

# THE CATO PROGRAMME IN THE NETHERLANDS ON CO<sub>2</sub> CAPTURE, TRANSPORT AND STORAGE



Erik Lysen<sup>1</sup>, Andre Faaij<sup>2</sup>, Chris Hendriks<sup>3</sup>

<sup>1</sup> UCE: Utrecht Centre for Energy research, Utrecht University, NL

<sup>2</sup> Dept of Science Technology and Society, Faculty of Chemistry, Utrecht University, NL

<sup>3</sup> Ecofys Energy and Environment, Utrecht, NL

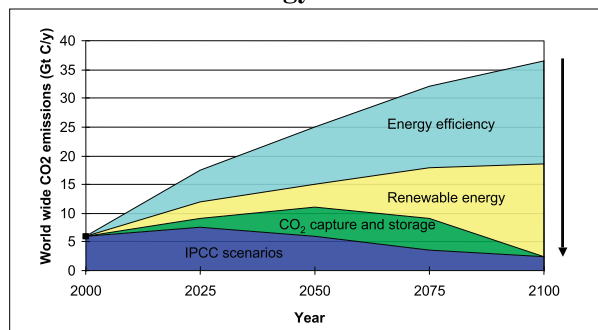
## DUTCH RESEARCH PROGRAMME

Greenhouse gas emission reduction targets agreed under the Kyoto protocol have prompted the Government of the Netherlands to support the CATO programme, implemented by a strong consortium of Dutch companies, research institutions, universities and environmental organisations, led by the Utrecht Centre for Energy research (UCE). Given its size, more than 25 million Euro, the CATO programme can be regarded as a national research programme on CO<sub>2</sub> Capture, Transport and Storage in the Netherlands.

## BACKGROUND

In many countries considerable efforts are being undertaken to promote energy efficiency measures and an increased use of renewable energy sources. At the same time it is becoming clear that the combined effect of energy efficiency and renewables cannot yet achieve the required reductions in emissions alone. Decarbonisation of fossil fuels may also be required to reach the required stabilisation of CO<sub>2</sub> concentrations in the atmosphere.

## CO<sub>2</sub> reduction strategy



Source: GESTCO project, C. Hendriks, Ecofys

## OBJECTIVE

CATO aims to build a strong knowledge network in the field of CO<sub>2</sub> Capture, Transport and Storage in the Netherlands, to assess and develop new knowledge, technologies and approaches for clean fossil fuel use, thereby supporting the transition to a fully sustainable energy system.

## CATO at a glance

- Unique Dutch knowledge network on Clean Fossil Fuels
- Strong consortium of 17 partners: companies, research institutes, universities, environmental organisations
- Budget: 25 million Euro (50% subsidy)
- Period: 2004-2008
- Embedded in international networks, such as: IEA-GHG and CO<sub>2</sub>NET

## STRUCTURE

The CATO programme is structured into 7 work packages, of which WP 1 has an integrating character for the programme:

- WP 1: System analysis & Transition
- WP 2: Capture of CO<sub>2</sub> (post-combustion, pre-combustion, denitrogenated conversion)
- WP 3: Storage of CO<sub>2</sub> (gas fields, coal fields (ECBM))
- WP 4: Mineralisation (Subsurface and surface)
- WP 5: Monitoring, safety and regulations
- WP 6: Communication
- WP 7: Management and knowledge transfer

For further information please contact:  
Utrecht University,  
Utrecht Centre for Energy research (UCE),  
Mr. Erik H. Lysen, managing director,  
Heidelberglaan 2, 3584 CS Utrecht, The Netherlands.  
Tel: +31-30-2537614 Fax: +31-30-2537601  
E-mail: [e.lysen@chem.uu.nl](mailto:e.lysen@chem.uu.nl), website: [www.uce-uu.nl](http://www.uce-uu.nl)



Utrecht Centrum voor Energie-onderzoek  
Utrecht Centre for Energy research

## PROJECT CONSORTIUM

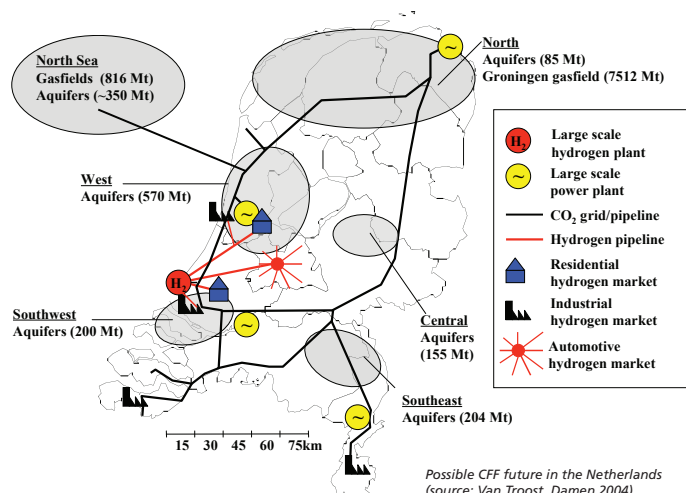
Companies
Shell International Exploration and Production (SIEP)
Shell Global Solutions
NAM, Nederlandse Aardolie Maatschappij
KEMA (Six Dutch electricity companies (Delta, Electrabel, E.ON, Essent, Nuon Power and Reliant) participate via KEMA)
NV Nederlandse Gasunie
Ecofys BV
Geochem BV
EBN (Energie Beheer Nederland)
Research institutions
ECN (Energy research Centre of the Netherlands), Business Unit Clean Fossil Fuels
TNO-MEP (Environment, Energy and Process Innovation)
TNO-NITG (Netherlands Institute for Applied Geology)
Universities
Delft University of Technology, Fac. CITG, Dept of Geotechnology
University Leiden, Group Energy and Environmental Research, section Social & Organisational Psychology.
University Twente, Dept. Chemical Technology
Utrecht University, Copernicus Institute
Utrecht University, Dept of Geosciences
Utrecht University, Dept. of Chemistry, Inorganic Chemistry
Environmental organizations
Netherlands Society for Nature and Environment
Greenpeace (Netherlands)
WNF, World Wildlife Fund (Netherlands)

## TYPICAL CATO DELIVERABLES

- Sustainability criteria for CFF options
- Scenarios for CFF based energy infrastructure
- Laboratory facilities for testing novel capture concepts
- Development novel materials CO<sub>2</sub> adsorption and H<sub>2</sub> production
- Design and construction Pre-combustion Decarbonisation pilot plant
- Tests and modelling of coal storage capacity
- Laboratory experiments subsurface mineralization
- Experiments surface mineralization: minerals and waste materials
- Risk assessment case studies
- Decision support for NGO's and general public

## LONG TERM TARGETS

- CFF options could become responsible for a major part of the reduction in GHG emissions in the Netherlands halfway this century with cost savings in the order of 1 - 2 billion Euro per year
- Improved stability and security of energy supply can be achieved due to a shift from oil to coal, natural gas and unconventional resources such as ECBM.
- Additional environmental benefits, like strongly reduced NO<sub>x</sub>, SO<sub>2</sub>, CO and dust emissions can be obtained throughout all key sectors of society.
- The Netherlands has specific advantages (natural gas infrastructure, many gas fields, aquifers, large heavy industry) for implementation of CFF options, which can give the country a strong comparative benefit compared to many other nations.
- Major opportunities exist for industry and energy companies for demonstrating, developing and exporting new technologies to other parts of the world



Possible CFF future in the Netherlands  
(source: Van Troost, Damen 2004)