Saf. Nucl. Waste Disposal, 2, 29–30, 2023
https://doi.org/10.5194/sand-2-29-2023

SaND
Safety of Nuclear Waste Disposal
Open Access

The role of international collaboration in the United States geologic disposal research program

Jens T. Birkholzer[1], LianGe Zheng[1], Prasad Nair[2], and Timothy Gunter[2]

[1]Energy Geosciences Division, Lawrence Berkeley National Laboratory, Berkeley, CA, USA
[2]US Department of Energy, Office of Spent Fuel and Waste Science and Technology, Washington, DC, USA

Correspondence: Jens T. Birkholzer (jtbirkholzer@lbl.gov)

Received: 24 March 2023 – Accepted: 7 June 2023 – Published: 6 September 2023

Abstract. More than a decade ago, the United States disposal program discontinued all research activities focused on the unsaturated fractured tuff formation at Yucca Mountain as the geologic disposal site for spent fuel and high-level radioactive waste. A new research and development (R&D) program was initiated to provide a sound technical basis for alternative disposal options across clay, crystalline, and salt rocks. The goals of this broad program were (and still are) to (1) increase confidence in the robustness of generic disposal concepts, (2) develop the science and engineering tools needed to support disposal concept implementation, and (3) conduct R&D on the direct disposal of existing dual-purpose (storage and transportation) canisters. Recognizing the benefits of international collaboration toward the common goal of safely and efficiently managing the back end of the nuclear fuel cycle, the program emphasized international cooperation as an effective strategy for sharing information and knowledge. In a multi-laboratory effort coordinated by Lawrence Berkeley National Laboratory, the United States Department of Energy (DOE) program established formal and informal cooperation partnerships with several international initiatives and institutions and developed a number of collaborative R&D activities in important research areas, such as engineered barrier integrity, near-field perturbations, radionuclide transport, performance assessment, and methods for characterization and monitoring of engineered and natural barriers.

This presentation gives an overview of these R&D activities, with a specific focus on activities that improve our current understanding of the coupled thermal–hydrological–mechanical–chemical (THMC) processes occurring in engineered and natural barriers. We start with a brief review of selected international collaboration initiatives and then describe a few specific collaboration projects. We focus specifically on such studies that use experimental data sets provided by international research cooperation for joint modeling work to increase confidence in performance-relevant predictions of coupled processes. Overall, the focus on international collaboration has allowed deep engagement of US researchers with the international waste management R&D community in terms of best practices, new scientific advances, state-of-the-art simulation tools, new monitoring and performance confirmation approaches, and lessons learned. The joint R&D with international researchers, worldwide sharing of knowledge and experience, and access to relevant data and experiments from a variety of host rocks have helped our researchers to significantly improve their understanding of the current technical basis for disposal in a range of potential host rock environments. International collaboration also provides ample opportunity for training and educating junior staff that are well suited to move the United States disposal research program forward into the next decades, a promising avenue for developing a next-generation workforce of disposal scientists.

Published by Copernicus Publications on behalf of the Federal Office for the Safety of Nuclear Waste Management (BASE).

Financial support. This research has been supported by the US Department of Energy, Office of Nuclear Energy (grant no. DE-AC02-05CH11231).