The Science behind Deep Borehole Disposal of Nuclear Waste

Patrick V. Brady, Bill W. Arnold, and Robert J. MacKinnon
Sandia National Laboratories
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Disposal in the bottom 2 km of 5 km deep boreholes in crystalline basement rock is a potentially rapid and relatively inexpensive means for isolating nuclear waste. Deep borehole disposal is favored by reducing conditions, high salinities, and low fluid flow rates at depth. Thermal-hydrologic calculations point to transient and minor vertical fluid flow for ~ 300 years after disposal. Suitable crystalline basement having low heat flow, little seismic activity, and no other very deep subsurface economic operations (e.g. oil and gas, mining) is present in many areas of the continental US. Key science questions include: predicting the long-term performance of seals and backfills, understanding fuel and waste package corrosion in saline brines under reducing conditions, age-dating deep groundwaters, and understanding deep groundwater hydrology.

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