Disclaimer
What follows is an excerpted, condensed rendition of the 2002 U.S. Department of Energy's "Final Environmental Impact Statement For a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada." The purpose of this document is to retain the structure and language of the original but in an abbreviated form to achieve greater accessibility for a wider audience. Whilst minor edits have been made in the interest of clarity, this should be considered an abridged reproduction of the original.

Final Environmental Impact Statement
For a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada

Volume I Chapter 1 (abridged)
Purpose and Need for Agency Action
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1.1 POTENTIAL ACTIONS AND DECISIONS REGARDING THE PROPOSED REPOSITORY

The Environmental Impact State (EIS) analyzes a *Proposed Action* and a *No-Action Alternative*. The Proposed Action is to construct, operate, monitor, and eventually close a geologic repository for the disposal of spent nuclear fuel (SNF) and high-level radioactive waste (HLRW) at Yucca Mountain. The No-Action Alternative is to leave SNF and HLRW at the 72 commercial and 5 DOE sites at which it currently resides in the United States.[1] The EIS analyzes the potential impacts of transporting SNF and HLRW to Yucca Mountain from these 77 sites across the United States.

1.2 RADIOACTIVE MATERIALS CONSIDERED FOR DISPOSAL IN A MONITORED GEOLOGIC REPOSITORY

The EIS describes SNF and HLRW, and includes mixed-oxide fuel, which is defined as a mixture of uranium oxide and plutonium oxides. Also included is immobilized plutonium forms, Greater Than Class C wastes, and Special Performance Assessments, the latter two of which are currently classified as low-level radioactive wastes (LLRW) but could require disposal in a geologic repository.

In a commercial power reactor, neutrons from cylindrical fuel pellets made of uranium oxide strike other uranium atoms and cause them to split. This activity produces heat, fission products, and more free neutrons. After a period in operation, enough fissile uranium atoms have undergone this process and is said to be "spent." The spent nuclear fuel must be replaced with fresh fuel. In commercial reactors, a fuel cycle will run from 18 to 24 months, at which time 25% - 50% of the fuel is replaced. The spent fuel is stored onsite. SNF comes from these reactors and is the byproduct of reactors operated to produce electric power for domestic use. SNF is intensely radioactive and would be the primary source of radioactive hazard and heat production in a repository.

SNF collectively includes the "spent" uranium oxide fuel, the cladding that contains the fuel, and the assembly hardware, which is normally made of zirconium alloy. There are limited quantities of SNF clad in stainless steel.

Beginning in 1944, the US operated reactors to produce material for nuclear weapons. The byproduct of this activity is HLRW. The reprocessing of some naval reactor fuels and some commercial reactor fuels, DOE test reactor fuels, and university research reactor fuels has also produced HLRW. Safety concerns and environmental hazards contributed to the decision to shut down the nuclear weapons complex in the 1980s, the result of which is that not all DOE SNF was reprocessed.

DOE stores its SNF and HLRW at three locations: the Hanford Site in Washington State, the Idaho National Engineering and Environment Laboratory in Idaho, and the Savannah River Site in South Carolina. Additionally, quantities of DOE HLRW are stored at the West Valley Demonstration Authority

[1] Current values as of February 2002

in New York. HLRW can be in a liquid, sludge, or saltcake form, and a solid immobilized glass form called “vitrified waste.” Vitrified waste was developed to keep the waste stable, confined, and isolated from the environment.

DOE could emplace weapons-usable plutonium in the repository in two forms: 1. Immobilised plutonium ceramic, which is a form of HLRW; 2. Mixed uranium and plutonium oxide fuel called “mixed-oxide fuel” assemblies.

1.3 NATIONAL EFFORT TO MANAGE SPENT NUCLEAR FUEL AND HIGH-LEVEL RADIOATIVE WASTE

Reprocessing of domestic SNF was cancelled by President Carter in the late 1970s, leaving disposal as the primary option of the nation’s SNF. In 1980, President Carter declared safe disposal of radioactive materials resulting from defense-related and civilian power-related activities is a national responsibility. Internationally, geologic disposal is the consensus choice of technology for the long-term sequestration and management of SNF.

In 1983, Congress enacted the Nuclear Waste Policy Act (NWPA), which acknowledged the Federal Government’s responsibility to provide permanent disposal of the nation’s SNF and HLRW, and established the Office of Civilian Radioactive Waste Management, which was the entity responsible for carrying out the evaluative, regulatory, developmental, and operational activities of the NWPA that are assigned to the Secretary of Energy. In 1987, Congress amended the NWPA and identified Yucca Mountain as the only site to be studied as a potential location for a geologic repository. Congress required a Final EIS to accompany any Secretarial recommendation to approve Yucca Mountain. This EIS is the fulfilment of that requirement. Additionally, Congress created the Nuclear Waste Technical Review Board (NWTRB) as an independent organization charged with evaluating the technical and scientific validity of site characterization activities for the proposed repository as well as activities related to the packaging and transportation of SNF and HLRW.

The EIS evaluates a possible scenario: a repository is constructed at Yucca Mountain with an inventory of 70,000 metric tons of heavy metal (MTHM). This inventory includes surplus weapons-usable plutonium, commercial and DOE SNF, and HLRW. It is possible that nuclear power plants will produce up to 105,000 MTHM of SNF through 2046, while the total projected DOE inventory of materials include 2,500 MTHM of SNF and 22,280 canisters of HLRW. The EIS considers disposal of this full inventory in later sections.

Section 801(a) of the Energy Policy Act of 1992 directed the Environmental Protection Agency (EPA) to retain the National Academy of Sciences (NAS) to conduct a study and issue findings and recommendations on setting reasonable standards for protecting public health and safety in relation to a repository at Yucca Mountain. The NAS issued its findings and recommendations in a 1995 report, and the EPA issued standards for storage and disposal.

Section 801(b) of that same act directs the Nuclear Regulatory Commission (NRC) to revise its general technical requirements and criteria for geological repositories to be consistent with the EPA site-specific Yucca Mountain standards. The NRC complied.

1.4 YUCCA MOUNTAIN SITE AND PROPOSED REPOSITORY

The proposed repository is on lands administered by the Federal Government in the Mojave Desert in Nye County in Southern Nevada approximately 100 miles northwest of Las Vegas, NV. It is isolated from concentrations of human population and activity. The arid climate results in a small volume of water that can move as groundwater in the mountain’s unsaturated zone, and the groundwater table sits below the level at which waste would be emplaced.

Groundwater from Yucca Mountain flows into a closed hydrogeologic basin, which is defined as a basin into which water is introduced by rain and which lacks egress or outflow into any river or ocean. The closed basin thus provides a natural barrier to the spread of radionuclides in the event of contamination.

If Yucca Mountain is approved for a repository, all or a portion of the land area would have to be withdrawn permanently from public access to satisfy NRC licensing requirements.

The proposed repository would be a large subterranean excavation with networks of tunnels (called "drifts") serving the emplacement area. Rail, legal-weight trucks, or heavy-haul trucks would provide most of the transportation of SNF and HLRW from the present storage sites to the repository. At the repository, the material would be loaded in disposal containers and would be moved underground by rail. Remote-controlled handling vehicles would place the waste packages in emplacement drifts. The combination of engineered and natural barriers would contain and isolate the waste for 10,000 years or more per NRC requirements. The Proposed Action evaluated by this EIS includes transportation of SNF and HLRW from present storage sites to Yucca Mountain and then emplacement.

In 1998, DOE produced a *Viability Assessment of a Repository at Yucca Moun*tain that evaluated a preliminary design. DOE documented subsequent design evolution in the *Yucca Mountain Science and Engineering Report*.

Under the No Action Alternative, DOE would end site characterisation activities at Yucca Mountain, and commercial utilities and DOE would continue to store SNF and HLRW.

1.5 ENVIRONMENTAL IMPACT ANALYSIS PROCESS

A major emphasis of the EIS process is the promotion of public awareness of the proposed actions and opportunities for public involvement. DOE has focused the EIS analysis on two alternatives: 1. The Proposed Action of constructing, operating, monitoring, and eventually closing a repository at Yucca Mountain; and 2. The No-Action Alternative.

On August 7, 1995, DOE published a Notice of Intent announcing that it would prepare an EIS for a proposed repository at Yucca Mountain. To reach minority and low-income communities, DOE contacted news publications and radio stations that serve those communities. Additionally, DOE met with 13 Native American Tribes, invited public interest groups, transportation interests, industry and utility organizations, regulators, and member of the general public to participate in the process. Throughout 1995, DOE held 15 public scoping meetings across the country. More than 500 people submitted more than 1,000 comment documents during the 120-day public scoping period. Several of these comments led to modifications in the scope of the EIS, notably 1. The inclusion of consideration of additional inventories such as the total projected inventory of SNF and HLRW and other wastes that might require permanent isolation; and 2. The addition of new Nevada transportation route alternatives.

Other concerns raised by the public during scoping emphasised that DOE needed to ensure the EIS thoroughly addresses the impacts of constructing and operating a geologic repository and related facilities including the use of a rail line, heavy-haul truck routes, and intermodal transfer stations on: land, air quality, geology, regional hydrology, biological resources, health and safety, long-term performance assessment for the repository, sabotage and safeguards and security measures during waste transport and disposal, cultural and historic resources, environmental justice, socioeconomics, and mitigation. In response to public comments, DOE decided to analyze a 5^{th} branch rail line and a 5^{th} route for heavy-haul trucks in Nevada.

On August 6, 1999, DOE issued the Draft EIS. DOE accepted all comments on that document including written, oral, and electronic comments through August 31, 2001. More than 700 persons provided formal comments at hearings held in 21 locations across the country. In total, DOE received more than 11,000 comments from more than 2,300 commenters on the Draft EIS.

Design for the proposed repository continued to evolve throughout this process, and the latest design information was presented by the DOE in a Supplement to the Draft EIS on May 11, 2001. The scope of the Supplement was limited to presenting the latest design information and presenting the expected environmental impacts that could result from the evolved design.