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TESTIMONY OF JOSEPH M. HENDRIE, CHAIRMAN

U.S. NUCLEAR REGULATORY COMMISSION

BEFORE THE SENATE COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

September 11, 1979

I am pleased to be here today to discuss with you some of the activities of the U.S. Nuclear Regulatory Commission (NRC) in nuclear waste management. I will respond generally to those questions you raised in your August 21, 1979 invitation to participate in these hearings and am providing for the record written staff responses to each of these questions. I will cover both high-level and low-level radioactive waste disposal, but will emphasize NRC's high-level waste activities.

High-Level Waste Management Program

High-level wastes are highly radioactive and must be isolated from the biosphere. Isolation methods that have been discussed include disposal into space, transmutation of elements, rock melting, disposal in very deep drill holes, disposal in seabed sediments, and disposal in mined repositories in deep continental geologic formations.

The U.S. Department of Energy (DOE) is responsible for developing and implementing the technology for managing high-level radioactive waste. DOE believes that geologic repositories presently offer the most viable near-term opportunity for the disposal of high-level waste as indicated in its recently published Draft Environmental Impact Statement on the Management of Commerically Generated Radioactive Waste 1/; therefore, NRC is focusing its near term efforts on preparing to review an application for a geologic repository.

Current scientific thinking on geologic repositories indicates that

1/ Department of Energy, Draft Environment Impact Statement on the Management of Commercially Generated Radioactive Waste, DOE/EIS-0046-D, April 1979.

successful long-term waste isolation will be heavily dependent upon the geologic setting in which the repository is placed. This makes the site suitability a major safety issue. For this reason, it appears wise to have as complete a picture as practical of the geologic and hydrologic environment into which the waste would be placed before making a decision to construct a repository.

There has been increasing acceptance that a decision to commit to full construction of a repository shall not be made exclusively on the basis of information collected from records, surface exploration and geophysical testing with a limited number of borings. There is no widespread agreement on just how much and what quality information is the minimum required to characterize a site satisfactorily. However, there does seem to be a general consensus that exploration at-depth, that is, sinking of an exploratory shaft, with lateral borings and in-situ testing at the planned depth of waste emplacement prior to a major commitment to the site, would be a prudent and conservative approach that would allow a meaningful comparison of alternatives as required by the National Environmental Policy Act.

The NRC waste management staff believes that DOE should characterize several sites in this manner, before submitting a formal application for construction of a repository at any single site. Such an approach would permit a detailed comparison of the various sites and should promote the selection by DOE of an environmentally sound repository site. It should be noted that characterization of several sites has been recommended by the Interagency Review Group (IRG) as being one of the alternative approaches for the national program for the disposal of high-level waste.

On November 17, 1978 the NRC published a proposed policy statement regarding establishment of procedures for licensing geologic high-level waste repositories to be constructed and operated by DOE 2/. The NRC has received a number of public comments on the draft policy statement and the staff is preparing a proposed new Part 60 regulation on the basis of the earlier draft policy statement, public comments received, and further staff evaluation.

In the near future, the Commission should receive for its consideration the proposed Part 60 regulation on the procedural aspects of licensing the disposal of high-level wastes in geologic repositories. The discussion below outlines the NRC's waste management staff's thinking on approaches to regulation of high-level waste disposal in geologic media.

Before initiating a site characterization program, DOE would submit to the NRC and make available to the public a site characterization report which, among other details, would delineate the rationale for selecting a particular site for detailed site characterization. The site characterization report should describe the site characterization program, including the extent of planned excavations, plans for in-situ tests, and other exploratory activities that DOE would pursue over the following year or so. The report would also include information on the extent to which DOE has consulted and coordinated its site selection activities with the affected states.

NRC staff would review DOE's site characterization plan, obtaining public and state government input and issuing an opinion on the plans adequacy of the plan. Site characterization activities conducted by DOE would be carried out with continuing review and interaction by the NRC staff.

2/43 Federal Register 53869 (November 17, 1978).

The intent of this type of approach to licensing is to ensure that enough information and data are developed on a sufficiently broad base so that acceptable licensing decisions can be made. Doing less may make it very difficult to conclude a construction authorization proceeding, since basic information might be missing. Investigating several sites will ensure that the required technical data will be gathered prior to a premature commitment to any particular site.

A decision on whether to proceed with construction should not be made until several sites are fully characterized -- the NRC staff would prefer four or five such characterized sites in various media. At that time, a more informed decision can be made, on the basis of detailed test data from each of the sites.

Following site characterization and receipt of the DOE application for a construction permit, the NRC waste management staff estimates that it will take approximately two to three years to evaluate the site-specific application, conduct the formal hearings, and reach a decision on whether to authorize construction. Construction of the facility by DOE is estimated to require an additional five to eight years. Approximately two years prior to the completion of construction, DOE would then submit an application for a license to receive waste and operate the repository. During the time the repository is being constructed, DOE would continue in-situ testing which would add to the knowledge base concerning the suitability of the site to contain the waste safely.

Additions to the NRC waste management staff are being made and new contractual efforts initiated as rapidly as practicable. In order for DOE to meet the IRG option date of 1985 for submittal of a repository application, NRC guidance and requirements concerning the application should be completed by FY 1983. Even with NRC's accelerated growth rate, substantial NRC guidance must await the FY 1983-1986 period when NRC's investigations of alternative geologic media will be completed. This means that DOE will be proceeding with limited guidance from NRC in some of the geologic media for the near term. We hope to be able to improve in this area.

A great deal of information will certainly accrue during the site characterization phase. It has been only within the past year that the NRC high-level waste management program was redirected to evaluate other geologic medium, including shale, basalt, domed salt, granite and vadose zones. It is anticipated that our generic investigation of domed salt and basalt will be completed during FY 1982. Investigations of granite, shale and vadose zones are projected to be completed during 1985.

To date, the designs of deep geologic repositories have relied primarily on the surrounding geology for containment of radionuclides. Reliance on the waste form and its packaging to prevent radionuclide release over the long term has only recently received emphasis by DOE and the NRC staff. The waste form work that has been done in the past has been devoted primarily to glass.

The NRC staff will be preparing in its upcoming draft regulations for several waste form and packaging alternatives which will be evaluated and characterized before final selection. The potential gains in assuring containment of the waste which could be made are, in the staff's judgment, sufficiently large to warrant this approach. The long-term performance of the waste form, its packaging, and their reactions with the host rock can be examined in the laboratory. They also can be extrapolated, with some confidence, through testing under aggravated conditions. This approach has been used successfully in modern materials development work. Based on staff discussions with scientific personnel both at DOE and elsewhere, this approach appears realistic and is in fact being given serious attention by DOE and its laboratory system. A high degree of assurance in the performance of the waste form will provide considerable additional assurance to the overall system and can be used to offset uncertainties in the geology, if necessary.

More emphasis has been directed toward the notion that an aggressive waste form and packaging development and demonstration effort should be pursued in order to provide a multi-barrier repository system. The NRC staff has been active in this area and believes that completely encapsulated nuclear waste could be protected by its chemical form and packaging for about 1000 years. The significance of the 1000 year period is that it would assure that most of the wastes' dangerous fission products would have decayed away. At that point, the concentration of radioactivity in the geologic repository would not be much different than that in the original ore body. This would leave the geologic medium as a fully redundant backup barrier during this time period. The NRC staff is working with DOE on this

multi-barrier approach and our preliminary regulation development work reflects this view.

Mr. Chairman, your Subcommittee requested that we address whether a feasible technology exists for the permanent disposal of the various kinds of nuclear waste that presents no significant hazard to the public health and safety or to the environment. Previously, the Commission had stated that it would not continue to license reactors if it did not have reasonable confidence that waste could be safely disposed of, and that we would continue to assess our basis for confidence and to inform Congress of our findings. As a result of a recent court opinion 3/, the Commission has decided to institute a proceeding during FY 1980 to examine the degree of confidence we can have at the present time that a safe permanent method of waste disposal can and will be available when it is needed. Your Subcommittee will be informed of the status of the Commission's deliberations in this area.

However, it should be noted that there is still a significant amount of scientific information pertinent to the high-level waste management area that must be evaluated before approval of a high-level waste disposal license application from DOE. Along these lines, the Interagency Review Group on Waste Managment has thoroughly reviewed the technical problems associated with geologic disposal of radioactive wastes.

The Commission staff has reviewed the Final Report of the President's Interagency Review Group on Waste Management and has expressed explicit agreement with the IRG's finding 4/ that: "Present scientific and

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3/ Minnesota v. NRC, Nos. 78-1269 and 78-2032 (D.C. Cir. May 23, 1979)
4/ Report to the President by the Interagency Review Group on Nuclear Waste Managment. (March 1979)

technical knowledge is adequate to identify potential repository sites for further investigation. No scientific or technical reason is known that would prevent identifying a site that is suitable for a repository provided that the systems view is utilized rigorously to evaluate the suitability of sites and designs and in minimizing the influences of future human activities."

In order to ensure that DOE is provided with timely guidance from NRC, the NRC waste management staff has developed a proposed rule for the high-level waste licensing procedures. It is anticipated that this administrative rule will be published for public comment after Commission review later this year. The purpose of the rule will be to provide a clear framework for the licensing review of geologic repositories, including procedures for state involvement in the licensing process and public hearings before major NRC decisions. After publication of the administrative rule, the NRC will issue, for public comment, during FY 1980, an Advance Notice of Rulemaking on the technical requirements which describe the siting and design criteria and fundamental performance requirements for geologic disposal.

This briefly describes NRC's current activities in the area of high-level waste management.

Low-Level Waste Management Program

Mr. Chairman, I would like to turn now to NRC's activities in the area of low-level waste managment.

Current experience to date indicates that the present practice of shallow

land burial is a feasible technology for safe dispoal of low-level nuclear waste. However, because of problems with siting and operation of some of the existing disposal sites during the past five years, half of the commercial low-level waste disposal sites have been closed. Only three sites are in operation today. This has resulted in a regional imbalance in disposal capacity.

The continued availablity of the three presently operating sites is tenuous as demonstrated by the recent temporary closing of the Beatty, Nevada site by Governor List and the recent letter from the three Governors involved (Nevada, Washington, and South Carolina) to the Commissioners saying that unless action is taken to improve the preparation and packaging of the wastes being sent to these disposal sites, they would take action to close the sites within their states.

NRC is taking the following actions to help solve problems in low-level waste disposal:

-- NRC enforcement of existing requirements for preparing and packaging wastes is being improved.

-- NRC is expediting development of comprehensive regulation for low-level waste disposal. Lack of such comprehensive regulations has contributed to present and past problems and may be inhibiting the development of new sites. An Advance Notice of Rulemaking for this new low-level waste management regulation (10 CFR Part 61) will be published for public comment in FY 1980, followed by publication of a draft regulation and its accompanying environmental impact statement in FY 1981.

NRC anticipates that the final low-level waste management regulation can be published by FY 1982.

-- In parallel with developing comprehensive regulations, NRC is expediting development of staff technical positions on actions to improve the performance of existing burial sites. This effort is focused on requiring the waste generators to put the most significant waste into forms that will enhance safety in the disposal and transportation of the wastes. For example, NRC is actively reviewing methods for processing liquid bearing wastes to eliminate free liquids and to convert resins and sludges into a solid matrix.

-- NRC is actively working with representatives of groups concerned with low-level waste (such as the Society of Nuclear Medicine) to encourage them to take the initiative in promoting development of additional regionally distributed disposal capability for low-level waste.

Additional Regulatory Authority

We turn now, Mr. Chairman, to the final question you have raised, that is, whether NRC should have additional regulatory authority over DOE's nuclear waste facilities. As you know, the

NRC's Authorization Bill for FY 1979 (S. 2584) required the NRC to prepare a study on the regulation of Federal radioactive waste activities. The study finally has been published as NUREG-0527, entitled "Regulation of Federal Radioactive Waste Activities."

There are two principal recommendations contained in the study. The first is that NRC licensing authority should be extended to cover all new DOE facilities for disposal of transuranic (TRU) waste and non-defense low-level waste. This recommendation is consistent with one of the IRG recommendations. The second is that a pilot program should be established to test the feasibility of extending NRC regulatory authority, on a consultative basis, to DOE waste managment activities not now covered by NRC's licensing authority or its extension as recommended in the first recommendation. The pilot program would focus on a few specific DOE waste management activities and would result in a report to Congress on the feasibility of the application of the consultative option to additional DOE waste management activities.

Commissioners Gilinsky and Bradford do not support this second recommendation. In their view, the issue is whether the DOE's high-level waste tanks and waste solidification facilities should be regulated by the NRC. They regard as pointless a pilot program which fails to include these facilities.

The decision on whether to establish the pilot program and, if so, the scope of the waste management activities it should include, is one

for the Congress to make.

Mr. Chairman, this concludes my prepared remarks. I would be happy to answer any questions you or other Subcommittee members might have at this time.

Question 1: What is the status of the NRC's investigation of proposed technologies for permanently disposing of the various kinds of nuclear waste?

Response: a. High-Level

Although several alternative technologies have been proposed for disposing of high-level radioactive waste, the Department of Energy (DOE) has proposed that emphasis should be placed on the development of mined repositories because the disposal of radioactive wastes in geologic media can likely be accomplished with minimal environmental consequences and the alternative technologies are insufficiently developed to be analyzed in detail. Consequently, in anticipation of a DOE application for a geologic repository, the NRC has proceeded on the assumption that the most responsible regulatory position would be to focus the Commission's waste management program on the licensing of a geologic repository. Over the next few years, we think our geologic program will focus on these areas: site characterization activities, development of waste form performance criteria, and activities leading to construction authorization. Currently, the NRC is devoting most of its resources to the site characterization program because this is the first step in repository construction. For the past few years, the major focus has been on the characterization of sites in bedded salt. Recently, the scope of the program has been enlarged to include domed salt and basalt. Additional media including granite, shale, and vadose zones are also under consideration in anticipation of DOE's adoption of the Interagency Review Group's recommendations. The overall status of our technical evaluation at this time is: site characterization guidance for generic and bedded salt will be completed in FY 81; for domed salt/basalt, in late FY 82; and for granite/shale and vadose zones, in FY 83. DOE may submit site characterization plans for NRC review before some of the guidance is complete. This may require some backfitting or adding to the plans, after they are underway. Guidance on waste form and on repository design for construction authorization will be completed on the following schedule: generic and bedded salt and domed salt/basalt in FY 83; and granite/shale and vadose zones in late FY 85. As has been noted on the site characterization guidance, the construction authorization guidance also will most likely run behind receipt of a DOE request.

b. Low-Level:

In response to existing questions at operation disposal sites, NRC is pressing short term efforts to develop technological answers that can be applied to present problems. Our studies on waste form characteristics will result in technical positions that will address the dewatering of liquid bearing wastes and solidification of reactor resins and sludges by early FY 80. Because the disposal of liquid scintillation fluids has been banned at one major disposal site and similar bans under consideration at the others, accelerated efforts are underway in cooperation with other agencies to find acceptable alternative methods for disposing of this waste. We expect that licensable alternatives will be available to the waste generators in early FY 80. In the longer term, a number of technical studies and research programs are underway with the specific purpose of providing the technical basis necessary to support the requirements of our regulations for low-level waste disposal that are under development. By FY 82, we plan to have regulations that will specify the overall performance requirements for low-level waste disposal and will deal with specific requirements for the waste form characteristics, hydrological and geological requirements for siting disposal facilities, and design and operation of the facility. Corollary efforts are underway to integrate these technological studies and assess their combined environmental effects, in the form of an Environmental Impact Statement, to be issued in draft in FY 81 and in final form in FY 82.

Question 2: How many alternative media and waste forms should be assessed to provide adequate assurance of protection of the public health and safety and the environment?

Response: The NRC waste management staff subscribes to the IRG conclusions that there are sufficient uncertainties associated with a respository placed in a geologic media to warrant fully characterizing several sites before final selection of one particular site. We would prefer that four or five sites be characterized by DOE, covering several media. The intent of this approach to licensing is to ensure that enough information and data are developed on a broad basis so that acceptable licensing decisions can be made. Doing less may make it very difficult to conclude a construction authorization proceeding, since basic information might be missing. Investigating several sites will ensure that the required technical data will be gathered, without making a premature commitment to any one particular site.

Similarly, the NRC waste management staff would prefer that several waste forms be fully characterized before final selectionof a particular waste form. The potential gains in assurance that an accepted waste form will be available are sufficient to warrant this approach.

Question 3: Should the NRC have additional regulatory authority over Deparment of Energy (DOE) nuclear waste facilities?

Question 4: If so, what form should that regulatory authority take (e.g., licensing or "consultation and concurrence")?

Response: The NRC's Authorization Bill for FY 1979 (S. 2584) required the NRC to prepare a study on the regulation of Federal radioactive waste activities. The study has been published as NUREG-0527 entitled "Regulation of Federal Radioactive Waste Activities."

The study has two principal recommendations. The first is that NRC licensing authority should be extended to cover all new DOE facilities for disposal of transuranic (TRU) waste and non-defense low-level waste. This recommendation is consistent with one of the IRG recommendations. The second is that a pilot program should be established to test the feasibility of extending NRC regulatory authority on a consultative basis to DOE waste management activities not now covered by NRC's licensing authority or the extension suggested in the first recommendation. The pilot program would focus on a few specific DOE waste managment activities and would result in a report to Congress on the feasibility of the application of the consultative option to additional DOE waste management activities.

The decision on whether to establish the pilot program and, if so, the scope of the waste management activities it should include, is one for the Congress to make.

Question 5: Does a feasible technology exist for the permanent disposal of the various kinds of nuclear waste that present no significant hazard to the public health and safety or to the environment?

Response: a. High-Level:

In June 1978, the Commission expressed the view that it would not continue to license reactors unless it was reasonably confident that safe waste disposal will be available when needed. In March 1979, a majority of the Commissioners reaffirmed their confidence, but the Commission committed itself to reassessing its basis for confidence as new data are developed and progress is made in the Federal waste management program. The Commission is now considering the form of a proceeding to review its basis for confidence.

b. Low-Level:

The NRC waste management staff believes that shallow land burial does provide such assurance to the public health and safety and to the environment for low-level, short life nuclides if the repositories are properly sited and operated. The NRC staff is investigating alternative methods for disposing of low-level, longer life nuclides, in order to minimize any hazard to the public.

Question 6: How long would it take NRC to process a DOE proposal to construct a facility for the permanent disposal of the various kinds of nuclear waste?

Response: a. High-Level:

The NRC staff assumes that DOE will submit a construction permit application in FY 1985, after completion of site characterization activities at several different sites. We estimate that it will take approximately two or three years after receipt of such a proposal for the Commission to evaluate the application, conduct formal hearings, and reach a decision on whether to issue a construction authorization. Construction of the facility is estimated to require an additional five to eight years. It is envisioned that approximately two years prior to completion of the construction phase of the repository, DOE could be in a position to submit an application for a license to receive waste at the repository.

In addition to the many technical issues that will have to be examined and resolved by the NRC prior to the issuance of a construction authorization, we anticipate a considerable amount of coordination between the NRC and other Federal, state, and local agencies will be neccessary during the review process. We feel that responsible interaction between various governmental agencies is an absolute necessity for a successful waste management program.

b. Low-Level:

The NRC staff now anticipates that the new low-level waste management regulation (10 CFR Part 61) will be approved in its final form by the Commission in FY 1982. Once the new regulation is approved, the licensing process for a low-level waste repository should take between two and three years.

Question 7: What standards or regulations has the NRC already promulgated to protect the public health and safety and the environment from nuclear waste activities? What additional standards will the NRC promulgate?

Response: a. High-Level:

Presently, the Commission's standards for protection against radiation (10 CFR Part 20) would apply to licensed DOE repositories, as well as the other activities licensed by NRC. Certain additional requirements are set forth in the Commission's policy relating to the siting of fuel reprocessing plants and related waste management facilities (10 CFR) Part 50, Appendix F). However, the Commission recognizes that the health and safety considerations associated with high-level waste disposal are unique, and we are proceeding to develop regulations that would deal specifically with this category of activities.

In FY 1979, a proposed policy statement on procedures for licensing geologic high-level waste repositories was issued for comment. In response to comments received, the NRC staff is preparing a revised licensing procedure and a new regulation for geologic high-level waste disposal. The administrative portion of the regulation will be published for public comment as a proposed rule (10 CFR Part 60) in early FY 1980. We anticipate that the proposed technical rule and supporting draft environmental impact statement will be published in FY 1980. Comments on the proposed technical rule will have been resolved in FY 1981, and a hearing, if needed, will begin. If required, rulemaking hearings will continue into FY 1982 and, after completion, the rule and EIS will be finalized.

b. Low-Level:

An advance notice of rulemaking on low-level disposal will be issued in early FY 1980 (10 CFR Part 61). In FY 1981 work will continue on the regulation, an environmental impact statement, and detailed appendices on alternative disposal methods. We anticipate the rule and EIS will be published in final form in FY 1982. Appendices containing the technical requirements for disposal of low-level waste by alternative disposal methods and amendments to 10 CFR Part 61 to support the alternatives will continue into FY 1983.