GFZ Helmholtz Centre for Geosciences

AA+W - stock.adobe.com

Innovative hydrogen pore storage demonstrator in Brandenburg, Germany

Key messages

- A highly innovative pilot site for one of the world's most important future technologies could be accomplished in Brandenburg in the next few years.
- The GFZ German Research Centre for Geosciences has unique expertise in the realisation of a demonstrator for underground hydrogen storage.

Background: Industrial-scale hydrogen storage

Hydrogen (H_2) is expected to make a decisive contribution to increasing the flexibility and coupling of the energy sectors and to opening up new decarbonisation pathways. However, the above-ground network and storage infrastructures are not capable of storing hydrogen on the scale predicted for large industrial users (e.g. basic chemicals, pig iron and steel).

Reliable geological storage of hydrogen is therefore essential on the path to a sustainable hydrogen economy. It ensures the security of supply and provides the necessary buffer between the production of energy and its consumption.

In addition to established storage options in salt caverns, pore storage facilities (aquifers and depleted natural gas reservoirs) are particularly suitable for storing hydrogen on the scale required for industrial value chains.

Pore storage facilities are regionally prevalent in Germany and have far greater storage capacities than caverns.

Contact us
Dr Cornelia Schmidt-Hattenberger
Geoenergy (Sek. 4.8), +49 331 6264-1552
cornelia.schmidt-hattenberger@gfz.de

Prof. Dr Susanne Buiter
Scientific Director GFZ
+49 331 6264-1000
director@gfz.de

Proposal for demonstration plant in Land Brandenburg

H_2 storage in pore storage systems is therefore of great strategic importance. However, little research has been done on its implications. In addition, optimal links to the energy industry, the raw materials industry and potential H_2 users in the mobility sector need to be considered.

All this can best be studied in a demonstration facility that meets the necessary requirements. From 2004 to 2017, the GFZ investigated the underground storage of carbon dioxide in the German State of Brandenburg.

However, the results cannot simply be applied to hydrogen storage. Compared to carbon dioxide and other gases, hydrogen is made up of very small molecules. This places high demands on sealing of the storage system and the transport infrastructure (tanks, pipes, etc.).

For the realisation of an underground hydrogen storage demonstrator, the GFZ Helmholtz Centre for Geosciences has extensive experience and unique expertise in the scientific investigation of geological storage facilities (H_2 research has been undertaken at GFZ since 2013)**.**

Key research questions:

- Drilling of an aquifer storage for hydrogen (H_2) storage (implementation of H_2-compatible materials)
- Development of an efficient hydrogen-oriented monitoring approach (essential for safety management)
- Investigation of the physico-chemical processes of hydrogen-liquid-rock interactions in the subsurface (for both storage formation and surface layers)
- Laboratory experiments and numerical simulations of H_2 transport properties in rocks (at all scales, micro to macro)
- Evaluation of microbiological conversion processes in the aquifer (estimation of possible gas conversion losses)
- Gas purification of the hydrogen gas mixture recovery
- Study of storage behaviour with repeated storage and retrieval

GFZ Helmholtz Centre for Geosciences
Telegrafenberg, 14473 Potsdam
www.gfz.de/en