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**Effect of Temperature on Permeability of Cement Sealant
for Deep Borehole Repositories**

The Department of Energy has been contractually obligated to initiate the removal of spent nuclear fuel (SNF) from reactor sites by 2020. The Blue Ribbon Commission on America's Nuclear Future has recommended work on validating the deep borehole concept for storage of SNF and high level wastes as a near-term solution. It is proposed that these systems should be sufficient to mitigate environmental exposure to long-lived radionuclides (e.g. I-129) by inhibiting fluid flow for long expanses of time. Key importance has thus been placed on the integrity of materials used to seal the waste emplacement zone. These sealants must have permeability greater than or equal to that of the surrounding host rock.

Cement featuring special additives to enhance expansiveness and mechanical durability has been proposed as a long-term sealant for deep, hot wells in the natural gas industry. A cement formulation has been identified that has been proven to expand during curing. Therefore, it can be assumed that fluid is sufficiently blocked from seeping through a lateral gap. However, measurements must be performed to validate the bulk permeability of the material for on-site conditions, where lithostatic pressures are as high as 100 MPa and canister temperatures are expected to be around 150°C. To provide good retention, the permeability target should be below 1 μD .