

Challenges for three-dimensional hydrogeological modelling of an LNG mined underground storage during construction

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Abstract Hydrogeological modelling of a membrane-lined liquid natural gas (LNG) underground storage has different aims at different stages of a project: design, construction or operation. Two-dimensional (2-D) modelling focusing on local scale for cavern design is well adapted for optimising cavern depth, as well as for determining the spacing and location of the boreholes of the drainage system. Evaluation of desaturation timing and efficiency as well as impact on hydrogeological environment requires models of larger extent performed in two or three dimensions. A 3-D model created by finite element software FEFLOW® was used to simulate the progress of excavation and its impact on the hydrogeological environment. Challenges for 3-D modelling cover the representation of the storage geometry, the modelling of unsaturated zones and the determination of the most significant parameters influencing the results.

Key words underground storage; mined cavern; membrane lining; design; construction; desaturation; salt intrusion; hydrogeology; modelling; LNG