

MRS REVISITED

Ben L. Smith and Ruth H. Neff
Tennessee Department of Health and Environment
Nashville, TN 37219

ABSTRACT

The State of Tennessee's opposition to the construction of a monitored retrievable storage facility remains unaltered. Major issues are revisited from the state's perspective, in the changing context of the Department of Energy's programmatic decisions and scheduling revisions, and the new leadership in Congress and the state. The Department of Energy's justifications for MRS and its growing costs are discussed. The past year's interactions between the Department of Energy and the state are described. A better way of managing the nation's spent nuclear fuel and high level nuclear waste--without a central packaging plant--is proposed.

INTRODUCTION

Exactly one year and one day ago, the State of Tennessee first made its case against MRS in this forum. At the Waste Management '86 Conference, Gay Hashbarger of my staff described Tennessee's wide-ranging independent technical review of the Department of Energy's proposal to build a monitored retrievable storage facility at a site in Tennessee. She described the state's impact analysis, its research into legal and constitutional issues, and summarized the broad program of public consultation conducted by the state.

The state found that the MRS was not necessary; that all functions to be performed at an MRS could be performed either at the reactors or at the repository; that the MRS would cost the nation's ratepayers and taxpayers an additional two to three billion dollars; that transportation impacts could be reduced--without an MRS--by improving transportation equipment, logistics and management; and that an MRS would have immediate and adverse impact on economic expansion and tourism in Tennessee. The MRS was considered to be safe, provided that the federal government was a diligent and competent manager.

On January 21, 1986, Governor Lamar Alexander announced his opposition to the MRS proposal. He told Secretary Herrington that he would issue a Notice of Disapproval when DOE submitted its proposal to Congress and would fight the project vigorously. The Governor was not alone. The Tennessee General Assembly, in a parallel action, adopted a joint resolution recording its firm intent to disapprove an MRS. The state's united, bipartisan and uncompromising position was characterized in the trade papers as a "Hell, No!"

Shortly thereafter, on February 5, 1986--one day before DOE planned to deliver its report to Congress--a U.S. District Court issued an injunction prohibiting the agency from submitting their report to Congress. The injunction effectively halted the MRS project, pending an appeal of the decision. Funding for MRS--above a \$3 million continuation level--was deleted from the FY 1987 DOE budget.

The intervening year has been superficially quiet with the injunction in place, but time does not stand still (except on videotape). The institutional context of MRS has changed drastically.

During the past year DOE appealed the District Court's decision to the Sixth Circuit Court of Appeals. The appellate court reversed the lower court's decision, but kept the injunction in place until Tennessee could appeal to the U.S. Supreme Court. The Attorney General of Tennessee filed a petition for a writ of certiorari on February 4, 1987. The Department of Energy had 30 days to file its response--until yesterday to be precise. The injunction remains in effect until the Supreme Court rules on the certiorari petition.

On April 28, 1986, DOE recommended three sites for characterization as potential first repository sites, which were subsequently approved by the President. On the same day DOE indefinitely deferred all site specific work leading to selection of a second repository site. (Both of these decisions have been challenged in the Courts.) In January of this year, DOE proposed an amendment to the Mission Plan; the revised schedule defers initial operation of the first repository for five years until 2003. The target date for opening an MRS was moved back two years--until 1998.

Political leadership has changed at both the national and state levels. As a result of the election of 1986, there is new leadership in the Congress, and in key Senate committees. Tennessee has elected and inaugurated a new Governor and sworn in a new legislature. Proponents of MRS should derive no comfort from this change in state administration. Tennessee's new Governor Ned McWherter has stated that the case for MRS has not yet been proven.

In my presentation, I will revisit the MRS controversy from the state's perspective in the context of the evolving civilian radioactive waste program. I will give special attention to DOE's chameleon-like justifications for MRS and offer a modest proposal to DOE and the nuclear industry.

First, let me assure you that Tennessee stands by its earlier findings and conclusions. We have seen no new information, nor heard no compelling arguments that would persuade the state to alter its position. Indeed, our additional investigations into siting methodology, transportation equipment and logistics, and rod consolidation have strengthened our initial conclusions.

Most recent articles in nuclear industry newsletters would give the impression that Tennessee's position on MRS is based solely on procedural questions. This is not true. We have some major differences with DOE on interpretation of the Nuclear Waste Policy Act. We will continue to pursue these differences in the federal courts. These are important to us, but I want to spend my time here today on other issues which are at the heart of our concern about the MRS proposal.

Our position is based upon rigorous technical analysis of the proposal rather than an emotional reaction to the public's negative perception of the nuclear waste program. There are a lot of data available to back up these statements.

Proponents of the MRS project have questioned the propriety of the state's evaluation of the need for the project. They contend that the decision on the need for MRS will be made by the Congress.

It is clear that the Congress has retained the responsibility for this important decision. I think most Tennesseans have confidence in this institution to make the right choices. This great deliberative body will benefit from many sources of data as the decision is debated. We feel a strong need to provide an independent assessment of the need for two reasons:

1. A significant portion of the cost of the MRS (\$170 million to \$260 million) will be borne by home owners, businesses and industries in the Tennessee Valley Authority power service area.
2. Further analysis has confirmed our early impressions that great benefits could be derived from optimization of waste system operations.

COSTS

Even as we hover over our check books anxious about paying the bill, the life-cycle costs of MRS have escalated. See Table I.

It is a little frightening to speculate on what the changes in the cost estimate may be from April 1986 to now. Given the previous increases, a large DOE silence on this may be most appropriate.

An August 1986, General Accounting Office report examined this rise in MRS costs and concluded that some significant items had not been included in total costs. There were:

- aid to affected localities for mitigating the impacts of constructing and operating the MRS facility
- grants equal to taxes for state and local governments (equivalent to taxes on a commercial facility)
- costs for consultation and cooperation agreements
- licensing and permitting fees
- site acquisition costs

If Congress were to approve the state and local compensation outlined in DOE's draft proposal to Congress, we estimate that it could add as much as

\$800 million to the costs of MRS. This is for the first two items alone.

The August 1986 GAO report, "Cost of DOE's Proposed Monitored Retrievable Storage Facility" found that an increase in the 1-mill-per-kilowatt-hour fee has not been ruled out by DOE. "Fee revisions may be recommended within a few years, when more accurate program cost estimates will be developed as the program matures from its present conceptual design phase to the engineering design phase."

Do you get any hint from the pattern of cost increases?

BENEFITS

Life-cycle cost estimates should be compared to the estimated project benefits. From the earliest public documents on the project, the benefits have been divided into tangible benefits which could be measured by dollar value and intangible system management benefits.

The tangible benefits fall into two areas for analysis. Some benefits accrue to the nuclear utility companies in the form of avoided spent fuel storage costs; benefits also include savings which will accrue to the DOE operation of the transportation system.

Sometimes we spend more to get more. Not so with MRS. As the costs have risen, the estimated dollar benefits have fallen. See Table II.

We find ourselves in substantial disagreement with the amount of projected at-reactor storage savings. The State of Tennessee contracted a study of the nation's spent fuel generation and the need for additional at-reactor storage. The study was performed by a team comprised of the University of Tennessee, Oak Ridge Associated Universities, and Nuclear Assurance Corporation.(1) The study provides estimates to the year 2020 for various scenarios of nuclear industry development. The results indicate that the amount of cumulative spent fuel discharges from reactors has been overestimated by DOE.

By the year 2000 the DOE estimates of spent fuel discharge are 20% higher than the study team's. By 2020 the DOE estimate is 50% higher. Recent DOE estimates have come into close alignment with the study team estimates, but to our knowledge these new estimates have not been incorporated into DOE's MRS proposal documents.

The cumulative spent fuel discharge estimates were compared to a reactor-by-reactor analysis of storage capacity. Further analysis was performed to predict the amount of fuel which was likely to be consolidated by utilities. Conservative assumptions were made by the study team concerning on-site transfers to and from like units on the same site and the continuation of currently planned/contracted fuel shipments.

The result of this work is the conclusion that avoided storage costs are only \$100 million as compared to the DOE estimate of \$150 million to \$450 million if the first repository is on schedule.

With little in the way of quantifiable benefits, \$150 million to \$650 million for the most favorable scenario (a Washington State repository), DOE has concentrated on a justification for MRS which

TABLE I

Estimates of the Life Cycle Costs of MRS

<u>Source/Date</u>	<u>Report</u>	<u>Cost</u>
DOE, April 1985	The Need for and Feasibility of MRS	\$500 to \$700 million
DOE, December 1985	MRS Submission to Congress (Review Copy)	\$1.4 billion to \$2.0 billion
DOE, April 1986	Analysis of the Total System Life Cycle Cost	\$1.7 billion to \$2.6 billion

TABLE II

Estimates of the Tangible Life Cycle Benefits of MRS

<u>Source/Date</u>	<u>Report</u>	<u>Benefits</u>
DOE, April 1985	The Need for and Feasibility of MRS	\$200 to \$500 million in at-reactor storage savings and anticipated transportation savings which were unquantified
DOE, December 1985	MRS Submission to Congress (Review Copy)	\$150 to \$450 million in at-reactor storage savings and no transportation savings except with a Washington State repository

is based upon subjective evaluations of system performance. The MRS proposal documents, which are now over one year old, claimed that MRS would produce the following benefits:

1. decoupling waste acceptance, transportation from reactor sites, and consolidation and sealing in canisters from uncertainties about the repository
2. accelerated waste acceptance beginning in 1996
3. improvements in system reliability and flexibility
4. simplification of repository operations
5. improvements in the specification and performance of the transportation system
6. institutional benefits realized by experience gained from the State of Tennessee

A key DOE commitment for the MRS proposal is that waste acceptance by the MRS would be precluded until a construction authorization for the first repository is received from the Nuclear Regulatory Commission. This approval from NRC is shown in the "Project Decision Schedule" to occur in 1993. The revised schedule set forth in the Mission Plan Amendment defers NRC approval until the first quarter of 1998. This means that any delay in the first repository schedule is translated directly into a delay of the MRS.

DOE has coupled the MRS schedule with the first repository schedule to allay the fears that MRS might become a permanent resting place for spent fuel if difficulties with the repository program cannot be overcome. While the coupling of MRS and repository schedules does preserve the commitment to an integrated waste management system, the potential MRS benefits are diminished. If the draft Mission Plan Amendment is adopted, there is no decoupling. Because of the coupling of schedules, accelerated waste acceptance even in 1998 is not likely to be viewed by utilities as a reliable date.

There are other difficulties which diminish the value of the perceived system management benefits. Fuel from western reactors has presented some difficult choices for DOE. If the assemblies were to be consolidated and sealed in canisters at the MRS, shipment across the country twice would be necessary. If the western fuel were shipped directly to the repository, facilities would be required there which would duplicate the investments made at MRS. The choice has apparently been made to duplicate many of the MRS functions at the repository to handle western fuel. The simplifications and cost savings at the repository which MRS might have offered have been greatly diminished by this decision.

It is time for a forthright restatement of the real system management benefits of MRS. The western fuel decision and the coupling to the repository schedule have introduced new conditions which have not been fully accounted for in the qualitative discussion of MRS benefits.

I can not pass this opportunity to comment on the last subjective benefit from the DOE list. That is, the institutional benefits which would be derived from interaction with the State of Tennessee. I can tell you that no such benefits have accrued over the past year. This probably relates to the strain in relations which seem to inevitably develop when parties must try litigation to resolve differences.

The points which we seek to sustain in our current litigation are important points, but the scope of that action is narrow. There are much broader issues concerning the evaluation of waste system alternatives which need to be resolved. DOE's interactive work with the State of Tennessee ceased abruptly a year ago. We have sought to reopen the dialogue on the broader issues of system evaluation. We are hopeful that such an interactive planning process can be reopened, but for now the institutional benefits of working with Tennessee are an illusion.

Considering costs and project benefits, the MRS is poorly justified. Can a wasteful and costly decision be avoided? We think that, with better planning, it can.

A BETTER WAY

A fundamental planning principle involves the formulation of reasonable alternatives and the comparison of attributes of these alternatives to make the best selection for a course of action. If you believe in the planning process, you make it work for you in decision-making. The treatment of reasonable alternatives is even-handed. Each is proposed in an optimum manner and all are measured against the same objective criteria. Violation of these simple procedures, as when subjective decisions are made before alternatives are really compared, can be counterproductive. We think that the no-MRS system alternative has not been optimized by DOE. Without such optimization it is impossible to determine if the expensive MRS decision is the right one. The Tennessee study team has now done sufficient analysis of an optimized no-MRS approach to strongly suggest that there is a better way.

Before the decision is made to pursue a central repackaging and storage facility, the option of an integrated no-MRS waste system should be fairly examined. What are the features of such a system.

Cask design, the placement of the rod consolidation function, and transportation system controls are key elements of the integrated no-MRS system.

A family of standardized dual purpose casks suitable for storage and transportation would be used for at-reactor storage. Rod consolidation at a large proportion of reactors would reduce storage needs and produce great benefits for the transportation system. DOE would provide incentives to utilities to consolidate fuel in return for the transportation system benefits which would be derived. To achieve the greatest benefits from operation of the transportation system, maximum use would be made of the rail mode from reactors to the repository. DOE would work with individual utilities to upgrade access and cask handling facilities to accommodate the largest cask practical. Use of such large casks, up to 125 tons, will greatly reduce transportation costs and the radiation exposure to the general public. DOE would need to work with utility industry groups to establish fuel acceptance criteria and

packaging standards as soon as possible. What we suggest would require waste system management, crossing the traditional private/public sector boundaries. To realize some very significant system benefits, DOE will need to encourage utilities toward technologies which some utilities have been reluctant to try.

Rod consolidation at reactors is a gradually maturing technology. Sufficient demonstrations have already taken place to indicate that rod consolidation will be the lowest cost option for expanding at-reactor storage. This may be done in conjunction with re-racking for costs in the low end of the range. In conjunction with dry cask storage, it is expected that the foreseeable storage problems of most reactors could be solved.

While utility-organized demonstrations are continuing to refine the technology, more progress could be made with a concerted effort.

The Nuclear Waste Policy Act encourages such a technology push and DOE should take a much stronger position to see that this occurs. DOE should provide utilities delivering consolidated fuel a credit based on DOE's avoided transportation system costs. The benefits to the public in reducing radiation exposure would be an added bonus.

It is obvious that a strong push in this direction would tend to undermine the already tenuous justification for MRS. Many utilities which have warmed the sidelines while others advanced the rod consolidation technology, are even more reluctant now to endorse a move in this direction. They prefer to see how the MRS debate will be resolved. But more acute storage needs at 27 reactors identified by the Tennessee study team will force serious consideration of rod consolidation between now and 1998. Some utilities are moving forward now. Northeast utilities expects to begin full-scale consolidation at Millstone Unit 2 this year. Virginia Power will consolidate 48 PWR fuel assemblies at their Surry Nuclear Plant. Northern States Power plans to consolidate 40 PWR fuel assemblies in a demonstration at their Prairie Island Nuclear Plant beginning in July 1987.

It is our hope that the important potential of at-reactor rod consolidation can be realized. We should not allow a mind-set toward justification of MRS to foreclose the refinement of a technology which can benefit many utilities and the public well before MRS could provide benefits. DOE should begin now to develop a credit system and direct a demonstration program which will produce the best at-reactor rod consolidation methods.

Dual purpose casks, designed to meet storage and transportation needs without the necessity for reloading fuel, is another key concept in an integrated no-MRS system. Like at-reactor rod consolidation, dual purpose casks have the potential to rationalize transportation system planning and produce great system benefits. The technology for such casks is gradually maturing with the Federal Republic of Germany taking the lead. Their nodular cast iron dual purpose cask holds promising potential for a low-cost solution to cask production. The use of nodular cast iron already licensed in Germany, should be fully explored in this country. Other designs and materials should also be included in a concerted program to determine an appropriate family of casks which should be standardized by DOE for competitive manufacture.

The use of dual purpose casks would represent another example of management across the traditional public/private boundary between the utilities and the transportation system. The concept has been proven in studies of system effectiveness, and the materials and technology have been successfully tested and demonstrated. Yet a decision by DOE to specify dual purpose casks would step over the traditional boundary of private utility management. Here again it may be necessary to devise the proper incentives to move utilities toward those choices which provide greater overall system benefits. DOE should see that the transportation system (including the cask) is integrated with at-reactor storage, away-from reactor storage and repository design to achieve an optimal system which will reduce risks, costs, and environmental impacts.

Transportation benefits attributed to the MRS are due to the optimization of the transportation system for the MRS to repository link. The spent fuel consolidated at the MRS would move by dedicated trains consisting of five to ten large rail casks. Because these rail casks would not be constrained by cask handling capabilities of the reactors, they would be larger than the casks used for the reactor to MRS link. In this scenario the use of larger rail casks in dedicated trains and fuel consolidation at MRS significantly reduce the number of shipments to the repository. Unfortunately, the extra distance involved in moving the fuel to an MRS and then to the repository, as compared to direct shipment to the repository, introduces extra costs which completely wipe out the transportation benefits (except for a Washington State repository) of the optimized MRS to repository link. Obviously optimization of fuel transportation all the way from the reactors to the repository will achieve greatest benefits.

Again, to achieve significant overall system benefits, DOE must start back at the reactors, crossing again those troublesome and traditional public/private boundaries.

As a part of the Tennessee study team efforts Nuclear Assurance Corporation (NAC) examined the cask handling and transportation capabilities at each U.S. reactor. Reactor crane capacity, cask set-down area dimensions, and access limitations were reviewed. NAC supplemented data base information with site specific data gathered from recent plant visits where appropriate.

Next a family of truck and rail casks were chosen instead of a single cask for each transportation mode. Rail casks were to be 70, 100, and 125 tons and 25 ton and 40 ton casks would be transported on the highway as legal and overweight shipments, respectively. The objective was to decrease the percentage of shipments moving by truck. DOE has assumed a 70/30, rail/truck mode split. We also wanted to devise a system which would use the largest cask capable of being handled by the reactor and transported effectively. The benefits in lowering transportation costs, radiation exposure to the public, and the extent of the public contact with spent fuel shipments are easily verified.

Of the 118 reactors evaluated by NAC, 75 reactors were determined to be capable of using a 125 ton cask, 25 reactors would be limited to a 100 ton cask and 4 reactors would be limited to a 70 ton cask. The 125 ton, 100 ton, and 70 ton casks would be shipped by rail. For certain reactors which currently lack rail access, short intermodal shipments by heavy-haul vehicle or barge would be

used to move the casks to the nearest railhead. Because of certain constraints approximately 13% of the plants would still use truck shipments. Ten reactors would use a 40 ton truck cask and 4 would use a 25 ton truck cask. These improvements in reactor/transportation system interface improve the rail/truck modal split to 87%/13%. Further improvements in the modal split might be achieved by use of a special transfer cask to move fuel from the reactor to a larger dual purpose cask that cannot be handled inside the plant.

DOE should work with utilities to upgrade rail access and cask handling facilities to accommodate the largest casks practical. To further optimize the transport system, DOE should move away from the idea of single cask shipments from reactors made by general commerce. Apparently the railroads do not like this idea. Multiple cask shipments should be made by dedicated trains with specially trained crews. Shipping campaigns from appropriate reactors should be organized by DOE.

With this system the spent fuel arrives at the repository in dual purpose casks which may then be retained in a storage area to decouple reactor shipments from emplacement of fuel in the repository. The system also provides an effective and reliable means of at-reactor storage which would not be vulnerable to disruptions or shutdowns at one centralized repackaging plant.

We are now in a position, with continuing work by our Tennessee study team, to provide a detailed description of an integrated waste management system which does not include centralized repackaging.(2) We believe that such a system will provide greater benefits at less costs than the MRS proposal. The costs for an integral MRS far overshadow the benefits. When quantifiable costs and benefits are compared, the most favorable benefit/cost ratio is .38. It could be as low as .058 using DOE's own figures. Surely we still pay attention to such things, even in Washington. The subjective benefits need new evaluation in light of changed conditions caused by coupling the MRS schedule with the repository schedule and the decision to handle western fuel at the repository. The project needs rethinking and rigorous comparison to reasonable alternatives.

We enjoy the benefits of nuclear power in Tennessee. Much of the technology for use of nuclear materials has been developed within our borders. We fully understand the responsibility of those who enjoy the benefits to take responsibility for managing the wastes. Our suggestions for an optimized waste management system point toward a better way. Spend some of the \$2.6 billion to provide incentives to utilities to consolidate fuel, up-grade rail access, and use large dual purpose casks.

What you've hear here is a challenge to do some creative institutional problem solving. I hope that Tennessee can be heard above the clamor to "do something even if its wrong."

REFERENCES

1. E. W. Colglazier, Jr. et al, "Evaluation of the Need, Feasibility and Siting of the MRS in Tennessee," University of Tennessee Waste Management Research and Education Institute, December 1985.

2. R. E. Hoskins, "Status of Spent Nuclear Fuel Management Technology Related to the Need and Feasibility of Monitored Retrievable Storage"

(Preliminary Report), University of Tennessee Waste Management Research and Education Institute, January 1987.