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Preparing for a Hydrogen Future – Constraints and Alternatives for Hydrogen Storage

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Abstract

As the US works towards a zero emissions future, Hydrogen has been touted as a clean alternative low carbon fuel for use in power generation, fired equipment, transportation fueling, and other applications. The initial transition to a Hydrogen-based economy will likely entail blending of Hydrogen into the Natural Gas supply at increasing levels. In order to ensure widespread transmission and use of Hydrogen is possible, Hydrogen storage and transmission infrastructure must be constructed at scale to support seasonal fluctuation in demand. Bulk storage of Hydrogen in salt caverns solution mined in domal formations is a proven technology. A fundamental question remains, whether there is adequate domal salt resources to support the Hydrogen storage demands of a mature Hydrogen economy in the US. As the economy adjusts to the coming energy transition, an evaluation of projected Hydrogen demand, associate storage requirements, and available storage space in domal salt resources in the US was conducted to identify gaps in capability and offer a potential solution, that volumetrically, satisfies the expected storage requirements for large scale adoption of Hydrogen as fuel. Future Hydrogen demand, and the storage requirements to support that demand are evaluated. The available domal salt resources to determine the ability of cavern storage to satisfy the projected storage requirements is evaluated. Constraints in the use of solution mined caverns for Hydrogen storage are identified and alternatives are considered to alleviate constraints on storage. Additional Hydrogen storage may be achieved through suitable depleted subsurface oil and gas reservoirs. Upon assessment of volumetric capacity, the technical feasibility of each storage solution requires a multidisciplinary approach that reviews historical operations and the understanding of rock-fluid, fluid-fluid interaction, rock mechanics behavior among others. Key parameters and an approach to evaluate depleted oil and gas reservoirs as potential Hydrogen storage units are considered.