

Frequently Asked Questions: Yucca Mountain and Used Nuclear Fuel Management

August 2006

Q : Why is it necessary to create a deep geologic repository for used nuclear fuel?



A : Scientific consensus has long affirmed that the safest method for managing used nuclear fuel is in an engineered repository deep underground. Congress considered this in enacting the Nuclear Waste Policy Act of 1982, mandating the federal government to begin collecting and disposing of used nuclear fuel from U.S. nuclear power plants in 1998.

The consensus supporting deep geologic disposal has strengthened since then. In 2001, the National Academy of Sciences concluded, "Geologic disposal remains the only scientifically and technically credible long-term solution available.

Q : Why is Yucca Mountain, Nev., the federal government's location for a deep geologic repository for the safe storage of used nuclear fuel?

A : The Nuclear Waste Policy Act required an examination of nine sites in six states. Several government agencies and scientific organizations participated in environmental studies and scientific evaluations of these sites. After a 1986 Department of Energy study ranking Yucca Mountain first among these sites, Congress amended the law in 1987 and directed DOE to focus its scientific and environmental investigation entirely on Yucca Mountain.

All aspects of the geological, hydrological and geochemical environment have been studied, along with a detailed evaluation of how conditions might evolve over thousands of years at Yucca Mountain. These studies support Yucca Mountain's designation as the site for a repository.

In 2002, based on these studies, Congress and the president approved the Yucca Mountain site. In 2004, the U.S. Court of Appeals ruled on several challenges to this approval by repository opponents and fully affirmed the site decision.

Q : How have the scientific studies supported Yucca Mountain as the used nuclear fuel repository site?

A : The scientific evaluation, encompassing more than 20 years and \$9 billion of scientific, environmental and engineering study, was completed in 2002. DOE summarized this work in several scientific reports, which served as the basis for the 2002 decision to approve Yucca Mountain as the site of the repository. (These reports are available at www.doe.gov.)

These reports also incorporated input from extensive public review and comment on DOE's preliminary findings. The reports state that the repository will perform well within the safety standard for Yucca Mountain set by the Environmental Protection Agency.

The reports show that for 10,000 years the largest expected annual radiation dose near Yucca Mountain would be 0.1 millirem—a small fraction of EPA's annual 15-millirem limit for the facility.¹ Recent studies addressing the

time period beyond 10,000 years also found that doses would be 1 "Dose" refers to the quantity of radiation to which people are exposed. Dose is measured in "rems " or "millirems"—one thousandth of a rem. U.S. residents normally receive about 300 millirems annually from the environment. DOE's final environmental impact statement showed negligible environmental impacts associated with the repository at Yucca Mountain and the transportation of material to the repository.

FAQs: Yucca Mountain and Used Nuclear Fuel Management.

Q : Why does the nuclear energy industry support building and operating the national repository for used nuclear fuel at Yucca Mountain?

A : The nuclear industry bases its support for Yucca Mountain on clear and fundamental principles: the sound scientific conclusion that the proposed repository will protect public health and safety the importance of the project to national energy, environmental and security policies the industry's commitment to safety in managing used nuclear fuel.

Q : Who will pay for the development, licensing and construction of a deep geologic repository?

A : Electricity consumers pay one-tenth of a cent per kilowatt-hour of electricity used from nuclear power plants to the federal Nuclear Waste Fund to finance DOE's repository project. Nearly \$28 billion have been committed to the fund since 1983, which will be used for developing and licensing a repository at Yucca Mountain. So far, about \$9 billion has been spent to study geologic disposal, primarily at the Yucca Mountain site. Efforts are under way in Congress to make the balance of those funds available to complete the repository.

Q : How will the data in D O E 's site selection documents be tested and verified?

A : A three-step Nuclear Regulatory Commission licensing process will test and verify DOE's scientific work in a highly rigorous public process. DOE must apply for NRC approval before building, operating and, ultimately, closing the repository.

As part of the licensing process, the agency requires DOE to demonstrate that it meets both NRC and EPA standards to protect public safety and the environment. This process is expected to begin in June 2008 when DOE submits the license application to the NRC.

Further, an extensive confirmatory scientific research program will be in place during repository development. If DOE's conclusions are found to be incorrect, decisions may be adjusted or reversed at any time.

Q : Since no federal repository exists, where have nuclear power plants been storing used nuclear fuel?

A : Because the federal government defaulted on its legal obligation to begin removing used nuclear fuel from power plants by January 1998, more than 100 U.S. nuclear power reactors are safely storing fuel on site. Although the available space and new technologies at reactor sites safeguard used fuel, storage at reactor sites is not a substitute for permanent disposal at a federal repository. These on-site facilities were not designed to function for the thousands of years during which a deep geologic repository would safely contain the used fuel.

This temporary storage solution is costly to electricity consumers, who must pay for both storage and disposal. Each year of delay in the Yucca Mountain project will add an estimated \$1 billion in temporary storage costs.

Additionally, scientists, the industry and the federal government have supported the disposal of used nuclear fuel at one, centralized underground location, instead of multiple locations across the country. This will allow even more efficient and safe management and effective security of the used fuel and defense radioactive waste.

Q : Who is responsible for transporting used nuclear fuel? What methods of transportation will be used to deliver it to the repository?

A : The federal government is responsible for transporting high-level nuclear waste DOE issued a strategic transportation plan in 2003 for moving used fuel to Yucca Mountain. DOE also is preparing to construct a 300-mile railroad spur to connect Yucca Mountain to the nation's existing rail system.

Q : How much radioactive waste will be stored at Yucca Mountain?

A : Congress has authorized the storage of up to 70,000 metric tons of used nuclear fuel and high-level radioactive defense waste at the repository. The environmental impact statement on the site demonstrated that 120,000 metric tons could be stored safely at Yucca Mountain. Independent scientific studies concluded that the

repository could be expanded to contain an even greater volume

Approximately 50,000 metric tons of used nuclear fuel are stored at nuclear power plants. If these fuel rods were stacked on top of each other, the stack would be only the length and width of a football field and less than 10 yards high.

Q : The president and Congress have approved Yucca Mountain, Nev., as the site of a used nuclear fuel repository. What are the next steps?

A : The Energy Department must submit a license application to the NRC. This application initiates a three-phase licensing process wherein DOE seeks separate approvals to construct, operate and finally close the repository at Yucca Mountain. DOE plans to submit the application to the NRC by June 2008, an important milestone toward building the repository. If the NRC approves the application, DOE anticipates opening the repository at Yucca Mountain as early as 2017.

This licensing process will ensure that the best available science always is applied to the long-term protection of public safety.

Progress on the license application has continued despite a 2004 federal appeals court decision that called into question the 10,000-year radiation protection standard for Yucca Mountain. The decision allows two alternatives for resolving the standard: EPA and the NRC could alter the standard or Congress will address the standard through legislation.

In August 2005, EPA proposed a revised standard and is expected to finalize the standard by the end of 2006. Work on the Yucca Mountain project now includes additional studies to address evaluation of time frames up to 1 million years as called for in the proposed EPA standard.

NRC licensing rules require long-term monitoring of repository performance so that

future scientific advances can be applied to the protection of public health and safety. These rules also require that DOE maintain the capability to retrieve material from the repository, if found necessary in the course of this long-term monitoring program.

The ability to retrieve the waste would allow DOE to employ advanced recycling technologies, such as those envisioned in the Global Nuclear Energy Partnership, to derive additional energy from the material. Recycling the material using the advanced technologies could significantly reduce the volume of remaining byproducts that DOE must deposit in the repository.