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TOTAL-SYSTEM PERFORMANCE ASSESSMENT FOR THE YUCCA MOUNTAIN SITE

Michael L. Wilson, Peter N. Swift, Sandia National Laboratories, Albuquerque, NM; Jerry A. McNeish, S. David Sevougian, Duke Engineering and Services, Las Vegas, NV.

Yucca Mountain, Nevada, is being studied as a potential site for disposal of high-level radioactive waste. The site has been the subject of an extensive site-characterization effort, and a series of total-system performance assessments (TSPAs) has been conducted over the past decade, with increasing complexity and detail in the models used for the assessments. The general approach for conducting a TSPA is to (1) identify and screen potentially relevant features, events, and processes to develop scenarios, (2) develop models, (3) estimate parameter ranges and uncertainties, (4) perform calculations, and (5) interpret results. Some of these steps can be carried out in parallel, and the procedure generally must be repeated iteratively as knowledge is gained. The TSPA model for Yucca Mountain includes numerous submodels for natural systems, engineered systems, and the interactions between them. Disruptive events are also modeled (primarily igneous activity, but with consideration of other possible disruptive events as well). As implied by step (3), we use a probabilistic approach, in which uncertainties are propagated through the system so that the effects of uncertainties on the final results can be analyzed.

The most recent TSPA analyses have been conducted in support of a preliminary site-suitability evaluation. If the site is found to be suitable and officially recommended, further TSPA analyses will be conducted to support the license application. Results to date show that risk is dominated by igneous activity at early times because the robust waste-package design prevents significant nominal (non-disruptive) releases for tens of thousands of years or longer. The peak dose in the model occurs hundreds of thousands of years in the future, and is dominated by nominal processes, including waste-package corrosion, infiltration and seepage of water, and radionuclide dissolution.

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