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Justify the use of Total System Performance Assessment (TSPA) v5.000 in the igneous event sensitivity analyses (SNL, 2008, Appendix P), when TSPA v5.005 was used to evaluate the igneous event scenario in the license application.

Basis: As part of igneous scenario analysis, the DOE provided sensitivity analyses using a single-value probability of intrusive and extrusive igneous events at 1 x 10^{-7} per year (SNL, 2008, appendix P). The igneous intrusive sensitivity analyses were identified as LA_v5.000_IG_003000_16.gsm and LA v5.000_IG_003000_17.gsm (SNL, 2008, Appendix P, pg P-44). However, these analyses were performed using a version of the TSPA identified as v5.000, which is not the version used for license application dose calculations. Instead the license application relies on a TSPA version v5.005. This information is needed to verify compliance with 10 CFR 63.114.

1. RESPONSE

The igneous event sensitivity analysis in Appendix P of *Total System Performance Assessment Model / Analysis for the License Application* (SNL 2008) was conducted using TSPA-LA Model v5.000 to illustrate the change in mean annual dose from the igneous modeling cases when the frequency of igneous events is set to a constant value of 10^{-7} per year. The model changes between TSPA-LA Model v5.000 and v5.005 did not change the uncertainty in the frequency of igneous events and it was expected that the effect of the sensitivity change, approximately a factor of six increase in the mean annual dose, would not change. In addition, this sensitivity analysis is not part of the demonstration of compliance presented in the DOE license application. For these reasons, the sensitivity analysis was not repeated using TSPA-LA Model v5.005. However, in order to provide additional justification that the approach taken to evaluate the igneous event scenario in the license application is correct, the sensitivity calculation has been repeated with TSPA-LA Model v5.005, and the results are shown below along with a comparison to the previously documented analysis.

In the original sensitivity analysis, TSPA-LA Model v5.000 was used to calculate the expected annual dose for each epistemic realization using a constant frequency of occurrence of 10^{-7} per year, rather than the uncertain frequency sampled from the probability distribution in the base case (SNL 2008, Appendix P, Section P14.2). In the base case the event probability distribution ranges between 1.38×10^{-11} per year and 7.76×10^{-7} per year, with a mean value of 1.67×10^{-8} per year. This probability distribution did not change between TSPA-LA Model v5.000 and TSPA-LA Model v5.005. This sensitivity analysis has been updated using TSPA-LA Model v5.005.

Figure 1 shows the results of the updated sensitivity analysis for the Igneous Intrusion Modeling Case using TSPA-LA Model v5.005. With an event frequency of 10^{-7} per year, the mean annual dose from igneous intrusion increases by a factor of five to seven. This increase is similar to that observed for TSPA-LA Model v5.000 (SNL 2008, Appendix P, Section P14.3, Figures P-6 and P-7). Thus the effect on the mean annual dose of fixing the igneous frequency at a constant

value is the same for either TSPA-LA Model v5.000 or TSPA-LA Model v5.005. The differences between the results in Figure 1 for TSPA-LA Model v5.005 and TSPA-LA Model v5.000 are due to the changes to the TSPA-LA Model between these versions, as described in *Total System Performance Assessment Model / Analysis for the License Application* (SNL 2008, Appendix P[a]).

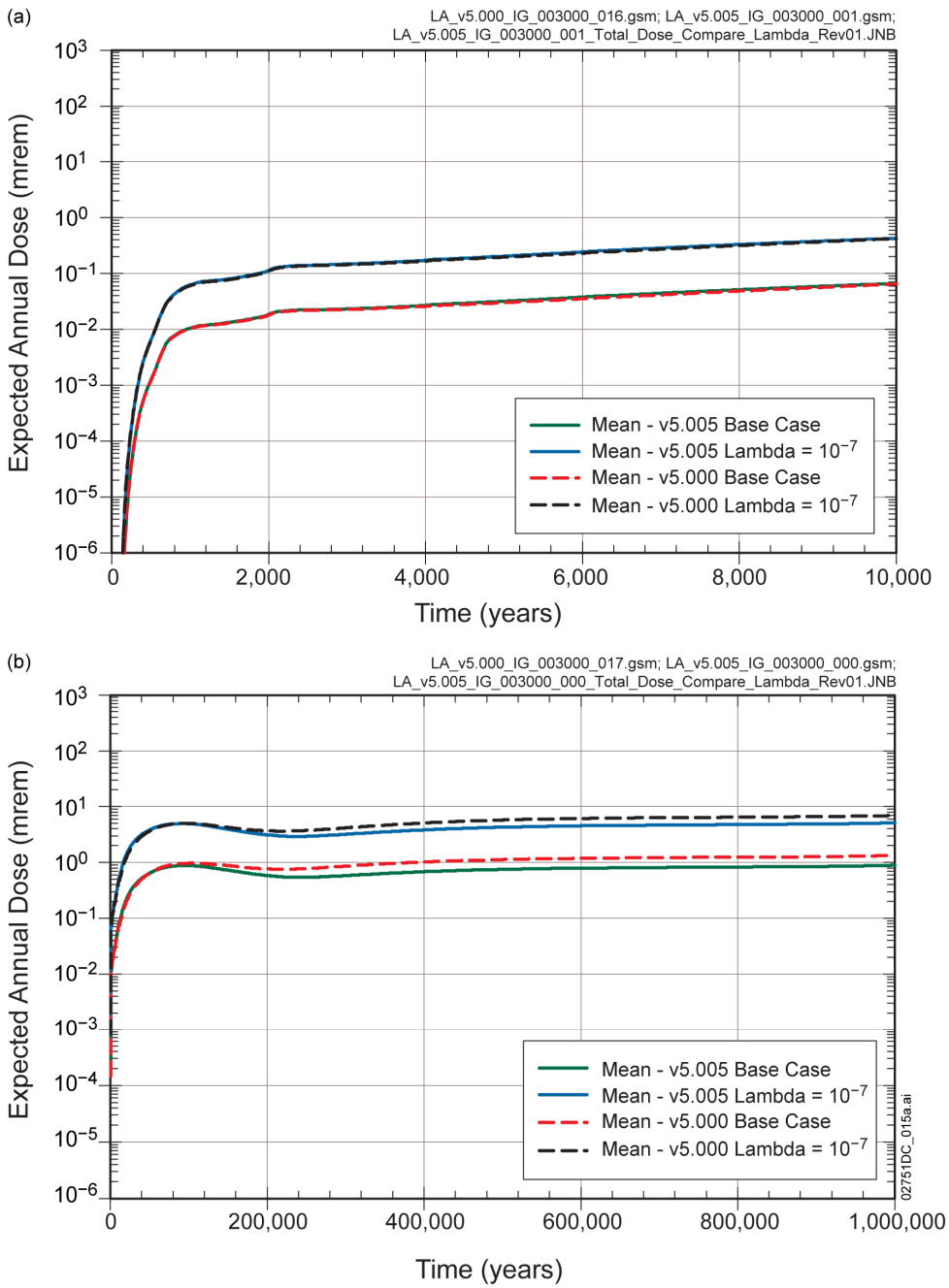

Figure 1 Comparison of Mean Annual Dose for the Igneous Intrusion Modeling Case: Base Case and Probability of the Igneous Event Set to 10^{-7} per Year for (a) 10,000 Years and (b) 1,000,000 Years, for TSPA-LA Model v5.000 and v5.005

The Volcanic Eruption Modeling Case did not change between TSPA-LA Model v5.000 and TSPA-LA Model v5.005. Thus, the sensitivity analysis results shown for this case in *Total System Performance Assessment Model / Analysis for the License Application* (SNL 2008, Figure P-7) are valid for TSPA-LA Model v5.005.

2. COMMITMENTS TO NRC

None.

3. DESCRIPTION OF PROPOSED LA CHANGE

None.

4. REFERENCES

SNL (Sandia National Laboratories) 2008. *Total System Performance Assessment Model /Analysis for the License Application.* MDL-WIS-PA-000005 REV 00 AD 01. Las Vegas, Nevada: Sandia National Laboratories.