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Assessing the Hydrogen Storage Potential of Onshore Texas Salt Structures

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ABSTRACT

Access to hydrogen storage facilities that are safe, secure, strategically-located, and of sufficient scale will be key as we expand the reach of a new US hydrogen economy. Hydrogen storage poses many challenges, including the cost and risk of storing a highly volatile and compressed gas above ground. As such, storing hydrogen below ground is preferable, with salt caverns providing one of the key storage solutions. The potential for hydrogen storage in onshore Texas salt structures is vast given that: (i) a minimum of 85 salt structures have been mapped onshore; (ii) three hydrogen multi-cavern, salt dome storage sites already exist and have proven viable within the Texas Gulf Coast region; and (iii) many salt structures are located close to critical markets and infrastructure such as pipelines, natural gas supply, and potential sites for CO_2 sequestration. In this work we examine the feasibility of large-scale hydrogen storage within onshore Texas salt structures. Key questions we explore include: How well developed is the salt structure inventory of Texas? Which parts of Texas are best suited to salt cavern hydrogen storage and why? What geological and geotechnical criteria can be used to determine the suitability of a site for salt cavern hydrogen storage? What are the political, geographic and infrastructural requirements for a salt cavern hydrogen storage site? How does hydrogen storage in salt caverns differ from storage of LPG, hydrocarbon, and compressed air? We address these questions by integrating salt tectonic, geological and geotechnical understanding with a GIS-based mapping approach. Overall, our objective is to better understand the strategic significance of salt domes in Texas with respect to the location of critical infrastructure associated with the emerging hydrogen economy.

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