

HySTORAGE: Assessment of Underground Hydrogen Storage Performances during First Pilot Test Phase

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Hydrogen is a key solution for Europe to reach its climate targets and become the first climate-neutral continent by 2050. Its volatile generation needs subsurface energy storage in caverns or porous rocks to structure the demand. The HyStorage project, which investigates the latter, has passed the first phase with 5% hydrogen in the natural gas stream.

The primary field test focusing on hydro-dynamical and microbiological effects is accompanied by extensive material testing. The complete research consists of experimental investigations before and during the field test, tracer tests, and reservoir simulations, including microbial conversion and mixing behavior. The enhanced simulation study, coupled with the gathered data as input data, allows to examine hydrogen storage's efficiency and predict future operations.

After completing the first storage phase of the pilot test with 5% hydrogen, the gathered data are post-processed and analyzed by completing the first storage cycle to conclude critical findings. The collected data includes rates, pressures, gas composition, and isotopic analysis.

Changing gas compositions gives insights to hydrogen losses due to mixing phenomena and microbial activity. The isotopic changes were analyzed to differentiate between both effects. The pre-experiments to investigate microbial reaction with the formation of water and the hydrogen-natural gas mixture showed a significant hydrogen reduction in the reactors.