

ROCK SALT FORMATIONS AS POTENTIAL NUCLEAR WASTE REPOSITORY

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Abstract

A series of laboratory testing and numerical simulations have been carried out to assess the mechanical performance of the rock salt formations for the potential nuclear waste disposal in Thailand. Uniaxial creep tests and stress-controlled tests determine the mechanical and rheological properties (strength, elastic, visco-elastic and visco-plastic parameters) of rock salt specimens obtained from Udon Thani. Based on the existing borehole information, five geologically favorable areas in Sakon Nakorn and Khorat basins are assumed as tentative repository sites. The computer modeling uses the laboratory-calibrated properties to simulate the time-dependent stress, strain and deformation around the salt cavern, as well as the movement of the overlying formations. The design emphasizes the mechanical stability under isothermal conditions during the waste emplacement (currently aimed at 50 years), and the long-term isolation for the next 500 years. The preliminary results from the area of Ban Kudjig, Wanon Niwat district, Sakon Nakorn province (one of the selected areas) suggest that long-term stability of the disposed caverns may be achieved if suitable design configurations have been implemented. The caverns should be solution-mined below 585 meters depth. The minimum diameter of the spherical shaped cavern should be 40 meters (equivalent to 25,133 m³). The minimum salt roof and floor are 200 meters. The surface subsidence is calculated to be less than one cm through the next 500 years, providing that the internal pressure is maintained to be equivalent to the hydrostatic pressure of saturated brine.