UNDERGROUND SUN.STORAGE

Focus areas

A work plan divided into ten work packages has been developed to formulate and answer the research questions raised by this project.

Work package 1:
Project Management

The tasks involved in this work package include managing communications between the various work packages, organising the public relations effort, disseminating the research findings, communicating with funders and reporting on the project.

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Work package 2:
Geochemistry and Reactive Transportmodelling

This package investigates whether hydrogen admixture would lead to changes in the chemistry of the reservoir rock and fluids. Another research focus is reactive transport modelling. The work will be based on laboratory experiments and simulations.

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Work package 3:
Microbial processes in Hydrogen exposed Reservoirs

Tests in this work package will deliver insights into microbiological transformations in the natural gas storage facility. Molecular biology techniques will be used to characterise microorganisms in formation water in the reservoir. A variety of gas mixtures (comprising methane, hydrogen, carbon dioxide and sulphur compounds) are being applied to core samples from the reservoirs in lab reactors, with gas components and pressure changes measured at regular intervals. The findings will provide information on the impact of hydrogen content on metabolic processes in microorganisms.

IFA TULLN BOKU

Work package 4:
Demixing Natural Gas and Hydrogen

The aim of this work package is to characterise the behaviour of the natural gas-hydrogen mixture under static and dynamic reservoir conditions. Potential demixing processes are being investigated, and here, too, laboratory experiments are employed.

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Work package 5:
Materials and Corrosion

This work package involves conducting laboratory tests to determine whether admixture of hydrogen results in corrosion of the steel grades typically used in the storage facility under normal operating conditions, and whether there is a possibility of changes occurring in the cementation of the storage wells.

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Work package 6:
Hydrogen Separation

Work in this package forms the basis for setting up a pilot plant to separate hydrogen from natural gas mixtures using membrane permeation. Numerical models and laboratory-scale experiments will provide support for configuration of the high pressure membrane module, and selection of the right membrane type for the separation process.

axiom ANGEWANDTE PROZESSTECHNIK GES.M.B.H.

Work package 7:
Design and Construction of the Testbed

This package comprises the design and construction of a pilot facility for in-situ testing of the storage of hydrogen-methane mixtures at an actual storage reservoir. The planned test facility must also be capable of demonstrating the power to gas principle, including its application to energy storage.

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Work package 8:
Operation of the Testbed

The objective of this work package is to carry out a field trial of storage of hydrogen-methane mixtures at an actual storage reservoir, located 1,000 m below ground. Gas flow rates and gas composition will be measured throughout the trial and balanced out on withdrawal. Microbial analysis and corrosion tests will also be conducted during the trial, and the membrane module produced by Axiom will be tested under real operating conditions.

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Work package 9:
Risk and Life Cycle Assessment

A comprehensive assessment of the risks associated with combined methane and hydrogen storage will be performed, as well as an evaluation of projected economic and environmental performance of the pilot project over its entire life cycle.

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Work package 10:
Economic and Legal Assessment

The Energy Institute at the Johannes Kepler University Linz is leading this work package, and execute it in cooperation with Verbund and RAG. The economic assessment involves looking at the various potential applications of the storage technology in the context of overall power to gas systems, so as to arrive at a range of different market roles and combinations of business models. The work will also include analysing the existing legal system with a view to identifying obstacles to the technology and proposing future improvements to the legislative framework.

ENERGIE INSTITUT an der Johannes Kepler Universität Linz

JKU JOHANNES KEPLER UNIVERSITÄT LINZ