



The EPA Radiation Standard for Spent-Fuel Storage in a Geological Repository

**Background Information
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BACKGROUND

In 2002, the U.S. Congress upheld the President's designation of the Yucca Mountain, Nevada, site for a national repository for used commercial nuclear fuel and high-level radioactive waste. This designation enabled the U.S. Department of Energy (DOE) to proceed with federal licensing activities required before beginning construction of a specially designed repository.

In accordance with the Nuclear Waste Policy Act of 1982, as amended, the DOE is developing a license application for Yucca Mountain that it will submit to the U.S. Nuclear Regulatory Commission (NRC). The NRC will independently evaluate DOE's repository design and safety analysis to determine if the planned facility meets regulatory requirements.

The "Energy Policy Act of 1992" (Ref. 1) required the U.S. Environmental Protection Agency (EPA) to issue public health and safety standards for the Yucca Mountain site "based upon and consistent with the findings and recommendations of the National Academy of Sciences" (NAS). The NAS study (Ref. 2) was issued in 1995 and found "no scientific basis for limiting the time period of the individual standard to 10,000 years or any other value." However, it recommended that the standard be applied whenever the peak risk, or highest exposure, is anticipated to occur. Some calculations project that the peak risk might occur tens of thousands of years into the future.

Following the NAS report, the EPA issued a proposed rule in 1999 (Ref. 3) and following consideration of many public comments issued a final rule in 2001 (Ref. 4) limiting the compliance period to 10,000 years. The EPA acknowledged the NAS recommendation but concluded "there is still considerable uncertainty as to whether current modeling capability allows development of computer models that will provide sufficiently meaningful and reliable projections over a time frame up to tens-of-thousands to hundreds-of-thousands of years. Simply because such models can provide projections for those time periods does not mean those projections are meaningful and reliable enough to establish a rational basis for regulatory decision-making."

The NRC incorporated the EPA standards into its own regulations (Ref. 5) and agreed with the "fact that it is feasible to calculate performance of the engineered and geologic barriers ... for periods much longer than 10,000 years does not mean that it is possible to make realistic or meaningful projections of human exposure and risk" The DOE also supported the 10,000-

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year compliance period on the basis that a “significantly longer time period for assessing compliance would be unprecedented, unworkable, and probably unimplementable” (Ref. 6). In response to several legal challenges, the U.S. Court of Appeals vacated in July 2004 (Ref. 7) the 10,000-year time frame used by the EPA on the basis that it did not comply with the Congressional mandate that it be based on the NAS recommendations. The Court ruled that the EPA could reissue the standard providing a better basis for its decision, issue a rule with standards extending to one million years, or seek legislative endorsement of the 10,000-year applicability period.

The Court ruled that the 10,000-year EPA standard and NRC regulations limiting radiation levels, analytical methods, and other programs to protect public health and safety from the repository were determined appropriately through scientific assessments. However, the Court agreed with Nevada that the EPA’s 10,000-year radiation standard was not “based upon and consistent with” a 1995 NAS recommendation as required by the Energy Policy Act of 1992.

The science behind radiation and its health effects is based on more than a half-century of study. In the United States, naturally occurring radiation exposes residents to an average of 300 millirems per year (Ref. 8).^a

The existing EPA standard states that for the next 10,000 years, the critical population group closest to the boundary of the Yucca Mountain repository can receive an annual dose of no more than 15 millirems—an amount equal to taking three round-trip transcontinental airline flights. The 15-millirem limit is about twice the amount of radiation that workers in the U.S. Capitol building receive per year from the naturally occurring radioactivity in the structure’s granite blocks. According to DOE studies, the expected annual radiation dose near Yucca Mountain would be 0.1 millirem, less than 1 percent of the EPA limit. Subsequent to the court decision invalidating the 10,000-year regulatory period, the EPA developed an additional post-10,000-year standard of 350 millirems per year by surveying background radiation in parts of the Rocky Mountain west and Southwest that had similar geography and geology to those of the Yucca Mountain site.

The court decision offered two alternatives for implementing its mandate: The EPA could revise regulations to extend the compliance period (and the NRC would then make its regulatory review consistent), or Congress could enact legislation to define a compliance period. The Court also suggested a third alternative whereby the EPA could reinstate the 10,000-year period by providing a better explanation of the rationale for it.

In August 2005, the EPA proposed a revised radiation standard for Yucca Mountain. This standard holds the annual dose limit at 15 millirems for 10,000 years. The standard also imposes

^a NUREG 1501 indicates a background dose of 300 millirems per year (3.0 millisieverts per year) for the United States in Table 2.9, Sec. 2.4.1, and includes a value of 2.4 for the World mean. Table 2.10 in Sec. 2.4.2 provides a rounded total of 3.6 to 3.7 millisieverts per year (360 to 370 millirems per year) including contributions from other sources such as occupational, and nuclear medical.



a 350-millirem limit for the period between 10,000 and 1 million years into the future.

References

1. “Energy Policy Act of 1992,” Public Law 102-486 (Oct. 24, 1992).
2. “Technical Bases for Yucca Mountain Standards,” National Academy of Sciences (1995).
3. “Public Health and Environmental Radiation Protection Standards for Yucca Mountain, NV; Proposed Rule,” Title 40, Part 197, *Code of Federal Regulations* (Aug. 27, 1999); 64 FR 46991, *Federal Register*.
4. “Public Health and Environmental Radiation Protection Standards for Yucca Mountain, NV; Final Rule,” Title 40, Part 197, *Code of Federal Regulations* (June 13, 2001); FRL-6995-7, pp. 32074–32135, *Federal Register*.
5. “Disposal of High-Level Radioactive Wastes in a Proposed Geologic Repository at Yucca Mountain, NV; Final Rule,” Title 10, Parts 2, 19, 20, 21, etc., *Code of Federal Regulations* (Nov. 2, 2001); Vol 66, No. 213, pp. 55732–55816.
6. Lake H. Barrett, Acting Director, Office of Civilian Radioactive Waste Management, Letter to U.S. Environmental Protection Agency (Nov. 2, 1999).
7. U.S. Court of Appeals for the District of Columbia Circuit, No. 01-1258 (July 9, 2004).
8. “Background as a Residual Radioactivity Criterion for Decommissioning,” NUREG 1501, U.S. Nuclear Regulatory Commission.

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