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Evaluation of the Potential Economic Impacts of 40 CFR 197: Environmental Radiation Standards for Yucca Mountain, Nevada

United States Environmental Protection Agency

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Air And Radiation (6602J)
EPA 402-R-99-007
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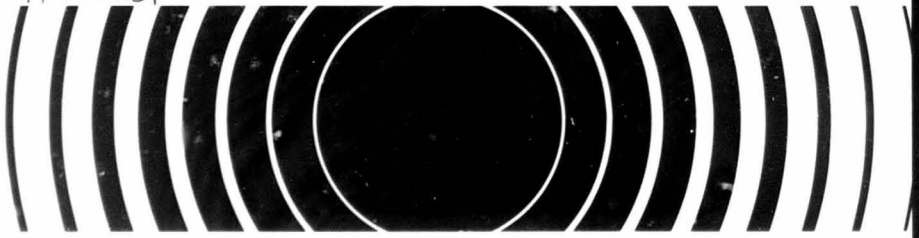

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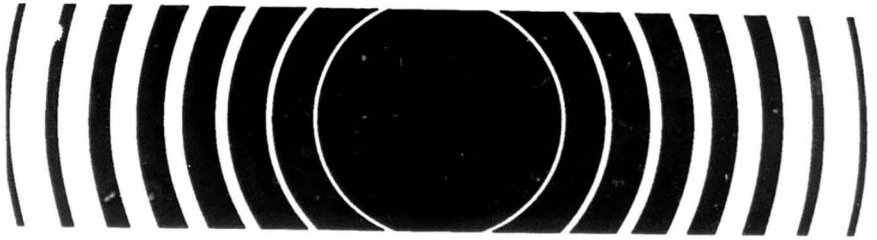

I

40 CFR Part 197

EVALUATION OF THE POTENTIAL ECONOMIC IMPACTS OF 40 CFR 197:

ENVIRONMENTAL RADIATION PROTECTION STANDARDS FOR YUCCA MOUNTAIN, NEVADA

August 1999

U.S. Environmental Protection Agency
Office of Radiation and Indoor Air
Washington, D.C. 20460

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List of Abbreviations and Acronyms

CED	committed effective dose
CFR	Code of Federal Regulations
DOE	U.S. Department of Energy
EnPA	Energy Policy Act of 1992
EPA	U.S. Environmental Protection Agency
HLW	high level waste
NAS	National Academy of Sciences
NRC	U.S. Nuclear Regulatory Commission
NWPAA	The Nuclear Waste Policy Amendments Act of 1987
NWPA	Nuclear Waste Policy Act of 1982
SNF	spent nuclear fuel
μSv	microsievert
USDW	underground source of drinking water
WIPP LWA	Waste Isolation Pilot Plant Land Withdrawal Act of 1992

IV

EXECUTIVE SUMMARY

Pursuant to its statutory mandate under section 801 of the Energy Policy Act of 1992 (EnPA), the U.S. Environmental Protection Agency (EPA) is proposing a rule (40 CFR part 197) that contains standards for the protection of the public health and safety from releases of radioactive materials stored or disposed of at the proposed repository at Yucca Mountain, Nevada. This report, as required by Executive Order 12866, provides an assessment of the economic impacts of the proposed rule.

The proposed rule contains provisions for the storage and disposal of radioactive materials which include spent nuclear fuel and high level waste. Contained in the rule is (1) an environmental standard for storage that limits individual exposure to an annual committed effective dose (CED) of 150 μSv (15 millirem), (2) an environmental standard for disposal that limits individual exposure to an annual CED of 150 μSv, (3) assurance requirements to provide confidence for long-term compliance, (4) a standard that limits individual exposure to an annual CED of 150 μSv resulting from human intrusion, and (5) two options for a ground-water protection standard.

At this time the Agency is unable to provide a rigorous cost-benefit or cost effectiveness assessment of the proposed standards due to the following three reasons. First, the lack of final repository and waste form designs does not allow an evaluation of the potential costs associated with achieving compliance with the proposed standards. Second, site-specific data needed to model the behavior of the repository over the compliance period have not been adequately developed; thus, a detailed evaluation of the costs required to achieve compliance with the proposed standards is untenable. Third, the implementation of the proposed EPA standards is the responsibility of the NRC, and how the NRC implements the standard will also influence cost estimates. Because the NRC's approach to the implementation of these proposed standards has not yet been determined, the estimated costs for compliance cannot be determined rigorously. Therefore, the Agency has conducted this evaluation of the likely economic consequences of the standard using largely qualitative assessments.

The EPA recognizes that in demonstrating compliance with 40 CFR part 197, the DOE will likely incur some costs that are incremental to the current costs estimated for high-level waste (HLW) disposal. These incremental costs are believed to be small, particularly when compared to the overall costs of the development of the repository, and include those that will be incurred in developing the data and models needed to predict the behavior of the repository over the time period covered by the rule. It is likely that these costs will approximate those that would have been incurred to demonstrate compliance with other standards, including the Agency's standards in 40 CFR part 191 or the NRC's standards for Yucca Mountain in 10 CFR part 60.

The EPA also recognizes the possibility of other outcomes given the uncertainties previously mentioned and given the limited information at hand for this analysis. At the extreme is the possibility that 40 CFR part 197 will preclude the siting of the repository at Yucca Mountain. This would imply repeating siting and characterization efforts already undertaken, which to date have totaled about $2 billion. Re-siting the repository is not presumed to be a likely outcome. More likely is the application of additional, but as yet unknown, engineered barriers or design modifications for the repository itself. The costs for these unknown design changes or barrier technologies are also unknown.

1.0 INTRODUCTION AND BACKGROUND ON THE RULE

1.1 Introduction

The Administrator of the U.S. Environmental Protection Agency (EPA), pursuant to section 801 of the Energy Policy Act of 1992 (EnPA), is proposing a rule which contains standards for the protection of the public from releases of radioactive materials stored or disposed of in the repository at the Yucca Mountain site in Nevada. This report, as required by Executive Order 12866, provides an assessment of the economic impacts of the proposed rule. As the Agency is hindered by the unavailability of necessary information to perform a rigorous quantitative economic assessment, this report provides background to the standards being proposed, a summary of the proposed standards, and a largely qualitative evaluation of the anticipated consequences.

1.2 Background - Rulemaking Context

Spent nuclear fuel (SNF) and high-level radioactive waste (HLW) have been produced since the 1940s mainly as a result of commercial power production and defense activities. Since that time, the disposal of these wastes has been the responsibility of the Federal government. The Nuclear Waste Policy Act of 1982 (NWPA) formalized the current national program for the disposal of SNF and HLW. The NWPA: (1) made the DOE responsible for siting, building and operating an underground geologic repository for the disposal of SNF and HLW; (2) directed EPA to set generally applicable environmental radiation protection standards for that program pursuant to its authority under other provisions of law; and (3) required the NRC to license any SNF and HLW repositories based upon EPA's standards by incorporating the standards into its detailed licensing requirements; i.e., the 40 CFR part 197 standards will be implemented by the NRC, not by EPA. These roles are maintained under the EnPA.

In 1985, EPA established generic standards for the management, storage, and disposal of SNF, HLW, and transuranic radioactive waste that were codified in 40 CFR part 191 (50 FR 38066). In 1987, the U.S. Court of Appeals for the First Circuit remanded the disposal standards to the Agency [NRDC v. EPA, 824 F.2d 1258 (1st Cir. 1987)]. The NWPA was amended in 1987 by the Nuclear Waste Policy Amendments Act (NWPAA, Pub. L. 100-

203), which, among other actions, narrowed the characterization of several potential SNF and HLW disposal sites to one, Yucca Mountain, Nevada.

In 1992, the Waste Isolation Pilot Plant Land Withdrawal Act (WIPP LWA, Pub. L. 102-579) and the EnPA were enacted. The WIPP LWA reinstated the 40 CFR part 191 disposal standards except those sections that were the subject of the remand by the First Circuit. The WIPP LWA also required issuance of standards to address those that were the subject of judicial remand and exempted the Yucca Mountain site from the 40 CFR part 191 disposal standards. Final disposal standards in 40 CFR part 191 were issued on December 20, 1993 (58 FR 66398).

The EnPA delegated to EPA the responsibility of setting site-specific, public health and safety, radiation protection standards for Yucca Mountain. Specifically, § 801(a)(1) of the EnPA directed the EPA Administrator to "promulgate, by rule, public health and safety standards for the protection of the public from releases from radioactive materials stored or disposed of in the repository at the Yucca Mountain site." The EnPA also specified that the Agency was to contract with the NAS to provide findings and recommendations on the standards. The standards were then to be based upon and consistent with those findings and recommendations. On August 1, 1995, the NAS released its report entitled Technical Bases for Yucca Mountain Standards (NRC95).

2.0 THE REPOSITORY

The Yucca Mountain site is located in southwestern Nevada approximately 90 miles northwest of Las Vegas. The eastern part of the site is on the Nevada Test Site, the northwest part of the site is on the Nellis Air Force Range, and the southwest part of the site is on Bureau of Land Management land. The area has a desert climate with topography typical of the Basin and Range Province.

The NAS described the potential disposal system as a system of engineered barriers for the disposal of radioactive waste located in the geologic setting of Yucca Mountain. (Note: when the Yucca Mountain repository or disposal system is discussed in this analysis, it is to be understood that no decision has been made regarding the acceptability of the Yucca Mountain repository for storage or disposal. To save space and excessive repetition, the description of the Yucca Mountain repository as "potential" will not be used but is intended.) The repository would be designed to hold the waste in drifts about 300 meters beneath the ground surface in the unsaturated zone. Access to the repository for waste emplacement would be via gradually downward sloping ramps entering the side of Yucca Mountain. The maximum capacity of the repository is now constrained by the NWPAA to 70,000 metric tonnes of SNF or HLW; about 90 percent (by mass) would be commercial SNF and 10 percent defense HLW. Within 100 years after emplacement operations begin, the repository would be sealed by backfilling the drifts, closing the opening to each of the drifts, and sealing the entrance ramps.

The engineered barrier system is expected to consist of at least a resilient waste form (e.g., SNF assemblies or borosilicate glass containing the HLW, internal stabilizers, the canister holding the waste) and backfill in the space between the canister and adjacent host rock. Spent nuclear fuel assemblies are made up of uranium oxide, fission products, fuel cladding, and support hardware, all of which will be radioactive. The resulting waste from the chemical processes associated with the separation of fissionable materials in spent fuel reprocessing is called HLW and contains all of the radioactive elements from the spent fuel except those that have been selectively removed.

The engineered barrier system would be placed beneath Yucca Mountain in the unsaturated zone. Yucca Mountain consists of layered units of welded and non-welded tuff (a type of rock formed from consolidated volcanic ash). The units are highly fractured. The water table is approximately 600 to 800 meters below the ground surface. There are two principal aquifer systems under Yucca Mountain, one in the volcanic tuff and another, at greater depth, in carbonate rock. The aquifers are classified as underground sources of drinking water (USDW) as the DOE is using them to supply drinking water to the Yucca Mountain site. Regional ground-water flow appears to be in a generally southwesterly direction.

3.0 SOURCES OF RADIOACTIVE WASTE

Radioactive wastes are mainly the result of Federal and commercial uses of nuclear fuel and other radioactive material. Today's action proposes standards which pertain to SNF, HLW, and other radioactive materials (these are sometimes referred to hereinafter as simply "waste") which may be stored or disposed of in the Yucca Mountain repository. Exhibit 1 shows the location of the generators that will be shipping SNF or HLW to the proposed Yucca Mountain repository.

Fissioning of nuclear fuel in nuclear reactors creates what is known as "spent" nuclear fuel (SNF). Sources of SNF include: 1) commercial nuclear power plants; 2) government-sponsored research and development programs in universities and industry; 3) experimental reactors, e.g., liquid-metal fast breeder reactors and high-temperature gas-cooled reactors; 4) U.S. Government-controlled nuclear weapons production reactors; 5) naval reactors and other U.S. Department of Defense reactors; and (6) U.S.-owned, foreign SNF.

Only SNF from defense reactors is being reprocessed, i.e., chemically treated to make possible the separation of the constituent radionuclides, in the United States at this time. The main purpose of the reprocessing is the recovery of nuclear materials needed for the nuclear weapons and naval nuclear propulsion programs.

Radionuclides that are not recovered become part of the acidic liquid wastes that are planned to be converted into various types of solid materials. [Every element is made up of two or more isotopes. Isotopes of an element differ in mass but maintain the chemical properties of the element. In atomic terms, all isotopes of the same element have the same number of protons but each has a unique number of neutrons. For example, the element uranium includes the isotopes uranium-234 (^{234}U), ^{235}U, and ^{238}U; the difference is only in the number of neutrons in their nuclei. When reference is made to isotopes of more than one element, the term for the atoms is "nuclides." Some nuclides are unstable and are subject to radioactive decay. These are called radionuclides. Some radionuclides are short-lived; e.g., xenon-133 and cerium-144 have 5.3-day and a 32.5-day half-lifes, respectively. (A half-life is the time it takes for one-half of the atoms of a specific radionuclide to decay.) Other

High Level Waste Generators for the Yucca Mountain Repository

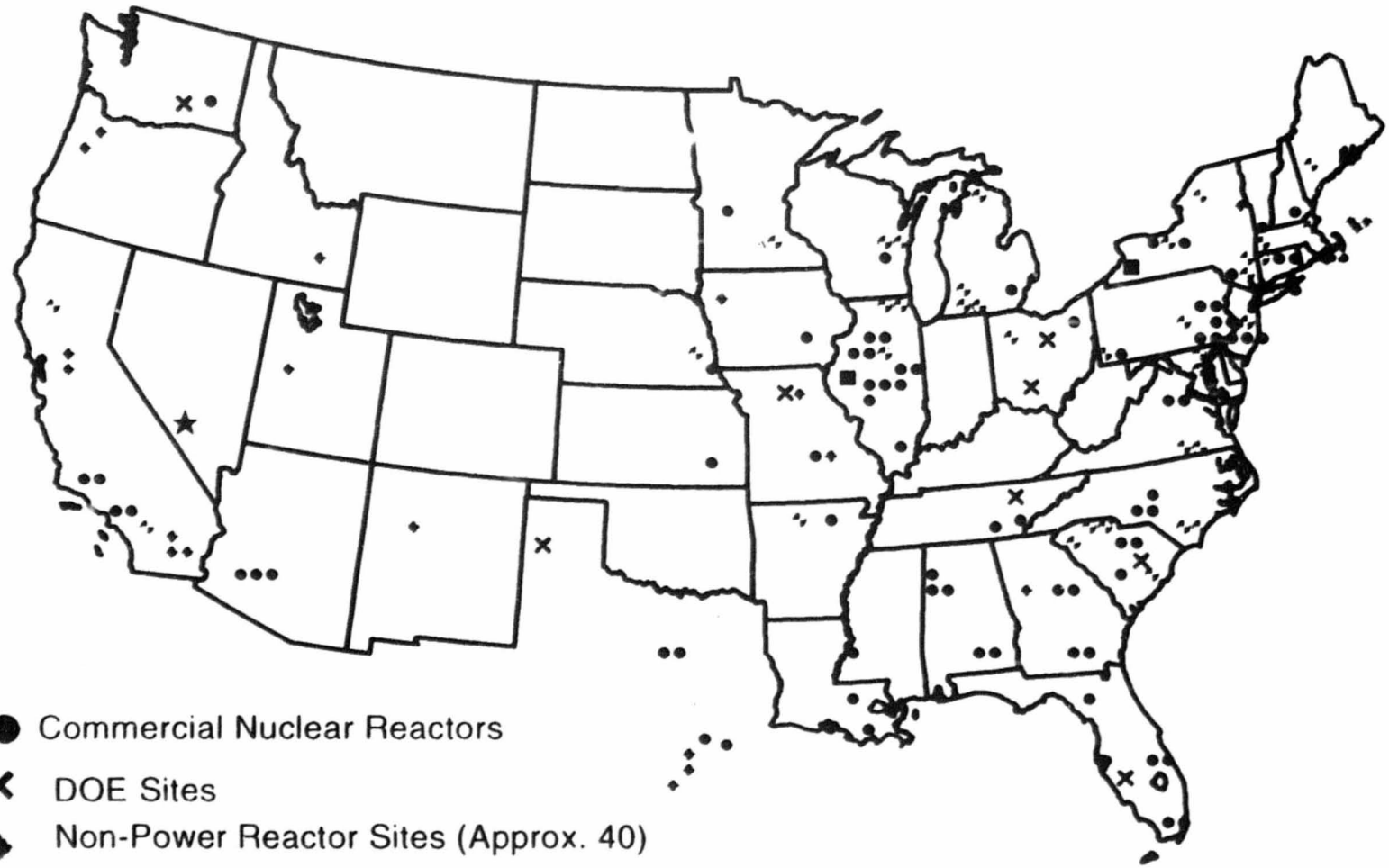

Exhibit 1. High Level Waste Generators for the Yucca Mountain Repository

radionuclides are long-lived; e.g., ^{234}U has a half-life of 246,000 years and neptunium-237 has a half-life of 2,140,000 years. In addition, many radionuclides decay and become new radionuclides: these are termed "parent" and "progeny" nuclides, respectively. That is, the parent nuclide decays and gives rise to the progeny nuclide.]

The highly radioactive liquid or solid wastes from reprocessing SNF are called HLW. If SNF is not reprocessed prior to disposal, it becomes the waste form without further modification. Only one facility for reprocessing commercial SNF, the Nuclear Fuel Services Plant in West Valley, New York, has operated in the United States; it was closed in 1972. Since that time, no commercial SNF has been reprocessed in the United States.

Today, most SNF is stored in water pools or above ground in dry concrete or steel canisters at more than 70 commercial, nuclear power reactor sites across the Nation. High-level waste is stored underground in steel tanks at three Federal facilities in Idaho, Washington, and South Carolina. Prior to storage or disposal in Yucca Mountain, the liquid HLW will have to be converted into a solid form, e.g., glass, since non-solid waste forms will not be permitted. By the year 2000, DOE estimates that more than 40,000 metric tons of SNF and about 340,000 cubic meters of HLW will be in storage (DOE94).

The Agency anticipates that the SNF and solidified HLW (hereinafter, HLW will refer to solidified HLW unless otherwise noted) will constitute the large majority of waste to be emplaced in Yucca Mountain. However, the Agency is aware of various other radioactive materials which might be stored or disposed of in the Yucca Mountain repository. These materials might include highly radioactive low-level waste (LLW), known as greater-than-Class-C waste, and excess plutonium or other fissile materials resulting from the dismantlement of nuclear weapons. Also, in the future, other types of radioactive materials may be identified for storage or disposal. Since the plans for these materials have not been finalized and their impact upon the performance of the disposal system has not been analyzed by the NRC or the DOE, it is not possible for the EPA to know the impact of these materials on the design of the disposal system. However, no matter what waste is placed into the Yucca Mountain repository, the performance must comply with the 40 CFR part 197 standards.

4.0 THE PROPOSED STANDARDS FOR YUCCA MOUNTAIN

The EPA, pursuant to its authority and responsibilities set forth in section 801 of the EnPA, is proposing standards for the protection of the public from releases of radioactive materials stored or disposed of in a disposal system in Yucca Mountain, Nevada. As required by the EnPA, the proposed standards are based upon and consistent with the findings and recommendations of the National Academy of Sciences. The standards appear in Subparts A and B of the proposed rulemaking.

4.1 Subpart A - Environmental Standards for Storage

This Subpart applies to radiation doses received by members of the public as a result of the storage of radioactive material in the Yucca Mountain repository. Storage of radioactive material in the Yucca Mountain repository shall be done in such a manner that the combined committed effective dose (CED) from storage of radioactive materials subject to 40 CFR part 191.03 (that is outside of the repository but inside the Yucca Mountain site) and storage of these wastes inside the repository shall not exceed 150 μSv (15 millirem) per year.

4.2 Subpart B - Environmental Standards for Disposal

This Subpart proposes a public health standard for the disposal of radioactive material in the Yucca Mountain repository. The standard requires that the Yucca Mountain disposal system be designed to provide a reasonable expectation, based upon performance assessments, that the peak dose incurred by the reasonably maximally exposed individual resulting from releases of radionuclides into the accessible environment, within 10,000 years, shall not exceed 150 μSv (15 millirem) CED per year.

Section 197.14 of this Subpart contains proposed assurance requirements to provide confidence that the compliance with the individual dose limits will be achieved over the long-term.

Section 197.15 of this Subpart proposes a test of resilience of the disposal system based upon the consequences resulting from unintentional human intrusion. The standard requires the disposal system to be designed to provide a reasonable expectation based on

human intrusion analysis that the peak dose to the reasonably maximally exposed individual resulting from release of radionuclides into the accessible environment for 10,000 years not exceed 150 μSv (15 millirem) CED per year.

Section 197.16 of this Subpart proposes two options for a standard for protection of groundwater. Option (1) requires that the Yucca Mountain disposal system shall be designed to provide a reasonable expectation that, for 10,000 years of undisturbed performance after disposal, it will not cause the average level of radioactivity in the plume of contamination in any underground source of drinking water, in the accessible environment, to exceed the limits specified in 40 CFR part 141 as they exist on the date of promulgation of this Subpart. Option (2) requires that the Yucca Mountain disposal system shall be designed to provide a reasonable expectation that, for 10,000 years of undisturbed performance after disposal, it will not cause the average level of radioactivity in the plume of contamination in any aquifer containing less than 10,000 milligrams per liter of total dissolved solids at the point of withdrawal in the accessible environment and serving as the sole source of drinking water for the reasonably maximally exposed individual designated under § 197.13, to exceed the limits specified in 40 CFR part 141 as they exist on the date of promulgation of this Subpart.

5.0 EVALUATION OF CONSEQUENCES

5.1 Measuring the Impact of the Standard

Executive Order 12866 requires an assessment of the economic impacts of a proposed rule. In performing an economic impact assessment, the impacts of EPA's actions are typically measured in quantitative terms as changes from existing practices or what would have likely occurred in the absence of Agency action. Because of the lack of final repository and waste-form designs, and the fact that the site-specific data needed to model the behavior of the repository over such time periods have not yet been developed, the Agency is unable to provide a rigorous, quantitative cost-benefit or cost-effectiveness assessment of the proposed standards. Therefore, the Agency has conducted its evaluation of the likely economic consequences of the standard using largely qualitative assessments of best and worst case impacts.

In order to have a better understanding of the impacts imposed by 40 CFR part 197 and to quantitatively estimate what the costs associated with the impacts might be, EPA is soliciting comments from all affected parties during the comment period for this rulemaking. Information from the comment period will be used to more precisely estimate the economic impacts of this action that will be included in the next iteration of this report.

5.2 Likely Impacts of the Standard

One perspective on assessing the impacts of EPA's proposed rule is to consider the standards being proposed within the context of the long-standing Federal effort to provide for the long-term geologic isolation of these wastes. From this perspective, EPA's proposed standards for Yucca Mountain can be compared to the generally applicable environmental standards that the EPA has promulgated in 40 CFR part 191 for geologic repositories and the standards the NRC has promulgated in 10 CFR part 60. Since the proposed numerical standards are generally consistent with the limits previously established at 40 CFR part 191, the overall impacts of 10 CFR part 197 on DOE's efforts to site and license a repository at Yucca Mountain would be judged to be minimal; DOE could have already factored the limits into the repository design process and accounted for them in its estimates of the total costs of the disposal program.

From this best case perspective, the EPA believes that the costs that the DOE will incur will be for the additional efforts in developing the data and models needed to predict the behavior of the repository for the time periods covered by the rule in order to demonstrate compliance with the limits. These costs, which would be incremental to both current site characterization efforts and licensing activities required by 10 CFR part 60, are believed to be small compared to the overall costs for the development and licensing of the facility. Further, while these incremental costs have not been quantified, they are considered to be minor within the context of the overall costs of approximately 40 billion dollars currently estimated to safely provide for long-term isolation of these wastes (PCL95).

In identifying the impact of the proposed standard it should be noted that it does not contain the cumulative release limits specified in 40 CFR part 191, and Appendix B provides considerable guidance on scenario and exposure assumptions to be used in performance assessment. Thus, determination of the acceptability and/or licensing of the Yucca Mountain site could be simplified. No quantitative estimate of the potential savings are possible as the NRC bears the responsibility of implementing the EPA standard, and the specifics of how the NRC intends to implement it will not be known until that Agency conforms its regulations to the final standards.

One final benefit of the proposed standard arises from the elimination of regulatory uncertainty. With final EPA radiation protection standards for Yucca Mountain, the DOE can complete its efforts to define the additional site data to be obtained, define and begin developing any additional models that may be needed to assess performance, and complete its designs for both the repository and the waste forms. Completion of these efforts by the DOE will allow for an earlier determination of the viability of the Yucca Mountain site, a critical factor in the overall program of the Federal government to provide for the long-term management of these wastes. As the costs of maintaining the wastes to be disposed of at Yucca Mountain at the interim sites where they are generated will continue until a repository is built, the cost savings associated with the elimination of delays due to regulatory uncertainty could be significant.

The best case conclusion that the impact of the rule on the repository will be minor can be reached with some certainty for select portions of the rule, particularly those addressing storage and assurance requirements. These parts in particular appear consistent with current efforts and the NRC's requirements at 10 CFR part 60 and they should have no impact or an insignificant one. However, concerning the rule in general, because the data needed to determine whether or not the standards can be met at Yucca Mountain have not yet been developed and because we have not ascertained what engineered approaches could or would be used to bring it into compliance, this case for a minor impact cannot be made with the certainty that is typically required in this type of analysis. Therefore, the potential worst case impacts are presented to bound all possible outcomes.

The worst case impact is that the standards being proposed preclude the siting of the repository at Yucca Mountain. This worst case is only presented as a possible outcome to provide a bound on the range of impacts on the repository, the re-siting of the repository is not presumed to be a likely outcome. More likely, should analyses indicate that a specific repository design does not meet the requirements, would be the application of additional, but as yet unknown, engineered barriers and/or design changes. Obviously, the costs associated with such unknown changes are unknown. However, in the event that re-siting is necessitated, many of the costs already expended in the identification and characterization of the site (approximately two billion dollars, see Exhibit 2) would be reincurred in re-siting the repository.

This worst case estimate of two billion dollars represents about five percent of the total estimated program costs. While this re-siting cost is a relatively small fraction of the total cost of the project, it is recognized that relocating a radioactive waste repository is not the same as relocating other facilities, and that other non-quantifiable costs and considerations would be factored in to a decision to relocate. However, should re-siting of the repository be required, the costs would be borne by the commercial generators of spent nuclear fuel and the Federal government. Current cost projections (PCL95) indicate that approximately 75 percent of any additional costs would be borne by the commercial generators of spent nuclear fuel, with the remaining 25 percent borne by the Federal government. The mechanisms for funding such increased costs and an indication of the magnitude of the potential impact on commercial generators are discussed below in section 5.3.

Exhibit 2. Yucca Mountain Repository Costs To Date

Cost Element	Expenditure
Systems Engineering	111,231,617
Waste Package	95,756,070
Site Investigations	423,034,155
Repository	90,645,568
Regulatory	155,043,953
Exploratory Studies Facility	211,242,682
Test Facilities	16,899,126
Field Operations Center	6,149,513
Maintenance and Operations	13,596,780
Administrative and support Ser.	15,140,241
Land Acquisition	1,351,762
Project Management	307,774,467
Financial Assistance	133,925,045
Other	2,352,147
Envir. Safety, and Health	37,775,900
Institutional	9,300,494
Support Services	49,288,775
Quality Assurance	22,761,778
Information Management	26,046,201
M & O	5,337,070
R & D/Unknown Tasks	120,708,052
Capital Equipment	67,856,296
TOTAL	**1,923,217,692**

PCL95 Peterson Consulting Limited Partnership, Independent Management and Financial Review - Yucca Mountain Project, Nevada, Denver, CO, July 1995.

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5.3 Funding Mechanisms for High-Level Waste Management System

Section 302 of the Nuclear Waste Policy Act of 1982 (Public Law 97-425) establishes a nuclear waste fund for the payment of transportation and disposal costs of high-level waste or spent nuclear fuel. Section 302a authorizes the Secretary of Energy to enter into contracts with anyone who holds title to or generates such waste and to accept ownership of the waste for a fee. The fee is currently set at 1.0 mil (one-tenth of a cent) per kilowatt-hour for electricity generated by civilian nuclear power reactors and sold 90 days or more after the 1982 act was enacted (on January 7, 1983). The Act also directs the Secretary of Energy to establish a one-time fee per kilogram of heavy metal in spent nuclear fuel or in solidified high-level waste that was used to generate electricity in a civilian nuclear power reactor prior the date when the new 1.0 mil per kilowatt-hour fee of the Nuclear Waste Policy Act of 1982 goes into effect. This one-time fee is also equivalent to 1.0 mil per kilowatt-hour. After paying that fee, the previous owner of the spent fuel or solidified HLW will have no further financial obligation to the Federal Government for its long-term storage or permanent disposal. The Federal government's share of any increased costs would be paid out of general tax revenues.

An overall increase of two billion dollars in the costs of the disposal prog ,n would equate to about one and one-half billion dollars to commercial generators. As noted earlier, this is about a five percent increase in the total costs, which are being covered by a fee of 1.0 mil (0.1¢) per kilowatt-hour of electricity generated. Given a nominal per kilowatt-hour charge of 10 cents, a five percent increase in the fee (to 1.05 mil) would equate to an increase of 0.05 percent per kilowatt-hour.

REFERENCES

DOE94 U.S. Department of Energy, Integrated Data Base for 1993: U.S. Spent Fuel and Radioactive Waste Inventories, Projections, and Characterizations, DOE/RW-0006, Rev. 9, Washington, D.C., March 1994.

NRC95 National Research Council, Technical Bases for Yucca Mountain Standards, National Academy Press, Washington, D.C., 1995.

PCL95 Peterson Consulting Limited Partnership, Independent Management and Financial Review - Yucca Mountain Project, Nevada, Denver, CO, July 1995.