



UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON NUCLEAR WASTE
WASHINGTON, D.C. 20555

Vol. 6

(26)

RC
RG
PK
KSD
tucg

September 27, 1990

MEMORANDUM FOR: Margaret Federline, Senior Policy
Advisor (OCM/KC)

R. Fraley for

FROM: R. F. Fraley, ACRS/ACNW

SUBJECT: ACNW RESPONSE TO EPA (R. J. GUIMOND) QUESTIONS
REGARDING THE EPA STANDARDS FOR HLW DISPOSAL

Attached, in accordance with Chairman Carr's suggestion, is a copy of the proposed reply to the questions from EPA regarding the ACNW comments and recommendations in the Committee's May 1, 1990 report. A copy of the incoming questions from EPA is also attached.

This reply was prepared by the ACNW during its meeting on September 19-20, 1990.

Please let me know as soon as practicable what the next step should be.

Attachments:

1. Proposed ACNW letter to EPA (R. Guimond)
request of August 6, 1990
2. Letter from EPA (R. J. Guimond) to Dade W.
Moeller, ACNW, dated August 6, 1990

CC:
OCM/KR
OCM/JC
OCM/FJR

1990 SEP 28 AM 10:51

RECEIVED

9401050059 931116
PDR COMMS NRCC
CORRESPONDENCE PDR



UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON NUCLEAR WASTE
WASHINGTON, D.C. 20555

Mr. Richard J. Guimond
Assistant Surgeon General, U.S. Public Health Service
Director, Office of Radiation Programs
U.S. Environmental Protection Agency
Washington, D.C. 20460

Dear Mr. Guimond:

We were pleased to receive your letter of August 6, 1990, as well as your telephone call of the same date, indicating a desire to work with this Committee in resolving certain issues related to the Environmental Protection Agency (EPA) standards for the disposal of high-level radioactive wastes in a geologic repository. In response to your questions pertaining to the letter of May 1, 1990, submitted by this Committee to Chairman Kenneth M. Carr, U.S. Nuclear Regulatory Commission (NRC), we offer the following comments. They correspond to the items as enumerated in your letter.

1. We believe that the EPA standards can be interpreted as being organized in a hierarchical structure. This is based on the assumption that the highest level expression in your hierarchy is a qualitative goal, that is, that the risks to future generations over the first 10,000 years due to the disposal of high-level radioactive wastes in a repository should be no greater than "the risks that would have existed if the uranium ore had not been mined" We note, however, that this statement is not included in the standards, nor is it identified as the highest level goal. The statement is included only in the "Summary" and the "Supplementary Information" that accompanies the original standards as published in the Federal Register.

What we interpret as the next level, which is quantitative and is a part of the standards, is the statement that there should be no more than 1,000 premature deaths over the first 10,000 years which are attributable to placement in a repository of the high-level wastes from 100,000 metric tons of reactor fuel. We fail, however, to see the connection or comparability between this statement and what we interpret as the highest level goal. We also fail to see the quantitative relationship between this requirement and the limits on the releases of specific radionuclides from a disposal facility which are probabilistic and serve as what we interpret to be the third level in the hierarchy.

Our concern with your apparent hierarchical structure is that the lower level quantitative statements (or standards) appear to be more stringent than the highest level qualitative statement. To assist us in better understanding the approach you have taken, it would be helpful if your staff could (1) state whether we have correctly interpreted the hierarchical structure of your standards, and (2) provide us with the rationale and, indeed, the calculations and assessments that served as a basis for developing the lower level quantitative standards. With respect to the latter request, we note that certain changes have occurred that may impact upon the validity of your earlier calculations. These changes include: (a) analyses of "real" repository sites have shown them to be more complicated than your staff may have assumed for the hypothetical site used in your analyses, (b) the potential impact of indoor radon, which was only generally recognized subsequent to your original assessment, may need to be factored into your risk evaluations, and (c) major advances in environmental modelling techniques over the last few years.

2. (a) We concur with your assumption that a disturbance can occur at any time during the initial 10,000-year period. In recognition of this fact, you have specified the radionuclide release limits in your standards in a manner so that it does not make any difference whether the entire release occurs within a single year or is spread out over time. We do not concur, however, that this makes it difficult to apply annual risk limits under these types of circumstances.

The principal basis for our position is the guidance provided by the International Commission on Radiological Protection (ICRP) in its Publication 46. In this report, the ICRP recommends that the risks from releases from the undisturbed performance of a waste repository be controlled through the application of annual dose limits. The ICRP further recommends that the risks from releases accompanying the disturbed state (classified as "probabilistic events") be limited on a similar basis, that is, through the application of annual risk limits. In both cases, the limits would apply to the critical population group.

If you maintain your position that application of an annual risk limit to releases occurring during the disturbed state is not workable, an alternative approach would be to apply some form of "accident or event" risk limit to these types of occurrences. This would be comparable to the approach being used in safety assessments of nuclear power plants where annual dose limits are applied for the control of radionuclide releases associated with routine operations and (single-event) risk limits are applied to releases occurring as a result of accident situations.

In making these suggestions, we clearly recognize that there are definite limitations in comparing the standards and approaches used in the regulation of a nuclear power plant to those needed for a high-level radioactive waste repository. Nonetheless, where the transfer of knowledge and experience from one type of nuclear facility to another can be beneficial, such analogies should be encouraged.

(b) We agree that the licensing organization should have the authority for defining the critical population group.

Having stated this, however, we also believe that it would be helpful if the EPA staff could identify and justify the critical population group assumed to be exposed in setting what we have referred to as your intermediate level goal. If we interpret the situation correctly, such information would permit estimation of the average annual risk (dose) limit that corresponds to this goal. In a similar manner, we would appreciate knowing the critical population group that was assumed in calculating the probabilistic radionuclide release limits specified in Table 1 of your standards.

Another item of information that would be helpful would be to know how the collective doses associated with the establishment of these radionuclide releases were calculated. To be specific, was a cutoff used, as was suggested by the ICRP in its Publication 46 and as has more recently been suggested by the National Council on Radiation Protection and Measurements in its Report No. 91, or was the full range of dose rates included in making these estimates?

Please note that our interest in being able to define a critical population group and to estimate this group's associated permissible dose rates is in line with our understanding of the guidelines recommended by the ICRP and by radiation protection authorities in other countries of the world for high-level waste repositories. We believe the guidance provided by these groups is sound and represents a satisfactory basis on which to judge the acceptability of the health risks associated with radioactive waste disposal facilities.

3. In recommending that a disposal facility be addressed as a system, we reaffirm our position that a properly organized system requires a consistent hierarchical structure. The application of remedial actions beyond retrievability of the emplaced waste is an integral part of such a system.

4. (a) We concur with your statement that "what is really important is the total anticipated impact of repository performance." The reason that we called for specific attention to human intrusion is that preliminary performance assessments for the WIPP facility have shown that this concern is the dominant contributor to the risks to the public. We have no data that show the same

situation is valid for the proposed Yucca Mountain repository, but it is possible that this will prove to be true. In fact, the EPA staff may have foreseen this situation when it included in the standards the statement that "... it is possible to conceive of intrusions (involving widespread societal loss of knowledge regarding radioactive wastes) that could result in major disruptions that no reasonable repository selection or design precautions could alleviate." We are aware that your standards state that "The Agency believes that the most productive consideration of inadvertent intrusion concerns those realistic possibilities that may be usefully mitigated by repository design, site selection, or use of passive controls . . .," but what constitutes realistic possibilities is open to multiple interpretations.

Again, what we are suggesting is directly comparable to the approach being used in the regulation and assessment of the public health risks from nuclear power plants. For a waste facility, the undisturbed state would correspond to a nuclear power plant during normal operations, and the disturbed state would correspond to a plant in which an accident has occurred. In the case of risk assessments for nuclear plants, it was found that the difficulties and uncertainties in addressing certain types of accidents were so large that the approach that has been adopted is to analyze their contributions separately. In these cases, estimates of the associated risks are based on the best judgments of expert groups. We believe a similar approach (i.e., using expert judgment) is almost essential and would be appropriate for assessing the potential impact of human intrusion on the performance of a waste repository.

(b) The basis for our comments on borehole sealing was that, if we assume (as you indicate in the guidance provided in Appendix B of your standards) that exploratory procedures will be "adequate for the intruders to soon detect, or be warned of, the incompatibility of the area with their activities," then the need for a carefully sealed borehole would be recognized quickly and action would be taken to ensure that proper corrective measures were taken. Your consideration of removing this requirement from the standards is welcomed. We concur.

(c) Our statement calling for "more realistic assessments" of the potential impacts of human intrusion at the proposed Yucca Mountain site was based in part on the guidance provided in Appendix B of the current EPA standards, which states that a borehole will create "a ground water flow path with a permeability typical of a borehole filled by soil or gravel that would normally settle into an open hole over time -- not the permeability of a carefully sealed borehole." Under these constraints, we believe it might be difficult to demonstrate compliance of any facility with the EPA standards. We are pleased to learn that the licensing authority (NRC) will make the

determination as to the appropriate realism for assessments regarding human intrusion.

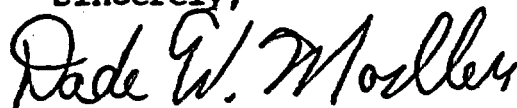
At the same time, however, we remain concerned with this approach. The guidance in Appendix B to the EPA standards includes detailed discussions of borehole seals and human intrusion. As a result, we believe that your Agency has preempted the definition of reasonable approaches in assessing these matters. Any deviation by the licensing authority from your guidance will almost certainly be viewed by the public as an exception to the standards.

(d) We appreciate the comments provided in your letter related to the role of passive controls, such as markers and records, in reducing the likelihood of human intrusion. We also concur with the statement in Appendix B of the EPA standards that "... passive institutional controls can never be assumed to eliminate the chance of inadvertent and intermittent human intrusion into ..." waste disposal sites. We concur that it is the role of the implementing agency to determine the degree to which these factors should be considered to control human intrusion.

5. The ACNW understands the need to include probabilistic requirements in the EPA standards. We believe it is important to recognize that (a) the probabilistic requirements in your standards apply only to the lowest set of goals in your hierarchy, and (b) contrary to what is practiced in comparable situations (e.g., the NRC safety goals for nuclear power plants), your requirements include a risk aversion factor. What we believe needs to be explicitly stated is that the probabilistic approach can be an important factor in regulating a waste disposal facility, but it should not be the sole basis for decisionmaking. Equal or greater weight can and should be placed on the development and application of deterministic requirements and, when necessary, the use of expert judgment. We are pleased to note that your staff is using a deterministic approach in developing requirements for the control of doses to the public due to the contamination of drinking water as a result of radionuclide releases from a waste facility.

We thank you for your thoughtful and constructive letter. As soon as you and your staff have had an opportunity to review our responses to your questions, we would welcome your reply and an opportunity to meet and discuss these matters with you in additional detail.

Sincerely,

A handwritten signature in dark ink, reading "Dade W. Moeller". The signature is written in a cursive, flowing style with a large, prominent "D" and "M".

Dade W. Moeller
Chairman



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

AUG 6 1975

OFFICE OF
AIR AND RADIATION

Dade W. Moeller, Chairman
Advisory Committee on Nuclear Waste
Nuclear Regulatory Commission
Washington, DC 20555

Dear Dr. Moeller:

We have reviewed the critique of the Advisory Committee on Nuclear Waste regarding the Environmental Protection Agency's (EPA) standard for disposal of high-level waste provided for the Nuclear Regulatory Commission (NRC) in your May 1, 1990 letter to Chairman Carr. We have comments and questions about your critique of 40 CFR Part 191. Our comments correspond to the same numbers as the five key problems listed in your letter.

1. Your letter states that all standards should be organized in a hierarchical structure. Do you believe that the EPA standard does not have such a structure and that this is a problem, or do you believe that the EPA standard does have such a structure, but with lower levels of the hierarchy more stringent than higher levels? We would appreciate some more specific, explicit comments, with examples.

2. (a) It is unclear how to use "annual risk limits from a disposal facility in a disturbed state," with a probabilistic standard. The disturbance can occur any time during the 10,000-year period. How would annual limits apply? Since our containment requirements are limits on releases, not individual risk, it does not make any difference whether the entire release occurs in a single year or is spread out over time. This also avoids the difficult predictive modeling that would be involved with individual dose which would have to include time, location, and pathway of release. For undisturbed performance, we already use annual risk limits.

(b) The critical population group (CPG) in the case of individual dose limits is left for definition by the agency responsible for implementation, i.e., NRC for a HLW repository. This is appropriate since site specific circumstances should be considered.

944/05/156

5

3. We believe that we have addressed the disposal facility as a system. Examples of any instances where we have not done this would be appreciated.

4. (a) The thrust of this comment appears to be that it is important to make reasonable assumptions when conducting assessments to determine compliance with the standard. We agree. However, this comment does not logically lead to your call for separating the evaluation of anticipated performance into three parts. What would this accomplish? In particular, it is unclear why the analysis of human intrusion scenarios would benefit from the requirements for human intrusion being written in a separate section of the rule. Indeed, such a separation might needlessly complicate the regulation because what is really important is the total anticipated impact of repository performance.

(b) The responsible regulator is free to allow any probability mitigating assumption on borehole sealing or other engineering assumptions that can be adequately justified either by the regulator or by the facility developers. It was EPA's intent in the guidance to state a maximum value as a worst case that may have to be considered. Based on uncertainties about the long-term performance of borehole seals, as well as the chance of undetected boreholes, the assumption about the borehole permeability was intended as a conservative assumption, based on past and current borehole practice. If this is troublesome, we will consider removing it and rely entirely on the developers' and regulators' justifications, without any guidance for the worst case that may need to be considered.

(c) We need clarification as to your statement "We also believe that more realistic assessments should be made of the potential impacts of human intrusions..." At this point, EPA has not made any performance assessments that fail due to intrusion. In the licensing case, NRC will make the determination as to the appropriate realism for assessments.

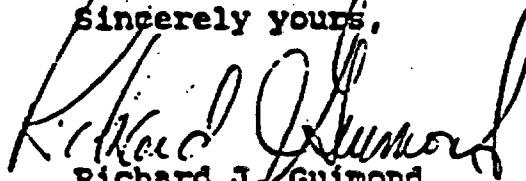
(d) Passive controls, such as markers and records, can be given credit by the implementing agency to reduce the likelihood of human intrusion. The degree to which these factors can be considered to control human intrusion are to be determined by the implementing agency.

5. We agree that compliance with EPA standards is only one of several inputs to the decision of whether to use a particular site as a repository. However, this comment is very unclear as to what you are suggesting EPA do. Are you suggesting that EPA should not include probabilistic requirements in its standards?

if so, we disagree. Are you suggesting that we should also have non-quantitative requirements? We have our qualitative assurance requirements, however, these are not applicable to NRC facilities. What specifically does ACNW have in mind?

We would appreciate your clarifying comments and responses to the above remarks as soon as possible. Please call Floyd Galpin at (202) 475-9633 if you have any questions.

Sincerely yours,

A handwritten signature in dark ink, appearing to read "Richard J. Guimond", written in a cursive style.

Richard J. Guimond
Assistant Surgeon General, USPHS
Director, Office of Radiation Programs