-effectiveness of monitoring developments** with design and testing of emerging and integrated systems

**Cooperate with interested parties to share information** about both capture and storage demonstrations
The project is planned & executed through five technical teams:

- **Capture** – aims to reduce the cost of CO$_2$ capture from a range of combustion sources in refining, in-situ extraction of bitumen and natural gas power generation.

- **Communications** – informs stakeholders about the CCP program.
  - Government / Industry / NGO’s / General Public

- **Economics** – assesses the financial impacts of new technical developments.

- **Policy** – reviews government incentives and activities in place.

- **Storage** – Storage Monitoring and Verification (SMV) to build understanding and develop methods for safely storing and monitoring CO$_2$ in the subsurface.
Capture Team key projects

Economic evaluation

- **State of the art post-combustion capture technology**
  - A detailed study by Foster Wheeler on capture of CO\(_2\) from Once-Thru Steam Generators, Combined Cycle Gas Turbines and Refinery Heaters, FCC’s and Reformers using an MHI solvent

Technology demonstration

- **Oxy-fired Once Through Steam Generators (OTSG)**
  - 50 MMBTU/hr OTSG retrofit – Praxair
- **Oxy-fired FCC Pilot Plant Demonstration**
  - Vacuum Gasoil & Atmospheric Residue Feeds – Petrobras

Development projects

- Capture of CO\(_2\) from refinery heaters using oxy-fired technology-burner testing.
- Emergent solvent testing for Post-combustion at EERC.
- Novel adsorption process assessment with InvenTyS
- A number of projects are in contract negotiation and will be publicly announced at the appropriate time, including developments for Membrane-Enhanced Water Gas Shift, Ionic Liquid Capture Solvents, & Chemical Looping Combustion.
Three Phase Project:
• Phase I (complete): Develop design basis and cost estimates for test and commercial scale OTSG
• Phase II (2011-12): Demo oxy-fuel combustion on 50 MMBTU/hr test boiler
• Phase III (2012+): Demo oxy-fuel combustion, compression and purification on test boiler

Overall Objective:
To demonstrate that oxy-fuel combustion is a safe, reliable and cost-effective technology for CO₂ capture from once-through steam generators

Funding Partners: Cenovus Energy (host site), CO2 Capture Project, Devon, Praxair Inc, Statoil ASA, MEG Energy and Climate Change Emissions Management Corp (CCEMC)

Technology Providers:
Praxair Inc – industrial gas & combustion technology
The Fluid Catalytic Cracking (FCC) unit is often the largest single source of CO$_2$ emissions in a refinery.

Air is used to continuously regenerate the catalyst by burning off deposited coke. In the oxy-combustion mode, air is replaced by pure oxygen, which must be diluted with recycled CO$_2$ to maintain thermal balance and catalyst fluidization.

The testing unit has a capacity of processing up to 33 bbl/d of hydrocarbon feed (1 ton/d of CO2). Tests are now taking place, with a planned duration of two months.

The project’s main goals are to:
- Test start-up and shut-down procedures
- Maintain stable operation of the FCC unit in oxy-combustion mode
- Test different operational conditions and process configurations
- Obtain reliable data for scale-up
End