To: Dan Fehringer

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

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OFFICE OF
AIR AND RADIATION

Dr. Frank L. Parker
Chairman
Board on Radioactive Waste Management
National Research Council
2101 Constitution Avenue, N.W. HA462
Washington, DC 20418

Dear Dr. Parker:

Earlier this year the National Research Council's Board on Radioactive Waste Management issued a paper entitled "Rethinking High-Level Radioactive Waste Disposal". This paper and the Board's more recent Symposium on Radioactive Waste Repository Licensing have certainly provoked a very thoughtful discussion of the problems associated with nuclear waste disposal.

In the spirit of contributing to this important discussion, we are writing with comments on several of the paper's points relevant to the Environmental Protection Agency (EPA) nuclear waste disposal regulations (40 CFR 191). We offer specific comments on the following: 1) the needed for a quantitative disposal standard established early on in the process; 2) EPA's efforts to build flexibility into our quantitative standard; 3) the value of iterative performance assessment; and 4) individual dose requirements versus total release requirements. We would certainly be interested in any response or reaction the Board may have to our comments.

Sincerely yours,

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

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U.S. Environmental Protection Agency
Office of Radiation Programs (ORP)
Comments on
NAS/BRWM "Rethinking High-Level Radioactive Waste Disposal"

Need for a Quantitative Disposal Standard

In 1955 the National Research Council recommended the strategy of isolating radioactive waste in stable geological formations deep underground. That approach to waste disposal is now being pursued in the United States and throughout much of the world. The idea is to emplace waste deep underground in specially engineered facilities where a combination of man-made and natural geologic barriers will ensure isolation of the radioactive materials.

Difficult and as fraught with uncertainties as it may be, assessing the long-term performance of geologic repositories against a set of pre-assigned criteria is essential, and it is essential that it be done early in the process. Geologic isolation of waste in repositories demands a very high degree of advance assurance that radioactive releases will be sufficiently small because, unlike surface storage facilities where problems can be readily perceived and attenuated, monitoring and remedial actions at a repository over thousands of year will probably not be possible. Prudence dictates that some attempt at predicting the long-term likelihood of success be made before investing substantial time and resources into any given site. Results of early predictions should not indicate a likelihood of encountering fatal flaws.

Furthermore, there is a justifiable public demand for a quantitative "yardstick" against which to measure the suitability of facilities and a public demand for a role in determining what that "yardstick" should look like. Without quantitative standards in place that have been promulgated through an open, public process, nuclear waste disposal decisions are likely to be highly suspect in the public eye and, therefore, more likely to be subject to uncertain licensing actions and subsequent litigation.

In response to suggestions received from the U.S. Nuclear Waste Technical Review Board and others and because public participation is so important in any rulemaking process, the Office of Radiation Programs is exploring the feasibility of conducting a negotiated rulemaking on 40 CFR 191. Such a process would involve a variety of constituencies--or "stakeholders"--in an attempt to arrive at a consensus on which to base a Notice of Proposed Rulemaking (NPRM). The first step will be to ascertain the willingness of stakeholders to participate.

Need for Flexibility in Any Quantitative Standard

To be sure, developing a regulatory framework for judging the suitability of nuclear waste disposal systems is a difficult undertaking because of the uncertainties associated with making long-term performance predictions. The Board correctly points out that, under these circumstances, regulators may err and issue regulations that are more restrictive than necessary or, in a worse case, so restrictive as to actually preclude development of suitable disposal systems.

To guard against this possibility and to accommodate for the uncertainties, the Agency went to considerable lengths to build flexibility into both the content of our 1985 disposal standard and its associated guidance for implementation. For instance, EPA:

1) Developed a technically-based standard. That is, as a basis for setting the appropriate level of protection, we examined what reasonably well-sited and designed repositories could accomplish. Our generic analyses indicated that disposal of waste from 100,000 metric tons of reactor fuel would cause a population risk ranging from no more than about 10 to a little more than 100 premature deaths over a 10,000-year period. To compensate for uncertainties in our generic repository models, we ultimately chose a level of protection significantly less stringent--1,000 deaths over 10,000 years. In addition and in response to concerns raised by EPA's Science Advisory Board about undue conservatism in our repository risk analyses, the Agency increased many of the radionuclide release limits. In response to concerns raised about the difficulty of predicting disruptive events over long time frames, the Agency relaxed the probabilistic release criteria by a factor of ten from those in the proposed rule.

2) Included qualitative assurance requirements. Requirements for active and passive institutional controls, monitoring, and engineered and natural barriers were specifically added to address and compensate for the uncertainties that necessarily accompany plans to isolate radioactive waste from the environment for a very long time.

3) Added specific language to emphasize that unequivocal proof of compliance is not needed. To quote directly from the rule: "Performance assessments need not provide complete assurance that the requirements of 191.13(a) [the containment requirements] will be met. Because of the long time period involved and the nature

of the events and processes of interest, there will inevitably be substantial uncertainties in projecting disposal system performance. Proof of the future performance of a disposal system is not to be had in the ordinary sense of the word in situations that deal with much shorter time frames. Instead, what is required is a reasonable expectation, on the basis of the record before the implementing agency, that compliance with 191.13(a) will be achieved."

4) Added "Guidance for Implementation" to the rule. It describes the Agency's intentions regarding performance assessments and uncertainties, underscores the importance of qualitative judgment in making predictions, and is designed to discourage overly restrictive or inappropriate implementation of the containment requirements.

The Agency will continue to make every effort to 1) develop a satisfactory regulatory framework for controlling releases from disposal systems while 2) allowing the implementing agencies sufficient flexibility to handle specific uncertainties that are likely to be encountered. We plan to carefully consider all suggestions for improvement as we proceed with repromulgation of 40 CFR 191.

Importance of Iterative Performance Assessment

We wholeheartedly endorse the Board's view of the importance of iterative performance assessment. Properly applied throughout the process of siting and developing disposal systems, iterative performance assessment can greatly reduce the likelihood of unplanned releases or unexpectedly poor performance.

By definition, performance assessment is a means of (1) identifying the processes and events that might affect a given disposal system; (2) examining the effects of those processes and events on the performance of the disposal system; and (3) estimating the cumulative releases of radionuclides caused by all significant processes and events. We believe performance assessment can and should be used as a tool throughout the entire process of siting, developing, and operating disposal systems. Performance assessment can help to steer the siting of repositories away from unsuitable locations, can help to identify where more information about a specific location is needed, and can be used to periodically confirm that a system is performing as expected. New information should be continuously integrated and models continuously updated to improve the reliability of and confidence in the performance assessments.

The Board is certainly correct in stating, "Judgments of whether enough is known to proceed with placement of waste in a repository will be needed throughout the life of the project." Ideally, implementing agencies will use performance assessment techniques, even if only in a simplified form, early in any repository development process (i.e. well before any radioactive waste is emplaced in the facility), and then continue to collect data and periodically reexamine long-term predictions of performance throughout the operational life of a facility. We are considering adding language to this effect to 40 CFR 191.

Release Limits vs. Individual Dose Limits

The 40 CFR 191 disposal standard promulgated in 1985 contained both a limitation on doses to individuals and limitations on releases of radionuclides to the accessible environment. In "Rethinking", the Board recommends that EPA consider dropping its release limits in favor of dose limits.

When we began the standard-setting effort in 1978, our initial inclination was to use individual dose since that was how radiation standards had always been set. However, we identified some potential problems with relying solely on individual dose criteria.

First, it could encourage disposal methods designed to enhance dilution of any wastes released. Disposal sites could be deliberately sited near bodies of surface water or large sources of ground water. Doses to individuals would be low as a result, but overall population exposures would increase.

Second, disposal systems have to isolate radioactive waste for much longer time spans than institutional controls can be guaranteed to be effective. Any individual exposure limit could only be applied at some distance from a repository, or it would have to ignore the risks from unplanned events such as inadvertent intrusion. This is because individuals who fail to understand passive warnings and penetrate directly into or close to a disposal system (through exploratory drilling for water or mineral resources, for example) could receive very large exposures.

Lastly, the disposal standards have to be applied through analytical performance projections--implementing such standards through environmental monitoring and potential remedial actions over thousands of years is not a credible approach. When we compared the analyses needed for compliance with exposure limits to the analyses needed for compliance with release limits, we found that release limits are likely to be easier to implement

than exposure limits. Predicting environmental releases avoids the need to make uncertain predictions of pathways and living patterns that is associated with predicting individual doses. The Nuclear Regulatory Commission, which is responsible for applying our standards for high-level waste disposal, made a similar evaluation. We note, too, that this was an issue discussed at a recent international meeting in Paris, France sponsored by the Organization for Economic Cooperation and Development's Nuclear Energy Agency. There was a concern expressed there about the possible difficulty of demonstrating compliance with a probabilistic individual dose standard.

For these reasons the proposed rule issued in 1982 did not contain any numerical restrictions on potential individual doses after disposal. However, after receiving many recommendations in favor of incorporating individual dose limits, the Agency decided the best approach would be to add individual dose criteria rather than replace the proposed containment requirements.

In light of comments received from the Board and others in favor of replacing release limits with individual dose limits, we are re-thinking this issue and are exploring the possibility of proposing a probabilistic individual dose option for comment.