DECARBit participants visiting the SINTEF Energy Research laboratories during the kick-off meeting in Trondheim.

CAESAR – CArbon-free Electricity by SEWGS: Advanced materials, Reactor- and process design

Starting date	1 January 2008
Duration	48 months
Budget	3.1 million €
EUcontribution	2.3 million €
Co-ordinator	Energy Research Centre of The Netherlands

CESAR – Enhanced separation & recovery

Starting date	1 February 2008
Duration	48 months
Budget	6 million €
EUcontribution	4 million €
Co-ordinator	TNO Science and Industry

DECARBit –Enabling advanced pre-combustion capture techniques and plants

Starting date	1 January 2008
Duration	48 months
Budget	15.5 million €
EUcontribution	10.2 million €
Co-ordinator	SINTEF Energy Research

European Conference on CCS Research, Development and Demonstration - Oslo, 10-11 February 2009

This is a new conference with the aim of establishing a forum for dissemination of project results as well as for sharing information between EU funded projects in the field of CO_2 capture and storage (CCS).

The conference is organised by the DECARBit, CAESAR and CESAR projects. They are all co-funded by the European Commission under the Seventh Framework Programme (FP7) and have as part of that taken the responsibility for initiating and arranging such an annual conference. The first one is to be arranged in Oslo 10-11 February 2009 and will comprise on-going projects within both FP6 and FP7.

Focus will be on research and technological development on CO_2 capture and storage. The conference will give an overview of the projects as well as more in-depth technological presentations in thematic sessions on Post-combustion, Pre-combustion, Oxy-fuel and Transport and Storage. It should be relevant to researchers, industry and other stakeholders, also those not connected to the framework programme projects.

The organising committee wish you all welcome to Oslo !

For more information: www.ccs-conference.com

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Newsletter
1 - 2008

DECARBit

CESAR
Enhanced Separation & Recovery

CAESAR, CESAR and DECARBit

Development of pre-and post combustion capture technology in FP7

Projects on CCS has been a great focus for the European Commission in the 5th and 6th research framework program, financing projects worth more than 170M€. The European Technology Platform on Zero Emission Fossil Fuel Power Plants was launched on 1 December 2006 in compliance with the superior priority area on technology development for capture and storage of CO_2.

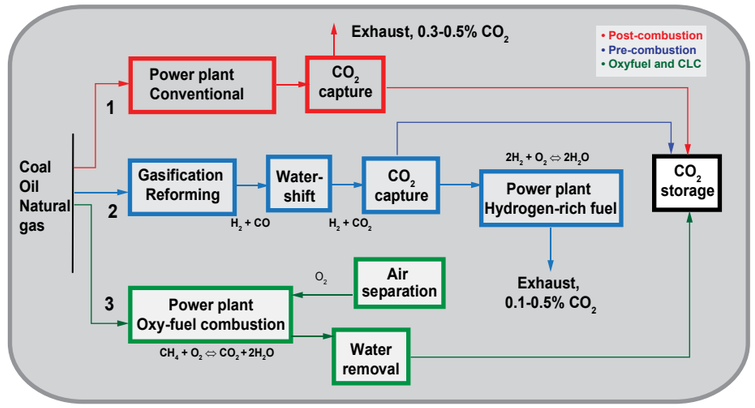
The emphasis continues in FP7 through several projects within CCS, and among them DECARBit, CESAR and CAESAR.

Background

Today the energy supply and use in Europe is heavily based on fossil fuels and imports and to comply with the aspiring policies adopted for Green House Gases (GHG) cuts, progressive R&DD action is needed within CCS.

There are several potential technologies for reducing CO_2 emissions. However, the 3 main routes for capture of CO_2 still hold true, depicted in the figure below. These routes share the input conditions (fuels) and the output (safe storage). Further, all routes share the need for gas separation technologies, be it CO_2, H_2, O_2 or nitrogen at varying process conditions.

Capture routes for CCS:



Early discussions about CCS tended to focus on which is the winning technology. Experience has taught us that this is not the correct question as there seems to be no "silver bullet". This is confirmed by the plurality of the CCS solutions chosen for industrial demonstration projects emerging world-wide. Varying business conditions, fuel supplies, incentives and vested interest are determining which technology is pursued; external factors are seen to be equally determining as the technologies themselves.

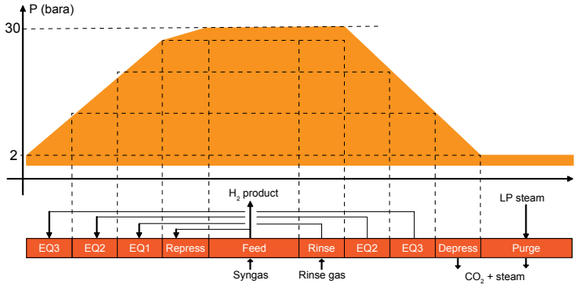
In this picture the aim of DECARBit and CAESAR is development of pre-combustion capture technology, while the focus of CESAR is on the development of technology for post-combustion capture of CO_2.

CAESAR

CArbon-free Electricity by (SEWGS): Advanced materials, Reactor- and process design

Overall objective

The overall objective of CAESAR is to reduce the energy penalty and costs of the SEWGS (Sorption-Enhanced Water-Gas-Shift) CO_2 capture process through optimization of sorbent materials, reactor design, and process design. With an optimized SEWGS process CO_2 avoidance costs could be reduced to less than € 15/ton CO_2.

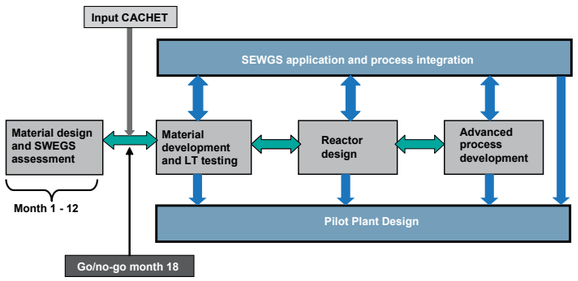


The figure shows an example of a SEWGS cycle with six reactors. A SEWGS cycle contains several different steps and is illustrated. During the feed step, syngas is fed to a SEWGS reactor, the CO_2 is captured and hydrogen is produced. At some point before breakthrough of CO_2, the reactor is rinsed to remove the hydrogen gas still present in the reactor. Subsequently the pressure is reduced in three pressure equalization steps (EQ2, EQ3, and Depress). The effluent gas is fed to a reactor vessel that needs to be repressurised. The reactor is now at low pressure, and when a countercurrent steam purge is applied, a pure CO_2 stream is obtained. To be able to produce a continuous stream of hydrogen and CO_2, multiple reactors are necessary.

Targets

- To optimize the SEWGS process for pre-combustion CO_2 capture from natural gas
- To broaden the scope of the SEWGS process to application in coal gas and industrial processes
- To design a pilot unit for the new applications that will be designed to operate on a slip stream of a commercial plant

Organisation



Partners

- Energy Research Centre of the Netherlands (ECN) – NL
- AIR PRODUCTS PLC - UK
- BP Exploration operating company, Ltd. - UK
- Politecnico di Milano – IT
- SINTEF - NO

CESAR

Enhanced separation & recovery

Overall objective

CESAR aims for a breakthrough in the development of low-cost post-combustion CO_2 capture technology to provide economically feasible solutions for both new power plants and retrofit of existing power plants which are responsible for the majority of all anthropogenic CO_2 emissions.

Targets

- To develop novel (hybrid) solvent systems
- To develop new high flux membranes contactors
- To improve modeling and integration studies on system and plant level
- To test new solvents and plant modifications in the Esbjerg pilot plant

Partners

- TNO Science and Industry – NL
- BASF SE – GER
- Centre Nationale de la Recherche Scientifique (CNRS) – FRA
- DONG Energy generation – DK
- Electrabel s.a. – BEL
- E.ON Engineering GmbH – GER
- E.ON – UK
- Gaz de France – FRA
- IFP – FRA
- Norwegian University of Science and Technology (NTNU), NO
- Polymen – FRA
- Public Power Corporation s.a. – GRC
- RWE Power AG – GER
- Siemens Aktiengesellschaft – GER
- SINTEF – NO
- StatoilHydro ASA – NO
- University of Stuttgart (ITT) – GER
- Vattenfall R&D - SWE

CAESAR - cont.

SEWGS multiple column unit (by Eric Sitters/ECN).

DECARBit

Enabling advanced pre-combustion capture techniques and plants

Overall objective

DECARBit responds to the need for further research and development in advanced pre-combustion capture technologies to substantially reduce emissions of greenhouse gases from power generation. The overall objective is to enable zero-emission pre-combustion power plants with a capture cost of less than 15 €/ton CO2, thereby underpinning and promoting implementation of large-scale CCS power plants, as well as retrofit applications and the possible use of new capture technologies in other energy intensive industries.

Targets

- To assess and research new techniques for CO2 separation in pre-combustion schemes by developing membranes, sorbents and novel solvent systems characterised by improved capacity and reduced efficiency penalty.
- To develop advanced oxygen production techniques using novel sorbents, membranes, new concepts for large-scale cryogenic systems and optimised process integration in order to lower power consumption and oxygen cost.
- Continue earlier development efforts for key enabling technologies; specifically addressing the need for gas turbine burners and fuel systems in which hydrogen-rich fuel gases can be safely supplied and burnt in compliance with NOx emission limits whilst making use of the efficiency potential of today's modern gas turbines.
- Underpin the cost reduction objective by techno-economical evaluation and ranking of the components and the integrated processes. Through screening and selection identify and select one or two candidates per key topical research area for extended testing (pre-combustion pilots).
- Assessment of advanced pre-combustion capture techniques to the benefit of other energy intensive industries such as refineries, other petrochemicals, cement, glass and steel industry.

Partners

- SINTEF Energy Research – NO
- ALSTOM Power Ltd – UK
- ALSTOM Switzerland Ltd – CH
- SIEMENS Aktiengesellschaft – GER
- CORNING S.A.S. – FRA
- L'Air Liquide S.A. – FRA
- SINTEF – NO
- Institute Français du Pétrole - IFP – FRA
- Netherlands Organisation for Applied Scientific Research - TNO – NL
- A.V.Topchiev Institute of Petrochemical Synthesis, Russian Academy of Science – RU
- Norwegian University of Science and Technology - NTNU – NO
- Eidgenössische Technische Hochschule Zürich – ETH – CH
- Delft University of Technology – NL
- Enel Produzione – IT
- Shell International Renewables B.V. – NL
- University of Ulster – UK
- EDP – Gestão da Produção de Energia S.A. – PRT
- Electrabel S.A. – BEL
- Nuon – NL
- StatoilHydro ASA – NO
- Total France – FRA

Monolithic membranes for gas separation.

Organisation