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MEMORANDUM FOR: Hugh L. Thompson, Director  
Office of Nuclear Material Safety and Safeguards  
  
William C. Parler, General Counsel  
Office of the General Counsel  
  
FROM: Guy A. Arlotto, Director  
Division of Engineering  
Office of Nuclear Regulatory Research  
  
SUBJECT: PART 61 PROPOSED AMENDMENTS: DETAILED ANALYSIS OF PUBLIC  
COMMENTS

On February 19, 1988, the staff transmitted proposed amendments to 10 CFR Part 61 to require geologic repository disposal of all above Class C low-level waste unless an alternative disposal method was approved by the Commission. In the Commission paper (SECY-88-51), the staff agreed to send the detailed analysis of public comments on the ANPR (52 FR 5992) to the Public Document Room within three weeks.

The working group of staff members from RES, NMSS, and OGC has completed the enclosed analysis of public comments. I would like your comments/concurrence as soon as possible so that we can transmit it to the EDO by the scheduled date.

**Original signed by G. A. Arlotto**

Guy A. Arlotto, Director  
Division of Engineering  
Office of Nuclear Regulatory Research

Enclosure: As stated

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DETAILED ANALYSIS OF  
PUBLIC COMMENTS

to accompany Part 61 amendments

APPROPRIATENESS OF CLASS C LIMITS  
FOR DEFINING HIGHLY RADIOACTIVE MATERIAL

In the ANPR, the Commission used the Class C concentration limits of 10 CFR Part 61 to illustrate its conceptual definition of HLW, and requested comment on the appropriateness of those limits for identifying wastes to be classified as "highly radioactive." Comments opposing this use generally fell into two categories: those who feel that there is inadequate technical support for use of the Class C limits to identify HLW, and those who feel more broadly that the Class C limits are inappropriate for their current use within Part 61.

The concern expressed by the first category of comments is moot since the Commission is no longer proposing to develop a numerical definition of HLW. Instead, the proposed rule refers to methods of waste disposal without altering existing waste classifications.

The second category of comments urged the Commission to reclassify all current Class C wastes as HLW. Reasons cited included perceived inadequacies in the technical basis for the Class C limits, presumed inability of State governments to provide the technical expertise necessary for safe disposal of Class C wastes, or a perception that the Federal government is better able to provide long-term institutional control over Class C waste disposal sites than are State governments.

These comments did not convince the Commission that there is any need to revise its current Class C limits. Part 61 regulations recognize the different characteristics of Class C waste (compared to Classes A and B) and require special treatment for disposal of Class C wastes (deeper burial or use of engineered barriers). The technical support for Part 61 received extensive scrutiny, both by the public and by independent technical reviewers, during the Part 61 rulemaking. No substantive technical flaws were identified during that rulemaking, nor were any demonstrated in the comments on the ANPR.

Alleged difficulties in handling Class C wastes during disposal operations seem specious since the shorter-lived radionuclides present in Class A and B wastes (e.g., Co-60) routinely produce higher external radiation levels than do the longer-lived radionuclides typically present in Class C wastes. Finally, regarding institutional control, many comments held the erroneous view that LLW site isolation capability depends entirely on institutional control. This is not the case. In fact, a fundamental feature of Part 61 is its limitation of the time during which institutional controls may be relied on (100 years), and its requirement that LLW site isolation capability for longer times be based on the geologic conditions and engineered barriers of the disposal facility.

Because no substantive argument was presented opposing current use of the Class C limits in Part 61, the Commission will not alter that use.

## MINIMUM QUANTITY

In the ANPR, comments were requested on the desirability of giving consideration to the total quantity of activity in a waste, in addition to concentration, in defining HLW. Comments were divided on this issue. However, it is clear that risk is determined by total quantity of activity present in the waste as well as concentration. This is one reason that all direct reprocessing wastes have been and will continue to be classified as HLW. By the same type of reasoning, wastes with high concentrations, but small total quantity of activity, could be candidates for treatment as non-HLW. Sealed sources are likely candidates.

The proposed amendments would not establish any provisions for special treatment of "minimum quantity" waste material. Under the proposed amendments, the ability of disposal facilities to accommodate specific wastes, considering both radionuclide concentrations and total quantities, will be evaluated in the course of licensing reviews for these facilities.

## DETERMINATION OF MATERIAL NEEDING PERMANENT ISOLATION

The ANPR proposed technical studies to determine which highly radioactive wastes required permanent isolation. The studies would focus on hypothetical "greater confinement facilities", i.e. more secure than shallow land burial. Modeling studies would assess which waste types could not be isolated from the environment by these facilities. These waste types would require a geologic repository to insure permanent isolation. Accordingly, they would be classified as HLW.

Many comments generally supported this type of analysis. It seemed to be a reasonable way of determining which wastes need permanent isolation. Potential problems noted in the comments were; (1) The absence of currently available greater confinement facilities. This would mean that studies on hypothetical facilities might not be applicable to real future disposal options, and (2) that just considering the half life of waste types was not comprehensive enough, waste form should be considered. Activated metals and sealed sources were cited as long-lived materials which, because of their stability, would not result in offsite releases. Cesium and strontium were mentioned as nuclides where half life was not indicative of high hazard. In general, comments wanted the studies to be as comprehensive as possible, including all waste types and radionuclides.

The arguments that no greater confinement facilities now exist or are authorized and the difficulties in using hypothetical cases are persuasive. For the present, the studies noted in the ANPR will not be carried out. This does not indicate a lack of confidence in this methodology in general. However, for the present, shallow land burial is the only alternative to a repository. In the absence of other authorized facilities wastes needing the degree of isolation greater than shallow land burial must be isolated in a repository. The Class C limits are appropriate at this time for determining suitable disposal methods. The proposed rule uses them in establishing the need for permanent isolation.

At the same time the proposed amendments allow for the possibility that new types of intermediate disposal facilities may be developed, which could be approved for disposal of suitable above Class C LLW. In such cases, it would be expected that similar technical studies would be necessary for an applicant to demonstrate that an intermediate disposal facility was suitable for isolation of certain above Class C LLW.

## LEGAL AND ADMINISTRATIVE PROBLEMS

The ANPR asked commenters to identify any potential legal or administrative problems in defining HLW. Many comments were directed at the options for Clause (A), and are addressed in the analysis of comments on options for classifying reprocessing waste. The approach used in the proposed rule, requiring geologic repository disposal of all above Class C LLW unless an alternative is approved, would appear to resolve most of the concerns expressed on this issue.

One particular problem which was discussed in the ANPR, and was the subject of further comment, deals with the contractual and financial arrangements for waste generators to dispose of waste in a repository. Under the NHPA, DOE has generally entered into contracts solely with reactor licensees, with fees from these licensees being used to fund waste disposal for them. By the provisions of the NHPA, any HLW generated by other licensees would be ineligible for disposal in the repository. The potential disqualification of such wastes from repository disposal is not an issue under the proposed rule, since the material would not be classified in the first instance as HLW. It would therefore be eligible for disposal in a repository and presumably would be disposed of in this manner where warranted by technical and financial considerations.



## REQUIREMENT FOR DISPOSAL OF WASTES BY SPECIFIC METHODS

The ANPR asked if the Commission should specify particular means of disposal as being required for any waste type, such as geologic repository disposal for all HLW. Many comments argued that this requirement should be adopted. Comments, particularly from the State of Washington, argued that the NWPA requires geologic repository disposal for all HLW. Other comments were against this type of requirement. Reasons cited were to encourage the development of new disposal technologies and to retain flexibility in the waste management system.

It was noted that the prime reason for defining HLW or other category of waste should be to insure that appropriate disposal methods are used.

Comments opposed to NRC specifying disposal methods for various types of waste stressed that the emphasis should be on insuring that waste types meet performance criteria, rather than overly prescriptive regulations. Also emphasized in these comments was the fear that by prescribing specified disposal methods for each type of waste, NRC would discourage the development of new technologies for waste disposal. However, one commenter did recognize that, for reasons of practicality, there probably would never be a wide enough range of disposal alternatives so that each method would be exactly suited for a certain type of waste. Thus, as a next best alternative, some wastes would have to be disposed of in facilities designed for more hazardous types of waste.

The proposed amendments to 10 CFR Part 61 are a compromise between these two views. On the one hand, a specific disposal method, by geologic repository, is required for above Class C LLW. This is in recognition of the types of facilities currently available for radioactive waste disposal. On the other hand, the proposed amendments leave open the possibility that other disposal facilities may become available which could be used for suitable above Class C LLW, subject to Commission approval. Thus, the approach proposed would not discourage the development of new technologies for waste disposal.

## WASTE DILUTION AND FRACTIONATION

Many comments were critical of the concentration based approach outlined in the ANPR. Much of the criticism focused on the possibility that under this approach waste could be diluted or fractionated to escape classification as HLW. The ANPR approach classified material as HLW if it contained certain concentrations of radionuclides having high initial radioactivity as well as certain concentrations of long lived radionuclides. Commenters were concerned that by fractionating a waste stream into components; one highly radioactive and one containing mainly long lived radionuclides, a waste stream could be classified as LLW. This would not be an appropriate classification for a waste stream which, in the absence of fractionation, would be considered HLW. A similar concern existed over the potential for dilution of a waste stream to concentrations below those for HLW.

These concerns are valid; the possibility of dilution or fractionation would be a potential problem for a concentration based system. However, there are instances where waste treatment processes would involve dilution or fractionation. These instances would be considered legitimate activities when carried out to enhance public health and safety and should not be prohibited. Neither the comments nor other sources of information cite actual instances where dilution or fractionation is a problem. As no concentration based revision to the existing system of waste classification is now being proposed, there is no need to address this issue in this rulemaking. However, if it should become a regulatory concern, action could be taken.

## COMMENTS ON ENVIRONMENTAL IMPACTS

Most letters did not identify any environmental consequences from a revision of the definition of HLW which should be addressed.

One comment related to the situation, noted in the ANPR, where additional material that may be classified as HLW under Clause (B) might not be accepted for disposal at a geologic repository because current Federal law prohibits disposal of waste generated by entities not having a waste disposal contract with DOE in a repository. The commenter suggested that the environmental consequences of having HLW not eligible for repository disposal should be considered.

Another comment advocated consideration of how a revision of the definition would affect the management of wastes at West Valley. There was also a comment focusing on similar effects at Savannah River.

EPA said that it would be necessary for the Commission to analyze what wastes would change classification as a result of the revision, and to present an assessment of the impacts of such changes and related changes in means of disposal. Other comments on this point stressed the impacts of reclassification on volumes of waste generated.

The approach outlined in the proposed rule is one which does not create any significant adverse environmental impacts. It would not result in any changes in classification of existing waste inventories. There would be no reclassification of HLW to LLW. The proposed amendments would require the disposal by geologic repository of a relatively small volume of above Class C LLW, unless an alternative has been approved by the Commission. But this waste cannot be disposed of routinely by shallow land burial under current Part 61 regulations. Thus, the proposed amendments simply specify that the "more stringent" methods of disposal required for this waste include geologic repository disposal; there is no substantial change inasmuch as it is also expressly provided that, as before, proposals for other methods of disposal may still be submitted to the Commission for approval.

MATERIAL WHICH IS EITHER HIGHLY RADIOACTIVE OR NEEDS  
PERMANENT ISOLATION SHOULD BE HLW

Many comments opposed the approach in the ANPR, which held that to be considered HLW, material must be both highly radioactive and require permanent isolation. In their view, either of these characteristics by itself should be sufficient to classify any material as HLW. Cesium 137 and Strontium 90 were cited as examples of radionuclides which had relatively short half lives, but were nonetheless extremely hazardous for a long time and required permanent isolation. One comment noted that the NWPA did not authorize the Commission to establish such a two part classification system.

The proposed rule accommodates the basic point raised here. Waste material which is either highly radioactive or long-lived, even if not classified as HLW, would have to be disposed of in a geologic repository, unless an alternative had been approved by the Commission. Requiring geologic repository disposal, or an approved alternative, of all above Class C LLW ensures that all waste not suitable for disposal by shallow land burial is safely isolated from the environment. Waste with concentrations of highly radioactive short-lived material exceeding the concentration limits for Class C LLW in Table 2 of Part 61 would be above Class C LLW and require geologic repository disposal unless an alternative was approved by the Commission.<sup>1</sup> The same requirements would hold for long-lived radionuclides in Table 1.

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1 Tables 1 and 2, giving concentration limits for determining above Class C LLW, can be found in §61.55 of 10 CFR Part 61.

CHANGING BASIS FOR CLASSIFICATION OF REPROCESSING  
WASTES FROM SOURCE TO CONCENTRATION OF WASTE

The ANPR asked for comments on the two options laid out for classifying reprocessing waste; retaining the source based definition, or using a concentration based approach.

Comments supporting the concentration based approach rested largely on the desirability of establishing a waste classification system based on risk or hazard of the waste. The source of the waste should be irrelevant, only the degree of risk or hazard it posed should be considered. Most favored a comprehensive classification system based on risk or hazard. Some comments emphasized the need for consistency between classification of wastes under Clauses (A) and (B) of the NWPA.

Some comments also noted the economic advantages of this option; there would be no need to utilize expensive repository space for wastes not needing this degree of isolation. Society could manage these wastes in a less costly manner.

Those comments favoring retention of a source based definition argued that this was consistent with past statutory usage of the term "HLW", and that Congress intended this interpretation when it passed the NWPA. Congress did not intend for NRC to interpret the term "sufficient concentrations" in Clause (A) of the NWPA. They were especially critical of using the same type of two part, concentration based approach suggested for classifying waste under Clause (B), as the basis for classifying reprocessing wastes under Clause (A).

Some comments accused NRC of attempting to set up a classification system which would allow much of the defense reprocessing wastes at Hanford and Savannah River to be classified as LLW, and escape NRC licensing. A number of comments were generally opposed to any option which would result in material presently defined as HLW to be redefined as LLW.

Some comments agreed with the additional views of Commissioner Asselstine that changing to a concentration based definition would result in problems because some material would be classified HLW under one statute but not under the NHPA.

Both views have merit. From a technical standpoint, basing the classification system on degree of risk is certainly the preferred approach. However, the issues of continuity with past usage and conformity with other existing statutes are important ones, and cannot be ignored.

In addition to concentration of waste, total risk or hazard of a waste is determined by total inventories of activity. While defense reprocessing wastes contain smaller radioactive inventories than are present in commercial spent fuel, compared to commercial LLW, total inventories of these reprocessing wastes are much larger. Furthermore, reprocessing wastes are more hazardous and longer-lived than is commercial LLW.

Keeping the classification of all reprocessing waste as HLW would mean that this interpretation of HLW under Clause (A) of the NHPA definition is consistent with past legislative treatment of HLW. Thus potential problems from conflicting statutory definitions should be minimized by this approach. Regarding defense reprocessing wastes at Hanford and Savannah River, this waste remains under NRC licensing authority granted by the Energy Reorganization Act of 1974 regardless of how it is classified for purposes of the NHPA.

Regarding comments directed at economic effects, if as is stated above, reprocessing waste requires the permanent isolation offered by a repository, then the cost of this must be incurred.

The decision to drop the approach outlined in the ANPR means that the classification of HLW will continue to be based on source, as is now the case. The possibility, held out in one option offered in the ANPR, that some reprocessing waste now considered HLW would be reclassified due to low concentrations of radionuclides, would be eliminated.

NATURALLY OCCURRING AND ACCELERATOR PRODUCED WASTE  
(NARM)

The ANPR asked if the Commission should include NARM in its analyses of waste which should be classified as HLW, even though it has no legal authority over NARM. Almost all comments supported the Commission's doing so.

The only NARM wastes likely to be candidates for geologic repository or approved alternative means of disposal are sealed sources containing radium and ion exchange resins used to remove radium from drinking water. Since comparable NRC regulated materials will not be classified as HLW under the Commission's proposed rule, the NARM wastes ought not to be so classified even if the jurisdictional limitations were not present.

## DEPARTMENT OF ENERGY COMMENTS

The Department of Energy (DOE) was concerned about the effects of inclusion of additional waste types in the HLW definition on its planning and development of a geologic repository. DOE pointed out that if waste types other than spent fuel or reprocessing waste would be sent to the repository, this would be an additional burden on its program. Firstly, the necessity to revise its HLW emplacement scheme and waste processing operations would lead to increased costs, and a new funding mechanism would have to be developed to cover costs. Secondly, putting additional waste types in the repository would affect the technical aspects of licensing and could delay the schedule for repository development. It would complicate demonstrations of the repository's performance, and could make it difficult to show compliance with the EPA HLW Standard (40 CFR 191).

The problems cited by DOE appear considerably overstated. While different waste types may have characteristics unlike spent fuel and reprocessing waste, the relatively minor amount of additional waste for which geologic repository disposal would be required unless an alternative had been approved by the Commission, and its hazard compared to spent fuel and reprocessing waste, would not have a major impact on repository performance. It is difficult to envision how this could significantly delay DOE's schedule or lead to greatly increased costs.

Regarding legal considerations, DOE disagreed with the ANPR as to NRC licensing authority over defense reprocessing wastes. In DOE's opinion waste is HLW for licensing purposes if so defined by NRC under NWPA at the time of authorization of facilities for long term storage of the waste. Thus, some of the Hanford tank wastes would not be considered HLW and subject to NRC licensing authority if, as DOE recommended, a hazard-based definition were to apply under Clause (A).

NRC continues to adhere to its position expressed in the ANPR. Its authority to license DOE HLW disposal facilities is based on the definition of HLW contained in the Energy Reorganization Act of 1974, and would not be altered by



any definition adopted under the NWPA. However, as no revision of the definition of HLW in 10 CFR Part 60 is being proposed, the proposed amendments would not involve this issue.

#### OTHER COMMENTS

Concerns were expressed that NRC's proposed approach to defining HLW would encourage reprocessing of spent fuel and thus could lead to nuclear proliferation. This concern seems unwarranted as there would be no change in current requirements for the disposal of spent fuel in geologic repositories.

A commenter suggested that the definition of HLW apply only to materials that have been declared to be waste and to waste materials that are in the form intended for final disposal. This comment is mooted, since under the proposed rule the only material classified at present as HLW is reprocessing waste ( which is HLW from the time of reprocessing ).

DOE was concerned that irradiated fuel assemblies intended for re-insertion into the reactor would be considered waste, and recommended that spent fuel be categorized separately from HLW, as is done in the NWPA. There does not appear to be such a need, and this suggestion has not been followed in the proposed rule.

Another commenter noted that spent fuel should be considered synonymously with HLW in terms of concentration limits. This would not be appropriate since the NWPA treats all spent nuclear fuel as a single class of material without regard to concentration.

There were several comments which questioned the States' capability for safely managing some LLW, with the implication being that it should be a Federal responsibility. This alleged lack of capability on the part of States is not obvious, and the issue of Federal/State responsibility for managing radioactive waste was resolved by the Low Level Waste Policy Amendments Act of 1985. As was stated in the ANPR, it is not directly affected by this rulemaking.

Several comments generally stressed the need to base the definition on risk or hazard, although specific classification limits were not suggested. As stated

elsewhere in this analysis, this is theoretically optimal, but practical problems limit its applicability.

There was a comment that every effort should be made to reconcile the definitions of HLW in various statutes and any proposed NRC definition. The avoidance of conflicting or ambiguous definitions of HLW is certainly a worthy objective and is one reason no change in the Part 60 definitions are being made. However, there is nothing that can be done through the present rulemaking to reconcile the language of past legislation.

The need to avoid leaving categories of waste undefined was pointed out by several commenters. If some material fell between HLW and LLW classifications, it should be addressed. The proposed rule would not leave open an undefined class of waste.