

**THE USEPA'S REPROMULGATION OF ENVIRONMENTAL STANDARDS FOR THE
MANAGEMENT AND DISPOSAL OF SPENT NUCLEAR FUEL AND HIGH-LEVEL
AND TRANSURANIC RADIOACTIVE WASTES (40 CFR Part 191) UPDATE 1990**

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ABSTRACT

Since the remand of 40 CFR Part 191 in July 1987, the EPA has been involved in efforts to revise the standards to meet the findings of the Federal Court and to examine and update the technical and philosophical approaches. In the past year, Part 191 has gone through several internal EPA reviews. This paper reviews the outcome of this procedure and summarizes the Agency's proposed changes from the original Part 191. It also describes the current status of the standards and how EPA plans to proceed with further development and promulgation.

INTRODUCTION

On August 15, 1985 the U.S. Environmental Protection Agency (EPA) promulgated environmental standards for the management and disposal of spent nuclear reactor fuel and high-level and transuranic radioactive wastes (40 CFR Part 191). These standards were designed to provide the overall environmental objectives for the nation's programs to dispose of these materials.

Shortly after the rule was promulgated, several States and environmental groups challenged it in the United States Court of Appeals for the First Circuit ("the Court"). Through rulings issued in 1987, the Court vacated the portion of the rule dealing with disposal (Subpart B) and remanded it to the Agency for further consideration based on problems it found with two sections of the standards. Subpart A (management and storage) was left in effect.

The most urgent need for the standards is to provide the environmental protection objectives for the Department of Energy's ongoing programs to develop ultimate disposal systems for the subject wastes, including two proposed geologic repositories.

As a result of the Court ruling and the need for such standards, the Agency has established a program to revise 40 CFR Part 191, republish it for public review and comment, and repromulgate it after considering the comments received. The rulemaking is centered on addressing the defects the Court found in the two sections of Subpart B. In addition, we are reviewing other aspects of Subpart B to see if they need to be updated in response to additional information and to changes in the national disposal programs.

Disposal Facilities

There are currently two major proposed facilities for the disposal of the wastes subject to 40 CFR Part 191. One is a research facility which, if found satisfactory, will be used for disposal of defense-related transuranic (TRU) wastes.

The other is a repository for high-level wastes (HLW) and spent nuclear fuel.

The research facility for TRU wastes, called the Waste Isolation Pilot Plant (WIPP), is currently being constructed by the Department of Energy (DOE) in the southeast corner of New Mexico. The WIPP facility is a horizontal, single-level complex of interconnecting tunnels about 2,200 feet beneath the surface in a 3,000-foot-thick layer of bedded salt. Packaged TRU wastes will be lowered by elevator to the repository level and then transported to emplacement locations in the mine.

If Congressional approval is given, some of the retrievably stored TRU wastes from DOE sites across the nation may start being shipped to the WIPP in 1990. This initial phase of WIPP operation will be on an experimental basis. During this phase, all emplaced waste must be maintained in a configuration which allows easy retrievability. At some point prior to commencement of disposal operations, the DOE must either determine that the site is suitable for disposal and declare it a disposal site, or withdraw all wastes and decommission the facility. If DOE decides to declare WIPP a disposal facility, it must comply with 40 CFR Part 191. Until the Agency issues a revised standard, DOE has agreed to design and operate WIPP based on 40 CFR Part 191 as promulgated in August 1985.

The only HLW disposal facility now under consideration is the Yucca Mountain, Nevada site. This site was designated by Congress in the Nuclear Waste Policy Amendments Act of 1987 (NWPAA) as the only site to be characterized for the first repository. Therefore, no other sites will be evaluated within the foreseeable future unless the Yucca Mountain site is found to be technically unsuit-

able. Only initial site characterization is currently underway at Yucca Mountain.

The Roles of Federal Agencies

High-Level Waste and Spent Nuclear Fuel

In 1983, President Reagan signed the Nuclear Waste Policy Act (NWPA). The main purposes of the Act were to establish deep geological repositories as the method the Nation will use for disposal of HLW and spent nuclear fuel, to establish a procedure for choosing the first two HLW repository sites, and to establish the roles of several Federal agencies in developing the disposal system.

The three major agencies named to carry out the provisions of the Act were EPA, the Nuclear Regulatory Commission (NRC), and DOE. EPA was assigned the task of issuing generally applicable environmental standards. The NRC was given the task of licensing any civilian repository (as opposed to a repository used exclusively for wastes from defense activities). The DOE was to site, design, construct, and operate any or all repositories which will be built.

The EPA environmental standards, 40 CFR Part 191, were issued on August 15, 1985. Regulations for licensing a repository were issued by the NRC on June 21, 1983 as 10 CFR Part 60 (as required by law, the NRC had begun to adopt EPA's standards into 10 CFR Part 60 but, because of the Court remand, has suspended that rulemaking until the new Subpart B is promulgated).

Transuranic Wastes

Virtually all of the TRU waste in the United States comes from defense-related activities and while the NRC will determine the adequacy of the HLW repository, based in part upon the Commission's assessment of whether its performance will meet EPA's disposal standards, they have no jurisdiction over defense-only wastes. The DOE has the same responsibilities for TRU waste disposal facilities as those cited above for the HLW repository. In addition, under current authorities, it is solely responsible for determining compliance with Part 191 for TRU waste facilities. Legislation introduced into, but not enacted by, the 100th Congress would have required EPA to concur with the DOE compliance determination for WIPP. This issue will likely be considered again during the current session of Congress.

Subpart B as Originally Promulgated

40 CFR Part 191 was divided into Subparts A and B. Subpart A deals with the management and storage of the subject wastes and is currently in effect. Subpart B dealt with the disposal of these wastes. Disposal was defined to begin

when the disposal facility had been backfilled and sealed with no intent to re-enter it.

The key sections of Subpart B included the following:

- Section 191.12 which contained the definitions. Two terms were central to Sections 191.15 and 191.16, "significant source of ground water" and "special source of ground water."

A "significant source of ground water" was an aquifer that is saturated with water containing less than 10,000 milligrams per liter of total dissolved solids, was within 2,500 feet of the land surface, and met several transmissivity and yield requirements, or, was the primary source of water for a community water system.

A "special source of ground water" was a Class I (the most highly valued type) ground water source that was within the controlled area encompassing a disposal system or are less than five kilometers beyond it, currently supplied drinking water for thousands of persons, and was irreplaceable in that no reasonable alternative source of drinking water was available.
- Section 191.13, "Containment Requirements," along with Appendix A, set limits on cumulative releases of radionuclides to the environment for the first 10,000 years following disposal. Appendix A contained a table which listed the numerical limits. Section 191.13 also contained probabilistic standards, which meant that over the next 10,000 years there must be a likelihood of less than one in ten of exceeding the numerical limits in Appendix A and, a likelihood of less than one in 1,000 of exceeding ten times the numerical limits.
- Section 191.14, gave several qualitative, common-sense provisions called assurance requirements. The principles embodied in these requirements were important complements to the containment requirements and should ensure that the desired level of protection was achieved.
- Sections 191.15 and 191.16 were both applicable for 1,000 years and assumed undisturbed behavior of the facility. Section 191.15 limited annual doses to members of the public to 0.25 millisieverts (mSv) [25 millirems (mrem)] to the whole body and 0.75 mSv (75 mrem) to any critical organ from radionuclides arriving through all pathways including an assumed consumption of two liters per day of drinking water from any significant source of ground water in the accessible environment.
- Section 191.16 applied to water withdrawn from a special source of ground water and set limits similar

to those contained in the National Primary Drinking Water Regulations which pertain to radionuclides.

Court Action Regarding 40 CFR Part 191

In 1986, several environmental groups and States filed petitions for review of 40 CFR Part 191. These suits were consolidated and argued in the U.S. Court of Appeals for the First Circuit which is located in Boston, Massachusetts. The Court's ruling concerned: (1) violation of Part C (the underground injection section) of the Safe Drinking Water Act (SDWA); (2) inadequate notice and comment opportunity on Section 191.16 (Ground-Water Protection Requirements); and, (3) selection of the 1,000-year time of applicability for Sections 191.15 (Individual Protection Requirements) and 191.16.

Interaction with the SDWA

Reasoning through a series of definitions related to "underground injection," the Court decided that disposal of HLW in geologic repositories "would likely" constitute a form of underground injection. If this is a form of underground injection, the Agency, under the SDWA, is required to assure that underground sources of drinking water will not be endangered by the injection. "Endangerment" is considered to occur when doses higher than those allowed by the National Primary Drinking Water Regulations may occur. The Court pointed out that the National Primary Drinking Water Regulations allow a dose of only 0.04 mSv per year (mSv/yr) [4 mrem per year (mrem/yr)] while Section 191.15 allowed an annual dose of 0.25 mSv (25 mrem) to the whole body and 0.75 mSv (75 mrem) to any critical organ from all pathways. The Court recognized that less than 0.04 mSv (4 mrem/yr) may result via the ground-water pathway. However, the Court felt that this would be unlikely since EPA stated in the preamble to the Part 191 that radionuclides may eventually be released into ground water near the repository in amounts which could result in a substantial dose (several rem per year). Therefore, the Court decided that a large portion of the 0.25 mSv (25 mrem) could be received through ground water.

The Court did support part of the Agency's approach. Inside the controlled area (i.e. not in the accessible environment), the Court ruled that Congress, through the NAWPA, had allowed *endangerment* of any ground water present. Therefore, EPA's approach of using the geological formation as part of the containment was validated.

The Court, in reference to whether a repository is a form of underground injection, summarized with:

"These are matters the EPA, relying on its expertise, should face and clarify in the HLW regulations...this is the time for the Agency to determine and express its position, since all concerned are entitled to know

whether the EPA believes that repositories must meet the SDWA's underground injection control rules.... We emphasize that we are not holding that the Agency is necessarily incorrect in promulgating the present standard.... However, the Agency has never acknowledged the interrelationship of the two statutes.... They [the standards] must be returned to the Agency for further consideration, which will result in either a new rule or, if the present standard is retained, an explanation of the present apparent inconsistency and irrationality."

Ground Water Protection Requirements

In response to comments mainly from States, Sections 191.15 and 191.16 were added to Subpart B after the Standards were proposed. The Court found that while sufficient opportunity was given for notice and comment on Section 191.15, this was not true for Section 191.16. This section was therefore remanded for a second round of notice and comment.

The 1,000-Year Duration of Sections 191.15 and 191.16

These sections set dose equivalent limits for individuals and radionuclide content limits in ground water, respectively. They apply to undisturbed repository performance for the first 1,000 years. The Court found that the 1,000-year period is not inherently flawed but rather that the administrative record and EPA's explanations did not sufficiently support the choice. The 1,000-year criterion was remanded for reconsideration or, at least, a more thorough explanation of the reasons for the choice.

REGULATORY ISSUES AND ALTERNATIVES

The principal objective of this rulemaking is to address the defects cited by the Court. The Agency does not plan to change any major aspects of the standards that were not challenged. For example, we do not plan to review the 10,000-year time frame used for the containment requirements or the need for qualitative assurance requirements to complement the numerical standards.

However, there are several additional tasks that the Agency is addressing to ensure that the final rule is as sound as possible. These include: (1) examining the consistency of the disposal standards with related rules; (2) classification of ground water; (3) examining the time frame to be used for the individual and ground water protection sections and any accompanying implementation problems; (4) updating the radiation risk factors; and (5) updating our data base for

assessing containment capability of various type of geologic media.

The following issues have been identified as specific topics to be addressed in this effort:

Relationship to the UIC Program

The position of the Office of Radiation Programs (ORP) is that operations such as those cited by the Court for geologic repositories do not constitute underground injection. We believe that the time to assess whether a material flows or moves is the time of emplacement and the term "injection" itself connotes delivery by flow. Congress focused on injection practices when directing EPA to control underground injection. Focusing on the practice of injection ties the concept of a fluid directly to the emplacement. This is expressed in practice by examining the material at the time of injection. The process of lowering solid materials down a shaft on an elevator or some human-controlled (i.e., not gravity or pressure-driven) conveyance and, upon reaching the emplacement level, either emplacing or transporting them via some form of mechanical transport to their emplacement location, is not considered to be well injection because the waste is not fluid at the time of injection, i.e., it does not flow into the disposal location.

Relationship to Other Standards

Particularly in light of the ruling regarding Part C of the SDWA, it is important to compare the consistency of Part 191 with other relevant standards and to be able to explain the reasons for key differences that may exist. Efforts have begun, and will continue, to examine the draft EPA low-level waste (LLW) standards, the ground-water protection portions of the Uranium Mill Tailings standards, the Well-head Protection Program from the 1986 Amendments to the SDWA, the SDWA Drinking Water standards (currently being revised), and relevant Resource Conservation and Recovery Act (RCRA) rules. Approaches being taken by other nations' nuclear waste programs and relevant recommendations by international organizations are also being taken into consideration.

Ground Water Classification

The need for changes in the ground water classification system are being reviewed. There are two options being explored. One is based on the foundation provided in the Agency's Guidelines for Ground Water Classification. Differential protection of Class I, II and III ground waters will be considered. Classifications that distinguish among Class II ground water sources on the basis of yield or current use -- as in the remanded HLW rule or the draft LLW rule -- will also be evaluated. The different levels of protection to be considered will be (1) 0.10 or 0.25 mSv (10 or 25 mrem/yr) for individuals taking into account all pathways including

ground water use and (2) a separate limit of 0.04 or 0.25 mSv (4 or 25 mrem/yr) depending on the class and yield of the ground water.

The other option would be based on whether the drinking water source is potable, which means that it contains less than 10,000 milligrams of total dissolved solids per liter. The different levels of protection to be considered in this option will be (1) 0.10 or 0.25 mSv (10 or 25 mrem/yr) for individuals taking into account all pathways including assumed drinking water intake and (2) a separate limit of 0.04 mSv (4 mrem/yr).

Time Frame for Individual and Ground Water Protection Standards

It is likely the Agency will seek comments on two alternatives for the length of time that the individual and/or ground water protection standards will be applicable. These time periods are 1,000 and 10,000 years. We will be particularly interested in the issues involved in implementing such standards over these time frames.

Updating Radiation Risk Factors

The process of determining the release limits presented in the Containment Requirements section of Part 191 depends in part on risk factors used to convert population doses into fatal cancer estimates. This has been completed using the latest factors available from the EPA Office of Radiation Programs (ORP) which are updated frequently. The result was that it is not necessary to change the release limits for the upcoming proposed rule. However, this evaluation did not include potential changes that may be brought about following the recent release of the fifth report of the National Research Council's Committee on the Biological Effects of Ionizing Radiation entitled, Health Effects of Exposure to Low Levels of Ionizing Radiation (BEIR V). Once ORP has evaluated the information in BEIR V, if changes in the standards are necessitated they will be incorporated into the calculations as soon as possible.

Implementation Procedures

We are considering potential implementation problems as we develop the individual and ground water standards. In particular, do uncertainties in projecting exposures or ground water concentrations over long periods of time affect the feasibility of different options? For example, could an individual exposure standard be practical to implement over 1,000 years but not over 10,000 years--even for a repository that appears to provide adequate protection?

In addition, we are incorporating new data and updated models to evaluate repository performance to see if

there need to be changes made to the containment requirements. The analyses for the 1985 standards centered on salt, basalt, and granite. We are now using updated computer programs to model ground-water behavior and we have access to much more data on unsaturated tuff than there was available during the early 1980's when the original Part 191 was being developed. Also, data collection has continued on the bedded salt geology around WIPP. Thus, our updated analyses are focusing on tuff and bedded salt. However, analyses of the other media will be reviewed and updated where appropriate, as well.

TOPICS THAT WILL NOT BE ADDRESSED

The Agency has identified several topics related to this rulemaking that will not be considered, for the indicated reasons:

Changes to Subpart A

Subpart A of 40 CFR Part 191, the standards for management and storage, are now in effect. While minor changes, such as clarification of definitions, may be proposed, there are no plans to change either the numerical standards or underlying philosophy and approach.

Transportation

Even though EPA has the authority to issue guidance or standards for transportation should it become evident that restrictions are necessary, there is no evidence of which we are aware which would indicate that there is a current need for such action. It is EPA's position that, to date, transportation of radioactive materials is adequately regulated by the Department of Transportation, NRC, and DOE.

Hazardous Components of These Wastes

Some of the radioactive wastes covered by this rule also contain hazardous wastes which are subject to the RCRA; these materials are known as "mixed wastes." Procedures for management and disposal of mixed wastes are now being developed and the Agency is issuing authorizations for States to regulate mixed wastes. The ORP maintains cognizance of these developments and has been working with the Office of Solid Waste (OSW), the EPA office charged with implementing RCRA, to prevent conflicts between RCRA and this rule. However, we do not intend to address these issues directly in this rulemaking.

Wastes Already Disposed Of

As it was originally promulgated, 40 CFR 191 did not apply to wastes already disposed of. The various provisions

of Subpart B were to be met through a combination of steps involving disposal system design and site selection and operational techniques. The Agency believed that it was appropriate that Subpart B apply only to disposal occurring after promulgation so that the full range of site selection and design controls could be taken into account in complying with this rule.

ORP plans to retain this basic focus and not expand the scope of Subpart B by including those transuranic wastes that DOE has already disposed of. However, we do expect to propose a change that will have the effect of clarifying that wastes exhumed, then disposed of later, are subject to Part 191 and that new disposal operations occurring after August 15, 1985 at existing sites are subject to Part 191.

FUTURE ACTIVITIES

Review of this rule is proceeding in accordance with EPA procedures. We have and will continue to interact frequently with the appropriate NRC and DOE offices, States, environmental groups, and industry representatives during the development of the rule. Two drafts of the rule have been entered into Public Docket Number R-89-01 at EPA Headquarters in Washington, DC.

We will prepare regulatory support documents which will be available when the proposed standards are published in the Federal Register. They will include a Draft Background Information Document (BID), which will provide information on the risk assessment including sources of radiation exposures, routes of exposures, methodology of assessments, and individual and population risk estimates, and a Draft Regulatory Impact Analysis (RIA), which will have a presentation of the costs of the controls and cost-effectiveness of the regulatory options. In addition, the Federal Register notice will include the proposed standard, listing the requirements discussed earlier, and a preamble to the rule which discusses the Agency's decision-making procedure and the rationale for its regulatory judgments. The rulemaking process will include a notice of proposed rulemaking, a public comment period, and public hearings which will provide important mechanisms for public input to help guide the final decision-making. The final rulemaking documentation will include final versions of the BID and RIA along with a volume which summarizes EPA's response to public comments.

We are planning to propose the Standards during the summer of 1990 and project finalization in early 1992.