CO_2 Capture Project

Phase 1 Overview

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BP International

www.co2captureproject.org

1st Regional Symposium on Carbon Management
Dhahran, Saudi Arabia, May 22nd 2006

Project Timeline

- **Phase 1: 2001-2004**
  - **Identification/selection/initial development**
- **Phase 2: 2005-2008**
  - **develop and refine technology performance**
- **Phase 3: 2009-2012**
  - **Demonstration(s)/Pilot(s)**

CO_2 Capture Project

Cooperating For A Better Environment

US Dept. of Energy
National Energy Technology Laboratory
David Hyman, Program Manager

EU DG Research
Directorate-General Research
Program Manager: Dennis O'Brien

Norges forskningsråd
The Research Council of Norway
Program Manager: Hans-Roar Søarheim

EU DG Energy and Transport
Directorate-General Energy and Transport
Program Manager: Vassilios Kougionas

Joint Industry Partnership (JIP)

bp · ChevronTexaco · EnCana · Eni · Hydro · Shell · Statoil · Suncor

www.co2captureproject.org

CO_2 Capture Project

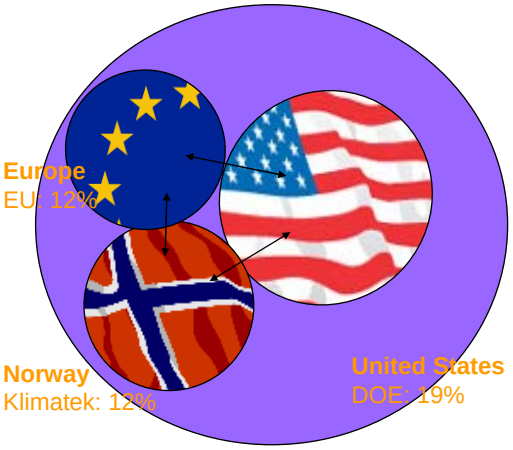
CO2 Capture Project - Objectives

- Achieve major reductions in cost of CO_2 capture & storage:
  - 50% reduction when applied to a retrofit application.
  - 75% reduction when applied to a new build application.
- Demonstrate to external stakeholders that CO_2 storage is safe, measurable, and verifiable.
- Progress technologies to:
  - 'Proof of concept' stage by 2003/4 (Commercialization post 2010).

CO_2 Capture Project

Program Funding

- International public-private collaboration
- Regional programs
- Sharing among programs to leverage results, reduce duplication
- $25m Funding
- $50m Project Cost



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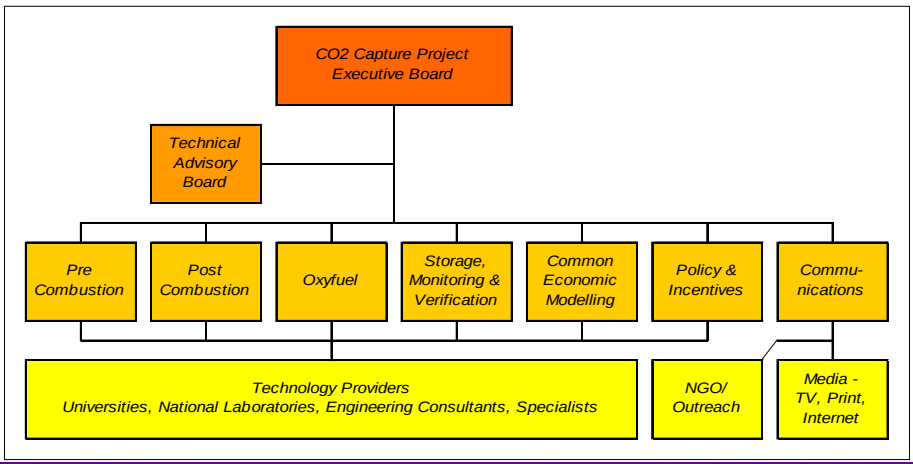
Program Organization



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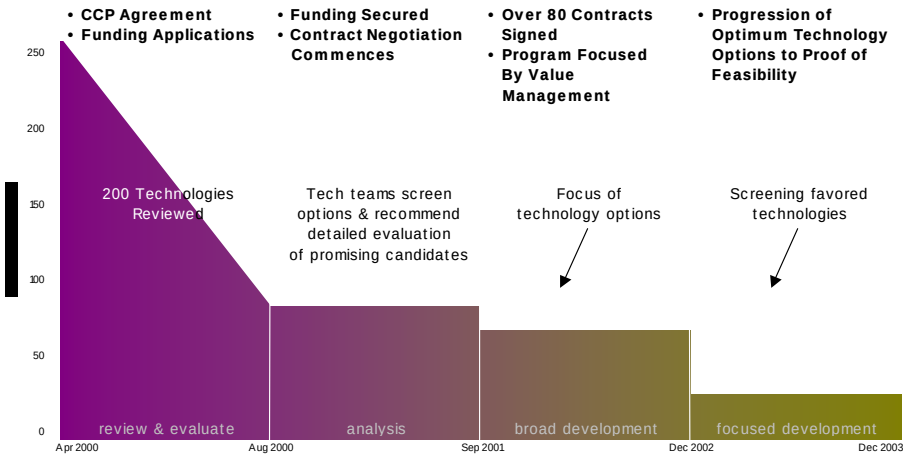
Technology High-Grading



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What Did We Learn: Technology

Capture

- Made significant headway in developing technology, resulting in step reduction in costs and importantly, ruled out some technologies

Storage

- Identified a comprehensive suite of questions we must address, to understand and demonstrate long term secure storage. Pioneered the risk-based approach for site identification, operation and monitoring

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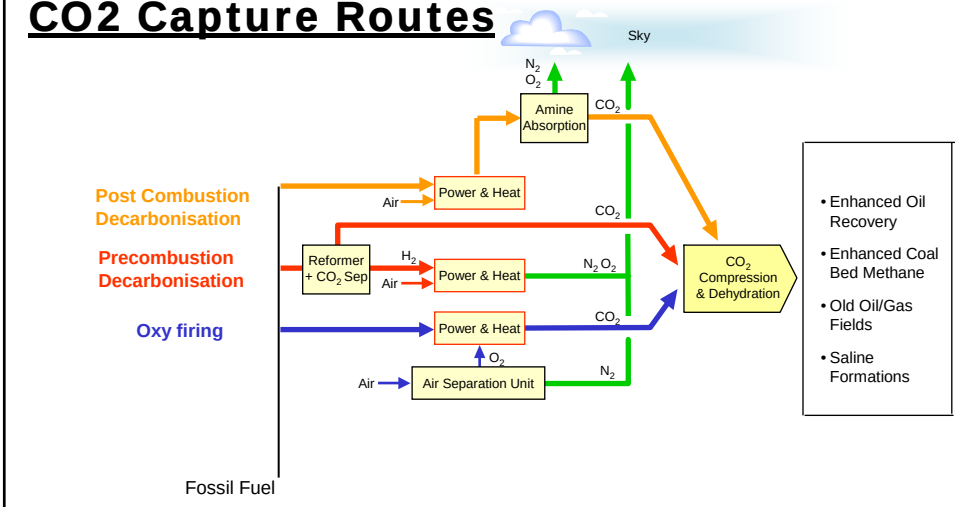
CO2 Capture Routes



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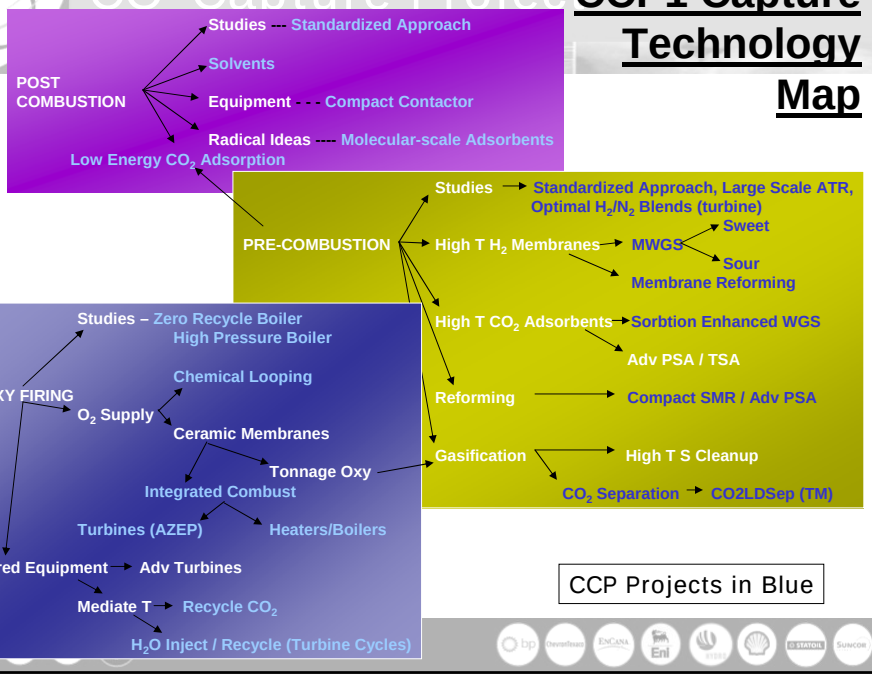
CCP1 Capture Technology Map

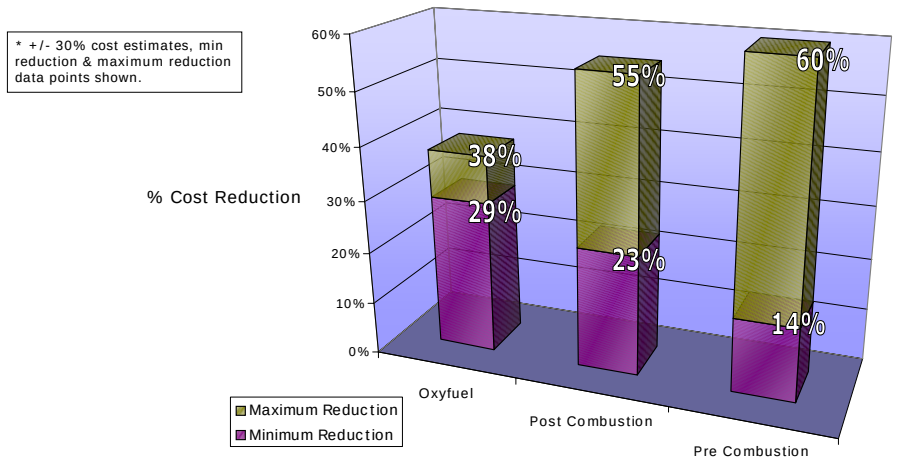


CCP Projects in Blue

CCP1 Capture Scenarios

Scenario		CO_2-generating fuel	Uncontrolled CO_2-emission
UK Refinery	Heaters & Boilers in existing refinery	Refinery fuel oil and gas	2,6 mill.ton/yr from target H&B's
Alaska Turbines	Small powergen turbines in operation	Natural gas	2,6 mill.ton/yr
Norway Gas Power	New 400 MW CCGT-plant	Natural gas	1,3 mill.ton/yr
Canada coke gasifier	New IGCC-plant	Petroleum coke	4,9 mill.ton/yr

Capture: CO_2 Avoided Cost Reductions*



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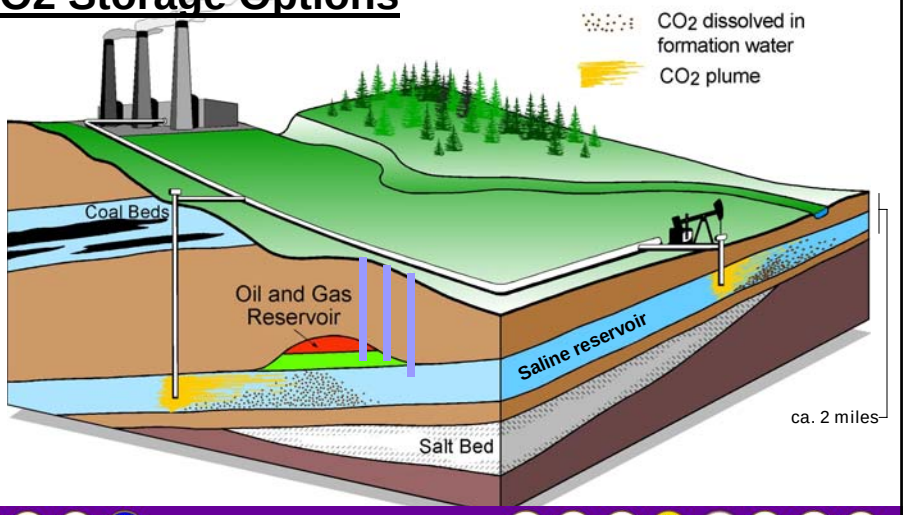
CO2 Storage Options



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Storage: Technologies Delivered

- Developed a **comprehensive understanding of the HSE risks** of, and the requirements for, secure geological storage
  - Geological formations more likely to be secure than man-made wells
  - Depleted oil & gas fields generally be more secure than saline formations
- Assembled a **large database of knowledge**, which will allow the risks associated with geological storage to be quantified and compared to other activities
- Developed an extensive repertoire of **monitoring options**, applicable to a broad range of settings
- Potential **leakage scenarios** have been mapped and matched to remediation actions

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Other Program Areas

- **Technology Advisory Board** – provided an unbiased review of project technology and progress
- **Policy and Incentives** - conducted review of current policy matters and identified opportunities and barriers for technology development and application
- **Communications** – communications strategy and engagement of NGO's from an early stage.
  - Website, Video & Brochure available from CCP
  - Peer review of results for UN PCC SRCCS
  - Two volume book published by Elsevier.

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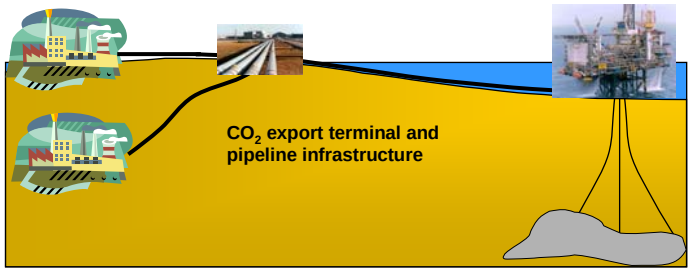
CO_2 cost chain

Power & Industrial processes with CO_2 capture and conditioning

Injection for Geological storage in producing or depleted oil and gas fields & aquifers



Cost	$3 – 100/t	→	$1 - 25/t*	→	$2 - 5/t*	=	**$ 6 – 130/t****

* Cost is distance dependant

*long term monitoring costs to be determined

** These numbers are indicative only

CCP Phase 1: Conclusions

- Industry & governments collaborated on an international scale, to provide strong leadership on technology development
- Developed a portfolio of technologies that now represent state-of-the-art, with broad application
- Technology R&D can produce step reductions in cost
- CO_2 sequestration must be proactively managed to reduce risks and ensure broad acceptance
- Communication and wide publication of results
- CCP2 has been launched and will build on the success of CCP

Visit www.co2captureproject.org - for more information