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THE U.S. NUCLEAR REGULATORY COMMISSION REGULATORY PROGRAM FOR HIGH AND LOW-LEVEL RADIOACTIVE WASTES

To Be Presented at AIF Workshop on
Management of Spent Fuel and Radioactive Waste

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THE U.S. NUCLEAR REGULATORY COMMISSION

REGULATORY PROGRAM

FOR

HIGH AND LOW-LEVEL RADIOACTIVE WASTES

I am pleased to be here today to discuss with you the certain aspects of the U.S. Nuclear Regulatory Commission's (NRC) Waste Mangement Program. I will provide you with a summary of our purpose, policies, and status as related to high-level waste. I will also briefly discuss the status of our efforts related to low-level waste. Afterwards, I welcome any questions or comments.

I want to emphasize at the outset, that the views expressed here are current NRC staff views. These views have not been formally presented to the Commission nor has the Commission taken a formal position with respect to these staff views.

High-Level Waste Program

The long-range goal of the NRC high-level waste management program is to provide assurance to the public that U.S. Department of Energy (DOE) high-level waste repositories are properly sited, designed, constructed, operated and decommissioned, in terms of health and safety to the public and workers, and impact on the environment.

Since December 1979, there has been a change in the emphasis and focus of the NRC's high-level waste program. Specifically prior to December 1978, NRC's program was closely tied to the DOE program. It was primarily oriented to developing a capability to act on an early application from DOE. In particular, the program

was directed at developing the capability to review a license application for disposal of spent fuel in bedded salt. In light of recent developments including the report to the President of the Interagency Review Group (IRG) on Nuclear Waste Management, the NRC program has been restructured to emphasize the following: (1) development of regulations and supporting guidance, (2) identification and performance of the needed research to support the regulations and criteria, and (3) development of the capability to review a license application for disposal of high-level waste in any of a variety of geologic media.

I do not mean to convey that these three priorities will be executed in series. In fact, we have activities underway in each area presently. In the development and refinement of regulatory requirements, we will identify research needs and develop the tools needed to conduct a licensing review.

Over the past few months, we have had meetings with DOE to review specific areas of their programs, and we have formulated and provided to DOE several policy positions that we believe are essential to focus the national program in the direction we now believe will lead to a licensed repository. This critical review of DOE programs is intended to identify early to DOE whether in NRC's opinion, the studies DOE is conducting will provide appropriate and sufficient technical information to support a license application. We believe that such an early review by NRC will avoid future costly time delays and will improve the overall quality of the data gathering process. Although we are sensitive to the situation of one government agency regulating another government agency, we are convinced this approach is correct. Also we can use the knowledge of the DOE research and development in directing our own technical program.

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. The NRC has received a number of public comments on the draft policy statement and the staff is preparing a proposed new regulation (10CFR60) on the basis of the earlier draft policy statement, public comments received, and further staff evaluation.

In the near future, the NRC staff will submit the proposed Part 60 regulation on the procedural aspects of licensing the disposal of high-level wastes in geologic repositories to the Commission for their consideration. 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 comments and issue an opinion on the adequacy of the plan.

Site characterization activities conducted by DOE would be carried out with continuing review and interaction by the NRC staff.

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 and that a premature commitment to any particular site will be avoided.

Current scientific thinking on geologic repositories indicates that successful long-term waste isolation will be heavily dependent upon the geologic setting in which the repository is placed. This makes 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.

The NRC waste management staff doubts whether a decision to commit to full construction of a repository can 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 IRG as being one of the alternative approaches for the national program for the disposal of high-level waste.

Following site characterization and receipt of the DOE application for a construction permit, we estimate that it will take approximately four 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 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 to allow DOE time to reflect these NRC requirements in its application. 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 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 waste management staff considers that a better approach would be one in which much more emphasis is put on the waste form. We believe that several waste form and packaging alternatives should be evaluated and characterized before final selection. The potential gains in assuring containment of the waste which could

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 our 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 contractors. 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, if necessary, to offset uncertainties in predicting the performance of hydrogeologic system.

As a result, the NRC waste management staff thinks that an aggressive waste form and packaging development and demonstration effort should be pursued in order to provide a multi-barrier repository system. The staff is considering a requirement where the 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. We are working with DOE on this multi-barrier approach and our preliminary regulation development work reflects this view.

We anticipate that the administrative rule for high-level waste 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 Rule Making 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. I would like to turn now to NRC's low-level waste management program.

Low-Level Waste Program

There are both similarities and dissimilarities between the low-level and high-level waste programs. In contrast to the high-level program which is gearing up to regulate and license a yet to be identified waste form to be disposed of in an as yet undetermined location and geological medium, low-level waste is being generated in a wide variety of forms and must be disposed of in the available shallow land burial sites. This creates a number of immediate problems with which we must deal at the same time we are drawing up regulations, guides, and standards to regulate future low-level disposals. Thus, we have a two pronged effort. One deals with the here and now, the other is aimed toward gearing up for the future.

I would like to discuss several of the current technical problems with which we are dealing and then discuss briefly where we are in our development of future regulations.

As you are aware there are three burial sites in operation today in the states of South Carolina, Nevada, and Washington. All three of these states are Agreement States and as such the state authorities exercise the primary regulatory control of these burial sites. Recently the State of South Carolina prohibited further disposal of liquid scintillation fluids. Small vials containing such organic material as xylene and toluene are generated in great numbers by medical, technical, and research institutions. The scintillation liquid contains very small concentrations of such radioactivity as tritium and carbon-14 and poses very little radiological risk. The large quantity of organic material, however, is chemically toxic and can interact with other radioactive waste. Thus, there are good reasons why such liquid wastes should not be disposed of in shallow land burial. The NRC has taken an active role in assessing alternative methods for disposing of such wastes. We are looking into various methods of incineration, distillation, and other recovery techniques and solidification processes. Our purpose is to identify licensable alternatives that the waste generators and disposers can choose from. An interesting and significant aspect of this effort is the degree of cooperation among the people concerned with the problem. We have been working closely with the waste generators through the National Institute of Health and the Society for Nuclear Medicine as well as the manufactures of the scintillation fluid in addressing this problem.

Another persistent problem that has plagued burial sites is also concerned with the presence of liquid in waste. Specifically, liquids in reactor waste products that are presumably dry. This problem was recently highlighted by the closure

of the Nevada site by the Governor of Nevada because improperly solidified reactor wastes were received at the Beatty site with corrosive liquid leaking from the containers. The disposal sites have long had requirements that liquids were not an acceptable waste form but in these presumably solidified or dewatered waste products, free standing liquid has been frequently found. In the past, no clear definition of a permissible amount of such free standing liquid existed. The consensus of the state authorities is that there should be no free standing liquid in such wastes. The NRC waste management staff is considering adopting a technical position in this regard that waste received at a burial site may contain no free standing liquid. Free standing liquid is defined as that which is visible or drainable in accordance with ANSI standard ANS-55.1-1979.

Further, our current thinking is that use of such materials as vermiculite and diatomaceous earth in an attempt to immobilize bulk liquids is not an acceptable practice. We are considering a second position involving solidification of resins and sludges from nuclear power plants into a solid monolithic matrix. We currently have investigative efforts underway to assess the impact of these positions and are determining when the earliest possible implementation as a regulatory requirement could take place. It is our current opinion that the free standing liquid requirement could be met in a relatively short time--say three to six months--and are determining whether the solidification requirement would take any longer.

I would now like to discuss our program for developing regulations, guides, and procedures for disposal of low-level wastes. There does not exist today any written requirements or criteria for the disposal of low-level waste other than those which have been developed and implemented through particular

conditions imposed on individual disposal site licensees. The NRC regulations contain only vague references to waste disposal and contain only one requirement --that the land must be owned by the state or Federal Government. We have an intensive effort underway to correct this situation. We have under development a comprehensive set of regulations and regulatory guides. These regulations are taking the form of an overall regulation that will establish performance objectives that will apply to a broad range of disposal methods. Appended to the broader part of the regulations will be specific requirements applicable to several alternative methods of disposal. The alternatives that will be addressed are shallow land burial, intermediate depth burial, use of mined cavities, and use of engineered structures. Basic to these regulations will be the use of multiple barriers each of which will provide a high degree of assurance that the radioactivity will be adequately contained and isolated for the time necessary to allow the radioactivity to decay to innocuous levels. One way of thinking of these barriers is to address first of all what you are disposing of. There will be specifications and requirements set for converting the waste into a solid form that has characteristics of physical stability and low leachability. In keeping with the waste classification concept the content and concentration of radioisotopes will be a factor in setting criteria for what may be disposed of by the various methods. Second, one must consider how to dispose of waste and this will involve requirements on the method of disposal, operational and engineering aspects of the disposal method, and suitable institutional controls. The third aspect of the barrier concept concerns itself with how the waste is disposed of and will address necessary siting requirements for hydrological and geological conditions. We expect by the end of this year to publish an advance notice of proposed rule making that will invite public comments and input to the development of these regulations and in connection with this

advance notice, we will publish strawman regulations that will reflect our current thinking and state of development. In early 1981, we expect to have these regulations in a form where they can be formally published in proposed form and supported by a draft environmental impact statement (DEIS). We intend to have these rules in place by 1982. At that time, the regulations will address the disposal by shallow and intermediate land burial and the detailed appendices for engineered structures and mined cavities with follow within a year after or so after that.

In closing, I would like to address the critical need for regional disposal capacity for low-level waste. As I said earlier, the present burial capacity consists of only three sites, two of which are located in the far west. As a result, some 80 or 90 percent of the low-level waste being generated today is being disposed of at the Barnwell, South Carolina site. We feel that there is an urgent need to develop more capacity and that this capacity needs to be more equitably distributed among the areas where the waste is being generated.

As I mentioned earlier, we are sensing an awareness and a feeling of responsibility among the medical and reseach community in dealing with their waste disposal problems. As the principal trade group for the nuclear power industry, I would like to appeal to you in the Atomic Industry Forum to act as missionaries in developing among the electric utilities a similar sense of responsibility for dealing with a problem which will no doubt seriously affect the future operation of nuclear power plants. Perhaps the best way that this sense of

responsibility could be demonstrated would be the creation of low-level waste disposal sites sponsored and funded by or perhaps operated by individual utilities or combinations of utilities in various regions. The need for this is particularly acute in the northeastern part of the United States. We are doing our part to clear the regulatory path to help solve this acute problem. We hope the industry will respond accordingly.