

MONITORED RETRIEVABLE STORAGE: U.S. STRATEGY FOR THE 1990's

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ABSTRACT

The U.S. Department of Energy (DOE) is pursuing initiatives to site and construct a facility for monitored retrievable storage (MRS) as an integral part of its system for managing spent nuclear fuel and high-level waste. The DOE is formulating a revised MRS strategy, including institutional initiatives and initiatives for increasing public acceptance; identifying strategic initiatives; and conducting engineering studies. The MRS facility will be developed in two phases, with the objective of limited spent-fuel acceptance starting in 1998.

BACKGROUND

The Nuclear Waste Policy Act of 1982 directed the DOE to study the need and feasibility of an MRS facility and to submit to the Congress a proposal for the construction of such a facility. In response to these requirements, the DOE, in 1985, published the results of a preliminary evaluation that addressed the need for, and the feasibility of, an MRS facility (1). These results indicated that an MRS facility would make important contributions to the development and performance of an integrated waste-management system. In February 1986, the DOE completed the need-and-feasibility analysis and a proposal to construct an MRS facility at a site in Oak Ridge, Tennessee. The MRS facility described in the proposal was designed to prepare spent fuel for emplacement in a geologic repository and to provide monitored storage for a limited quantity of spent fuel. The DOE was unable to submit the proposal (2) to the Congress until March 1987 because of an injunction resulting from a lawsuit filed by the State of Tennessee.

The Nuclear Waste Policy Amendments Act of 1987 (the Amendments Act) set aside the DOE's specific proposal to site the MRS facility at Oak Ridge, Tennessee, but it moved the MRS issue forward in several important ways. Most important, the Congress authorized the construction of an MRS facility, while it established an MRS Review Commission to provide an independent assessment of the need for an MRS facility. In addition, the Amendments Act implicitly endorsed the DOE's concept of an integrated MRS facility by specifying that the site selected by the DOE for such a facility is to be the one judged "most suitable for a monitored retrievable storage facility that is an integral part of the system for the disposal of spent nuclear fuel and high-level radioactive waste...." Finally, the Amendments Act established two parallel paths for siting an MRS facility: (a) siting through a DOE-directed process and (b) siting through the efforts of the Nuclear Waste Negotiator. The MRS site, however, is not to be selected until a repository site has been recommended to the President.

Once the preferred site has been selected, the Amendments Act authorizes the DOE to submit a license

application for an MRS facility and specifies that the license is to be subject to the following four conditions:

1. The construction of the MRS facility cannot begin until the Nuclear Regulatory Commission (NRC) has issued a license for the construction of the repository.
2. The construction of, or waste acceptance at, the MRS facility must cease if the repository license is revoked or if the construction of the repository ceases.
3. No more than 10,000 metric tons of heavy metal (MTHM) can be stored at the MRS facility until the repository begins receiving waste.
4. The quantity of waste present at the MRS site at any one time may not exceed 15,000 MTHM.

The Amendments Act specified that the MRS Review Commission was to prepare a report on the need for an MRS facility as part of a waste-management system that achieves the purposes of the Amendments Act. The report was to include (a) an evaluation of the status and adequacy of the DOE's evaluation of the advantages and disadvantages of an MRS facility; (b) an evaluation of the technical utility of an MRS facility; and (c) a recommendation to the Congress as to whether an MRS facility should be included in the waste-management system. In preparing the report, the Commission was to obtain comments from affected parties, including States containing potentially acceptable sites.

To support the Commission and to assist in determining the optimal configuration for the waste-management system, the DOE completed a series of systems studies that examined a wide range of scenarios for MRS development and operation. These studies were designed to update DOE's analysis of how the MRS facility might best contribute to the overall mission objectives. The results of these studies were summarized in a report (3).

In presenting its position to the MRS Review Commission (4), the DOE identified a number of advantages for the MRS facility. These advantages can be summarized in terms of several strategic objectives: repository development,

timely and adequate waste acceptance, confidence in system development, and system flexibility.

The MRS facility could facilitate the development of the repository by providing experience in the regulatory and institutional areas. For example, neither the Department nor the Nuclear Regulatory Commission has participated in a licensing process for a Federal waste-management facility of the size required. Licensing an MRS facility significantly earlier than the repository could provide both to the Department and to the Commission valuable procedural experience that should facilitate the licensing of the repository. Positive experiences with an MRS facility and evidence that radioactive waste can be handled, and managed safely should help to allay continuing public concerns and, in particular, concerns in the repository host State. Finally, the transportation of waste to the MRS facility would provide institutional learning and experience that should prove useful in the repository program.

The MRS facility would allow timely and adequate acceptance of spent fuel because it can be developed relatively rapidly, is based on technologies that have been proved and licensed, and is associated with far fewer uncertainties than the repository. In regard to confidence in system development, a commitment to an MRS facility would enhance confidence in the start of system operations because of the much greater confidence in the development, licensing, and operating schedule of such a facility. It would also demonstrate that the Federal Government is proceeding with timely assumption of the responsibility to accept spent fuel for disposal. Furthermore, once in operation, the MRS facility would enhance confidence in the Department's program by providing the earliest possible demonstration of the ability of the Federal Government to accept, transport, and handle spent fuel at significant annual rates.

In terms of system flexibility, the MRS facility would enhance the program's capability to adapt to an uncertain future, increasing the flexibility of repository development by allowing adjustments without impacts at reactor sites. In addition, it would provide a valuable flexible coupling between waste-management activities at reactor sites and the repository, allowing each to be developed at the appropriate pace without impinging on the other. During system development, the MRS facility allows the interface between the Federal system and reactors to be defined independent of such uncertainties as the waste package to be used at the repository. During operation, the MRS facility can allow an orderly transfer of spent fuel from reactor sites to the Federal system that is independent of the ability to emplace fuel in the repository.

The MRS Review Commission submitted its report to the Congress on November 1, 1989 (5). The Commission found that cumulatively the advantages of an MRS would

justify the building of an MRS if (a) there were no linkages between the MRS and the repository; (b) the MRS could be constructed at an early date; and (c) the opening of the repository were delayed considerably beyond its presently scheduled date of operation (i.e., considerably beyond 2003). However, concerned that an MRS facility unlinked to the repository might lessen the commitment to developing a repository, the Commission recommended that the Congress authorize the construction of a Federal emergency storage facility with a capacity limit of 2,000 metric tons of heavy metal (MTHM); authorize the construction of a user-funded interim storage facility with a capacity limit of 5,000 MTHM; and reconsider the need for additional interim storage in the year 2000. Thus, the DOE and the MRS Review Commission agree as to the necessity for a facility that would provide storage before permanent disposal, but they differ on the storage capacity required, the appropriate funding mechanism, and to some extent, the role of the facilities.

Shortly after the Commission issued its report, the Secretary completed a reassessment of the waste-management program (6). This reassessment led to the development of a three-point action plan for restructuring the program. The plan centers on a restructuring of the Office of Civilian Radioactive Waste Management, initiatives to gain access to the candidate repository site -- Yucca Mountain in Nevada -- to continue our scientific investigations, and an initiative for establishing an MRS facility with a target for spent-fuel acceptance in 1998.

Included in the Secretary's reassessment was the development of realistic schedules for each component of the waste-management system. For the repository, the new schedule shows a delay of seven years, with waste acceptance starting in 2010. Accordingly, the early development of an MRS facility is a key element in our overall strategy for the waste-management program. An MRS facility starting in 1998 could replace 15,000 metric tons of at-reactor storage if the repository opens in 2010, and the number of reactor sites requiring out-of-pool storage could be reduced by more than 40 percent.

WHAT IS AT STAKE?

In the DOE's view, a great deal is riding on the MRS facility. First, the DOE believes that to maintain the nuclear power option, the Federal Government must demonstrate a timely solution to the waste problem. This solution should be demonstrated by starting to accept waste from utilities before the repository is available, and the best route to early waste acceptance is the MRS facility. Second, the DOE believes that an MRS facility is a key to the continued orderly operations of nuclear power plants, to the orderly development of the Federal waste-management system, and to the continuing orderly operation of that system once it is in place. In addition, the MRS facility can provide

significant benefits to the development of the total waste-management system, including the development of the repository. There is general consensus that confidence in the Government's ability to solve the waste issue is central to the future of the nuclear option.

THE DOE'S PLANS FOR DEVELOPING THE MRS FACILITY

As already mentioned, the Secretary's recently announced three-point action plan (6) includes early spent-fuel acceptance at an MRS facility. As part of this plan, the DOE is formulating a strategy for MRS development. Included in this strategy will be institutional initiatives and initiatives for increasing public acceptance. In addition, the DOE has established an MRS Management Team and is conducting engineering studies. The general features of the plan are briefly described below.

General Approach

To meet the key objective of early waste acceptance, early siting of an MRS facility is important, and the preferred approach is a volunteer host. In addition, modifications of the statutory schedule linkages between the MRS facility and the repository will be required.

In the area of design, the DOE is working to identify an MRS configuration that can be developed rapidly and uses proven technologies to the greatest practical extent.

As part of the early-waste-acceptance strategy, the DOE is developing the needed transportation capabilities.

Design and Development

The preferred MRS concept is a facility that has the capability to receive spent fuel in transportation casks from the utilities, provide a limited amount of storage, and stage spent-fuel shipments to the repository. The design will have the flexibility to provide additional functions that may be beneficial or required as the design of the total system matures.

The MRS facility will be constructed above ground. It will use engineered barriers and monitoring to ensure safe storage. It will be licensed by the NRC and will comply with all applicable Federal, State, and local laws.

To provide early waste acceptance, the MRS facility will be developed in two phases. The first phase will consist of a simple receipt-and-storage capability with limited acceptance rates. To ensure that such a capability can be implemented, the DOE has been conducting an engineering feasibility study of technologies for the direct transfer of spent fuel from shipping casks to the storage modules that could be used for field storage. Direct-transfer technologies are needed because the first-phase facility would not have the spent-fuel-handling capabilities that will be

provided in the full-capacity MRS facility developed in the second phase. The feasibility study also examined several concepts that encompass both transfer and storage. Whatever configuration is finally selected, it will incorporate full inspection and safety-related capabilities.

An option for the early acceptance of a limited amount of spent fuel during the first phase of the MRS facility is the use of transportable storage casks. The DOE is continuing to consider this option.

The second phase will consist of facilities for handling large amounts of spent fuel at the design acceptance rates and additional storage capacity. The design of the two-phase MRS will integrate first-phase facilities into the second phase.

The DOE is analyzing the total-system implications, including technical, cost, and schedule considerations related to each configuration option. The initial analysis is focusing on the schedule needs associated with each option, in order to ensure that the necessary transportation and storage technologies are available when required for operation.

Siting

Technically suitable areas for the MRS facility can be found throughout the continental United States. Furthermore, the MRS facility is an engineered facility that can be safely adapted to most sites.

As already mentioned, the preferable approach to siting is finding a volunteer host. The Amendments Act authorizes grants to political jurisdictions and Indian Tribes for the purpose of assessing the feasibility of hosting an MRS facility. These grants will be made available, and a notice of grant availability will be published in the Federal Register.

The DOE will be prepared to choose the preferred option if more than one State or Indian Tribe volunteers an MRS site. In making this choice, a number of factors will be considered, such as geographic location, accessibility, transportation options, the socioeconomic environment, the political environment, and legislative conditions.

Licensing

The MRS facility will be licensed by the NRC on the basis of 10 CFR Part 72, "Licensing Requirements for Independent Spent Fuel Storage Facilities." The NRC has revised 10 CFR Part 72 specifically to accommodate the MRS facility. The DOE plans to submit a single license

application and expects a single formal adjudicatory hearing to cover the full scope of the MRS design.

To expedite the licensing process, the DOE plans to use the following strategy:

- Topical reports and design packages will be submitted for review by the NRC staff well in advance of the formal application.
- The MRS design will be simple and will use proven technologies, particularly those already licensed or certified by the NRC.

The DOE is already starting interactions with the NRC to identify licensing issues and start resolving them, and the DOE intends to continue developing and evaluating strategies for expediting licensing.

THE ISSUE OF A "DE-FACTO-REPOSITORY"

The main focus of its program remains permanent disposal in a geologic repository. Nonetheless, there is concern that, once an MRS facility is developed, it will become a de facto repository and the DOE will lose its resolve to develop a geologic repository. The report of the MRS Review Commission identifies this as the "most frequently heard argument against an MRS facility."

The MRS Review Commission found that there is no technical basis for linkages to the repository. This finding is a very important contribution to the policy debate on the MRS facility, because it clears the way for a rational debate on the merits of the facility itself.

Concern about the MRS facility's becoming a de facto repository arises only if the MRS facility is viewed out of context, in isolation from the total waste-management system. To successfully address this concern, the DOE must help the public understand the real-world consequences of its policy deliberations. In particular, it must help the public understand that, far from being a potential repository, the MRS facility is an integral, functional part of the total waste-management system, contributing to more orderly system development and operations, including the development of the repository. Even if the current capacity limit of 15,000 MTHM were doubled, the MRS facility would receive only one-third of the spent fuel expected to be generated through the year 2020. The DOE and those who want to see the benefits of nuclear power preserved must also make clear that, in the absence of the orderly system development that an unconstrained MRS facility can

facilitate, there is a risk of having de facto MRS facilities at reactor sites all around the country.

CONCLUSION

The DOE is pursuing initiatives to site and construct an MRS facility with focus on a volunteer host. To achieve this objective, early siting is important, and a volunteer host is preferable. In addition, early MRS development will require a modification of the current schedule linkages to the repository.

The MRS facility will be developed in two phases, with limited spent-fuel acceptance starting in 1998. The DOE's basic goal is providing the nation with a safe, timely, and reliable system for the permanent disposal of spent fuel and high-level radioactive waste. The MRS facility can provide a key to that system.

Without an MRS facility, the DOE -- and the United States -- will have no Federal waste-management capability until at least 2010, with the start of waste acceptance riding solely on the first-of-a-kind, highly difficult repository program. With success, the DOE can build, in a safe and timely manner, an exceedingly valuable facility that can serve as the linchpin to a successful waste-management program.

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