Retrospection of U.S. Nuclear Regulatory Commission Efforts on Natural Analogs and the Peña Blanca Uranium District

VEBLEN, Linda A., and LESLIE, Bret W., U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, (301) 415-6266, E-mail: lav@nrc.gov

Disposal of high-level nuclear waste requires a U.S. Nuclear Regulatory Commission (NRC) license. 10 CFR (Code of Federal Regulations) 63 (*i.e.*, "Disposal of High-Level Radioactive Wastes in a Geologic Repository at Yucca Mountain, Nevada") prescribes rules governing the licensing of the U.S. Department of Energy (DOE) proposed repository. The licensing regulations are risk-informed and performance-based, and identify the role of natural analogs in supporting models of repository performance. NRC has collected natural analog information from the Pena Blanca district, Chihuahua, Mexico since 1990. NRC independently used that information to better understand the performance of a potential tuff-hosted nuclear waste repository at Yucca Mountain and to understand limitations of the use of natural analog information.

NRC-funded work in the Pena Blanca district has focused on (1) characterization of processes important to oxidative alteration of uraninite, (2) characterization of processes important to subsequent migration of radioelements through silicic tuffs, and (3) modeling the processes which control uraninite alteration and radioelement migration. Field studies included geologic mapping, contact gamma surveys, collection of solid, vegetation, and water samples, and characterization of local hydrology. Laboratory investigations included analyses of mapping data, mineralogy, petrology, rock, plant and water chemistry, stable and radioisotope analyses, and hydraulic characterization of tuffs. These studies (http://www.swri.edu/4org/d20/ghs/PBlanca/index.html) have led to (1) a description of the alteration of uraninite that occurred over long time scales that is comparable to that observed in Yucca Mountain-approximate laboratory experiments of spent fuel degradation; (2) implementation of an alternate source term model for the NRC's performance assessment code; (3) a better understanding of radioelement mobility in fracture transport pathways; and (4) demonstration of episodes of elevated radionuclide mobility, likely related to increased water flow.

The NRC staff views expressed herein are preliminary and do not constitute a final judgment or determination of the matters addressed or of the acceptability of a license application for a geologic repository at Yucca Mountain.