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FINITE ELEMENT ANALYSIS OF LONG-TERM STABILITY OF McINTOSH SALT DOME FOR CAES OPERATIONS

by Mahantesh Hiremath
Serata Geomechanics, Inc.

Long-term stability analysis of CAES caverns to be excavated in the McIntosh salt dome, Alabama, is presented using finite elements. A rheological constitutive model developed by Serata Geomechanics, Inc. (SGI), which has been successfully tested at several other sites, is the basis for the computer program REM. At the present time, "normal" properties of salt and subsoil strata are used from the SGI data bank. A proposal for material testing and site-specific material property development is under study at EPRI.

Four-noded isoparametric quadrilateral elements are used throughout. Two sections -- vertical and horizontal -- are studied under plane strain simulation. The finite element mesh consists of 2586 elements in the vertical section and 2928 elements in the horizontal section. The vertical section permits true representation of the geology of the salt dome and the caprock. The horizontal section is useful for assessing the influence of CAES cavern locations, center-to-center distance, etc.

The preliminary investigation, completed in June 1987, was based on the salt dome structural data available at that time. The present work includes the revised salt dome structure and takes into account the history of brine wells of Olin Corporation in a more precise manner.

The computer results for:

- Displacement patterns
- Principal stresses and strains
- Octahedral shear stress and strain contours

are enclosed for the case of assessment of stability of the dome under the present brine wells of Olin Corporation up to 50 years.

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