

## Scientists Recommend “All-Pathways” Radiation Protection Standard For Yucca Mountain Repository

### Key Facts

■ The Department of Energy (DOE) is studying Yucca Mountain; Nevada as a potential site for a disposal facility for used fuel from nuclear power plants. Federal law requires that the Environmental Protection Agency (EPA) establish public radiation protection limits for a used nuclear fuel disposal facility. This standard must protect health and safety of the public living in the vicinity of Yucca Mountain for at least 10,000 years.

■ DOE must obtain an operating license for the Yucca Mountain repository from the Nuclear Regulatory Commission (NRC). One requirement for DOE to obtain the operating license is to prove that the facility will meet the radiation safety protection standard established by the EPA. Federal law requires the NRC to incorporate the EPA’s radiation protection standard into its licensing regulations for Yucca Mountain.

■ The EPA, in the late 1970s, began considering how it should regulate nuclear waste repositories, and the Nuclear Waste Policy Act of 1982 directed the agency to develop standards specifically for a repository. However, EPA has never been able to finalize a radiation protection standard for a repository. In the 1992 Energy Policy Act, Congress required EPA to “prescribe the maximum annual effective dose equivalent to individual members of the public” as “the only such standard applicable to the Yucca Mountain site.” Scientists typically refer to

this method of standard setting as an “all pathways” approach—meaning potential radiation exposure from all sources (air, groundwater, the food chain, etc.) are calculated and added together to determine the total public health and safety risk to those citizens most likely to be affected.

■ A person living about three miles from a repository at Yucca Mountain, would get approximately one additional millirem<sup>1</sup> per year of radiation exposure—a small fraction of the average annual exposure of 360 millirem from naturally occurring sources, according to DOE.

■ Establishing a radiation protection standard is an essential part of a plan to safely and responsibly manage used nuclear fuel. EPA must adhere both to recommendations from credible scientific bodies and specific instructions from Congress, in establishing a radiation limit that protects public health and safety.

■ There is widespread disagreement between EPA and other federal agencies and between EPA and the scientific community, including the National Academy of Sciences (NAS), about how to establish an appropriate level for a Yucca Mountain radiation standard. Congress must provide guidance that requires appropriate standards that

<sup>1</sup> A millirem is dose-based measurement of the effects of radiation on the human body. For example, a chest x-ray measures about 20 millirem.



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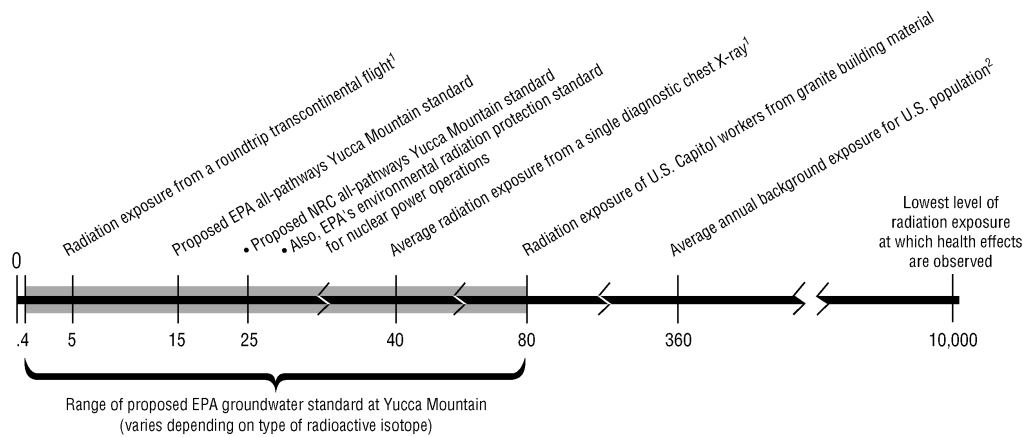
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## Proposed NRC & EPA Yucca Mountain Radiation Protection Standards in Context

(Measured in Millirems\*)



\* A unit of measurement of radiation or the biological effect of radiation

<sup>1</sup> United States Environmental Protection Agency (EPA) web site <<http://www.epa.gov/radiation/students/calculate.html>>

<sup>2</sup> U.S. General Accounting Office (GAO), radiation standards, scientific basis inconclusive, and EPA and NRC disagreement continues (GAO/RCED 00-152, June 2000)

protect public health and safety based on the most current scientific methods. This disagreement centers on whether an all pathways radiation protection standard, as recommended by the NAS, and supported by the NRC, will be sufficient to protect public health and safety or whether an additional groundwater radiation limit should also be applied. would provide significant additional protection to the public. EPA believes the additional groundwater limit is necessary; while the NRC, NAS, Congress and the scientific community at large say it is not necessary because it would not provide significant additional protection to the public.

### EPA Instructed To Set Standard Based on NAS Recommendations

The 1982 Nuclear Waste Policy Act required EPA to establish environmental protection standards for a repository. The law required that the NRC implement the

standard by incorporating it into licensing requirements for a repository.

In 1985, EPA established generic radiation protection standards for disposal of used nuclear fuel and high-level radioactive waste. They were designed to apply to any repository site because investigations by the Energy Department of potential repository sites had not yet identified a single location to study. That same year, a number of states and environmental groups filed suit to overturn the regulation. The U.S. Court of Appeals for the First Circuit in 1987 invalidated the individual and groundwater protection standards of the EPA standard and remanded the standard to the EPA.

The 1987 amendments to the Nuclear Waste Policy Act required DOE to study only Yucca Mountain as a proposed repository site. The mandate for EPA to establish

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broad criteria for a radiation protection standard remained in effect and unfulfilled.

In 1992, President George Bush signed into law the Waste Isolation Pilot Plant Land Withdrawal Act, which set aside underground salt formations near Carlsbad, N.M., as a site to dispose of transuranic radioactive waste. This material is composed of the same long-lived radioactive elements as what will be disposed at Yucca Mountain, but in smaller quantities. The law also reinstated provisions of the 1985 EPA standard, except for those invalidated by the U.S. Court of Appeals decision. It also required EPA to issue standards to reestablish the individual and groundwater protection standards that the court remanded, but exempted Yucca Mountain from EPA disposal standards that existed at the time.

Also in late 1992, Congress enacted the Energy Policy Act requiring EPA to establish a specific Yucca Mountain standard within one year of receiving recommendations from the National Academy of Sciences. The law requires EPA to set an all-pathways radiation protection standard "based upon and consistent with the findings and recommendations of the National Academy of Sciences."

The NAS published its recommendations—"Technical Bases for Yucca Mountain Standards"—in 1995. NAS called for a health-based individual protection standard without separate groundwater limits. Placing constraints on a single component—such as groundwater—detracts from an all-pathways approach, which the NAS recommends to best protect public health and safety.

Congress clearly stipulated an all-pathways approach and the NAS clearly recommended against adding a separate groundwater standard. Therefore, if EPA were to establish a separate groundwater standard for Yucca

Mountain, it would violate the Energy Policy Act.

Throughout the 1990s, EPA issued draft standards for Yucca Mountain, but was never able to finalize the standard. Finally, in August 1999, EPA released its proposed standards for protecting public health and safety at Yucca Mountain for public comment. The agency proposed a 15-millirem all-pathways standard and additional limits on various contaminants in groundwater. The agency since has received numerous comments from federal agencies, industry and scientific organizations, such as the NAS, strongly opposing its proposed groundwater standard.

## EPA's Proposed Standard Rejected by Scientists, Other Federal Agencies

EPA recommends a 15-millirem all-pathways standard, and additional limits on groundwater, which is located 800 feet below the proposed repository. The agency claims the inclusion of a separate groundwater standard is consistent with the Safe Drinking Water Act and the precedent established at New Mexico's WIPP facility. However, it was the intention of Congress that the Safe Drinking Water Act be applied to current supplies of drinking water at the consumer's tap. This law was not designed to apply to groundwater deep below the Earth's surface. Nor was it designed to apply to potential uses far in the future. Also, the precedent of protecting groundwater at the WIPP facility is not relevant because that repository was built in a salt deposit and has no potable groundwater associated with it.

The major issue regarding the EPA rule-making is whether the agency is bound to comply with the 1992 Energy Policy Act and implement NAS's recommendations, or whether the agency has discretion in establishing a standard.

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Based on two decades of scientific research, Congress specifically instructed EPA to "promulgate by rule, public health and safety standards for protection of the public from releases from radioactive materials stored or disposed of in the repository at Yucca Mountain site. Such standards shall prescribe the maximum annual effective dose equivalent to individual members of the public from releases to the accessible environment." Congress further stated that EPA's individual dose limits "shall be the only such standard applicable to the Yucca Mountain site," thereby excluding from consideration a separate groundwater limit. Protection of groundwater is included in the all-pathways standard.

EPA believes that it is not required to follow the direction of Congress or the NAS recommendations made in accord with Congress' instructions. EPA acknowledges that NAS "has a special role" to play in the process of setting a standard to protect public health and the environment.

There is broad concern by the scientific community that a separate groundwater limit makes the EPA standard unworkable. Evidence, most recently in the Department of Energy's draft environmental impact statement on Yucca Mountain, indicates that a separate groundwater standard will lead to less protection of public health and safety while adding unnecessarily high costs for the Yucca Mountain Project. At worst, the EPA standard could needlessly disqualify Yucca Mountain as a potential repository site. Ironically, EPA's proposed standard could significantly hamper America's ability to meet Clean Air Act standards by jeopardizing the future of the nation's only large-scale source of emission-free electricity—nuclear energy.

In formal comments to the EPA, and in testimony before the House Commerce

Committee's Subcommittee on Energy and Power, National Academy of Sciences' scientists have said the agency's recommendation to establish a groundwater standard for Yucca Mountain is not based on sound science. NAS said the agency strayed considerably from its 1995 recommendations, and that a groundwater standard would be redundant given protection provided by the all-pathways limit of 15-millirem. EPA's groundwater proposal "will add little, if any, additional protection to individuals or the general public from radiation releases from the repository," the NAS scientists said.

The Nuclear Regulatory Commission recommends an all-pathways standard of 25 millirem, and also criticized the EPA's use of a groundwater limit. The NRC said the groundwater criteria "would become the de facto standard instead of the individual protection limited called for by the Energy Policy Act." The NRC protested that EPA would have the commission require that groundwater in the vicinity of Yucca Mountain meet EPA's maximum contaminant levels (MCL) originally established to implement the Safe Drinking Water Act. "The maximum contaminant levels were based on an analysis of treating contaminated water in public drinking water systems subject to the Safe Drinking Water Act and not on an analysis of technology and costs to remediate groundwater at actual sites," William Travers, NRC executive director for operations, wrote in a Nov. 2, 1999 letter to EPA. "EPA proposed to apply the same maximum contaminant levels to groundwater supplies before treatment rather than 'at the tap' after treatment." The NRC says a 25-millirem standard ensures public health and safety from all possible sources of radiation.

The Health Physics Society, representing 6,000 scientists, engineers, educators and health physicists, also advocates a 25-

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millirem all-pathways standard, with no separate limit for groundwater. "Including a separate groundwater provision will detract from the rule's primary purpose and focus on public health and safety. A limit on dose received by an individual from all exposure pathways...is fully protective of public health and safety," HPS said in comments to EPA.

The Department of Energy said EPA's groundwater standard does not appropriately apply maximum containment levels for radionuclides, which were included in the Safe Drinking Water Act "for a different purpose." Under these circumstances, where EPA's standards are applied to groundwater rather than water after it has been treated, "the (EPA) proposal does not appear to articulate a rational basis for the proposed groundwater protection standard," DOE said.

The nuclear industry supports the use of an all-pathways radiation dose standard and recommends the level be set at 25 millirem. The 25-millirem standard proposed by health and science professionals, other federal agencies and the industry is four times more protective than the state of Nevada's 100 millirem safety standard for industrial, research and medical users of nuclear materials in the state. A 25-millirem standard would be consistent with other disposal facilities, including transuranic radioactive waste disposal facilities at the Nevada Test Site, located adjacent to Yucca Mountain. Both the 25-millirem and 15-millirem levels would fully ensure public health and safety, EPA's proposal for a separate groundwater standard could result in less, not better overall protection of public health and safety. The EPA standard forces the focus on a single factor—groundwater—leading to a less protective repository design that could release more radioactivity into the air.

### 25-Millirem Standard Fully Protects Public Health & Safety

A 25-millirem radiation limit fully protects public health and safety for those residents near Yucca Mountain if a repository is built at the site. This level is consistent with existing regulations for storage of used nuclear fuel at nuclear power plants.

Congress, in the Energy Policy Act of 1992, said EPA's individual dose limits "shall be the only standards applicable to the Yucca Mountain site," thereby excluding from consideration groundwater contamination limits or any standard other than a dose standard. The inclusion of a separate groundwater standard for Yucca Mountain is unnecessary to protect public health and safety.

In 1995, Larry Weinstock, EPA's director of radiation protection, told the Nuclear Waste Technical Review Board: "Our goal is not only to set a standard that is protective of public health and the environment for the long term, but also to set a standard that can be implemented by the Nuclear Regulatory Commission. We believe that only a standard that meets both of these tests will be acceptable to the public. No matter how good our standards are, if they cannot be implemented, we will have failed."

Establishing a safe radiation protection standard is vital for the nation to safely and responsibly manage used nuclear fuel at a federal underground repository. EPA must adhere both to specific instruction from Congress and recommendations from credible scientific bodies in establishing a radiation limit that protects public health and safety for the next 10,000 years.

*This policy brief is also available on NEI's site on the World Wide Web—<http://www.nei.org>—where it is updated periodically.*