

## H-2-SALT: GEOLOGICAL CHARACTERIZATION OF POTENTIAL HYDROGEN STORAGE SITES IN PERMIAN BEDDED SALT DEPOSITS, CENTRAL KANSAS

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### Abstract

Hydrogen storage in subsurface caverns is known as perhaps largest and longest-term energy storage system. While few such systems are currently in service (e.g., Texas; Teesside, UK), they are envisioned as being a pillar of the current energy transition that will allow intermittent power production from renewable sources (e.g., wind, solar) to be balanced with demand at grid-scale. In addition, hydrogen energy storage can allow existing fossil power plants to run more economically either by minimizing startups/shutdowns or by allowing them to take advantage of arbitrage. Finally, stored hydrogen can feed a variety of non-power users such as heating, transportation, and manufacturing.

The H-2-SALT paper study aimed to assess the feasibility of a power-to-hydrogen system utilizing salt cavern storage of hydrogen in bedded salt in central Kansas, where over 750 such caverns have been constructed to date, of which approximately 350 are still in service. Two sites were evaluated in this study near Colwich and Hutchinson in central Kansas. Existing well and salt cavern data were collected to develop a regional geological database for the two sites and adjacent areas for use in more detailed geological and geomechanical site characterization efforts.

Bedded salt in central Kansas is predominantly found in the Hutchinson Salt Member of the Permian Wellington Formation, which is generally age equivalent to the deposits at Teesside, UK, that host the world's only hydrogen storage cavern in bedded salt. While the Hutchinson salt can range up to 500 ft in thickness, at Colwich it is ~300 ft (~90 m) thick, while thickness at the Hutchinson site is ~450 ft (~135 m). Available geological and geomechanical information were integrated to estimate salt cavern parameters (including maximum and minimum cavern pressure as well as cavern and inter-cavern size limitations) following established criteria for cavern stability. No major stability issue is existed at the study area. Interbed slip risk exists in the bedded salt and should be evaluated during the storage operations. It is recommended that a stratigraphic test well be drilled to collect log data and core samples that can reduce uncertainty surrounding geological and geomechanical properties of the salt beds that will be required for further cavern and energy storage system design studies.

### Keywords

Kansas, Salt, Cavern, Hydrogen