REQUEST FOR ADDITIONAL INFORMATION (RAI)
Volume 3—Postclosure Chapter 2.2.1.4.1 (Demonstration of Compliance with the Post Closure Individual Protection Standard)
2nd Set (RAIs 1 through 3)
(DEPARTMENT OF ENERGY'S SAFETY ANALYSIS REPORT SECTION 2.4.2)

In SAR Section 2.4.2.1.1, DOE provides a description of the theoretical basis for how TSPA scenarios are evaluated and how the results of individual scenarios are combined to determine a compliance with 10 CRF 63.114 (b) and 10 CFR 63.311.

Descriptions on the propagation of uncertainty into the results of the TSPA analysis are provided in the reference SNL (2008). The descriptions DOE provided on the numerical implementation are not detailed enough in some areas for the staff to complete its review.

RAI #1

Provide a detailed description of the numerical integration method used to evaluate the expected dose over the waste package damage area (faulting and seismic model cases). In particular, describe how the contribution to the expected dose from the zero waste package damage area to the first discrete value (e.g., 1/3 in the faulting model case) of the damage area was accounted for. It is not apparent that the contribution from the initial portion of the damage area is included in the integration result within the EXDOC implementation.

Basis: The numerical value of the expected dose over the waste package damage area may vary depending on the numerical integration approach and the number of integration points. As an illustration, Appendix J of SNL (2008) provides a description of the computation of the expected dose for the fault displacement model case. Three realizations with discrete fractions of the waste package damage area (1/3, 2/3, and 1) were used to compute the expected dose over the damage area. SAR Section 2.4.2.2.2 described the effect of simultaneously increasing the number of fault events (from 6 to 12) and the number of waste package damage areas (from 3 to 5) on the expected dose for 5 realizations (SAR Figure 2.4-61), and estimated an increase in the expected dose by 30 percent for all the 5 realizations considered (SAR p. 2.4-88). If the dose were independent of the damage area, the segment ranging from 0 to 1/3 fraction of the damage area would contribute 1/3 of the expected dose. The reported increase by 30% (SAR p. 2.4-88) could be explained as the contribution from this [0, 1/3] segment, implying that this segment was potentially disregarded in the numerical integration algorithm.

In general, a detailed description is needed of the numerical integration method to compute expected values over the damage area for all other model cases that consider discrete values of this variable. In particular, discuss the treatment of the first damage area element ranging from 0 to the first discrete value.

RAI #2

The documentation for the 10,000 year analysis implies the simulation period needs to be 20,000 years for the numerical interpolation technique to be valid. Describe the numerical interpolation method used to compute dose curves for the one million year analysis (SNL 2008 Appendix J, equations J4.5-2 through J4.5-8), which appears to not rely on a similar numerical interpolation approach (i.e., use of a simulation period of 2 million years to appropriately represent the events for a 1 million year period).

Basis: For the computation of 10,000 year expected doses, individual realizations were computed for times that extend to 20,000 years. The computation of the expected dose requires constitutive realization functions to extend up to twice the period of interest (e.g., 20,000 or two-million years) (SNL 2008, Appendix J). It is not clear if two-million year realizations were used to compute the one-million expected doses. An explanation is needed on the computation of the one-million year expected doses.

RAI #3

For a single aleatory realization of the seismic ground motion and igneous intrusion modeling cases, provide the electronic files containing the GoldSim results and supporting files for a full set of 300 epistemic samples for the following TSPA intermediate results. The aleatory realizations may be selected to be consistent with the results used in responding to RAI Volume 3, Chapter 2.2.1.4.1, First Set, Number 2.

1) All_Uncert_Results
2) All outputs saved in the following GoldSim containers:
    \TSPA_Model\Engineered_System\Engineered_System_Out
    \TSPA_Model\Results\Mass_Balance
    \TSPA_Model\Results\EBS_Out_Results
    \TSPA_Model\Results\UZ_Out_results
    \TSPA_Model\Results\SZ_out_results
3) Radionuclide specific biosphere dose conversion factors
4) Radionuclide specific groundwater whole body doses
5) Patch and crack waste package failure fraction
6) Patch and crack failed area
7) Waste package water flow rate
8) Waste form degradation rate
9) Distribution coefficients for radionuclides on stationary corrosion products as computed by the surface complexation model

Basis: Needed for NRC staff review