

ABSTRACT

This paper provides an update of the current status of a U.S. Department of Energy (DOE) project to prove the technology developed for determining the minimum gas pressures of compressed natural gas (CNG) caverns based on the continuum damage mechanics criterion described by DeVries et al. [1998] and Nieland et al. [1999]. In the earlier work, two major conclusions were reached: (1) the design criterion based on salt damage could be used to reduce the minimum gas pressure in gas storage caverns and (2) an efficient test matrix could be applied to provide site-specific material properties required by the salt constitutive model used for the advanced design criterion. However, these conclusions were based largely on hypothetical information unrelated to a specific CNG storage application.

To prove this technology, a proof-of-concept project was formalized by RESPEC and Bay Gas Storage Company, Ltd. (Bay Gas) to refine and demonstrate the use of a new design criterion based on continuum damage mechanics for determining the minimum gas pressure for storing natural gas in salt caverns. The project is well underway, and the new design criterion will be applied to two Bay Gas storage caverns. If successful, the project will demonstrate that a limited test matrix comprised of approximately 30 tests can be used to define a material model for salt that is capable of predicting the formation and evolution of salt damage that can lead to instability of a salt cavern. The project will determine whether or not the working gas capacity for the two Bay Gas caverns can be increased by application of the salt damage criterion.