

BACKGROUND ON 40 CFR PART 197
ENVIRONMENTAL RADIATION PROTECTION STANDARDS
FOR YUCCA MOUNTAIN

by

Raymond L. Clark
Captain, U.S. Public Health Service
Office of Radiation and Indoor Air (6602J)
U.S. Environmental Protection Agency
Washington, D.C. 20460-0001
202-233-9198

ABSTRACT

The *Energy Policy Act of 1992* (EnPA) directed the Environmental Protection Agency (EPA) to set "public health and safety standards for protection of the public from releases from radioactive materials stored or disposed of in the repository at the Yucca Mountain site." It also directed EPA to contract with the National Academy of Sciences (NAS) to "conduct a study to provide [to EPA]...findings and recommendations on reasonable standards for protection of the public health and safety...."

The Agency received the NAS Report, entitled *Technical Bases for Yucca Mountain Standards*, on August 1, 1995. The report provided many findings and recommendations for the technical issues involved in the rulemaking and clear separation of policy issues from technical issues.

Upon receipt of the NAS Report, the Agency began preparation of the proposed standards. This included holding public meetings, a comment period on the NAS Report, establishing official dockets and an information file, establishing several means of electronic communication, and meeting with many stakeholders. Comments on the NAS Report have been compiled and are being considered as the Agency proceeds. Selected comments are discussed in detail.

The National importance of this project has brought about extensive discussions within the Agency. It is currently planned to propose the standards this Spring.

HISTORY

In 1985, EPA issued Part 191 of Title 40 of the *Code of Federal Regulations* (40 CFR Part 191), *Environmental Radiation Protection Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes* (1). These standards were issued under the authority of the *Atomic Energy Act of 1954*, as amended (2), and Reorganization Plan No. 3 of 1970 (3). The standards are generic and apply to most facilities for the management, storage, and disposal of the named types of waste. The Nuclear Regulatory Commission (NRC) must adopt these standards into their licensing regulations and the Department of Energy (DOE) must follow these standards for their disposal facilities. The disposal portion of Part 191 was remanded by a Federal court in 1987. The Agency pursued the reestablishment of the disposal standards until October 1992.

At that time, two Federal laws were enacted. First was the *Waste Isolation Pilot Plant Land Withdrawal Act of 1992*. (4) It reinstated most of the disposal standards in Part 191. However, it also indirectly exempted Yucca Mountain from Part 191.

The second law enacted was the EnPA. (5) Section 801(a)(1) of the act directs the Agency to establish standards for Yucca Mountain:

". . . the Administrator [of EPA] shall, based upon and consistent with the findings and recommendations of the National Academy of Sciences [NAS], promulgate, by rule, public health and safety standards for protection of the public from releases from radioactive materials stored or disposed of in the repository at the Yucca Mountain site."

There were two requirements given for the contents of the Yucca Mountain standards. One, as stated in the preceding quote, was that the standards be "based upon and consistent with the findings and

recommendations of the National Academy of Sciences." The second was that the standards "shall prescribe the maximum annual effective dose equivalent to individual members of the public"

The passage of the EnPA was the beginning of a new EPA rulemaking titled, *Environmental Radiation Protection Standards for Yucca Mountain, Nevada*. A new part of the CFR will also be created, i.e., 40 CFR Part 197.

In compliance with section 801(1)(a) of the EnPA, the contract between EPA and NAS was signed in February 1993. Shortly thereafter, the NAS established the Committee on Technical Bases for Yucca Mountain Standards which was administered by the Board on Radioactive Waste Management of the NAS. The Academy released its report ("NAS Report") on August 1, 1995.

SELECTED COMMENTS RECEIVED

A comment period was opened by the Agency to receive comments regarding the NAS Report. Approximately 65 written responses were received from private citizens and organizations in 18 States and the District of Columbia. The Agency believes that it is instructive to provide a cross-section of the issues and comments which were expressed. The choice of comments to be presented is intended and thought to be representative of the segments of the population who commented and their most significant concerns. However, this is a subjective process and is not inclusive of all comments. Also, since these are abstracts of the comments, they reflect the author's interpretation. Inclusion or non-inclusion of comments or issues should not be interpreted as necessarily representing the Agency's position or subjects of consideration.

Compliance Period

This issue is the time which performance analyses will need to address. The NAS suggested that, from a technical perspective, this time should be as long as the geologic regime around Yucca Mountain is relatively stable and its behavior is boundable; their estimate was about one million years.

There were generally three areas of opinion on this issue. One group generally preferred the conservatism and the idea that such a projection would cover the time during which the wastes remain hazardous; however, most recognized that uncertainty is a difficult issue. The second group believed that the uncertainties inherent in projections over such a long time frame would make the results meaningless and advocated a shorter period. And, the third group suggested alternative approaches.

In the first group was the Nuclear Information and Resource Service (a public interest group), the Institute for Energy and Environmental Research (IEER), and the Sierra Club. In the second group were Clark County, Nevada (the county contiguous with Nye County - the host county for Yucca Mountain - which encompasses Las Vegas, the nearest major city to Yucca Mountain) however, this County also mentioned that a period longer than 10,000 years may be appropriate to reflect characteristics of some of the waste; and DOE which advocated 10,000 years. The Nuclear Energy Institute (NEI, an organization representing the nuclear power industry on policy matters) suggested 1,000 to 10,000 years for the quantitative analysis and that assessments beyond 1,000 years be used for only qualitative insight. In the third group, the preliminary position of Nye County, Nevada, was that many parties would doubt the feasibility of such a period because of the uncertainty involved. However, it does provide conservatism. Therefore, the County preferred that the NAS-suggested period not be rejected immediately but that it be carefully considered following the collection of other opinions. Also in the third group was the Nuclear Waste Technical Review Board (NWTRB, a Presidentially appointed panel whose mission is to evaluate the scientific and technical validity of activities undertaken by DOE in its management and disposal program for spent nuclear fuel and some defense high-level radioactive waste) which felt that if a period longer than 10,000 years was used that the standards should explicitly accommodate the increasing uncertainty associated increasing time.

Form of the Standard

The NAS recommended use of an individual-protection standard written in the form of an annual upper limit on the risk of developing a fatal cancer. The other consideration was setting the limit in terms of an annual dose rate.

Those agreeing with the use of a standard based on risk most often cited easier public understanding as the reason for their preference. This group included Nye County and DOE. Clark County implied support of the risk basis and Inyo County, California (another county which is contiguous with Nye County and is thought to be a discharge area for some of the ground water flowing under Yucca Mountain) supported the risk-based standard but

did so relative to radionuclide release limits and or a population-dose limit rather than a dose-based limit. On the other side was the National Resources Defense Council (NRDC) which cited legal drawbacks to this approach which outweigh the better understanding by the public and that a risk-based standard is as subject to change as a dose-based standard; a group of about 35 responses on a form letter (the form-letter group) which implied support for a dose limit; and NEI which referred to international and national recommendations, Federal radiation-protection policy, and EnPA all of which cite dose as the basis for limits. The Sierra Club spoke of setting dose limits as well as radionuclide-release limits and population-dose limits.

Level of the Individual-Protection Standard

The NAS stated that setting the level of risk is a societal decision, not a matter of technical judgment, and that it should be established through an EPA rulemaking. However, they did suggest a starting point for discussion, an annual risk of 10-6 to 10-5 of an individual developing a fatal cancer.

In this case, Clark County stated that the level of risk should fall within the range of involuntary risks to which the public is exposed. Two groups, the Nuclear Information and Resource Service (NIRS) and the Sierra Club, favored zero or as close to zero as can be achieved unless the exposure is fully disclosed and voluntarily accepted by the exposed individual. The DOE thought that societies less advanced than today's might not be able to access contaminated water or, if they could, there would be other health risks that would overwhelm risks from the repository. However, more advanced societies would likely detect contamination and mitigate them - to assume otherwise is extremely conservative. The DOE suggested that the risk range start in the 10-5 to 10-4 range rather than the range suggested by NAS. Nye County believes that there is no policy justification for an annual risk higher than 10-6.

Human Intrusion

The NAS found that there is no scientific method to predict either the frequency or method of future human intrusion into the repository. However, they also stated that an acceptable repository should still be able to acceptably perform following an intrusion. The NAS recommended that EPA assume that an intrusion occurs in the future under a scenario to be determined by the Agency and that the impact of that intrusion be assessed and compared to the individual-risk level.

Three groups, NWTRB, DOE, and NEI disagreed with the NAS recommendation and suggested, for differing reasons, that qualitative rather than quantitative requirements be included in the standards. The NWTRB believes that NRC regulations already have a number of provisions related to the issue and that any NAS-type analysis should be used only for qualitative insight purposes. The DOE stated that, it is obvious that the 'intruded' case will be limiting given a comparison between intruded and non-intruded scenarios and, therefore, this is the only evaluation that will matter. The DOE recommends that human intrusion be addressed through qualitative design requirements and passive institutional controls or, if a qualitative scenario must be used, it should be specified in the standards. The NEI believes that if human intrusion is addressed, it is more appropriate for NRC to consider as part of the compliance demonstration than it is to be part of the EPA standards and, further, that it be used only for qualitative insight into the robustness of the repository. However, on the other side, Nye County supported the NAS recommendation.

Negligible Incremental Risk (NIR)

The NAS determined, based upon the calculation of the average global individual, that some doses are so small that they could be considered negligible and not further included in the licensing of the disposal system.

Most commenters rejected the NIR concept. The organizations NIRS, IEER, NRDC, and the form-letter group unconditionally rejected it. The State of Nevada believes that population-dose limits should be in the standards and implied that NIR should be rejected. On the other hand, NWTRB and DOE strongly supported the suggestion.

Critical Group

The NAS recommended use of the critical-group method. The critical-group method is a way used to calculate individual doses but which is less conservative than using the maximally exposed individual since it determines the average dose within the most-exposed group in the general population rather than addressing just the maximally exposed individual. The NAS suggested two possible methods of designating the critical group. One uses a probabilistic determination of the critical group while the other uses a subsistence farmer as a

representative of the critical group.

The DOE rejected the probabilistic approach and stated a preference for the subsistence farmer approach or something between the two approaches. They urged that worst-case assumptions not be lumped on top of one another. They also believe that this would protect the general population. In direct contrast, NWTRB fully supports the probabilistic method saying that the other method is too conservative.

The Sierra Club rejected the probabilistic method with a preference for the subsistence- farmer method. The State of Nevada and Inyo County also prefer the subsistence-farmer approach. However, Inyo County believes that possibly there are other scenarios which could present a greater risk. Nye County endorsed the critical-group method but did not specify a preferred option. This county also thought that this approach would protect the general population, as well. Clark County did not specify which method they preferred but urged that extreme and unrealistic scenarios be avoided. The IEER stated that EPA should consider both methods.

The form-letter group completely rejected the critical-group concept and insisted that the maximally exposed-individual method be used; they also do not believe that only an individual-protection standard will adequately protect future generations. The NEI believes that the authority for specifying exposure scenarios should be carried out by the NRC, not EPA, and, therefore, declined to provide comments.

Separate Requirements for the Protection of Ground Water

In its report, the NAS recognized that EPA had previously set radiation protection standards within which are separate requirements to protect ground water as a resource. In their report, they made no recommendations regarding resource protection but instead stated that they limited their recommendations to limit risks to individuals.

The DOE opposes inclusion of separate ground-water protection requirements based upon the belief that the individual-protection standard will provide sufficient protection. They also note that the generic requirements under the Safe Drinking Water Act were established for treated tap water not for untreated ground water. On the other side, IEER supports the protection of ground water as a resource and urges EPA to include separate requirements.

RULEMAKING PROCESS

Shortly after release of the NAS Report, the Agency held public meetings regarding the NAS Report and EPA's role in the Federal high-level waste (HLW) and spent nuclear fuel (SNF) management and disposal program. The meetings were held in Amargosa Valley and Las Vegas, Nevada, and Washington, D.C. Dockets containing publicly available documents regarding the rulemaking were also established in Las Vegas and Washington, D.C. and an information file is maintained in Amargosa Valley. There is also a home page on the World Wide Web at <http://www.epa.gov/radiation/yucca/index.html> and a 24-hour, toll-free recording at 1-800-331-9477.

The Agency then began deliberations which involved representatives from offices across the Agency. When the participating offices approve of the rulemaking package, the package will be sent to the Office of Management and Budget (OMB) for review. This review is intended to examine cost implications of the rulemaking and to coordinate the Executive Branch position. The OMB review is statutorily limited to a 90-day review period but it can take less time.

Once OMB clearance has been received, the Agency will publish the proposed standards in the *Federal Register* for the purpose of receiving public comments. Typically, it is during this public-comment period that public hearings are held. This provides two fora in which the Agency will receive public input on the proposed standards.

The public comments will be considered together with new information and consultation within the Agency. The Agency will prepare a response-to-comments document in which the Agency will present its position relative to the public input. There will also be a background information document and a regulatory impact analysis which provide the technical and economic considerations which went into the standards. The final step will be publication of the final standards in the *Federal Register*.

RECENT ACTIVITIES

The Agency has been gathering information necessary for the rulemaking. The area of study has centered on the area south and west of Yucca Mountain extending to Death Valley, California. The major subjects studied have been the biosphere and its condition, the characteristics of the aquifers, the local population, and the state of knowledge of each of these subjects. Staff from EPA and its contractors have visited the Nevada Test Site and the study area several times in the past year to become more familiar with the conditions there. On all visits, the staff was accompanied by personnel who were familiar with the areas and subjects under study.

The Agency has found that the biosphere in the study area has been heavily studied and appears to be fairly well known. This is also generally true of the local population. However, that is not true of the aquifers. Knowledge of the direction and speed of flow is mainly studied through sensitivity analyses rather than based upon experimental study. This was not a surprise since much discussion of this issue has occurred in the scientific community.

Given the National importance of this rulemaking, there has been extensive discussion of issues associated with this rulemaking within the Agency. However, the Agency plans to propose the draft standards this Spring.

SUMMARY AND FUTURE ACTIONS

The Agency has taken into consideration the findings and recommendations of the NAS and the public comments which were made regarding it and plans to propose the Yucca Mountain standards this Spring. Discussion of issues within the Agency is continuing. Agency personnel have visited the site and the region on fact-finding missions. The proposed standards will be sent to OMB for review prior to proposal. Following release from OMB, there will be a public-comment period and hearings. Final standards and support documents will be issued as soon as possible thereafter.

REFERENCES

1. Part 191 of Title 40 of the Code of Federal Regulations, *Environmental Radiation Protection Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Waste*.
2. *Atomic Energy Act of 1954, as amended*, 42 U.S. Code 2011-2296.
3. *Reorganization Plan No. 3 of 1970*, U.S. Code, appendix 1.
4. *Waste Isolation Pilot Plant Land Withdrawal Act of 1992*, Public Law 102-579, 106 Stat. 4777.
5. *Energy Policy Act of 1992*, Public Law 102-486, 106 Stat. 2921.