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Hydrogen storage potential in the Upper Rhein Graben area

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Energy storage is thought to be a crucial part of renewable energy systems as it helps to alleviate the main drawbacks of renewable energy generation: their intermittency and seasonal and geographical constraints. Subsurface storage of hydrogen is one often cited option for geological energy storage and may facilitate the energy transition. Hydrogen can be stored in porous media, such as saline aquifers and depleted hydrocarbon reservoirs, and in engineered salt caverns.

The Upper Rhine Graben (URG) lies within the tri-national Upper Rhine Region where cross-border decarbonisation scenarios require energy storage infrastructure. Here, we analyse the hydrogen storage potential of sedimentary formations within the URG based on available geological data and models. While the deeply buried sandstones of the Permo-Triassic have generally low permeabilities and porosities and only form fractured reservoirs which have limited suitability for hydrogen storage, Paleogene deposits have some storage potential and host also numerous hydrocarbon reservoirs which may be reutilised. Salt diapirs in the southern URG have the potential to hold many engineered salt caverns with significant storage potential, however the geological knowledge of the internal structure of the salt diapirs is limited. Overall, the potential of geological hydrogen storage within the URG is in the order of several TWh.