STRATEGIC PRINCIPLES FOR PLANNING AND DECISIONMAKING

IN THE

CIVILIAN RADIOACTIVE WASTE MANAGEMENT PROGRAM

Office of Civilian Radioactive Waste Management
U.S. Department of Energy

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1. INTRODUCTION

The Office of Civilian Radioactive Waste Management (OCRWM) in the Department of Energy is responsible for disposing of this nation's spent fuel and high-level radioactive waste in a manner that protects the health and safety of the public and the quality of the environment. Our mission originated in the Federal repository program studies of the late 1950s, was explicitly established by the Nuclear Waste Policy Act of 1982, and was reaffirmed by the Nuclear Waste Policy Amendments Act of 1987.

To fulfill our mission, we are developing an integrated waste management system consisting of a geologic repository for permanent disposal deep beneath the surface of the earth, a facility for monitored retrievable storage, and a system for transporting the waste.

We intend to govern the planning, decisionmaking and implementation of the high-level radioactive waste management program through use of a set of strategic principles. These strategic principles will serve as the program's constitution. In keeping with the policy of open dialogue Secretary of Energy James D. Watkins has established, we are developing the strategic principles in consultation with affected governments and interested parties. We have sponsored two workshops to provide an opportunity for affected governments and interested parties to contribute to the substance of the strategic principles. The original version of this paper served as the basis for dialogue at the workshops.

This revised document reflects the comments, suggestions and criticisms of the participants at the first two workshops and includes our preliminary response to these concerns. It was prepared as the basis for discussion at a third workshop to be held on April 3-4, 1991 in Denver, Colorado. In many cases the message we received at the first two workshops reflected both the diversity of participant opinion and the fact that we did not seek to reach consensus. In other cases, however, for example, public confidence and cost-effective expenditure of funds, we received such straightforward advice that we are proposing the addition of a new strategic principle to respond to the concerns expressed. Thus, Chapter 2, which is a statement of our mission, policies, objectives and strategic principles, now includes five new strategic principles, that reflect points of major emphasis at the workshops. In addition, we have added a strategic principle concerning the assessment of how well we are doing in implementing the policies, objectives, and strategic principles. These new strategic principles are identified by shading.

Chapter 3 contains the remaining strategic issues. For each issue, in addition to the background and options sections largely retained from the first draft, we have added a section providing a synopsis of what we heard from the participants and a section detailing our preliminary response. In a few cases it is our judgement that the

issue was not important enough to be considered strategic. In the majority of cases, after receiving further input from the participants at the Denver workshop, we will elaborate in the Mission Plan Amendment on our plans for handling the issue.

2. MISSION, POLICIES, OBJECTIVES, AND STRATEGIC PRINCIPLES

MISSION

To dispose of the nation's spent fuel and high-level radioactive waste in a manner that protects the health and safety of the public and the quality of the environment.

BASIC POLICIES

The basic policies under which we conduct the program are as follows:

- The protection of the health and safety of the public, including workers, and the quality of the environment is of paramount importance.
- The program must be conducted such that public confidence is warranted, with opportunities and means provided for meaningful participation by affected governments and interested parties.
- The program must be distinguished by its technical integrity and excellence and directed at reaching scientific consensus and public understanding.
- The program must be managed and conducted in an efficient and cost-effective manner.

PROGRAM OBJECTIVES

To direct the implementation of our mission, we have established the following objectives:

- Timely disposal capability: to establish as soon as practicable the ability to dispose of radioactive waste in a geologic repository licensed by the Nuclear Regulatory Commission (NRC).
- Timely and adequate waste acceptance: to begin the operation of the waste-management system as soon as practicable, obtaining the system-development and operational benefits that have been identified for the MRS facility.
- Schedule confidence: to establish confidence in the schedule for waste acceptance and disposal such that the management of radioactive waste is not an obstacle to the nuclear energy option.
- System flexibility: to ensure that the program has the flexibility necessary for adapting to future circumstances while fulfilling established commitments.

STRATEGIC PRINCIPLES

In addition to the basic policies, we need strategic principles for planning and decisionmaking. This section presents the principles that we have identified to date, including those suggested at the first two workshops.

The principles will provide a framework in which we can make decisions in a rational, goal-oriented manner directed at achieving the objectives of the program, while giving affected governments and interested parties adequate opportunity for meaningful predecisional involvement.

The principles will serve as guides for the more-detailed plans and studies that we will need to successfully conduct waste-management activities. In view of the complexity of the program and its first-of-a-kind nature, we will use the principles as guides for decisions and actions rather than rigid constraints.

Management principles

Maintain the focus of the program on permanent disposal. Disposal is the primary objective, it is the DOE's principal responsibility under the law, and success in achieving it is vital to maintaining the nuclear energy option. All program activities must be conducted in a manner that supports and facilitates permanent disposal.

Provide facilities for the timely acceptance of spent fuel. This principle is critical to achieving timely and adequate waste acceptance and obtaining the system-development and operational benefits that have been identified for an MRS facility, including the flexibility essential for spent-fuel management.

Maintain strict environmental compliance programs. Preliminary analyses indicate that the development of facilities and waste-management and disposal operations are not likely to result in significant environmental impacts. Nonetheless, this principle is important because its implementation will ensure that we give environmental protection priority and that we closely monitor field activities for compliance with all applicable environmental protection standards.

Ensure that funds are spent in a cost-effective manner. Given that standards of excellence are established and applied, we must maintain effective means for controlling the costs of the program. This principle will be based on optimizing the use of resources over the long term, recognizing potential impacts on the waste-management efforts of the utilities, and evaluating potential impacts on public confidence.

Maintain standards of excellence. Technical excellence has always been a fundamental requirement of the program, and its importance increases with the increasingly difficult challenges that arise as the program moves forward. It is essential for success in licensing, establishing scientific consensus, increasing public confidence, and the prudent management of resources. We will apply standards of excellence to all other aspects of the program, including institutional activities, outreach, and management.

Ensure that all quality-assurance requirements are met. Quality assurance comprises the planned and systematic actions necessary to provide adequate confidence that the product or result of an activity covered by a quality assurance program will meet its intended purpose and/or function; it is a prerequisite for licensing. The extent to which quality assurance and procedural controls will be applied to particular items and activities will depend upon their relative importance to safety, waste isolation, or program objectives.

Consider public trust and confidence in program decisions. In making management, technical, and institutional decisions for the program, we must recognize the importance of public concerns and consider the potential implications for building and maintaining public trust and confidence.

Assign equal importance to institutional and technical activities. The history of the program has shown that institutional challenges are as difficult as the technical ones, and we must recognize their importance in program plans, activities, and resource allocations.

Diminish uncertainties related to spent-fuel management by the utilities. We will identify system parameters that may affect utility efforts or plans for spent-fuel management as early as practicable. We will maintain effective channels of communication with the utilities.

Provide alternatives and contingency plans. We need this principle to ensure success despite the inevitable surprises and unexpected problems that will arise in a complex, first-of-a-kind enterprise. It requires that we analyze in parallel alternatives to key components of the system so that if our primary candidate encounters difficulties, we can come up with a workable alternative with minimized delay. It also requires that we anticipate the difficulties which might be encountered, and that we develop in advance plans for minimizing their effects. While the provision of backups and contingency planning increase the initial costs of the program, they are insurance against unforeseen problems that could otherwise lead to delays and real or perceived programmatic failure.

Coordinate the technical, institutional, and management activities of the program. Implementation of this principle should enhance the integration of technical and institutional activities, contribute to the control of program schedules, and enhance the prospects for the success of the mission.

Assess our own performance rigorously. It is not enough to have policies, objectives, and strategic principles to guide decisionmaking; they have to be used. To objectively determine the adequacy of our performance and how it can be improved, we will maintain an assessment program. We will apply performance measures systematically and periodically to determine how we can remedy inadequacies and further strengthen our efforts.

Technical principles

Apply the concept of defense in depth in waste-management and disposal. We will emphasize safety in the design and planning for all operations involving waste handling, include backup safety systems and fail-safe designs where appropriate, and use multiple barriers against waste migration. This approach should facilitate licensing and help to establish public confidence in safety.

Use state-of-the-art systems-engineering techniques in developing and designing waste-management facilities and operations. Systems engineering is an orderly process for the development of complex systems. It consists of defining objectives and requirements, developing a design that meets the requirements, evaluating the design against the requirements, revising the design as needed, and repeating the process with increasing detail to ensure that the requirements are complete and satisfied by the system and its components. Important features of the process are its emphasis on ensuring that all components work together, on special studies of the entire system's ability to meet requirements, and on rigorous control of the technical information used in the process. Systems engineering is essential for the success of the program because it provides the means for identifying and controlling the many interfaces among the elements of the system, coordinating the multiple scientific and engineering disciplines involved in the program, and optimizing the design and operation of the system.

Use simple and proven designs and technologies. The use of simple and proven technologies, particularly those already licensed by the NRC, and the use of designs that approximate those of licensed facilities should facilitate licensing and increase cost effectiveness. This principle is applicable to an MRS facility, a repository, and a transportation system.

Provide for outside review. The purpose of this principle is to ensure that, in resolving important issues and making important decisions in the program, we have the benefit of appraisal by outside experts. Such appraisal, which includes peer reviews, is

important in verifying or validating assumptions, plans, results, or conclusions critical to the success of a program. It bolsters technical confidence, and may also generate fresh ideas and approaches to problems. Further, the use of recognized independent authorities strengthens our credibility. We will not limit the outside reviews to technical issues; we will extend them to institutional and managerial issues as well.

Institutional principles

Provide for the involvement of affected governments and interested parties in the decisionmaking process. As the organization charged with the development of the waste-management system, we have certain responsibilities that cannot be shared. One of these responsibilities is making technical and programmatic decisions. However, the views of affected governments and interested parties are essential to the decisionmaking process and will be actively solicited. The involvement of affected governments and interested parties early in the decisionmaking process will help us identify emerging issues and formulate appropriate alternatives. This will make issue resolution more productive and will also allow the program to benefit from the knowledge and experience of the affected parties.

Work cooperatively with affected governments and interested parties. To foster productive links with affected governments and interested parties, we will consult and cooperate with them and will seek to exchange information and ideas. We will use cooperative agreements to bring additional groups into the program, both for technical advice and for the dissemination of information to their members.

Share information and data. We will share technical information and data on a timely basis and in an appropriate form.

Provide support to educational programs. Greater understanding of the health, safety, and environmental issues surrounding waste generation and management is key to the success of the program. It is also needed to help develop the skills necessary to meet the future human-resource needs of the program. We will implement this principle by stimulating the teaching of science at the secondary, undergraduate, and graduate levels and developing curricula and instructional materials—both print and electronic—for primary, secondary, and undergraduate studies. A related effort will be to foster undergraduate and graduate studies for the public policy aspects of waste management.

Evaluate socioeconomic issues in cooperation with affected governments. We will apply standards comparable to those applied to environmental and technical issues, including independent review, to socioeconomic effects. And we will seek the cooperation of affected governments to ensure that we consider significant local issues.

In siting, designing, and constructing waste-management facilities, consider potential benefits to the host States and communities. The Nuclear Waste Policy Amendments Act requires the Secretary of Energy, in siting Federal research projects, to give special consideration to proposals from States where a repository is located. It also authorizes the Secretary of Energy to enter into a benefits agreement with the State of Nevada concerning a repository or with any State or Indian Tribe concerning an MRS facility. Such a benefits agreement would include specific benefits, including enhanced program participation, identified in the Nuclear Waste Policy Amendments Act. Other benefits to jurisdictions willing to host a repository or MRS facility could be developed through the Nuclear Waste Negotiator.

3. STRATEGIC ISSUES

3.1 TECHNICAL ISSUES

COOLING SPENT FUEL BEFORE DISPOSAL

Background

The waste that will be emplaced in a repository consists of spent nuclear fuel and vitrified high-level radioactive waste, both of which emit heat. This heat will affect the properties of the host rock and the flow of fluids (both liquids and gases), which is the principal mechanism for transporting radioactive materials from the repository to the human environment. In theory, the heat will create, near the emplaced wastes, fluid-flow patterns that differ from the natural flow patterns, and these altered patterns may affect the repository system's ability to retain radionuclides.

Our current strategy is to design the repository and the engineered-barrier system to be able to meet the Nuclear Regulatory Commission's performance objectives for waste containment and isolation over the range of anticipated environmental conditions, including relatively high initial temperatures and the presence of water in the pore spaces of the rock surrounding the waste packages. This strategy is expected to add conservatism to the design of the engineered-barrier system in that the heat from the waste form may actually help keep water from reaching the majority of containers for up to hundreds of years. However, there are uncertainties as to what happens in the host rock before and after the temperature rise due to the waste-induced heat has reached a peak (the thermal pulse) and the rock cools. As part of the site-suitability determination, we will have to evaluate the capability of the natural system to continue to provide for adequate waste containment and isolation under the expected thermal loading. We will need to be able to demonstrate during licensing that we understand the effects of the thermal pulse on the repository and the engineered-barrier system and that the performance of all elements of the system is acceptable with respect to established standards.

The heat produced by the waste emplaced in the repository and the resulting repository temperatures may be reduced by cooling the spent fuel and high-level waste for extended periods before disposal. Such cooling may, to some extent, reduce the attendant uncertainties about the long-term performance of the repository and the engineered-barrier system. Cooling may also enable repository designers to put more fuel in each emplaced waste package, thus reducing the volume of rock excavated and the costs of underground development and operation. However, to get the maximum benefit from cooling, extended storage (on the order of several decades) is required, which increases the costs of storage.

Originally suggested options for initiating a discussion

Option 1. We could accept spent fuel directly from reactor pools (i.e., spent fuel cooled for at least 5 years).

Option 2. We could set a minimum cooling period longer than 5 years for acceptance from reactor sites.

Option 3. We could set a period for long-term cooling (e.g., 40 years) and provide facilities for storing the spent fuel during that period.

Option 4. We could establish a policy of accepting first the oldest spent fuel, which will be 40 years old on the average when a repository starts operations, with the proviso to take younger spent fuel to prevent reactor shutdowns.

Synopsis of workshop discussions

The discussions at the workshops concluded that a specific recommendation on predisposal cooling would have to await the results of site characterization. Until more is known about the thermal response of the host rock, no decision on the age of spent fuel at the time of emplacement, or on the areal heat density in the repository, could be made. The issues raised during the discussions included the following:

- A "hot" repository may not be desirable because less waste can be emplaced in it (compared to emplacing cooled spent fuel), and this consideration is particularly pertinent in the case of Yucca Mountain, which has some limit on its capacity (to be determined during site characterization).

- A "hot" repository may not be consistent with simple and proven (reasonably available) technology. Also, a "hot" repository may lead to more elevated surface temperatures, possibly resulting in impacts to flora and fauna.

- In addition to cooling, there are two other ways to achieve a "cold" repository (1) load less spent fuel in each of the packages and (2) emplace the packages less densely in the repository. In either case, it would be necessary to do something else with the remaining spent fuel (i.e., develop more storage or construct more repositories). The repository-capacity question led to a discussion of the need for a second repository and strong recommendations that this issue be raised in the Mission Plan Amendment.

- The comparative costs of a "hot" repository at Yucca Mountain versus a "cold" one should be established, and the tradeoffs between costs and risks should be analyzed.

- If the repository is to be "hot", we will need to accept spent fuel that is younger than average, because by 2010, the time the repository is scheduled to open, the average age of the spent fuel will be about 40 years. To accomplish this, we would have to be able to stipulate which spent fuel we want.

- Option 3, which could result in a call for several MRS facilities, may not be feasible, because not even one such facility has been sited. If extended cooling is needed, the utilities may not pay for storage at the level of current program costs (i.e., hundreds of millions of dollars per year).

DOE response and current plans

The issue of long-term cooling is closely related to the design of the waste packages, which is discussed next. The discussions at both workshops suggest that the original set of options should be replaced by the two options below.

Option 1. We should proceed with our current plans, which would result in a relatively "hot" repository.

To obtain a preferential temperature distribution over a significant portion of the disposal area, "heat management" may be necessary for the waste packages, with us specifying parameters for each of the spent fuel assemblies loaded into each disposal container. This function could be performed at the repository or at the MRS facility. This option would require no legislative changes but the concept of "heat management" may require changes in the standard contract with the owners/generators of spent nuclear fuel.

This option is consistent with the original option 1, given above. Within limits, it is also consistent with the original option 2, provided the standard contract with the utilities is modified to contain a different acceptance specification for the minimum age of the spent fuel.

Option 2. We should change our plans to a "cold" repository.

Option 2 could be implemented in three ways. One way is to accept only spent fuel that has been cooled for a specified period of time, as in the original option 3. The length of the period for the desired cooling has not been firmly established, though preliminary calculations show that it may be as long as 80 years. If cooling is to be provided for such a long period, multiple storage facilities may be needed, and the

current repository program might be slowed or put on hold for a number of years. Even if the period of cooling is on the order of 40 years, multiple storage facilities still may be needed, and the costs of the waste management program could increase substantially. The other two ways are (1) emplacing fewer waste packages in the repository and (2) loading less spent fuel into each waste package.

The question of a "hot" versus "cold" repository is one that cannot be fully answered until the characterization of Yucca Mountain is completed. The exact capacity of Yucca Mountain as a potential repository site is unknown, but it appears that 70,000 MT, perhaps more, can be accommodated. Also, the implications of an elevated surface temperature from a "hot" repository are not likely to be significant, as the increase in surface temperature would be about 1°C. Tests intended to provide information on these issues, such as those that will address the response of the rock and the hydrologic system to thermal stress, have been defined and are described in the Site Characterization Plan. Meanwhile we expect to get some useful ideas and suggestions on alternative waste package designs in a workshop with industry experts. This workshop is to be held in June 1991.

The issue of long-term cooling has serious implications for the entire program, including the number, capacity, and operating life of storage facilities; spent fuel management by the utilities; transportation; the design and performance of the repository and the waste package; and costs. It also has serious implications for the capacity of the repository and hence the need for more repositories. We therefore plan to perform system studies to analyze the tradeoffs involved.

DESIGNING WASTE PACKAGES TO EXCEED REGULATORY REQUIREMENTS

Background

The waste package is defined by the Nuclear Regulatory Commission (NRC) as "the waste form [spent nuclear fuel or high-level radioactive waste] and any containers, shielding, packing, and other absorbent materials immediately surrounding an individual waste container." For the Yucca Mountain candidate site, the current conceptual design for the waste package consists of the waste form and a disposal container.

The waste package must meet various functional and regulatory requirements related to the operation of a repository and to the containment of radionuclides after a repository has been closed. Included in these requirements are the performance objectives of providing substantially complete containment for the waste for not less than 300 to 1000 years and thereafter controlling the rate of radionuclide release from the engineered-barrier system. The demonstration that these objectives will be met, along with the demonstration of satisfactory total system repository performance for

10,000 years, are expected to be among the most difficult technical challenges during licensing, and for this reason great importance is attached to the design of the waste package and to determining the conditions to which it will be subjected in a repository.

In the current conceptual design for the Yucca Mountain candidate site, the container is a single-walled vessel made of a corrosion-resistant alloy yet to be selected, which will be compatible with the geologic, hydrologic, and geochemical conditions expected to prevail in a repository over the long term. This design will be developed to meet, but not necessarily exceed, the regulatory criteria for the life of the waste package.

An alternative approach would be to design a waste package (and possibly other components of the engineered-barrier system) that clearly exceeds the regulatory criteria. In this approach, we would initiate a study to evaluate a range of very-low-probability potentially disruptive processes and events that could affect the performance of the engineered-barrier system and conduct a functional analysis to establish performance requirements. When these activities have been completed, we would develop alternative conceptual designs. Alternative designs for the waste package might include simple single-walled containers or complex multilayered packages consisting of different metals and nonmetals (e.g., ceramic liners, which are highly resistant to corrosion).

Suggested original options for initiating discussions

Option 1. We could design the waste package to be compatible with the waste-emplacement environment and to meet, but not attempt to significantly exceed, the regulatory criteria for the life of the waste package.

Option 2. We could design a waste package that would exceed by a significant margin the regulatory criteria. This design would be done in parallel with studies of the waste-emplacement environment, which are included in Section 8.3.4.2.4 of the Site Characterization Plan.

Option 3. We could pursue both options in parallel with studies of the waste-emplacement environment and other scientific studies during site evaluation. Once the results of the studies are available and a cost-benefit analysis has been performed, a single design path would be chosen.

Synopsis of workshop discussions

Most participants agreed that long-lived waste packages for the repository would be desirable, because they would provide defense in depth against the loss of containment and radionuclide migration, and add a margin of safety. However, there was no consensus on the specific advantages to be gained by developing such packages or the reasons for selecting such an option.

Some felt that people understand backups and therefore redundancy and defense in depth would help build public confidence; common sense dictates that the repository should have as many barriers as practical. Some participants also felt that an enhanced waste package would help diminish uncertainties about the site. A more common opinion, however, was that the public views 10,000-year predictions with skepticism, as they do our technical capabilities and technology in general, and the uncertainties are too great to significantly improve public confidence. Because some technical people doubt the feasibility of building even a 1000-year container, let alone a 10,000-year container, it will be difficult to persuade the public that a package will survive intact for many thousands of years.

Similarly, while some said that a long-lived waste package could facilitate licensing, and perhaps diminish concerns about the consequences of inadvertent human intrusion into the repository (no specific scenarios were discussed), others doubted that significant benefits in licensing would be gained. We were also admonished not to use the waste package to compensate for deficiencies at a particular site. On the other hand, public confidence might be increased by constructing the waste package to a higher standard without, at the same time, decreasing our reliance on the performance of the site, the natural barrier.

Two other issues emerged in the discussion: costs and the desirability of regulatory criteria for a single component of the repository system (i.e., the waste package), as opposed to performance criteria for the overall system. Some questioned whether the advantages of a waste package that exceeds regulatory requirements would be worth the cost, and others felt that the additional cost might be acceptable if the value can be demonstrated clearly. In regard to regulatory requirements, we were advised that the public will view with alarm and suspicion any tinkering with regulations; we should work within the existing regulations, go beyond doing the minimum, but not compensate for geologic inadequacies.

DOE response and current plans

Option 3 represents the current design approach. The current reference design is at a conceptual stage. Alternative materials and design concepts were to be further evaluated in the next, more-advanced design phase, which we had planned to start in

1990. However, we have deferred most work on advanced designs until more information is available about the suitability of the site and the waste-emplacement environment; the pertinent studies are described in Section 8.3 of the Site Characterization Plan. Another issue that needs to be resolved before design work should proceed is long-term cooling, as discussed above under the preceding issue. Deferring detailed design will conserve resources and allow the concentration of efforts on the scientific investigations.

In terms of total-system performance, option 2 and perhaps option 3 may help to offset residual uncertainties that may exist about the performance of the natural system at the site. This would not be "compensating for a bad site"; it would merely add strength to the multiple-barrier approach. It might thereby help to demonstrate the long-term performance of a repository and contribute to public confidence in the safety of a repository. Interest in a waste package that could provide containment for 10,000 years or more has been expressed by the Nuclear Waste Technical Review Board, which has also asked us to address questions of the potential benefits and tradeoffs associated with the long-term cooling of spent fuel. Important considerations in evaluating tradeoffs for a long-lived package will be cost and feasibility.

We will hold a workshop on June 18-20, 1991, to discuss concepts for the engineered-barrier system and their applicability to extended performance life.

Option 3 allows us to retain option 1 if scientific investigations ultimately indicate that the current design approach is adequate and the benefits to be gained from a longer-lived package do not clearly justify significant increases in cost.

We agree that changes to regulatory requirements should not be tailored to a particular site. With regard to the waste package containment period, a change in the regulations to either a longer or a shorter period could affect public confidence. A change to a shorter containment period could be viewed as an attempt to compensate for inadequate engineering. A change to a longer containment period might cause the public to question our position on the waste-isolation characteristics of the site. We could choose to design a longer-lived waste package and such a package would become, in systems-engineering terms, an internal requirement, not an imposed (external) constraint. Any credit taken by demonstrating waste package containment for more than 1000 years would not be intended to compensate for geologic inadequacies. While the engineered-barrier system is important to the repository system, especially for the defense-in-depth concept, reliance on the natural barriers is the basic tenet of the concept of geologic disposal. Thus, though performance assessments conducted for licensing would probably incorporate the benefits of a long-lived waste package, evaluations of site-suitability will consider the natural barriers on their own merits, not in conjunction with any enhanced engineered barriers. We intend

to perform system and tradeoff studies to evaluate the benefits and costs of the options, including licensability considerations.

TIMING AND CRITERIA FOR DETERMINING THE SUITABILITY OF THE CANDIDATE SITE FOR A REPOSITORY

Background

As described in the Site Characterization Plan, we will conduct a comprehensive program of scientific investigations to evaluate whether the Yucca Mountain candidate site in Nevada is suitable for a repository. This program will consist of both surface-based tests and tests conducted in an exploratory facility that includes underground excavations at the depth proposed for a repository.

We will establish priorities for the surface-based and underground tests in order to detect, as early as possible, conditions that would indicate that the site is unsuitable for development as a repository. If the site is determined to be unsuitable, then we will have to report to the Governor and the legislature of Nevada and the Congress of the United States.

If the site is not determined to be unsuitable, we will continue the site-evaluation program to determine whether a repository at the site would safely contain and isolate the waste for thousands of years. After the completion of site evaluations, we will make a formal finding that will serve as the basis for recommending the site to the President, and if the President agrees, he will recommend to the Congress that the site be developed as a repository. This process is specified by the Nuclear Waste Policy Act as amended.

Before making the formal determination, it may be advisable to make preliminary findings of suitability. We also need to decide on the criteria and method used in the determination.

Suggested original options for timing

Option 1. We could make preliminary evaluations of suitability at regular intervals (e.g., every 24 months) on the basis of the available data.

Option 2. We could make preliminary evaluations of suitability at major program milestones (e.g., before starting to construct the exploratory facility).

Option 3. We could make all of these evaluations.

Suggested original options for suitability criteria

Option 1. We could apply those aspects of our siting guidelines (10 CFR Part 960) that are appropriate for evaluating a single site.

Option 2. We could revise the guidelines to use the NRC's licensing criteria in 10 CFR Part 60.

Option 3. We could revise the guidelines by changing generic guidelines to site-specific factors.

Option 4. We could revise the guidelines and use criteria developed by external parties.

Option 5. We could work together with affected parties to develop new site-specific suitability guidelines.

Synopsis of workshop discussions

Strong views regarding the options did not emerge from the workshop discussion, and the participants were more interested in discussing general regulatory problems, such as the lack of environmental standards (the Environmental Protection Agency (EPA) is revising Subpart B of 40 CFR Part 191, which was vacated and remanded), the degree of protection provided by the original EPA standards, and the difficulties associated with demonstrating compliance with the original EPA standards.

In the case of the suggested options for timing, none of the options were specifically endorsed, but there was agreement that we should determine as expeditiously as possible whether the site merits further study.

In the case of the suggested options for criteria, some participants clearly favored option 1. There also seemed to be agreement that attempting to change any regulations would be imprudent because it might seem to the public that we are trying to get around requirements for safety.

We were advised that good criteria for determining unsuitability are vital. One participant suggested that a false-negative determination on suitability early on in the process is worse than a false positive; a false positive may cost no more than another year of wasted effort, while a false negative could destroy a multiyear investment. Thus, it is not necessary to make a final determination of suitability at the outset; it is necessary merely to determine whether the site is suitable for further studies. Others cautioned that the process of deciding whether to continue studies should include participants financially independent of those studies.

DOE response and current plans

The determination of site-suitability has a high priority in the repository program. We also recognize the importance of making an early suitability determination. We are currently following option 1 with respect to the timing of suitability evaluations and option 1 with respect to suitability criteria. We have restructured our site-evaluation program to this end and plan to start surface-based testing as soon as we obtain the necessary access to the site. Our goal is to conduct reliable and insightful tests early in site characterization. In establishing priorities for the testing program, we did consider the likelihood of reaching false-positive or false-negative conclusions.

The vehicle for communicating with the public on site-suitability will be semiannual reports on the progress of site characterization. The progress reports will discuss any results of site-suitability evaluations completed during the 6-month reporting periods and reference the reports that fully describe these efforts.

We are also involved in an intensive effort to develop a general approach for conducting iterative site-suitability evaluations during site characterization. A core group of experts has been established for this purpose, and the general approach being developed should be available this summer. We plan to seek broad external comment on it. We also plan to conduct an early site-suitability evaluation, now scheduled to be completed in early 1992, that will include an external peer review. Efforts by the Electric Power Research Institute and by Golder Associates to develop a suitability methodology are also under way, and we will compare and evaluate these independent approaches before finalizing our own strategy.

The current methodology is based on using our siting guidelines for both the early and later evaluations of site-suitability (i.e., option 1). In choosing this approach we carefully considered that, for a number of the siting guidelines, establishing that a qualifying condition is met may require extensive data from underground testing. We decided on this option after evaluating various alternatives, considering comments from the State of Nevada, and considering expert opinion. This approach seems to be compatible with the opinions expressed at the workshop.

APPROACH TO THE DEMONSTRATION OF PERFORMANCE

Background

In order to issue a construction authorization for a repository, the NRC must find that the site and the design of a repository comply with requirements specified in 10 CFR Part 60. These regulations require a demonstration of compliance with 40 CFR Part

191, the EPA standards for geologic disposal (currently being revised). Two approaches could be taken in specifying the regulations. One is to establish regulations on how to perform analyses as well as specifying the required performance objectives. The second approach is to establish the required performance objectives and provide guidance on how analyses are to be performed.

NRC's current requirements establish performance objectives for the total repository system—that is, both natural barriers and engineered barriers—as well as each of the system elements. In a regulatory strategy paper (SECY-88-285), the NRC identified several topics as requiring a rulemaking. One of these topics is demonstration of compliance with the EPA standards. We believe that rulemaking in this case is not appropriate and have advised the NRC that this is our position.

Suggested original options for initiating a discussion

Option 1. We could petition the NRC to change its regulations by specifying only total-system performance objectives, without performance objectives for particular elements of the system.

Option 2. Without petitioning for a change in regulations, we could request the NRC to abstain from rulemaking on the topic of performance demonstration but to provide us with guidance through regulatory guides.

Option 3. We could hold further discussions with the NRC on the topic and evaluate alternative approaches.

Synopsis of workshop discussions

Some participants preferred regulatory guidance to rulemaking, especially since flexibility is necessary in a first-of-a-kind licensing, while others saw merit in a rulemaking because it would reduce the complexity of issues to be resolved during licensing. We need stability in the rules. It would therefore be useful to "get the rules on the table now," get them litigated, defined. To the extent that the NRC procedures can be defined beforehand, it would help if any changes were done by rulemaking to permit open discussion.

Similarly, while some felt regulatory criteria should be restricted to the total system, there were strong arguments against our attempting to change the regulations. Such attempts might create the perception that we are trying to get around something. This view was also expressed during discussions of other issues. The participants recognized that some changes are inevitable and that these necessary future changes may hurt more in terms of public perception. A credible process for making changes

is needed so that we are not forced to forego the ability to apply what we have learned. An approach that might help is to make a clear commitment that any rule change will be made to improve safety rather than bureaucratic convenience.

A major topic in the discussion was the status of EPA regulations, with some participants stating that concerns about NRC regulations were premature until the EPA acts. Without the EPA standards, the NRC criteria are meaningless, and our plans for performance assessment are built on quicksand.

Other discussions involved taking credit in the regulatory analysis for engineered barriers. Opinion on this topic was divided. Some felt that it is premature to think about using engineered barriers to complement isolation provided by the natural barriers; it reduces confidence in the program, as there is no experience with engineering for 10,000-year periods. Other participants, however, felt that the concept of engineered barriers should be part of the overall performance allocation.

DOE response and current plans

The NRC's regulation is generally not prescriptive, recognizing that a repository has never been built and operated. The regulation states, for example, that, provided the overall system performance objective is satisfied, the NRC may approve or specify subsystem performance objectives other than those specified in 10 CFR 60.113. We fully agree with this philosophy and believe it is prudent to retain the flexibility to propose alternative approaches to demonstrating compliance rather than being required to meet specific interpretations established by rule.

We favor option 3 until alternatives are more clearly defined after 10 CFR Part 60 is revised to reflect the revised EPA standards.

We believe that it is our responsibility as a potential applicant and licensee to propose our position on the issues. Our proposed positions should be evaluated by, and discussed with, the NRC and should be considered by the NRC in making decisions on the need for, and the nature of, regulatory guidance. The NRC could provide guidance on this issue in NRC staff technical positions or in regulatory guides, or the NRC staff could review our topical reports on the issues and document their findings in safety evaluation reports as they do for the nuclear power industry.

PHASED LICENSING FOR THE REPOSITORY

Background

As specified in the NRC regulations in 10 CFR Part 60, the licensing of a repository will include authorization to construct a repository; a license to receive and possess radioactive waste at the site, to be issued after the repository is constructed; and an amendment of the license permitting the repository to be decommissioned and permanently closed. One reason for phasing the licensing in this manner is to allow the NRC to evaluate additional information about the expected safety performance of the repository.

Since a repository is a first-of-its-kind facility, its licensing, especially the first phase, is expected to be the most difficult challenge of the repository program, and there is concern that the information included in our license application may be deemed insufficient for a favorable finding. To increase the probability that we will be able to provide the information required for licensing we have evaluated a number of options, including several that are based on licensing the repository in phases.

Suggested original options for initiating a discussion

Option 1. If the site is determined to be suitable, we could seek to obtain a construction authorization for a full-scale repository, as assumed in our current plans.

Option 2. Instead of attempting to obtain a construction authorization for a full-scale permanent repository, we could attempt to first license pilot-scale facilities at a repository site. These pilot-scale facilities would be used to obtain information needed to complete and refine the design of a repository and a waste package, and to conduct tests in order to collect more data for the next licensing phase. They would be eventually scaled up to a repository subject to additional licensing.

Option 3. We could petition the NRC to divide the licensing process into two distinct phases. In the first phase we would seek to receive a construction authorization, under 10 CFR Part 60, for a temporary storage facility in the underground repository. This facility would not be licensed as a repository. In the second phase, which would occur years later, we would seek a license for a repository.

Option 4. We would seek to license a repository, but we would use the approach of incremental licensing for individual blocks of underground

waste-emplacement areas, using waste-acceptance procedures and criteria agreed upon by the NRC.

Synopsis of workshop discussions

There seemed to be general agreement that we should stay with option 1, our current plans for licensing. The other options were viewed as offering no significant advantages and having the potential to adversely affect public perception as an attempt to get around regulations or an attempt to permanently emplace waste before the repository is licensed. There were, however, some criticisms of our current approach on the grounds that we do not plan to construct the entire underground repository before waste-emplacement begins. (We plan to construct two panels of waste-emplacement rooms and start waste-emplacement while simultaneously developing other panels.)

One participant commented that option 2 (license for pilot-scale facility at repository site) would yield no data that would not be obtained through the regular licensing process. This option was seen as just an additional licensing process with the potential for litigation.

Option 3 (licensing in two distinct phases) was not clearly understood. We explained that it had been put forward by some other parties, not us. The objective is to use the repository for retrievable storage for perhaps hundreds of years, doing tests during that time. If the repository passes the tests, then it should be licensed and closed; if not, the waste should be retrieved. Though it is a radical option, we felt obliged to include it here.

Little merit was seen for option 4 (incremental licensing for individual storage area blocks).

DOE response and current plans

Option 1 remains the current program plan, although we are in the process of evaluating licensing alternatives. In this evaluation we are examining a wide variety of options that encompass both conventional and novel approaches. It should be noted that the current licensing process is actually a multi-step process with NRC approval for construction, operation, and closure. Furthermore, options 2 and 3, and possibly option 4, would require legislative amendments. And we heard at the workshops that alternatives could carry disadvantages in terms of unfavorable public perception. However, other alternate licensing strategies, e.g., accelerating the license application date, may have value.

CONTINGENCY PLANNING

Background

We are evaluating whether the Yucca Mountain candidate site in Nevada is suitable for a repository. To complete this evaluation we plan an extensive program of testing both from the surface of the site and underground, at the depth proposed for a repository if the site is found suitable. Issues related to the determination of suitability have been discussed earlier in this chapter.

We were directed to evaluate the Yucca Mountain candidate site by the Nuclear Waste Policy Act as amended. This law also specifies that if the site is found to be unsuitable, then we must notify the Governor and the legislature of the State of Nevada and recommend to the Congress, within 6 months, actions that should be taken to ensure safe disposal. By the decisions we make now, we must put the United States in the strongest position in the event that the Yucca Mountain candidate site is found unsuitable.

Suggested original options for initiating a discussion

Option 1. We could abstain at present from specific actions to prepare for the possibility that the Yucca Mountain candidate site might prove to be unsuitable, other than responding to requests from the Nuclear Waste Negotiator.

Option 2. We could increase our participation in international scientific investigations of disposal to be better prepared for considering host rocks other than the volcanic tuff present at Yucca Mountain.

Option 3. We could change our approach to the development of the waste package; instead of developing a design specific to the Yucca Mountain candidate site, we could develop waste package designs suitable for a variety of potential host rocks.

Option 4. We could identify, on the basis of available information from our earlier activities and data from international programs, host rocks and areas that might provide potentially suitable sites for a repository.

Synopsis of workshop discussion

The workshop broadened the discussion to the need for contingency planning in general. There was general agreement that such planning is indispensable to a

program like ours. The participants strongly recommended that we develop a serious contingency plan.

DOE response and current plans

We fully agree that contingency planning is essential, because our program is a first-of-a-kind undertaking marked by controversy and contention. We have performed contingency planning in the past, but these efforts lacked the formality and documentation needed to assure affected governments and interested parties that a substantial effort was being devoted to contingency planning.

Our planning staff began developing a process of strategic and contingency planning last summer that is an outgrowth of a Department-wide planning initiative. In September 1990, we delivered to the Secretary of Energy a strategic plan stating, among other things, that we will investigate alternatives that could be implemented in the event that the Negotiator is not successful. The need to consider this issue was reiterated in the multiyear program plan sent to the Secretary in December 1990.

We recently began to develop and evaluate contingency planning processes. It is clear that we need to plan for a variety of near-and long-term contingencies in a comprehensive, rigorous way. Above all, we need to develop contingency plans to address the following two issues:

- What should we recommend to the Congress in the event that the Yucca Mountain candidate site is found to be unsuitable as a repository? What decisions can we make now to put us in the strongest position to respond in the event that the Yucca Mountain candidate site is found to be unsuitable?

- What should we do in the event that the Negotiator is not successful in finding a volunteer MRS site?

Our plans are to continue the development of a contingency planning process that supports overall strategic planning.

GEOLOGIC DISPOSAL FOR WASTES OTHER THAN SPENT FUEL AND HIGH-LEVEL WASTE (GREATER-THAN-CLASS C WASTE)

Background

In 10 CFR Part 61, the NRC has defined three classes—A, B, and C—of low-level radioactive waste in order of increasing radiation hazard and longevity. Waste that exceeds the radioactivity concentrations permitted for Class C is known as "greater-

than-Class C waste." This waste comes from a wide variety of sources, including the operation and decommissioning of reactors, medical activities, and research. It varies in physical characteristics, composition, and radioactivity. At present, this waste is kept in storage at the sites where it is generated.

The actual quantities and characteristics of greater-than-Class C waste are presently being determined. Most of it will be radioactive metals from decommissioned power reactors, but it is believed that a portion of this waste could be "mixed waste"—that is, waste that contains both radioactive materials and hazardous chemical substances as defined in the Resource Conservation and Recovery Act of 1976.

The DOE, through its Office of Environmental Restoration and Waste Management (DOE-EM), is responsible for the disposal of greater-than-Class C waste under the Low-Level Waste Policy Amendments Act of 1985; DOE-EM is currently conducting a comprehensive study directed at determining the quantities and characteristics of this waste. In the past, the DOE has proposed providing for such waste special "intermediate-level" disposal—that is, disposal at depths on the order of 100 feet below the surface. Such disposal would provide greater isolation than do low-level waste sites and would be much less costly than a geologic repository. (Management of greater-than-Class C waste is not covered under the Nuclear Waste Fund established by the Nuclear Waste Policy Act unless the NRC determines that such waste must be disposed of in a geologic repository.)

Responsibility for classifying waste and determining which waste requires geologic disposal rests with the NRC. The NRC has not determined that greater-than-Class C waste requires geologic disposal. However, in its rule on the disposal of low-level waste, 10 CFR Part 61, the NRC proposed geologic disposal for this waste "unless proposals for the disposal of such waste in a disposal site licensed pursuant to 10 CFR Part 61 are submitted to the Commission for approval." We have encouraged the NRC to resume the effort of redefining the classes of radioactive waste, distinguishing between greater-than-Class C waste that requires geologic disposal and that which does not require such costly disposal.

Suggested original options for initiating a discussion

Option 1. DOE-EM could complete the characterization of greater-than-Class C waste. The OCRWM should then evaluate how much space this waste would require in a repository, how it might affect licensing, and how it might affect the performance of the repository.

Option 2. We (the DOE's Office of Civilian Radioactive Waste Management) could petition the NRC to develop specific performance criteria for the packaging and emplacement of this waste, regardless of the

method of disposal. We should also petition the NRC to identify the greater-than-Class C waste, if any, that should be isolated in a repository.

Option 3. We could petition the NRC to develop specific regulations for the disposal of greater-than-Class C waste.

Option 4. DOE-EM could plan to provide interim surface storage for this waste.

Option 5. DOE-EM could start planning to develop special "intermediate-level" facilities for this waste.

Option 6. We could defer planning for the disposal of this waste until the decision on the need for a second repository is made. We could then plan to emplace all this waste in a second repository if one is needed.

Option 7. We could start planning to accept some greater-than-Class C waste in the first repository.

Synopsis of workshop discussions

The topic of greater-than-Class C waste was not specifically addressed in the workshops, and therefore the options suggested above were not discussed. However, the disposal of this waste was included in discussions of site-suitability because it is pertinent to the question of disposal capacity. It remains a significant uncertainty in terms of waste volumes requiring disposal, because of the statutory limitations on the loading of the first repository before having a second repository in operation. Several participants strongly argued that the need for a second repository should be addressed now.

DOE response and current plans

Consistent with its responsibilities under the Low-Level Waste Policy Amendments Act of 1985, DOE-EM is determining current and future quantity and the characteristics of greater-than-Class C waste. DOE-EM has assigned this task to the Idaho Operations Office, which in turn contracted EG&G-Idaho to do the work. We are participating in the review of the results of EG&G's analyses. This effort is still ongoing, and a final report is expected later this year. The present "best estimate" volume of unpackaged greater-than-Class C waste by the year 2035 is approximately 300,000 cubic feet.

If the NRC were to determine that the greater-than-Class C waste is high-level radioactive waste, OCRWM would have to provide for its disposal in a geologic

repository under the NWPA as amended. As this determination has not been made, OCRWM is not planning to include greater-than-Class C waste in a repository.

A decision to emplace greater-than-Class C waste in the first repository (option 7) could substantially affect the planning, design, cost, and licensing of a repository. It would require detailed analyses of potential effects on the preoperational safety of the repository, the long-term isolation capability, the waste-emplacement configuration, and many other factors. We will continue to discuss with the NRC the disposal requirements for greater-than-Class C waste.

USING A DEMONSTRATION FACILITY TO INCREASE CONFIDENCE

Background

Proceeding to develop a repository at a more deliberate pace and in smaller, but perhaps surer, steps might contribute significantly to confidence that a repository will perform safely over both the near and the long term. One way to implement such an approach is to include in the repository-development process a demonstration project that would allow us to develop and demonstrate disposal technology with real waste in a geologic setting that is the same as, or similar to, that of the proposed repository.

The objective of a demonstration project would be to decrease uncertainties, thereby supporting licensing and increasing the confidence of the public. If the demonstration facility were co-located with the potential repository, the project could also significantly increase the amount of site information that is available for licensing. The role that a demonstration project would play in reducing uncertainties depends on the type of facility that would be used, the location of the facility, the tests that would be performed, and the time at which the demonstrations could be performed.

We will construct an exploratory facility at the Yucca Mountain candidate site to provide access to the horizon that would be used for a repository if the site is found suitable and to provide underground excavations for various tests needed to determine the suitability of the site. None of the tests currently planned for that facility will use actual waste. However, in principle, the facility could be used for the demonstration tests discussed above, although more underground excavation might be necessary and the scope of the testing would probably be increased.

Suggested original options for initiating a discussion

Option 1. We could perform the demonstration in the exploratory facility to be built at the Yucca Mountain candidate site. We could start by constructing a shaft or ramp to the proposed depth of a repository,

excavating repository-size drifts, and boring waste-emplacement holes in which tests would be performed.

Option 2. We could develop an underground research laboratory near, but separate from, a repository block. This research laboratory would be completed before the exploratory facility and could be used for prototype testing, demonstrating the suitability of the rock horizon proposed for a repository, and examining the spatial variability of the rock. This option would be subject to continuing NRC analysis.

Option 3. We could develop at the Yucca Mountain candidate site a test-and-evaluation facility pursuant to Sections 211 and 305 of the Nuclear Waste Policy Act as amended. The Act authorizes the construction of such a facility for demonstrating the technology needed for geologic disposal and for tests related to site evaluation and the operational aspects of waste disposal. For these tests it allows the emplacement of up to 100 metric tons of spent fuel under continuing NRC review. This facility would be used only if the Yucca Mountain candidate site is determined to be suitable for a repository.

Option 4. Before proceeding to construct, license, and operate a full-scale repository, we could construct and operate a repository as a pilot-scale facility with limited waste-emplacement and licensing in increments.

Synopsis of workshop discussions

There was little support for a demonstration facility in the discussion. In view of the long time required for isolation—thousands of years—a demonstration facility with tests conducted over several years might not add much to public confidence. And using spent fuel in a demonstration facility would likely be adversely received in Nevada.

Once the repository starts operations, it itself will be run as a demonstration project, with information gathering continuing for over 50 years, during which time all emplaced waste is to remain retrievable. If the demonstration is to involve further studies and hence additional costs, the utilities will not support it.

DOE response and current plans

We are currently evaluating the need for a prototype facility, but one in which we do not anticipate a need to emplace spent fuel. The benefit of a prototype facility must be evaluated recognizing that we will later construct an exploratory facility at the site consistent with NRC regulations. Because data collected away from the site may not

be considered representative, it might be necessary to duplicate some work in the exploratory facility. However, there may be compensating benefits for the overall test program in terms of flexibility, experiment design, and implementation.

RISK ASSESSMENT IN SELECTING TRANSPORTATION MODES AND PREFERRED ROUTES

Background

We are taking various steps to ensure the development of a comprehensive program for the assessment and management of transportation risks. These steps include the development, enhancement, or evaluation of various computer models, including models based on well-established probabilistic techniques of risk assessment. To support these models, we are also developing a transportation data base; this includes the preparation of a standard reference document for transportation assumptions, the collection of data on accident rates for rail and road transport, and the development of risk factors for national transportation network analyses.

We have kept the Nuclear Waste Technical Review Board informed regarding our work in the development or revision of computer models and codes, and the Board has responded with comments and suggestions. We anticipate a similar working relationship with the Board regarding the development of plans for the application of these models and codes.

The methods and models used for risk assessment could be applied to the selection of transportation modes (truck or rail) and preferred transportation routes. We have not yet made a final determination about transportation modes. However, it is currently our intent to ship waste by rail where possible. For shipments from the MRS facility to the repository, we currently plan to use dedicated trains.

Suggested original options for initiating discussion

Option 1. We could use risk assessment as the primary method of selecting transportation modes.

Option 2. We could use risk assessment as the primary method of identifying transportation routes.

Option 3. We could use risk assessment as a tool in supporting decisions on transportation modes and routes.

Option 4. We should not use risk assessment in these transportation applications.

Synopsis of workshop discussions

Participants acknowledged that although the actual risks from transportation are likely to be low, transportation is likely to be the major issue in waste-management, and the public is likely to be extremely concerned about its safety. The participants cautioned us on the use of risk assessments, saying that such assessments are of questionable technical value and can be misconstrued by the public. They did not distinguish between the use of risk assessments specifically in decisions on route selection and transportation modes. Several participants advised us to carefully consider public concerns, to attempt to understand the issues in the terms of the ordinary person, and to address them thoroughly, even if public perceptions of risk are not consistent with the results of technical risk assessments. In evaluating measures with the potential of improving transportation safety, we should be concerned with increasing regulatory approval and public confidence and not be concerned only with the probability of the incident that is to be prevented or mitigated.

We should be careful in interpreting the results of quantitative risk assessments and using them as proof of safety. Even a small transportation accident would damage the credibility of those assessments since the public does not relate to averages or probabilities. To address the concerns of the public in our analyses, we should consider real situations and include worst-case scenarios, even if they are so unlikely as to be incredible. We were advised that we need to answer such questions as what it means in terms of real world exposure to have a truck stop next to you. If the Yucca Mountain candidate site is found suitable, the Nevada routes to the repository will be secondary roads through small towns. The implications for the people living there must be addressed.

We were cautioned not to attempt to "sell" program safety, but rather to concentrate on establishing productive communication with the public. There was also a suggestion that, if risk assessment is to be used, it should be performed by State and local organizations rather than us.

DOE response and current plans

Although risk assessment is an important tool in the consideration of transportation impacts, other factors must also be considered in selecting shipping modes and preferred transportation routes. The Department of Transportation (DOT) has established specific regulations for the highway routing of spent fuel shipments. In these regulations the States have an established role in the designation of preferred routes for these shipments within their boundaries. Although there are no DOT

regulations for the routing of spent fuel shipments by rail, the Congress has recently directed the DOT to study the advisability of establishing such regulatory requirements and review the overall factors that should be addressed by both shippers and carriers in the selection of both routes and modes of transportation. If after DOT's review, new regulations are needed, the DOT will promulgate them. In selecting transportation modes and routes, we will ensure that our selections are in full compliance with regulatory requirements.

Another major element that we must consider in our transportation planning is the physical security of spent fuel shipments. The NRC has established specific regulatory requirements for the protection and safeguarding of these fuel shipments; they include specific security factors that will affect mode and route selection. We will ensure that our selections are in full compliance with the NRC's regulatory requirements.

There is a reasonably clear consensus that risk assessment should be used cautiously to support transportation decisions. Risk assessments often provide important insights to tradeoffs but by themselves are unlikely to adequately address public concerns about transportation risks. Moreover, as indicated above, the assumed risks are so low that they may not discriminate among various route selections. It is therefore not appropriate to rely on risk assessments as the primary method of making decisions on routing or transportation modes. At the same time, we recognize that risk assessments do yield important insights, and there is no advantage to us or to affected governments and interested parties to abandon the use of this technique entirely.

In the area of risk assessment, we believe that public confidence will be enhanced by State and local agencies making independent evaluations. To assist them, we have made available our RADTRAN computer code on the TRANSNET system. We are currently completing the documentation of this code.

We propose to implement option 3 and use risk assessment as a tool, where appropriate, to support decisions on transportation modes and routes. We will seek to obtain the views of the affected governments, interested parties, and the public on these risks and will address their concerns, as appropriate, through the following outreach activities to be included in our risk-management program:

- Meeting with affected governments and interested parties to identify their concerns.

- Attempting to reach consensus with affected governments and interested parties.

- Keeping the affected governments and interested parties informed about our activities in risk management.

- Conducting public information meetings and publishing periodic update reports.

- Providing means for communicating directly with us.

DEVELOPMENT OF DUAL-PURPOSE CASKS FOR TRANSPORTATION AND STORAGE

Background

A dual-purpose cask is a metal container that has been designed and approved to be used for both transportation and storage of spent fuel. Dual-purpose casks must satisfy the requirements of 10 CFR 72 for certification by the Nuclear Regulatory Commission (NRC) for use as storage casks and must also satisfy the requirements of 10 CFR 71 for certification as transport casks. To date no casks have been certified by NRC for dual-purpose use, and some certification issues remain to be resolved. However, a cask vendor (NAC) is currently involved in obtaining an NRC certification for a dual-purpose cask.

We are considering the use of dual-purpose casks for the first phase of an MRS facility. These casks would allow earlier waste acceptance because they could be shipped to an MRS site and stored. Since the fuel shipped in them may not need to be unloaded or handled in any way, they would permit waste acceptance before the waste-handling building of an MRS facility is completed. However, dual-purpose casks are not at present included in our program for developing transportation casks. For use in the first phase of the MRS facility, these casks would be demonstrated and certified by commercial vendors and the utilities or by a cooperative demonstration program.

Suggested original options for initiating a discussion

Option 1. We should not include any dual-purpose casks in our shipping-cask fleet.

Option 2. We should include a limited number of dual-purpose casks in our cask-development program for the initial phase of MRS operations.

Synopsis of workshop discussion

Diverse views were expressed on the issue of dual-purpose casks. Some participants favored including a limited number of dual-purpose casks in the program on the grounds that this option would help to minimize the handling of spent fuel; yield benefits in overall system costs, particularly if casks would allow the closing of storage pools at the sites of decommissioned reactors; and provide for more system flexibility. The major concerns were NRC certification (receiving NRC permission to ship the casks after long-term storage), compatibility with utility plans for storage, and cost. The latter seemed to be the principal issue, since the casks are expensive (though their costs might be reduced by a large procurement), and any savings would be realized later, whereas the utilities would have to make the investment now. The costs should be thoroughly analyzed in terms of system economics. Benefits in both licensing and costs might be obtained if the cask to be developed was mainly a storage cask with a one-time transportation certificate.

There was also concern that the use of dual-purpose casks might affect MRS siting if it creates the impression that the DOE is rushing into storage at an uncompleted facility. The issue was that the public might not be comfortable with the notion of simple storage on a construction site.

An alternative approach that might achieve the benefits of dual-purpose casks at less cost would be to divide the three functions of the dual-purpose cask (store and protect at the reactor site, transport safely, and store and protect at the destination site). This could potentially be achieved by packaging the spent fuel in multi-assembly storage canisters that would be free of external radioactive contamination, thereby simplifying transfer operations at storage sites. The multi-assembly canisters would be placed in reusable containers for transportation, allowing the reuse of the most expensive components.

DOE response and current plans

Although our current cask-development program does not include dual-purpose casks, commercial vendors have proceeded with the design and development of these storage and transport casks. Should these vendors be successful in receiving NRC certification for storage and transportation, we will evaluate the use of their casks as part of early waste acceptance at the first phase of an MRS facility. We will first consider the overall system costs and benefits. We will also examine their operational safety and the NRC's dual certificates of compliance in particular. If these issues cannot be resolved quickly enough to permit us to acquire a sufficient number of the casks by 1998, there will be no advantage in developing these casks. If these issues are satisfactorily resolved, we will determine whether cooperative projects with industry should be funded to further develop and use dual-purpose casks.

The situation is similar with regard to the utilization of a system based on the use of multi-assembly storage canisters. A spent fuel storage system consisting of multi-assembly storage canisters within concrete horizontal modules has been developed by a vendor (NUHOMS) and is currently being utilized at two reactor sites. The multi-assembly canister has not at this time been approved for use as a component of a certified transportation cask.

Our decision on the use of either of these technologies will be based on their safety, cost effectiveness, usefulness in the waste-management system, feasibility for the intended use, the use of these technologies by utilities and the regulatory issues. Also, input from a volunteer host will be factored into decisions on the selection of technologies to be used at an MRS site. We expect to make our decision after NRC has issued certificates of compliance for the technologies.

We recognize that, regardless of the ultimate role that we see for such technologies to accomplish our goals within the Federal waste-management system, many utilities are making decisions now to deploy such technologies to meet their current storage requirements. We will continue to monitor their decisions and work with them to ensure that the systems are compatible and the spent fuel can be safety and easily transferred to the Federal Government.

3.2 MANAGEMENT ISSUES

ROLES OF UTILITIES AND THE FEDERAL GOVERNMENT IN THE MANAGEMENT OF SPENT FUEL BEFORE DISPOSAL

Background

Our standard contract with the owners/generators of spent nuclear fuel, signed in accordance with the requirements of the Nuclear Waste Policy Act, states that in 1998, after commencement of facility operations, we are to start accepting the spent fuel stored at reactor sites. Since the schedule for the repository has been delayed, we plan to ship the spent fuel to a central storage facility, such as an MRS facility. If spent fuel transfer to a central facility cannot begin as currently planned, it will be necessary to develop substantial additional capacity for storage at all or some reactor sites. This issue concerns the appropriate and effective distribution of responsibilities between the Federal Government and the utilities in the management of spent nuclear fuel before disposal in a repository.

Suggested original options for initiating a discussion

Option 1. Utilities are responsible for the storage of spent fuel until the fuel is transferred to the Federal Government. Transfer occurs when the spent fuel is loaded into government-owned transport casks and leaves the reactor site for a Federal waste-management facility.

Option 2. Utilities store spent fuel and also prepare it for further storage or disposal in a Federal waste-management facility in order to facilitate the operation of Federal facilities. Two variations are available for implementing this option (1) the utilities retain title to the spent fuel and perform the waste preparation under contract to us or (2) they transfer title to us before preparing the fuel.

Option 3. Utilities are responsible for providing for spent fuel storage until we pick up the fuel. However, for storage after 1998 we would pay with monies from (1) the Nuclear Waste Fund or (2) general revenues.

Option 4. After a specified date, we assume responsibility for, and take title to, spent fuel at the reactor sites. Until transferred to a Federal facility, the fuel would remain in storage at the reactor site in (1) a utility storage facility or (2) a storage area controlled by us.

Option 5. Utilities are directed to collect and store spent fuel at a small number of commercial-reactor sites as (1) part of Federal waste management, with costs paid from the Nuclear Waste Fund, or (2) at their own expense.

Synopsis of workshop discussion

Participants showed little interest in options 3, 4, and 5, which would require changes in the contract and legislation. The utilities may not want us involved in at-reactor storage. Furthermore, they are not interested in long-term at-reactor storage,* regardless of who pays for it, because it creates difficulties for decommissioning plants. In regard to option 3, a participant commented that payment from general funds would be preferable.

On the other hand, some participants said that spent fuel storage at reactor sites is preferable to storage by the government. They felt that to achieve public acceptance the fuel should be kept at reactor sites with a rebate from the fee.

There seemed to be some agreement that we should not take title to spent fuel at reactor sites because it would split responsibility for spent fuel management and cause problems in accountability.

In regard to option 2, there was little support for the utilities performing waste-preparation functions. However, one requirement clearly emerged: since the utilities are pursuing options like consolidation to increase the capacity of existing storage pools, they need to know what we will accept. The utilities would have a better basis for their waste-management decisions if they knew, for example, whether we would accept consolidated fuel.

DOE response and current plans

Our current planning for the Federal waste-management system is representative of option 1, which is also consistent with the existing institutional, contractual, and legal structure.

In response to the workshop discussion, we have developed the following strategic principle: "strive to diminish uncertainties related to spent fuel management by the utilities." This principle has been added to Chapter 2 under "Management Principles." We plan to implement this principle by identifying pertinent technical interfaces with the utilities and providing the utilities, in a timely manner, the information they need to coordinate their waste-management activities with ours. This would include acceptance criteria for spent fuel and information on the compatibility of treatment technologies that might be used at reactor sites, such as consolidation or loading into special storage canisters.

PRIVATE-SECTOR INVOLVEMENT IN THE DEVELOPMENT AND OPERATION OF AN MRS FACILITY

Background

An MRS facility can provide significant benefits to the Federal waste-management system by improving the development of the overall system, providing timely and adequate waste acceptance, enhancing confidence that the waste-management problem can be managed in a predictable and timely manner, and providing a flexible coupling between at-reactor waste-management operations and repository operations by acting as a buffer between systems with dissimilar needs and characteristics.

The MRS facility will provide the Federal waste-management system with the capability to accept commercial spent fuel beginning as early as 1998. The facility will be designed to receive, store, and stage shipments of spent fuel to the repository for

permanent disposal; it will also provide the flexibility to perform additional functions that may be beneficial or required as the design of the waste-management system matures.

Technically suitable sites for the MRS facility can be found throughout the continental United States. The Nuclear Waste Policy Amendments Act authorizes two siting approaches for the MRS facility. One is negotiation with a State or Indian Tribe that can offer a technically suitable site on reasonable terms; to implement this approach, the Congress created the Office of the Nuclear Waste Negotiator. The other is a survey-and-evaluation process conducted by us.

As a way to expedite the siting and development of an MRS facility, the privatization of some or all of the development process has been proposed.

Suggested original options for initiating a discussion

Option 1. The MRS facility should continue to be a federally owned facility operated by a contractor.

Option 2. A storage facility could be sited, constructed, and operated by private industry. The utilities would contract directly with the owner of the facility for spent fuel storage.

Two variations are possible for option 2 as follows:

1. The facility could be developed by private industry, as in option 1, but, we, instead of the utilities, would purchase storage space and services. The utilities would deal with us.

2. We would lease storage space from the private developers of an MRS facility and hire a contractor to operate the facility for us.

Synopsis of workshop discussion

The workshop participants showed little interest in discussing private-sector involvement. The participants questioned why this issue was being discussed and said that this issue had already been settled by law. In addition, participants felt that other MRS issues (e.g., need, siting, co-location, and cost) are more relevant. One participant stated that the issue of who owns and operates an MRS facility is wrapped up in the larger issue of finding a site. We were reminded that ownership does not affect who does the work, and even in a Federal facility much of the work will be performed by private contractors. One of the participants felt that siting might be facilitated by private-sector involvement: if the Negotiator could clearly state early in

negotiations with a potential host State or community that the facility will be developed by the private sector, rather than the DOE, the response may be more favorable.

We also received comments from parties who were not able to attend the workshops but who reviewed the strategic principles discussion draft. They stated that the law authorizes an MRS facility owned by the Federal Government, and our approach should therefore be Federal ownership. To the extent private initiatives are successful in providing an alternative, we may wish to evaluate those alternatives, which might involve a number of options for ownership and operation, at some future date. At this time, there is no need to adopt a strategic principle that calls for a change in the ownership of the facility as authorized by law.

DOE response and current plans

We agree that the privatization issue does not by itself, deserve the status of a strategic principle, although we believe that privatization may be able to expedite the development of an MRS facility. We will, as suggested by one commentor, evaluate private-sector involvement to the extent that it is successful in providing alternatives.

In regard to MRS siting, we agree that the efforts of the Nuclear Waste Negotiator offer the best opportunity to site an MRS facility. Consequently, our near-term role in MRS siting will be to monitor the progress of external efforts to find a volunteer host and to support those efforts as appropriate.

USE OF THE NUCLEAR WASTE FUND FOR STORAGE

Background

If an MRS facility is developed as an integral part of the waste-management system and the acceptance priorities for spent fuel are based on the current contract with the utilities, then there seems to be no question that the Nuclear Waste Fund should be used to pay for its development and operation. However, as discussed in the preceding sections, a number of other options for providing storage could be used, and the means for paying for their costs should be determined.

Suggested original options for initiating a discussion

- Option 1. An MRS facility is developed as an integral part of the Federal system. All of the costs of this option are paid from the Nuclear Waste Fund.

- Option 2. An MRS facility is developed as an integral part of the Federal system. The costs of MRS development are paid for from the Fund,

but the utilities using it for storage pay for the incremental operating costs of storage from the start of waste acceptance, assumed to be in 1998, to the start of operations at a repository.

Option 3. An MRS facility is developed to provide storage for utilities needing additional capacity. The full costs of development and operation are borne by the users.

Option 4. The Fund is used to develop and operate commercial storage facilities or facilities provided at selected reactor sites.

Synopsis of workshop discussions

Very little interest in this topic was evinced in the discussions. The participants were more interested in other storage-related topics. One participant commented that the issue of funding had already been settled. Another pointed out that some of the options do not necessarily have cost implications. Since ratepayers are paying for storage, transportation, and disposal, their dollars are traded internally, and trading money internally does not really have a cost impact. The differences among options are more political than monetary.

DOE response and current plans

Because of the lack of discussion regarding this issue, we propose to drop it from further consideration as an issue of strategic importance.

USE OF PEER REVIEWS

Background

A peer review is a documented critical review performed by persons who have technical expertise in the subject matter of concern but are not directly involved in the analysis, study, or plan under review. Peer reviews are management tools for interpreting and verifying or validating assumptions, plans, results, or conclusions critical to the success of a program. Although the following discussion is directed at the Yucca Mountain project, peer reviews will be used as appropriate in other parts of our program.

Since our program has traditionally relied on peer reviews, the issue here is not instituting peer reviews as a new practice. Rather, it is a question of establishing guidelines for the use of peer reviews.

Peer reviews yield multiple benefits. The expert appraisal of plans, methods, analyses, and results bolsters technical confidence, and the use of recognized independent authorities strengthens our credibility. Peer reviews may also generate fresh ideas and approaches to problems.

Suggested original options for initiating a discussion

Option 1. We should conduct special peer reviews as necessary on high-visibility issues of critical importance to ensure that the best available resources are mobilized for key decisionmaking.

Option 2. We should institute regular peer reviews in the routine conduct of the program such as the certification of data, comment on research conclusions, etc.

Synopsis of workshop discussion

The options suggested for discussion are not mutually exclusive, and there seemed to be agreement that we should use both options, depending on the circumstances. Furthermore, some of the discussion went beyond the topic of peer review to internal technical reviews and reviews mandated by law, such as those performed by the Nuclear Waste Technical Review Board.

Option 2 was deemed important from the public-confidence perspective, and we were advised to give serious consideration as to how peer reviews could be used to bolster public confidence. There also seemed to be agreement that most of our work should be internally reviewed, with the important work being externally reviewed and that, as recommended by the National Academy of Sciences, we should more frequently submit our work to outside experts who are not involved in the program.

The use of independent experts in the actual studies or activities versus their use as reviewers of those activities was discussed. Also, the scarcity of independent external experts was noted, as was the potential for the extensive use of peer reviews to result in cronyism. Finally, we were advised that peer reviews should not be limited to technical issues; institutional programs, socioeconomics work, and even management issues should get the same treatment.

We also received a number of specific suggestions, including the following:

- International peer review should be considered.
- It is important to have really independent reviewers rather than using mainly DOE contractors.

- Peer-review panels should include technical critics.

- Need to find reviewers who will ask the hard questions, play the role of the devil's advocate.

DOE response and current plans

We will continue to use the peer review process as an important mechanism for ensuring the quality and credibility of our work. We will respond to the recommendations of each peer review and incorporate those deemed appropriate into our plans and operations. The peer-review process will be used in accordance with applicable quality-assurance procedures, and the findings therefrom will be considered part of the management decisionmaking process.

In determining when to use peer review, we plan to weigh the benefits and costs of a peer review before the review is initiated. This evaluation will consider other review mechanisms that are routinely employed. For example, plans, procedures, and reports receive extensive technical reviews within the Office of Civilian Radioactive Waste Management, including reviews by the national laboratories and participating contractors, by our project offices, and by other DOE organizations. These reviews may carry a document through several cycles of qualified technical review. In addition, reviews are performed by the NRC staff, the Nuclear Waste Technical Review Board, and affected governments (e.g., the State of Nevada). Often these reviews by oversight groups occur on an ongoing basis during the conduct of the activity.

We recognize that peer reviews are generally limited in scope and duration, and they may not be sensitive to regulatory, institutional, and management concerns. In responding to peer-review results, we must consider these other factors and incorporate any impacts in our response. This subject is also discussed under the issue "Building Public Trust and Confidence."

ALTERNATIVE MEANS OF MANAGING THE WASTE MANAGEMENT PROGRAM

Background

Several alternative approaches to managing the program were identified and evaluated in response to the requirements of the Nuclear Waste Policy Act by an advisory panel

that submitted its report to the Secretary of Energy in December 1984.* The panel's report was reviewed by a senior DOE group.

The panel identified several options for managing the program, but its preferred option would have required amending the NWPA. Because spokespersons for both the States and the utilities had advised strongly against attempting any amendments to the Act at that time, the DOE review group concluded that no major organizational changes should be initiated until several significant program milestones had been completed. Furthermore, the DOE review group concluded that most of the problems faced by the program were inherent in the nature of radioactive waste management and the Nuclear Waste Policy Act and could not be solved by changing the nature of the organization or management.

The issues identified by the panel have since been repeated by other parties. Most often cited are the DOE's credibility problems, lack of internal flexibility, and lack of cost-effective management.

The panel concluded that several organizational forms would be more suited than we for managing the construction and operational phases of the program. The option preferred by the panel was the creation of an independent Federal corporation. The panel also concluded that no modification of the DOE/OCRWM organization would provide adequate stability and continuity.

Suggested original options for initiating a discussion

Four options for managing the program were identified in 1984 by the advisory panel as follows:

Option 1. The present management structure should be retained.

Option 2. An independent Federal agency or commission should be established to manage the program.

Option 3. A mixed public-private corporation should be established.

Option 4. A private corporation should be established.

*Report of the Advisory Panel on Alternative Means of Financing and Managing Radioactive Waste Facilities, December 1984.

Synopsis of workshop comments

There appears to be little support for turning over management of the program to another entity at this time. However, a number of participants saw merit in considering the possibility that another entity should manage the program during the later phases of implementation.

Participants cited three reasons for turning the program over to another entity: our credibility is so low as to render us incapable of carrying out the task; it was not clear that we have a stake in disposing of the waste; and an entity less bureaucratic than a government agency might be desirable. Among the arguments against a change were that no single company would have all the necessary capabilities, so that a consortium would be necessary; that the slow pace of progress is due not to government ineptitude but rather to checks and balances, which would apply to another entity as well; and that appeal for Congressional intervention would be less effective than it is with an executive agency.

DOE response and current plans

We believe that we should manage the program at this time because the primary current issues involve legislative and regulatory adjustments. We need to establish the program's system aspect and scientific basis. The entity running the program now should be "at parity" with the other governmental entities shaping the program's future.

We agree, however, that, as the program enters the implementation stage (construction and operations), some other type of entity might be better suited. We will continually weigh the merits of turning over responsibility to another entity at the implementation stage. The decision process will be set in motion early enough that if the Congress decides to transfer responsibility, the transfer can be done with no loss of momentum.

Meanwhile, we intend to continue looking for ways to improve program management. We have already implemented a number of initiatives directed at enhancing the management of the program. They included direct-line reporting from the Yucca Mountain Site Characterization Project Office to the OCRWM Director, the appointment of a permanent OCRWM Director, consolidation of contracts, an independent review of the management structure and procedures, a reorganization of the OCRWM, and signing a contract with a management-and-operating contractor.

COST CONTAINMENT

Background

The Nuclear Waste Policy Act of 1982 as amended established the Nuclear Waste Fund to provide funds for the permanent disposal of spent nuclear fuel and high-level waste. The owners and generators of spent nuclear fuel are required to pay into the Fund a fee of 1.0 mill per kilowatt-hour of electricity generated and sold. In 1985, President Reagan decided that separate facilities for commercial spent fuel and high-level wastes from defense programs were not to be pursued, but that each party must pay its full respective share of the total program costs. Through September 1990, the owners and generators of spent nuclear fuel had paid $4.6 billion into the Fund. In 1991, $5 million was provided to start payments for the disposal of defense high-level waste.

We take very seriously our responsibilities to provide proper management and accountability for the funds entrusted to us.

Synopsis of workshop discussions

Participants at the workshops pointed out that the discussion draft did not explicitly address cost containment. The issue of cost was either neglected or treated as an issue secondary to technical and management decisions, even though it has a significant effect on the program. We were urged to revise the draft to reflect the importance of cost and schedule control to the success of the program and to add cost containment as a strategic principle. We were also urged to use the concept of "total enterprise cost"; that is, we should analyze the cost impact of a concept all the way back to the utilities.

DOE response and current plans

We agree that cost containment should be a basic policy and management objective of the program. We have, therefore, revised the list of strategic principles in Chapter 2 to add cost containment. Two aspects of cost containment are important; one is cost-effective design of the waste-management system, while the other is cost-effective management of the program itself.

Within the context of making program decisions affecting system design, costs have always played an important role in major decisions. The decision in 1985 to include defense high-level waste in the civilian repository and the establishment of the DOE position on the MRS Facility issued in 1989 are examples where the cost of alternative actions were considered along with other factors before these decisions were

made. We will continue using cost as an important consideration in making major program decisions.

We agree that the cost of the waste-management system must be viewed as the total system cost, including the cost impacts that are experienced by the utilities and are not covered by the Nuclear Waste Fund. For example, in the MRS System Studies performed in 1988 and 1989 that were used in establishing the DOE position on the MRS facility, total system costs, including those paid by utilities for out-of-pool spent fuel storage, were estimated and used in determining the preferred system configuration. Cases studied included systems with or without rod consolidation, having consolidation alternatively performed at the repository or the MRS facility, having spent fuel alternatively packaged into the disposal containers at either the repository or the MRS facility, and alternative deployment schedules for the MRS facility. The total system cost estimates, particularly those for at-reactor storage, were a prime factor in the decision to have an MRS facility, without consolidation, which could be deployed relatively quickly and thus minimize at-reactor storage needs.

Since the program's baseline change proposal system was initiated in the mid-1980s, cost impact assessments have been required, along with technical, regulatory, safety, schedule, and other impacts to accompany change proposals brought before the Program Change Control Board. As specified in the program's change control procedures, the Board members are required to evaluate the validity of the cost impact (and other impact) assessments in the review of the proposed change. Changes to the program's baselines (technical, cost and schedule) must be formally approved by the Chairman of the Change Control Board only after receiving the recommendations of each of the Board members. Thus, the change control system provides a formal means of incorporating costs into the program's decisionmaking, as well as enhancing accountability and traceability in our decisionmaking process.

Regarding cost-effective management, we have conducted several activities over the years to promote cost control. Since the passage of the Nuclear Waste Policy Act, several of the key program elements established performance measurement baselines, in conformance with DOE Cost and Schedule Control Systems criteria, designed to allow management to track program progress. To enhance this tracking process, a Program Management Information System was established to collect these performance data in a meaningful way and report them to management, accompanied by evaluations of variances and plans for corrective actions. With the passage of the Amendments Act in 1987 and the announcement of the restructured program in 1989, the program's cost and schedule baseline has been significantly changed from the earlier performance measurement baselines which were developed. With the implementation of a more meaningful baseline, the continued enhancement of progress reporting systems, and adherence to the formal change control procedures mentioned above, more effective cost control will be fostered.

One of the best means of providing cost control is afforded by the steps embodied in the budget formulation process. Each year, we issue program guidance to all field offices establishing OCRWM planning assumptions including key programmatic milestones and budget constraints. For a given year's budget, the formulation process spans a period of about two calendar years over which oversight by groups both internal and external to the program exercise control. In addition to the OCRWM management's review of the budget, the Department's Internal Review Board, the Office of Management and Budget, and the Congress itself provide reviews and direction for formulating the budget. Because of the many interaction points with these parties, the budget is subject to much scrutiny. Workscope, priorities, and schedule attainment are constantly revisited by management before execution of that year's budget begins.

We prepare total system life cycle cost estimates to establish the reference long-term cost for the program. These estimates are submitted to the Congress and published. The cost estimates are reviewed by both the DOE's Office of Independent Cost Estimating and the General Accounting Office (GAO). These regularly performed external assessments have helped make the cost-estimating process one which is thorough and accountable. In addition, the independent auditing firm of Peat Marwick Main annually reviews the financial management of the Nuclear Waste Fund. Also, having our technical work subject to the scrutiny of the Nuclear Waste Technical Review Board, as well as DOE's Inspector General and the GAO, contributes to providing a sounder basis for the cost estimates.

In addition to the Program Change Control Board activities described earlier for managing the baselines, the Department has strengthened the project management system by establishing an executive level Baseline Change Control Board to be chaired by the Acquisition Executive. By establishing an executive-level change control process, the Department provides the Acquisition Executive and senior DOE management a formal means for timely involvement in major program decisions.

The management of the program has not been as cost-effective as we would like because of the time needed to implement a quality assurance program that meets NRC requirements and the delay in obtaining access to Yucca Mountain. The quality assurance program has now been fully implemented, and we hope that access to Yucca Mountain will be obtained soon. There are certain fixed costs that continue through periods of delay, causing inefficiencies in the management of the program. We are, however, seeking to improve our management efficiency. We have completed a comprehensive review of our contracts and have consolidated a number of them. We expect further consolidation now that the management-and-operating (M&O) contractor is on board. We expect the M&O contractor to implement improvements in cost-effective management, improve efficiency in the performance of the technical work, and

to also improve cost effectiveness in the design and operation of the waste-management system.

Another important initiative for controlling costs is the redirection of the site characterization program to focus on detecting, as early as possible, conditions that would indicate that the site is unsuitable as a repository. Site characterization will be a major driver of program costs for the next several years, and our current efforts to develop priorities for both surface-based and underground tests will increase the cost-effectiveness of site investigation.

3.3 INSTITUTIONAL ISSUES

BUILDING PUBLIC TRUST AND CONFIDENCE

Background

The subject of building public trust and confidence developed during the workshops; though the discussion draft distributed before the meetings included several strategic institutional issues, it did not include building public trust and confidence as a single issue. It was added to the agenda, and now to this revised document, in response to the comments of participants. Participants identified public trust and confidence as a key issue that should be addressed in considering most of the topics on the agenda. Many participants suggested possible initiatives that we could undertake in the technical, institutional, and management areas of the program to address concerns about credibility.

Prior to the workshops we recognized the importance of this issue and had been engaged in a major effort to identify and formulate initiatives directed at increasing public trust and confidence. We would like to propose these initiatives here for comment from a broader audience. The initiatives include measures to enhance participation by affected governments, interested parties, and the public; to improve communication; and to build public understanding. Initiatives that could contribute to public trust and confidence are not limited to this section; others appear in the technical and management sections of this revised document.

Suggested original options for initiating a discussion

The discussion draft proposed several options for enhancing participation under the headings "Timing and Means for Predecisional Participation by Affected and Involved Parties" and "Gaining Public Acceptance of Waste Transportation."

The options for participation originally included in the discussion draft were as follows:

Option 1. We could attempt to establish a partnership in which Federal, State, and local governments jointly develop decision alternatives for the program in consultation with the public.

Option 2. We could establish mechanisms for predecisional dialogue.

Option 3. We could limit involvement to postdecisional dialogue.

Synopsis of workshop discussions

In discussing the issue "Timing and Means for Predecisional Participation by Affected and Involved Parties", participants generally agreed that (1) we cannot "share" ultimate program decisionmaking responsibility, nor would affected governments and interested parties want a share in decisionmaking in all cases, and (2) we should emphasize affected government and interested party participation in framing policy options at a very early stage in the decisionmaking process, not just in the review of completed drafts.

In discussing the issue of gaining public acceptance of waste transportation, and throughout the workshops, a recurring theme was the participants' insistence that we must improve our communication with the public and commit appropriate resources to accomplish this objective.

DOE response and current plans

We propose to build on option 2 as a concept for predecisional involvement, expanding the original definition to include the concept of "joint development of decision alternatives" featured in the original option 1.

In order to build public trust and confidence, we propose to implement the following actions:

Develop a clear and realistic concept for predecisional involvement by affected governments and interested parties in program decisionmaking, and commit the resources needed to make it work.

1. Identify significant technical and programmatic issues requiring action and the process by which related decisions will be made. This initiative would involve assessing current technical, institutional, and management issues; determining when significant decisions related to these issues must be made and the

manner by which affected governments and interested parties could participate in shaping decision alternatives; identifying the appropriate mechanisms for involvement; and determining how input will be incorporated into decisionmaking.

2. Create ongoing forums and mechanisms for the involvement of affected governments and interested parties. Use appropriate forums, such as workshops and informal committees or working groups, and mechanisms, such as rulemakings or cooperative agreements, to involve affected governments and interested parties in decisionmaking.

3. Demonstrate responsiveness to input. We will provide clearly identifiable responses to predecisional input.

Build cooperative relationships with affected governments, as defined in the Nuclear Waste Policy Act as amended.

1. Seek to develop innovative agreements with affected governments. Build on the current effort to develop an understanding which governs interactions and communication with Nye County, Nevada, by seeking similar agreements with other affected governments, as appropriate.

2. Replace the current participation grant program with direct payments to affected governments. The President's budget for fiscal year 1992 includes a proposal to replace the current participation grants with direct payments, in order to afford recipients greater flexibility, streamline the financial-assistance process, and reduce the administrative oversight involved.

3. Support an independent and clearly defined oversight role for affected governments. Work with affected governments to enhance their review and oversight of our activities.

Enhance our internal interaction and communication resources.

1. Use independent experts to evaluate and recommend improvements in institutional program efforts. Subject institutional program elements to evaluation and assessment by outside experts. The review body would provide assessments and recommendations leading to continuing improvement in the institutional aspects of the program.

2. Enhance our institutional resources. Commit appropriate resources to institutional efforts, including increased upper-management involvement and augmented staffing, training, and materials.

3. Increase integration of technical and institutional staff. Provide opportunities for technical and institutional staff to interact and to work together on program issues. Provide opportunities for staff to receive training in disciplines outside their area of specialty.

Build a communication program that covers the entire Civilian Radioactive Waste Management Program.

1. Use nationally recognized experts to help design a communication program, including extensive staff training. We have already begun this effort by engaging nationally recognized communication experts to conduct staff training workshops and assist in designing a risk-management program. These efforts will be expanded by planning a comprehensive communication program, extending participation in training to a broader range of our personnel, and conducting more-intensive training for communication and institutional personnel and those who interact directly with affected governments, interested parties, and the public.

2. Drawing on risk-communication principles, strengthen our communication efforts. This initiative would involve such efforts as developing messages about risks, simplifying and strengthening information materials to convey these messages, developing visuals to help convey important messages, actively seeking opportunities to communicate with a wider variety of affected governments and interested parties, and eliciting and responding to concerns expressed.

Work to increase public understanding of nuclear and radioactive waste issues through the promotion of education in the science, mathematics, and engineering disciplines.

1. Enhance education materials and activities. Expand current efforts to develop educational materials on nuclear and radioactive waste issues, assist in curriculum development, and enhance teacher training to increase the quality and availability of resources for use in elementary and secondary schools. Expand current cooperative agreements and projects with universities, our fellowship program, and support for Historically Black Colleges and Universities in order to encourage careers in science and engineering.

2. Expand our participation in joint education projects with other DOE offices and national and international organizations. This participation will include working with other DOE offices in implementing the Secretary of Energy's education directives and with the education programs of the League of

Women Voters in the United States and the Nuclear Energy Agency of the Organization for Economic Cooperation and Development.

SHARING OF DATA ON A TIMELY BASIS

Background

Vast quantities of data will be collected by the waste management program. The purpose of the data will be to support an evaluation of site-suitability and, if the site is suitable, to support repository design and preparation of a license application to the NRC. As such, the control and assurance of the quality of the data must remain paramount in the management and dissemination of data to affected governments and interested parties. While access should not be restricted to any data, we must be able to certify those data to be used in determining suitability and in the license application and to justify the dismissal of data not used, whether suspect for technical or quality-assurance reasons. These considerations will also apply to an MRS facility and to transportation casks.

Another important point to consider is the following: scientific investigators consider that they have the right to present or publish data, analyses, and interpretations, and the premature release of data jeopardizes this right. The publication and presentation of project data and results in peer-reviewed journals and at professional conferences by scientific investigators also contributes to the credibility of the project.

Suggested original options for initiating discussion

Option 1. We could make raw data and supporting information available to all concerned parties as soon as is practical after data acquisition.

Option 2. We would release data only after they have been processed, reduced, and analyzed.

Option 3. We could release data along with analyses and conclusions as formal published reports.

Synopsis of workshop discussion

Participants were generally in agreement on the desirability of early access to data but did not clearly favor any particular option. For example, while some participants clearly expressed support for option 2, others rejected it on the grounds that it takes too much time, thus preventing timely access to data by affected governments and

interested parties; furthermore, raw data are sometimes needed because they may lead to conclusions other than those officially reported. The discussion clearly indicated that another option is needed—an option that under the proper circumstances allows examination of the data as they are acquired, but limits widespread dissemination of data until such time as the investigators and we are satisfied with its quality. The question of academic publication was seen as less important than getting the data out.

DOE response and current plans

We are committed to the premise that all scientific and technical data collected for this program are public property and must be made available, within a reasonable timeframe, to anyone requesting them. These requirements must be balanced with the need to ensure that the instrumentation used in data collection was functioning properly and that the data are adequate for their intended purpose.

Beginning in October 1991, we will release a quarterly catalog of data which has been collected by our investigators. The catalog will list all acquired or developed data types or information, and provide descriptions of the data, the location where they were acquired, the date and time of acquisition, the method of acquisition, and the location where, upon request, the data may be examined. Data will be reported to the system which generates the catalog within 45 days of completion of the acquisition process or, otherwise, on a DOE-approved schedule. Data listed in the catalog would be available upon request.

Once the Licensing Support System is developed, information will be available through it. The rule under which this system was established contains provisions for raw data, especially for data entry after quality-assurance requirements have been satisfied, and specifies how and when the data are to be made available before licensing.

SOCIOECONOMICS

Background

The issue of potential socioeconomic effects was addressed in section 4 (Background) of the discussion draft of the strategic principles document. That discussion noted the potential for favorable and adverse socioeconomic effects associated with waste-management. It also pointed out that the Nuclear Waste Policy Act as amended, specifies a process for avoiding, minimizing, or mitigating adverse socioeconomic effects, to the maximum extent practicable and provides for financial assistance to affected governments.

Synopsis of workshop discussions

In the discussion of socioeconomic concerns we received a number of practical comments and suggestions. A number of participants expressed the view that the subject of potential socioeconomic effects should be elevated in the hierarchy of the program's priorities and that socioeconomic issues be addressed for all components of the program—the repository, the MRS facility, and transportation. They asked us to make socioeconomics a program priority.

In addition, participants suggested the need for greater flexibility to conduct their socioeconomic programs in connection with scientific investigations of the candidate repository site. They also suggested a more cooperative approach toward the management of socioeconomic effects and said that we and affected governments need to agree on methods for assessing socioeconomic effects and on procedures for impact assistance. Participants also recommended that we treat work in socioeconomics in the same way we treat other technical work, including the use of peer reviews as appropriate.

DOE response and current plans

In response to the comments of the workshop participants, we have established a strategic principle with respect to potential socioeconomic effects. Understanding and addressing socioeconomic concerns will be critical to the success of our program. Before the strategic principles workshops, we had begun to address many of the issues outlined above and to develop a more active approach for the socioeconomic program. Concerns regarding potential socioeconomic effects have been a major issue in Nevada, and they will also be an issue to potential MRS hosts and to States and Indian Tribes through whose jurisdictions waste may be transported.

We recognize that to be effective our socioeconomic program should cover all components of the waste-management program and should involve the active participation of affected governments and interested parties. We are now beginning to involve affected governments in developing and implementing our socioeconomic program. For example, the consultation draft of the Yucca Mountain Project Socioeconomic Plan was distributed to affected governments and interested parties for review and comment. We are now in the process of consulting individually with commentors to discuss their concerns and address them as appropriate. We also are involved in a cooperative effort with Nye County in Nevada to develop a protocol for addressing socioeconomic monitoring and assessment issues. In addition, affected governments are currently provided grant funding to enable them to participate in the program and to conduct appropriate socioeconomic studies. We are also working with affected governments to enhance the Socioeconomic Monitoring Program for the Yucca

Mountain Project. Periodic reports are currently produced to disseminate data from the Socioeconomic Monitoring Program.

In cooperation with affected governments, we plan to initiate or continue the following activities:

- Establish policy guidance for implementing our socioeconomic program, including socioeconomic-impact assessment and mitigation activities for each program component, as appropriate.
- Expand our current Socioeconomic Monitoring Program for the Yucca Mountain Project.
- Expand our cooperative efforts with affected governments by encouraging their active participation in the development of the socioeconomic program and fostering working relationships with officials and planners from affected governments.
- Develop our capability to address perception-based (special) impacts and to evaluate the theoretical and empirical bases for studies conducted by affected governments and interested parties on perception-based impacts.
- Establish a policy, process, and procedure for peer review of socioeconomic activities.

EMERGENCY-RESPONSE PLANNING AND TRAINING

Background

Section 180(c) of the Nuclear Waste Policy Act as amended requires us to provide technical assistance and funds to States for training the public-safety officials of local governments and Indian Tribes through whose jurisdictions waste shipments will pass. We are developing a program plan and policy to implement this requirement. The plan will incorporate issues raised by the regional groups overseeing our transportation activities. It will address both routine transportation and assistance for accidents requiring emergency response. A significant issue related to our responsibilities under Section 180(c) is the timing of assistance for training in emergency response.

Suggested original options for initiating a discussion

Option 1. We could start assistance 3 to 5 years before shipments begin.

Option 2. We could start assistance immediately.

Synopsis of workshop discussion

While the discussion yielded no explicit recommendation on the options presented, other issues were clearly of interest to participants, especially the need for establishing local capabilities for responding to transportation emergencies. We were told that, contrary to the findings of a recent NRC report, many local communities are at a loss over how to deal with waste transportation; their emergency-response teams often consist of volunteers who have no training, protective clothing, or equipment. The first responders (i.e., fire departments) want to have specialized (HAZMAT) teams to supplement their usual capabilities. It may be necessary to develop specialized teams that would have nuclear safety among their other responsibilities.

Not all participants agreed with this assessment of the situation, stating that an enormous amount of guidance is available and that many and varied capabilities are in place both at the State level and in small towns. In addition, there is in place a greatly expanded emergency network among nuclear power plants.

We were also advised to pay attention to local governments on transportation issues, to recognize that in terms of public acceptance transportation is likely to be a bigger problem than the repository, and not to attempt to "sell" transportation safety when we should be responding to the concerns of the citizens. We were advised that there is a need to integrate the different DOE transportation programs (OCRWM, WIPP, and others), and to consider the need for uniformity of State regulations.

DOE response and current plans

Section 180(c) Implementation

The OCRWM's approach to evaluating and resolving Section 180(c) issues comprises continued identification, coordination, research, and resolution of the issues through a combination of DOE studies, work with regional and national groups of States, Indian Tribes and technical organizations, and interactions with affected governments and interested parties. Before assistance can be administered, key implementation issues must be clarified. The clarification process continues through workshops with affected governments and interested parties; interaction and research through cooperative agreements with regional and national groups; coordination with other DOE programs; cooperative efforts with other Federal agencies; and conflict resolution.

Once key issues are clarified and resolved, three documents (a policy options paper, the OCRWM assistance policy statement, and an implementation plan) will define the OCRWM's policy decisions on the assistance and funding process. As the

drafts are issued, further workshops will be held and comments will be solicited from affected governments and interested parties. The OCRWM will review all comments and, where appropriate, incorporate them in the revised policy. The final policy statement will be published in the Federal Register and distributed to all participants involved in the review and comment process. Training assistance will be conducted in phases. The process will be outlined in the policy statement and the implementation plan. Program recipients receiving Section 180(c) technical assistance and funding will be notified formally in writing of their eligibility.

A preliminary draft Section 180(c) Strategy was presented at the Transportation Coordination Group (TCG) meeting, held concurrently with the first Strategic Principles Workshop in December 1990, for discussion and comment. We are in the process of integrating comments received from TCG members. The final draft Strategy is expected to be released for public comment later this spring. The Federal Register notice will be published at that time and formal comments taken.

Activities with the Commercial Vehicle Safety Alliance (CVSA) may contribute to the development of assistance to States and Indian Tribes for routine safe transport. The CVSA, in a cooperative agreement with OCRWM, convened a Task Force on Nuclear Waste Transportation in 1986 to draft procedures for highway shipments of spent fuel. The draft inspection procedures, developed in November 1987, which can be used by State inspectors to inspect shipments at point of origin and destination, include inspection of driver, shipping papers, vehicle and package. In August 1989, CVSA renewed its cooperative agreement for a 5-year pilot program to test these procedures by inspecting WIPP shipments from INEL to WIPP. If the outcome of the pilot program is favorable, adoption of these procedures would create inspection and enforcement standards that could minimize the strain that differing State regulations would place on the OCRWM Transportation program.

Assistance to Local Jurisdictions

The issue of inconsistency among local responders' responsibilities, needs, and capabilities to respond to a spent fuel or high-level waste transportation accident was echoed at the TCG meeting that paralleled the Strategic Principles Workshop in December. This issue is still under discussion with affected governments and interested parties, including the Interagency Task Force for public assistance under the Hazardous Materials Transportation Uniform Safety Act. OCRWM recognizes the benefits in facilitating local government involvement in the policy dialogue as the Section 180(c) Strategy is developed. OCRWM will endeavor to enter into a cooperative agreement with a national organization representing local governments, and continue to work with the Interagency Task Force and other organizations.

DOE Integration Activities

The Hazardous Materials Transportation Uniform Safety Act (HMTUSA), effective in November 1990, contained several important provisions that may affect how the DOE implements the requirements of Section 180(c). One provision that may have a broad impact requires that all Federal departments minimize duplication of effort and expense in public sector training and planning. We will coordinate with the Department of Transportation (DOT) to ensure that training needs are met within this HMTUSA requirement. Other agencies that offer funding and training programs are the Environmental Protection Agency and the Federal Emergency Management Agency. We will work with the Federal Radiological Preparedness Coordination Committee (FPRCC) to develop roles and responsibilities with DOT and the other agencies.

The DOE has also begun development of the Transportation Emergency Preparedness Plan (TEPP). This plan will coordinate all DOE transportation emergency preparedness activities, and, among other activities, undertake to devise a uniform training program. When in place, the TEPP will minimize the demands on time and resources for State and local transportation and emergency response personnel who must deal with OCRWM, WIPP, and other programs, and streamline administration of these programs. OCRWM is a member of the TEPP Steering Committee under the framework of the DOE Emergency Management Coordinating Committee (EMCC). The Steering Committee includes members from all DOE elements having a non-weapons transportation emergency preparedness responsibility, and provides information and recommendations to the EMCC Secretariat regarding transportation emergency preparedness activities. A subcommittee of the Steering Committee is being formed that will focus on DOE training programs for States, Indian Tribes, and local governments.

Timing of Training Assistance

According to a report issued in March 1990 by the Western Interstate Energy Board (The Timing of Emergency Response Training Under Section 180 of the NWPA as Amended), general planning for training should take from 2 months to 2 years, while the period required for the training itself is 2 years.

Training assistance will begin in those jurisdictions through which waste will be first shipped. The actual training sequence will depend, in part, on the shipping plans. As the number of shipments and number of routes increase, the assistance will increase accordingly. Our first priority will be to determine the timing required for assistance for the initial shipments.