ECCO
<u>E</u>uropean value <u>C</u>hain for <u>CO</u>$_2$

ECCO public conference
Trondheim, Norway – 14th June 2011

Contract no. 218868

European value chain for CO$_2$

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SEVENTH FRAMEWORK
PROGRAMME

Agenda

- HSE, Welcome and introduction – *Petter E. Røkke, SINTEF Energy Research*
- The scenario studies – *Amy Brunsvold, SINTEF Energy Research*
- The "ECCOtool" – the challenge of studying possible CCS chains, objective and idea for a tool to be developed within ECCO – R&D focus;
    - Introduction: Structuring a value chain tool – *Per Eilif Wahl/Sigurd Løvseth, SINTEF Energy Research*
    - Economical aspects to be included – *Charles Eickhoff, Progressive Energy*
    - Costs related to offshore EOR – *Nils H. Eldrup, Project Invest AS*
    - Storage economics of the ECCO-tool – *Daniel Loeve, TNO*
    - Selection of case studies, contents and challenges – *Charles Eickhoff, Progressive Energy*
    - Performing case studies, results and finding. Experiences through testing of a value chain tool. – *Paula Coussy, IFP Energies Nouvelles*
- Overview on the qualified interpretation of the results from the case studies - *Joana Correia-Serpa, JRC*
- Incentives and regulatory frameworks influence on CCS chain establishment – *Gøril Tjetland, the Bellona foundation*
- Open discussion

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SEVENTH FRAMEWORK PROGRAMME

HSE

- Emergency exits

- Toilets

- Coffee break ~15.00

Introduction to ECCO

- Objectives and structure of the ECCO-project

- What makes ECCO different from the other EU-projects on CCS and which perspectives are to be studied within ECCO that are not studied in other CCS projects?

- What results do we expect that will be produced from ECCO?

The ECCO project

Duration :
3 yrs – started 1st Sept 2008

Budget:
5.355 M€ ~3.853 M€ in grant

Partners:
19 legal entities
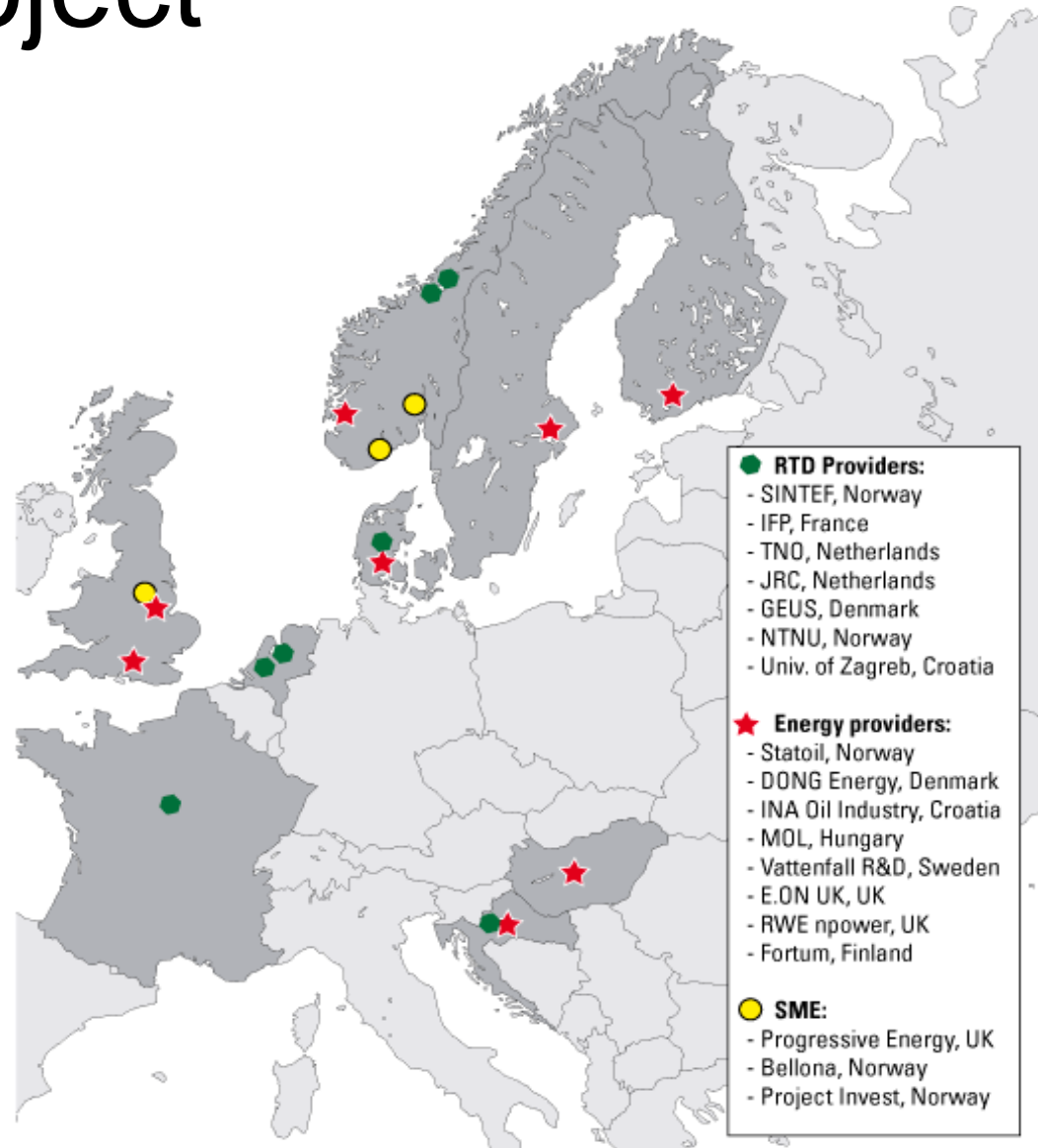   8 energy providers (oil & gas companies and utilities)
    2 engineering companies
    1 NGO
    8 highly ranked RTD providers

Coordinator:
SINTEF Energy Research

RTD Providers:
- SINTEF, Norway
- IFP, France
- TNO, Netherlands
- JRC, Netherlands
- GEUS, Denmark
- NTNU, Norway
- Univ. of Zagreb, Croatia

Energy providers:
- Statoil, Norway
- DONG Energy, Denmark
- INA Oil Industry, Croatia
- MOL, Hungary
- Vattenfall R&D, Sweden
- E.ON UK, UK
- RWE npower, UK
- Fortum, Finland

SME:
- Progressive Energy, UK
- Bellona, Norway
- Project Invest, Norway

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Project objectives

The main objective of ECCO:

Facilitate robust strategic decision making regarding early and future implementation of CO_2 value chains in the face of uncertainty.

IMPACT:

- *The knowledge, methods, and tools developed in ECCO shall influence future CCS initiatives by enabling the industrial players and the authorities to analyse, understand, and make sound decisions.*

Project objectives (cont.)

- Provide the basis for, and the recommendations leading to implementation of the most promising EOR and EGR alternatives

- Prepare for analyses and recommendations through the development of a CO_2 value chain analysis tool

- Quantify the potential for enhanced hydrocarbon recovery (EOR/EGR) and CO_2 storage in European petroleum reservoirs and evaluate technological challenges

Strategy – key questions

- **What might be the future CO_2 world?**
  - **Scenario analysis –> 4 - 6 scenarios**
    - Exist infrastructure?
    - Key influences?
    - How will parameters affecting oil/gas/el market develop?
    - What are the incentives/regulations for CCS?
  - ➔ IMPORTANT – best guess - qualified experts opinion

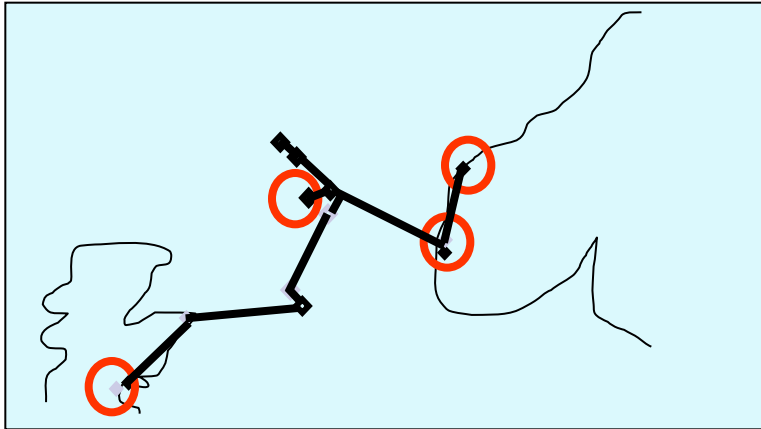- **How to identify feasible CO_2 chain options?**
  - **Formulation & analysis of cases**
    - Relevant questions/problem formulation
    - Cases reflecting sponsoring partner views
    - Cases illustrating the effect and importance of various parameters – sensitivity analysis
  - ➔ IMPORTANT – relevant cases - "smart use of tool"

- **How to evaluate the CO_2 chain options and choose the most promising solutions for CCS?**
  - Tool for economic analysis of CO_2 chain
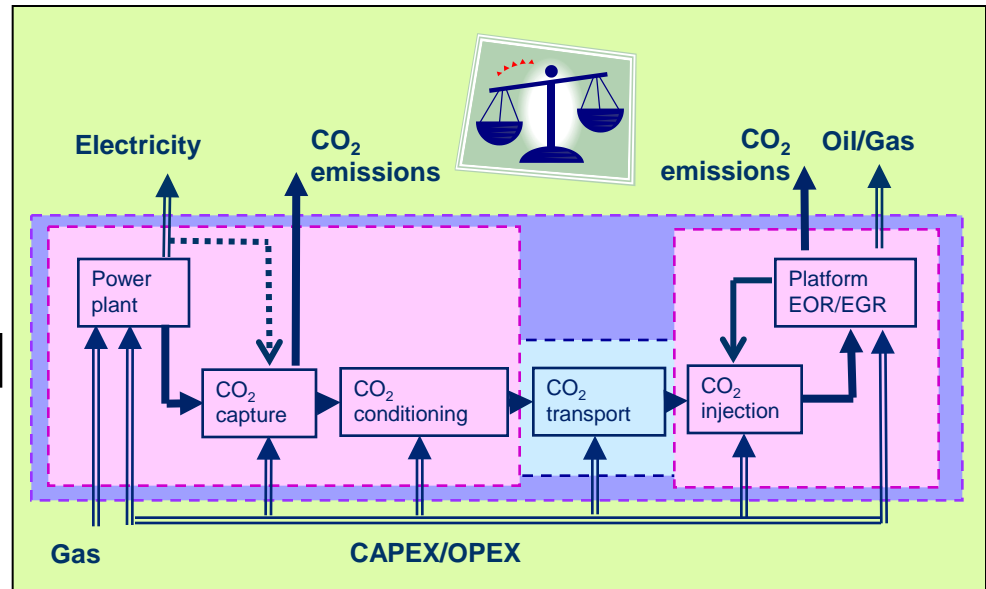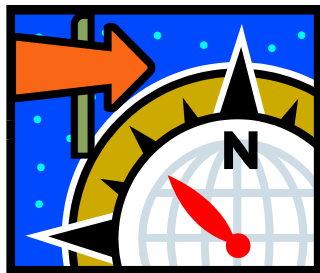 - ➔ IMPORTANT – simple BUT high quality input data & consistent implementation

1. Scenario – "predicting" future CO$_2$ world

2. Case study – defining options
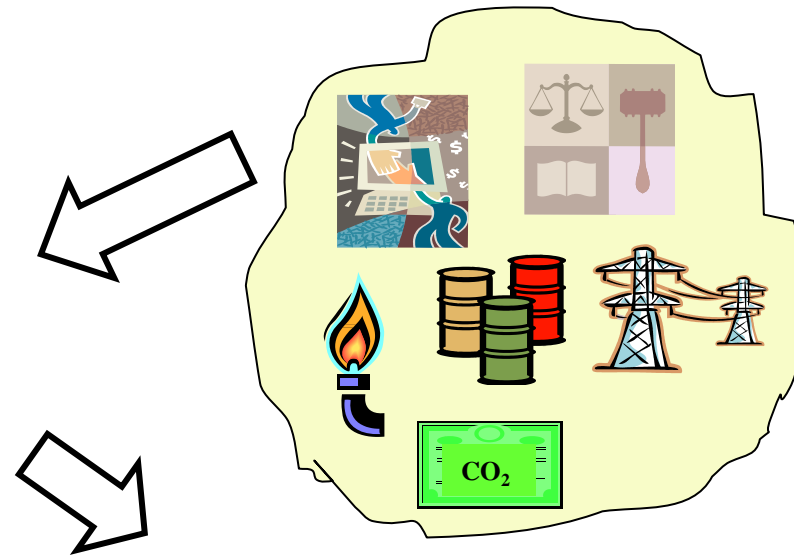
3. Economic analysis – profit vs. costs

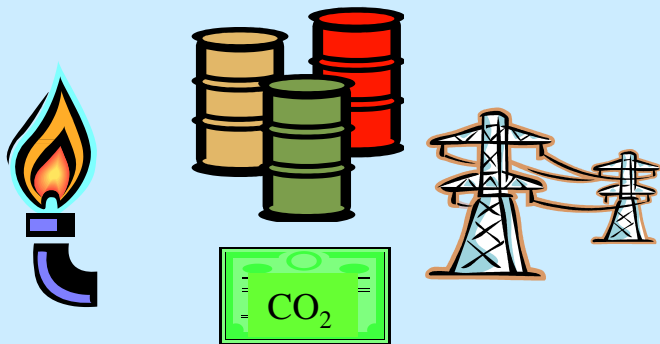# 4. Case study – evaluating options & recommendations

Electricity

CO$_2$ emissions

CO$_2$ emissions

Oil/Gas

Power plant

Platform EOR/EGR

CO$_2$ capture

CO$_2$ conditioning

CO$_2$ transport

CO$_2$ injection

Gas

CAPEX/OPEX

CO$_2$

ECCO — European value chain for CO$_2$

ECCO – <u>E</u>uropean Value <u>C</u>hain for <u>CO</u>$_2$
Tool – how to design a smart tool?

- Clear purpose
- Only necessary complexity
- TRANSPARENT structure – clear definitions
  - inputs
  - parameters (local/global)
  - functional relationships/models (local/global)
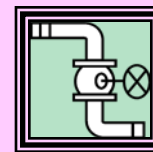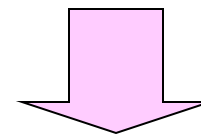 - output
- GOOD DATA (costs etc…)
- CONSITENT implementation

Modules

Economic characteristics

of chain components

CAPEX (time, local parameters)
OPEX (time , local parameters)
Other data for modules…

Modules

Global parameters –marked

Core
Chain design
Economic analysis of chain
(balance PROFIT vs. COSTS)

Main expected results in the end
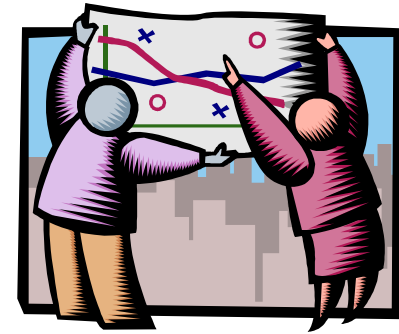
- ECCO is focused towards the complete CO_2 value chain, and will generate results and cause progress beyond state of the art within the following topics

    - **Methodology for CO_2 value chain assessment** by means of establishing scenarios as input for formulation of CCS cases, which are further analysed with the tool. **SP2**
    - **CO_2 value chain assessment tool** that enables transparent and robust analysis of CO_2 value chains. The tool will be designed to allow for flexible, demand-driven tailoring **SP3**
    - **Reservoir technology for EOR and EGR** increasing the ability to predict EOR and EGR profiles and potentials for CO_2 injection into European oil and gas reservoirs. **SP4**
    - Strategies and recommendations for deployment of CO_2 value chain: Main report: **"ECCO Strategies for CO_2 value chain deployment".** The report comprises ECCO's joint strategies and recommendations regarding deployment of the CO_2 infrastructure in the near and mid-term future, liability issues and cross-border regulations, Emission Trading Schemes (ETS), financing schemes, and regime of incentives, and organization of the supply chain. **ECCO (SP2)**

Project expected impacts

- Underpin the realisation of CO_2 value chains for captured CO_2 from large point sources for CO_2 injection in petroleum reservoirs (EOR/EGR) and CO_2 storage.

- Improve security of supply by enabling sustainable use of fossil fuels, protracting increases in fuel imports by making better use of existing resources and shortening time to market for promising CCS related technologies.

- Strengthen the competitiveness of the European economy by maintaining and reinforcing the leading position in CCS technologies and by sharing and building on the existing EOR experience in Central and Eastern Europe and on-going activities in the North Sea.

ECCO – Europpean Value Chain for CO_2
Users of results

■ The main users of ECCO-results (B3.2.2 *Exploitation of results*)

- **CO_2 Producers** – seeking opportunities for improving economy of their system.
- **EC and other supranational bodies** – developing regulations and incentives.
- **National authorities** - who have the Kyoto and ETS obligations to meet, and seeks ways to organise the national system in line with EC regulations and industrial interests.
- **CO_2 Transporters and sellers** – who have a potential new stream to handle safely, and seek optimal infrastructure development, and are affected by market development.
- **CO_2 Storage operators** - who need to be assured they have a large enough flow over the required time, and are dependent on long-term perspective with respect to constraints as regulations and incentives.
- **R&D providers and universities** – being in a better position to serve the industry and authorities exploiting the platform of knowledge, tools, and methods generated in the project.
- Finally, the increased knowledge of EOR and EGR potential and challenges provided by ECCO might provide the basis for further industrial activities in this front.