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Technical Conference Paper

Salt Site Selection Criteria for Hydrogen Storage

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SMRI Fall 2024 Technical Conference
22-25 September 2024
Edmonton, Alberta, Canada

Solution Mining Research Institute Fall 2024 Technical Conference

Edmonton, Alberta, Canada 22-25 September 2024

Salt Site Selection Criteria for Hydrogen Cavern Storage

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Abstract

The are currently many factors driving a national hydrogen economy, such as renewable energy transition to electric grids, hydrogen vehicles, and industry needs. For these hydrogen systems to be successful they will need to rely on large scale hydrogen storage. Underground geologic storage is the best option for economies of scale in storing large quantities of energy.

Hydrogen behavior within geologic storage is still novel and when compared to natural gas, hydrogen is potentially more mobile, may leak easier, and is chemically more reactive. To successfully store hydrogen within salt, a site characterization must assess capacity, containment, and product purity. Each energy system will require a certain capacity of hydrogen storage to meet the system demand. A salt formation will need to be of ample depth, thickness, and continuity to be able to meet that required demand. For hydrogen storage to be successful the salt formation must be able to successfully contain hydrogen gas. Product can be lost through chemical and mineral reactions, microbial consumption, permeability pathways, or through slip in bedding planes. Depending on the end use, hydrogen purity may be of concern. Biological, chemical, and mineral reactions with hydrogen can produce methane and other gases such as hydrogen sulfide, which can impact both product purity and operations safety. Hydrocarbons found within salt can migrate and mix with hydrogen.

To address storage capacity and geologic impacts to both hydrogen containment and product purity a series of data collection and analyses should be performed. This paper provides a feasibility matrix that addresses each assessment element, characterization information needed, basic data sources, and analyses to be performed.

Key words: Geology, Salt Properties, Hydrogen, storage cavern