

# THE USEPA'S ENVIRONMENTAL STANDARDS FOR THE MANAGEMENT AND DISPOSAL OF SPENT NUCLEAR FUEL, HIGH-LEVEL AND TRANSURANIC RADIOACTIVE WASTES (40 CFR PART 191)

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## ABSTRACT

Since the remand of 40 CFR Part 191 in July 1987, the U. S. Environmental Protection Agency (EPA) has been involved in efforts to revise the standards to meet the findings of the Federal Court and to generally update Part 191. In the past year, many issues concerning Part 191 have been discussed. This includes non-technical issues such as studying the feasibility of a negotiated rulemaking, as well as technical issues, for example, gaseous releases and appropriate time frames. This paper reviews many of these issues and will discuss the status of the deliberations. In addition, the most recent version of the schedule for proposing the standards will be given.

## INTRODUCTION

On August 15, 1985, the U.S. Environmental Protection Agency (EPA) promulgated environmental standards for the management and disposal of spent nuclear 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.

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 two sections of Subpart B. In addition, we are reviewing other aspects of the standards to determine the need to modify them in response to additional information or for technical corrections.

There are many issues under consideration as we proceed to repromulgate but our foremost guiding principle is the protection of public health and the environment. Comments have been received on our pre-proposal drafts that suggest that we should issue a more stringent rule than the 1985 standards, and, concurrently, we have received comments that we should issue a less stringent rule, possibly using a different basis than the one used in 1985. The Agency's view of the stake in this situation is the credibility of the National disposal program as a whole. We are convinced that any weakening of the protections afforded by the 1985 standard without very strong technical reasons could very well jeopardize the viability of any nuclear waste repository siting or licensing for many years to come. However, we are interested in exploring ways to provide greater flexibility in implementing our rule, without altering the level of protection it provides.

Our second guiding principle is that EPA intends to proceed expeditiously toward reissuing our standards. Any

changes we make or consider must not unnecessarily cause a long delay in our schedule. The details of the schedule will be laid out in a later section.

## ROLES OF THE 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 high-level waste (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 the Department of Energy (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 standards, 40 CFR Part 191, were issued on August 15, 1985. The initial regulations for licensing a geologic repository were issued by the NRC on June 21, 1983 as 10 CFR Part 60. As required by law, the NRC had begun the process to incorporate EPA's standards into 10 CFR Part 60 but, because of the Court remand, NRC has suspended that rulemaking until the new standards are promulgated.

### Transuranic Wastes

Virtually all of the transuranic (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 40 CFR Part 191 for TRU waste facilities; however, this may change based on legislation being considered in Congress. This will be addressed later.

### SUBPART B AS PROMULGATED IN 1985

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 191.13, "Containment Requirements," which, along with Appendix A, specified the nuclide-specific release limits, i.e., the cumulative amount of those nuclides which may be released to the environment over the 10,000 years following closure of a disposal facility. There was also a probabilistic aspect to this section which required the implementing agency to take into account events, both natural and human-induced, which could disrupt the behavior of the facility. This section required there to be less than one chance in 10 of exceeding the Appendix A quantities and less than one chance in 1,000 of exceeding 10 times those amounts. The different probability levels reflected an attempt by the Agency to separate more likely disruptions from those that are credible but less likely, e.g., normal ground-water flow versus fault movement or breccia pipe formation. There was no requirement to consider events with probabilities lower than one in 10,000; this was in recognition of the large uncertainties involved in estimating probabilities and in the futility of regulating highly improbable events, such as a meteorite impact.
- Section 191.14 which gave several qualitative, common-sense provisions called assurance requirements. The principles embodied in these requirements were important complements to the containment requirements and were intended to ensure that the desired level of protection was achieved.
- Sections 191.15 and 191.16, individual and ground-water protection requirements, respectively, which 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 250 microsieverts ( $\mu\text{Sv}$ ) [25 millirems (mrem)] to the whole body and 750  $\mu\text{Sv}$  (75 mrem) to any critical organ from radionuclides arriving through all pathways. Section 191.16 applied to water withdrawn from certain sources 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. The U.S. Court of Appeals for the First Circuit rendered the following opinions in July 1987: (1) there is a potential violation of Part C (underground injection) of the Safe Drinking Water Act (SDWA); (2) there was *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 was not adequately supported. A very short summary of the findings follows.

### 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, i.e., not allow doses or levels of contamination higher than those allowed by the National Primary Drinking Water Regulations, i.e., 40  $\mu\text{Sv}$  per year (4 mrem per year) for beta-gamma emitters or various concentration levels for radon, radium, uranium, and gross alpha emitters.

### 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 applied 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.

### ISSUES UNDER CONSIDERATION AND THEIR STATUS

The principal objective of this rulemaking is to address the defects cited by the Court. However, there are also several other issues that the Agency is considering. The major issues are discussed in the two following sections. This is a review of the issues and their status as of late January 1992, any of these could change by the time of proposal.

### STATUS OF THE COURT-REMAND ISSUES

#### Underground Injection

One basis of the Court's remand of Subpart B was that geologic repositories may be a form of underground injection under the SDWA. The Court also noted that the Agency was silent on this issue. The reason for the silence was that no one up to that time had considered geologic repositories as envisioned by the Department of Energy (DOE) to be a form of injection. The Office of Radiation Programs continues to believe that geologic repositories such as those currently being considered by DOE, e.g., at Yucca Mountain or the Waste Isolation Pilot Plant, are not forms of underground injection. We believe that the basis of a determination of whether a material flows or moves is the waste form and method of emplacement. We believe that the geologic repository



operations envisioned by DOE, i.e., the process of lowering containerized solid material 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 them or transporting them via some form of mechanical transport to their emplacement location, do not constitute underground injection. We have recently begun discussions with other affected offices in the Agency to explore the possibility of excluding such geologic emplacements from the Agency's underground injection control program.

### Ground-Water Protection Standards

The Court-identified relationship between the Agency's level of individual protection in 1985, 25 mrem/yr, called into question the potential endangerment of ground-water allowed by that level and the most probable pathway from the repository, i.e., through aquifers. The current approach is to still allow the all-pathways dose level to remain the same but to specify that doses received through drinking water will not exceed the current Agency regulations which are issued under the authority of the Safe Drinking Water Act.

The ground-water protection standards, as promulgated in 1985, were based on the Agency's Guidelines for Ground-Water Classification which have since been withdrawn. On July 18, 1991, EPA's Office of Ground Water and Drinking Water proposed a new set of National Primary Drinking Water regulations for radionuclides (*Federal Register*, Volume 56, page 33050). We believe that the best approach to meeting the Court's ruling is to be consistent with the level of protection in these regulations. To emphasize the importance of ground-water protection and to enable application to management and storage as well as disposal, a new subpart, Subpart C, has been written. This subpart presently incorporates the concentration and effective dose limits from the July 1991 proposed regulations. We will follow that proposal closely and adjust our rulemaking accordingly. This is also consistent with the new ground-water protection principles that EPA has issued.

### The Time Frame for Individual and Ground-Water Protection

As noted above, the Court asked for further justification of the 1,000-year time frame found in the individual and ground-water protection sections. Following consideration of the issue, the Agency is likely to propose the 10,000-year time frame. This is based upon two factors: (1) consistency with the containment requirements' time frame and (2) generic analytical indications that the 10,000-year period is achievable if the repository is carefully sited and designed. We are cognizant of the greater uncertainty involved in these projections but we have attempted to limit it by specifying that analyses need consider only undisturbed performance and by adding to the guidance in the rule that performance analysts may assume a level of intelligence and technical capability, society, human physiology, diet, pathways through the accessible environment, and medical knowledge the same as today's. However, we are interested in comments on the advisability and implementability of the 10,000-year time frame for the individual and ground-water protection standards.

### Individual Protection Standards

It is likely that the Agency will propose an annual committed effective dose limit to the critical group of 250  $\mu$ Sv (25 mrem) to be evaluated only under conditions of undisturbed performance but received through all potential pathways. We continue to believe that to require analysis of disturbed performance for individual exposure is beyond the limits of current assessment capability to perform meaningfully.

### STATUS OF OTHER ISSUES UNDER CONSIDERATION

#### An Alternative to the Probabilistic Approach in Section 191.13

A possible alternative for the 1985 containment requirements has come to be known as the *three-bucket* approach. Rather than requiring all potential release scenarios to be assigned specific probabilities and be assembled into a CCDF, this system would require a CCDF only for those likely events, defined, for example, as having a probability greater than 0.1 over 10,000 years of exceeding the standard. Processes, events, and sequences of processes and events with probabilities of occurrence estimated to be in a range of 0.1 to 0.0001 over 10,000 years would be analyzed individually and compared to 10 times the release limits. As it was in the 1985 standards, events, processes, and sequences of those processes and events with a probability of occurrence below 0.0001 need not be considered. Considering the difficulty in assigning specific probabilities to very improbable events, some believe that this approach would assure some flexibility in the licensing system while not affecting the safety goal of the standards. We believe there is enough merit to this approach to propose it for comment as an option.

#### Possible Containment Requirement Addition

It has been brought to our attention that an alternative to our 1985 release limits may be a useful change which would allow for flexibility in assessments of disposal system performance but which would not compromise the original level of protection. The 1985 release limits were based on a particular geological and environmental pathway model. This model may not accurately portray the situation at all sites. While we have no intention of eliminating the release limits, we are considering alternatives.

The alternative to the release limits most actively being considered is a collective (population) effective dose limit which is equal to the 1,000 health effects over 10,000 years from 100,000 metric tons of heavy metal which is the basis of the 1985 release limits. Using our current conversion factors, that limit is 2.5 million person-rem (25,000 person-sieverts).

#### 100,000-Year Performance Evaluation

The Agency is convinced that it is important to consider a term longer than 10,000 years to assist in judging the adequacy of a disposal system. For some time, we have attempted to find a method which would require such information to be on the record yet, in recognizing ever increasing uncertainty involved in projecting further and further, not require the performance meet a particular standard. Under the current provision, it would be left to the implementing agency to decide the acceptability of the system. In our latest proposal, we will require an analysis of repository performance for the

period from 10,000 to 100,000 years, based on undisturbed performance without specifying any particular release or dose level. Rather, the intention is to have on the record a longer term look at the performance of a disposal system while leaving its acceptability to the implementing agency. This concept is consistent with the approach to this issue by many European countries.

#### Determination of Compliance

Since 1985, there has been confusion over when in the facility development process it is necessary to show compliance with Part 191. In an attempt to clarify this issue and voice our intentions, which were left silent in 1985, two new sections are being considered for proposal. The first new section requires that compliance with Part 191 be shown prior to the emplacement of any radioactive wastes.

The second new section, patterned after requirements in the Nuclear Waste Policy Act of 1982 pertaining to waste emplacement at the Yucca Mountain candidate repository site, allows an exception to this for the purpose of experimental emplacements. This could be done, however, only after several conditions were met, *viz.*, preliminary performance assessments are available to guide the experiments, the purpose of the tests and the amount of waste required are in written form along with a time schedule, and there are pre-established plans and tested procedures for removal of the wastes.

#### Guidance

Appended to the Part 191 standards is a section on guidance for implementation. Its purpose is to set the context in which the standards were conceived and, therefore, to communicate more clearly what the Agency was thinking on some of the issues. This section is not legally binding on the implementing agencies but rather may be followed at their discretion. In the latest draft of Part 191 (February 3, 1992), several sections have been added that were not present in 1985.

First is a section in which the Agency states that iterative performance assessments should be performed to provide more assurance of meeting the standards and to build confidence in the results. In addition, that prior to emplacement for disposal the implementing agency should have confidence that compliance will be obtained. This could be done through periodic reexamination of the data or whenever data were developed during operation which could have a significant impact on the projected future performance.

A second section is on future states of the accessible environment. The Agency believes that it is not appropriate for compliance determination to be centered on speculation about future humans and their environment. The Agency's *intention* is that the factors this includes, mainly those involving the surface environment, could be assumed to be essentially the same as they are today. These steady-state factors include the level of knowledge and technical capability, human physiology and nutritional needs, the state of medical knowledge, and societal structure and behavior. It is the Agency's perception that by limiting the range of possible scenarios that concentration on showing compliance will be more properly focussed on the setting and design of the disposal system.

And, finally, the Agency has attempted to explain that its term "reasonable expectation" is meant to express a level of confidence for disposal systems different than the NRC term "reasonable assurance" has come to mean for operating facilities. The length of time over which disposal systems, which should be dependent upon natural properties of the media surrounding it, must perform satisfactorily, *i.e.*, at least 10,000 years based on the containment requirements, inherently makes predictions more uncertain than for operating facilities with much shorter lives and which have been built using materials which have been fabricated by man.

#### Gaseous Releases

Following several meetings and reviewing the results of many reports, we are not convinced, at this time, that a problem exists concerning gaseous releases despite the fact that they were not considered in developing the 1985 standards. We have heard conflicting opinions on the subject. Therefore, unless we are shown clear evidence that our standards cannot be reasonably implemented because of this, it is our intention to make no changes but again ask for comments upon proposal. We also continue to believe that the issue has not been adequately studied to address technical alternatives, geochemical conditions which could affect the releases, and chemical form of the radionuclides.

#### Negotiated Rulemaking

Based on suggestions from the National Academy of Sciences and the Nuclear Waste Technical Review Board, the Agency assessed the feasibility of conducting a negotiated rulemaking for Part 191. The contractor interviewed potential participants in order to determine under what conditions they would be willing to enter the process. The suggestion was met with universal dislike from Federal agencies, an environmental group, and an industry group. It was decided that due to polarization of opinions and lack of interest that there was no point in proceeding even with work group sessions.

#### **UPDATE ON CONGRESSIONAL ACTION**

For several years, the Congress has been considering legislation which would withdraw land for the Waste Isolation Pilot Plant (WIPP) in New Mexico to allow DOE to bring transuranic waste onto the site. In all such legislation there has been some provision for EPA oversight relative to the implementation of Part 191 for WIPP.

There are essentially two versions of legislation currently active in Congress, a Senate version which is similar to a bill approved by one House committee and another version which has been reported out of two House committees. For discussion, they will be referred to as the Senate version and the House version, respectively. Both versions give EPA a role in implementation. The differences come in the extent of that role.

The Senate version gives EPA a veto power through concurrence or non-concurrence in any DOE finding of compliance. It also places a time schedule of one year to propose a new Part 191 and another year to finalize it.

The House version considerably reduces the time to proposal and final, three months and six more months, respectively, and the Test Phase must wait until final standards are issued. In addition, within six months, EPA must issue implementing regulations. It considerably expands EPA

authority compared to the Senate version. EPA must approve the following documents before disposal: plans for the Test Phase; a retrieval plan; compliance documents for Subpart A of Part 191, the Clean Air Act, and the Resource Conservation and Recovery Act; and compliance with the disposal requirements in Part 191. And after emplacement begins, EPA would have to assure conformance with Subpart A of Part 191, the Solid Waste Disposal Act, and the Resource Conservation and Recovery Act, as well as approve biennial performance assessments and a decommissioning plan.

#### SCHEDULE

Preparation 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, industry representatives, and others during the development of the rule. Four drafts of the rule have been entered into Public Docket Number R-89-01 at EPA Headquarters in Washington, DC.

We are preparing 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; all will provide important mechanisms for public input to help guide the final decision-making. The final rulemaking documentation will include final versions of the preamble to the standards in the *Federal Register*, RIA, and the BID along with a volume which summarizes EPA's response to public comments.

The schedule which we are determined to meet is to propose the new standards in late spring or summer of this year and to finalize them about a year later. Of course, this is always subject to change if new legislation is passed or unforeseen technical and procedural issues arise. At the present, it is a firm goal that is supported and encouraged by the Agency management.

#### SUMMARY

In summary, it is the Agency's overall intention to not lower the level of protection as was provided in the 1985 standards without very strong technical reasons. However, there is interest in finding ways to facilitate flexibility in the implementation of the standards provided the level of protection is maintained.

We are addressing the issues raised by the Court in a manner which we believe is responsive to its findings. We are also addressing several other technical issues which we believe merit further consideration.

Our current schedule is for proposing a new standard by late spring or summer with a final rule about a year later.