Abstract for submission to the subject category on the Engineered Systems at the 13th International High-Level Radioactive Waste Management Conference (IHLRWMC): Albuquerque, New Mexico, USA, April 10–14, 2011

Simple Biosphere Model for Non-Site-Specific Performance Assessments

R.R. Benke,[1] A.T. Gray,[2] and P.A. LaPlante[1]

[1]Center for Nuclear Waste Regulatory Analyses
6220 Culebra Road, San Antonio, Texas 78238-5166, USA

[2]U.S. Nuclear Regulatory Commission
Division of High-Level Waste Repository Safety
Washington, DC 20555, USA

Contact: R. Benke, rbenke@swri.org, Telephone: +1-210-522-5250

Abstract

The U.S. Nuclear Regulatory Commission (USNRC) and its contractor are developing analytic methods to identify effective and efficient regulatory programs that implement changes to U.S. policy on high-level nuclear waste disposal. The staff has developed a beta version of a Scoping of Options and Analyzing Risk model (β-SOAR). β-SOAR is designed to provide timely risk and performance insights for a variety of potential high-level radioactive waste disposal options. Waste isolation from the biosphere is an integral part of any system performance evaluation. A simple biosphere model facilitates scoping assessments and insights on performance.

The objective of the biosphere component in the β-SOAR model is to provide a simplified, generic modeling capability to approximate radiological doses to an individual who consumes groundwater contaminated with radionuclides. Other radiological pathways are not, at this time, included in the biosphere model. The biosphere model is generic and is not specific to any site. Beginning with radionuclide mass arrival rates, the simple model accounts for the fraction of arriving mass transferred to the biosphere, annual amount of groundwater accessed by a hypothetical community, groundwater consumption rate by an individual, and radionuclide dose coefficients for ingestion.

Relative dose results from β-SOAR can be used to evaluate different performance characteristics of potential geologic disposal systems. This paper describes the existing simple biosphere model and potential future upgrades. The advantages of a simple biosphere model relate to (i) the use of a single, system-level metric (e.g., dose or risk) for generating insights; (ii) the influence of the biosphere model on relative results; and (iii) a flexible framework that facilitates modifications in accordance with the future direction of the regulatory program for high-level waste disposal.

This abstract is an independent product of the CNWRA and does not necessarily reflect the view or regulatory position of the USNRC. The USNRC staff views expressed herein are preliminary and do not constitute a final judgment or determination of the matters addressed or of the acceptability of any licensing action that may be under consideration at the NRC.