REQUEST FOR ADDITIONAL INFORMATION (RAI)
Volume 3—Postclosure Chapter 2.2.1.2.1 (Scenario Analysis)
7th Set (1 RAI)
(DEPARTMENT OF ENERGY'S SAFETY ANALYSIS REPORT SECTION 2.2, TABLE 2.2-5)

Microbial Activity in the Near-Field Condensation Zone

RAI #1: Identify whether the effects of the evolution of unsaturated zone water chemistry due to microbial activity in the near-field condensation zone during the repository early thermal period have been addressed in a FEP listed in SAR Table 2.2-5. If these effects are considered to be part of an existing included FEP, then provide a technical basis for why the model abstractions that include the FEP adequately bound any potential impacts from microbial activity in the near-field condensation zone during the repository early thermal period. If the effects of the evolution of unsaturated zone water chemistry due to microbial activity in the near-field condensation zone during the repository early thermal period are addressed in an existing excluded FEP (SAR Table 2.2-5), then provide an updated FEP description, screening decision, and screening justification for the FEP that explicitly addresses the effects of the evolution of unsaturated zone water chemistry due to microbial activity in the near-field condensation zone during the repository early thermal period. Otherwise, provide an updated list of FEPs that includes the new FEP and provide a screening decision and screening justification for the new FEP. This information is needed to verify compliance with 10 CFR 63.114(a)(5)-(6).

Basis: DOE addresses microbial activity in multiple FEPs, including FEP 1.2.08.00.0A (Diagenesis), FEP 2.1.10.01.0A (Microbial Activity in the EBS), and FEP 2.2.09.01.0B (Microbial Activity in the UZ) (SNL, 2008). In the justification for FEP 1.2.08.00.0A, DOE states that the excluded FEP 2.2.09.01.0B addresses the effects of microbial activity in the unsaturated zone (SNL, 2008). DOE's description of FEP 2.2.09.01.0B (SNL, 2008) limits microbial effects to those that may affect radionuclide mobility. DOE excluded microbial activity in the EBS (FEP 2.1.10.01.0A), citing (i) high temperatures and dry conditions in the drifts during the early thermal period and (ii) low water activity and the scarcity of nutrients under ambient conditions as factors that would sharply limit any microbial activity within the drifts. In contrast, the condensation zone in the surrounding rock will have warm temperatures and a higher water content during the early thermal period, increasing its capability to support microbial activity beyond ambient conditions to an extent that could influence the composition of water in the condensation zone. Water from the condensation zone resaturates the dryout zone when the thermal period diminishes, potentially entering the repository drifts as seepage and influencing the corrosion of engineered barriers.

Reference

SNL. 2008. "Features, Events, and Processes for the Total System Performance Assessment: Analyses." ANL–WIS–MD–000027. Rev. 00. ACN 01, ERD 01. Las Vegas, Nevada: Sandia National Laboratories.