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Yucca Mountain 2008 Performance Assessment: Implications of Seismic Hazard Curve Uncertainty

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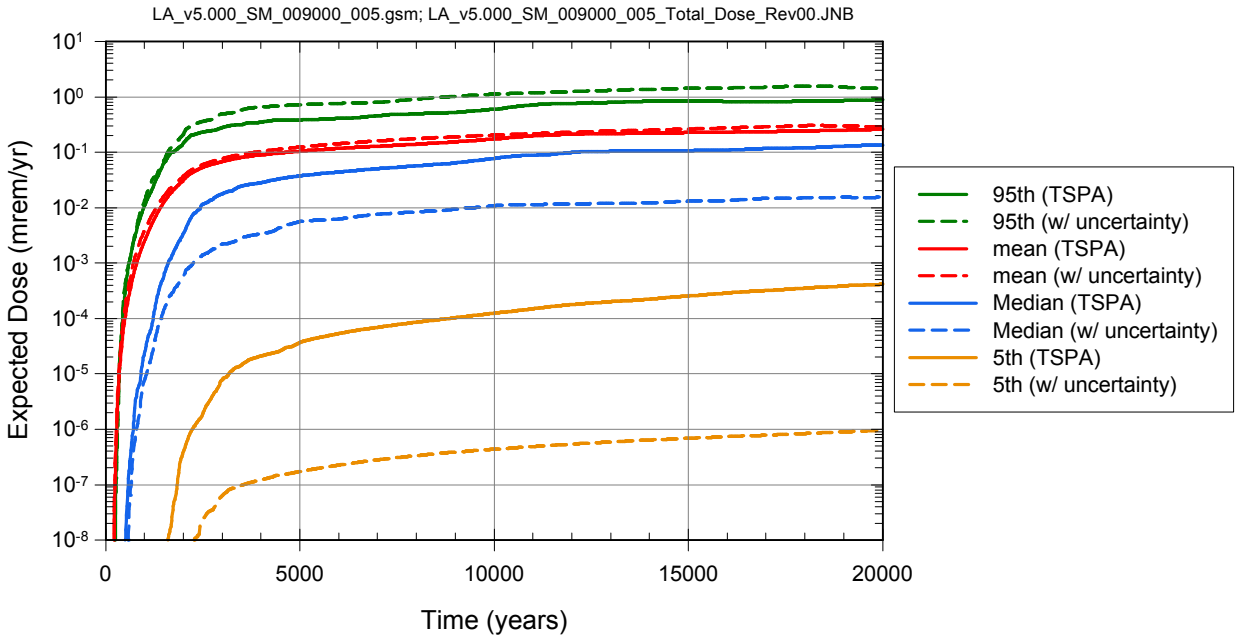
In support of the 2008 Total System Performance Assessment for License Application (TSPA-LA) for the proposed high level radioactive waste repository at Yucca Mountain (YM), Nevada, the development of hazard curves for vibratory ground motion and fault displacement included an expert elicitation [1]. As a result of this elicitation, the uncertainty in the hazard curve at Yucca Mountain for seismic ground motion events was summarized as a distribution of hazard curves.

The seismic ground motion modeling case for the TSPA-LA Model used a mean hazard curve for peak ground velocity. This mean curve is defined as the expected value of the distribution of hazard curves and is above the 0.8 quantile of the distribution for high intensity ground motion events (i.e., for events occurring at low annual exceedance frequencies). As documented in [2], It was decided that the use of the mean hazard curve would ensure a conservative representation of seismic hazard in the TSPA-LA Model and the resultant license application for the YM repository. While such a conservative approach may be appropriate in a regulatory analysis, it is not consistent with the treatment of uncertainty for the igneous modeling case in the 2008 YM PA. Specifically, the potential occurrence of igneous events was found to be one of the major contributors to the uncertainty in the final results of the 2008 YM PA as a consequence of the inclusion of the uncertainty in the rate of occurrence of igneous intrusive events . This rate plays the same role for igneous events as the hazard curve plays for seismic events. As a consequence, it is important to assess the potential effects of uncertainty in the seismic hazard curve on results obtained in the 2008 YM PA.

In this paper, we extend results obtained in the 2008 PA by including the uncertainty in the seismic hazard curve and study the impact of seismic hazard curve uncertainty on the distribution of expected dose over time for the seismic ground motion modeling case. The results are in agreement with the anticipated implications of seismic hazard curve uncertainty. Specifically, the uncertainty in expected dose is greatly extended for lower expected dose values and slightly extended to higher expected dose values. The use of the mean hazard curve is generally conservative, as most of the resulting expected dose values are below results obtained in the 2008 PA with use of the mean seismic hazard curve. Furthermore, a sensitivity analysis shows that the uncertainty in expected dose due to seismic events over the first 20,000 years following repository closure is dominated by uncertainty in the seismic hazard curve.



1. CRWMS M&O (Civilian Radioactive Waste Management System Management and Operating Contractor). *Probabilistic Seismic Hazard Analyses for Fault Displacement and Vibratory Ground Motion at Yucca Mountain, Nevada*.Las Vegas, NV: Milestone SP32IM3, September 23, 1998. Three volumes. Las Vegas, NV: CRWMS M&O. ACC: MOL.19981207.0393. September 23, 1998 1998.
2. SNL (Sandia National Laboratories). *Total System Performance Assessment Model/Analysis for the License Application*.MDL-WIS-PA-000005 Rev 00, AD 01.Las Vegas, NV: U.S. Department of Energy Office of Civilian Radioactive Waste Management 2008.