REVIEW OF YUCCA MOUNTAIN DISPOSAL CRITICALITY STUDIES*

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Abstract—The U.S. Department of Energy, Office of Civilian Radioactive Waste Management, submitted a license application for construction authorization of a deep geologic repository at Yucca Mountain, Nevada, in June of 2008. The license application is currently under review by the U.S. Nuclear Regulatory Commission. However, the Obama administration has now requested withdrawal of the license application. With the withdrawal request and the development of the Blue Ribbon Commission to seek alternative strategies for disposing of spent fuel, the status of the Yucca Mountain repository is uncertain. What is certain is that spent nuclear fuel will continue to be generated and some long-lived components of the spent nuclear fuel will eventually need a disposition path(s). Strategies for the back-end of the fuel cycle will continue to be developed and need to include the insights from the experience gained during the development of the Yucca Mountain Project license application. Detailed studies were performed and considerable progress was made in many key areas in terms of increased understanding of relevant phenomena and issues regarding long-term disposal. This paper reviews technical studies performed by the Yucca Mountain Project supporting the development of the disposal criticality analysis licensing basis and the use of burnup credit. Topics include assembly misload analysis, isotopic and criticality validation, commercial reactor critical analyses, loading curves, alternative waste package and criticality control studies, radial burnup data and effects, and implementation of a conservative application model in the criticality probabilistic evaluation—as well as other information that is applicable to operations regarding spent fuel outside the reactor. This paper summarizes the work and significant accomplishments in this area. It also provides useful information that others in the burnup credit and criticality safety community should consider in future strategies for closing the back-end of the fuel cycle, specifically, the handling and packaging of commercial spent nuclear fuel.

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