The DECARBit project – enabling technologies for pre-combustion CCS power plants

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ABSTRACT

The DECARBit project is a large scale integrating project under FP7 that runs from 2008 to the end of 2011, with a budget of 15 million Euros. 16 core partners from 8 countries constitute the project in addition to an industrial contact group of 5 large energy companies in order to ensure industrial interest and involvement from technology end users. SINTEF Energy Research is the co-ordinator of the DECARBit project.

The aim for DECARBit is to reduce the energy needed for the separation of CO_2 and oxygen in pre-combustion power plants or similar industrial processes. In the project advanced technologies are developed such as high pressure, high temperature CO_2 separation using membranes, sorbents or solvents and oxygen separation using new advanced cryogenic and non-cryogenic techniques are developed. DECARBit also contain detailed investigation on hydrogen combustion and combustion systems for gas turbine applications targeting low emissions and high efficiency.

DECARBit has now passed the first three years and have entered into the second phase, where pilot testing of selected technologies is the main part of the work. In the second phase, the main part of the work will be done within SP5 (Pre-combustion pilots). The actual technologies to be pursued during phase II of DECARBit have been selected following a thorough application process, in which the partners have described their planned pilot testing in detail based on the results from phase I. The evaluation of these proposals have partly been performed by the "Technical and Exploitation Advisory Committee".

The main achievements obtained during the second year of DECARBit are:
- A Common Framework Definition Document, the first result of the European Benchmarking Task Force (EBTF – a team of participants of three CCS R&D projects, which are DECARBit, CAESAR and CESAR).
- A number of new low T sorbents for CO_2 separation based on MOFs (Metal-Organic frameworks), supported oligomers/polymers and mesoporous inorganic solids have been evaluated.
- Different properties of membrane materials have been evaluated for separation of CO_2-H_2. Two different solvent – membrane combinations have been studied.

- A review of different type of novel solvents suited for the separation of CO_2-H_2 mixtures under pre-combustion conditions has been carried out.
- Regarding oxygen transport membranes (OTM), work is reported on the preparation of a dense layer on top of a porous support.
- Potential of current SEV gas turbine burners using H_2-rich fuel mixtures: The modified SEV hardware demonstrated successfully combustion with up to 47%vol H2 at realistic GT conditions. As such, the concept shows promise for further trade off investigation and further optimisation for improved performance.
- Pilots selected