MRS, TRANSPORTATION, INTEGRATED SYSTEMS

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ABSTRACT

In passing the Nuclear Waste Policy Act of 1982 (NWPA), the United States Congress initiated a systematic process for addressing the national problem of what to do with the growing inventory of high-level nuclear waste and spent fuel. In addition to requiring development of geologic repositories, the NWPA directed the Secretary of Energy to perform a detailed study of the need for, and the feasibility of, monitored retrievable storage (MRS) and to submit to Congress a proposal for construction of one or more MRS facilities. As a third element of the disposal system, the NWPA also directed the development of the transportation capability to ship the nuclear wastes from the points of origin (chiefly reactors at commercial power plants) to the facilities developed under the NWPA. The Office of Civilian Radioactive Waste Management (OCRWM) of the Department of Energy (DOE) was created to manage the overall disposal program. Within OCRWM, the Office of Storage and Transportation Systems (OSTS) is responsible for developing the mandated proposal for an MRS facility, establishing the transportation capability to support the disposal operation, and directing the integrated development of system components so that the entire waste system functions in an optimized way.

This paper deals only peripherally with the DOE proposal for an MRS facility since an in-depth paper on that program will be delivered at a later session of this meeting. The primary focus of this discussion is the program that OCRWM is developing to ensure the availability of a safe, efficient transportation system for shipping under provisions of the NWPA.

In planning the transportation program, two major tasks are recognized. The first is to develop and acquire the equipment and services to support operation of the NWPA transportation system. The second task is to encourage the institutional climate that will allow establishment and operation of the system. OCRWM is confident of its ability to develop a safe, effective system in a timely manner. The second task requires the participation and support of a wide range of interested parties, and, therefore, presents a more formidable programmatic challenge.

INTRODUCTION OF THE INTEGRATED SYSTEM

The waste disposal system envisioned by the OCRWM will have several components: at-reactor storage; the repository; possibly a monitored retrievable storage facility; and the transportation that links the facilities. To ensure that all the components will operate as a coordinated entity, OCRWM has adopted a systems integration approach to its program planning. Each component system will be designed and developed with the schedules and interfaces of the others in mind. Planning must accommodate the critical interfaces with the nuclear plants and DOE facilities where the waste is currently being stored.

To optimize the design of the waste management system, OCRWM has evaluated alternative systems concepts with respect to their potential for reducing risk, increasing flexibility, lowering costs, and enhancing the ability to meet desired schedules. The current preferred Departmental strategy is to include an MRS facility as an integral component of the disposal process in order to improve overall system performance. The DOE proposal for construction of this facility includes a recommendation for siting in the State of Tennessee.

The concept advanced in the proposal is for the MRS facility to function as an intermediate facility for receiving the spent fuel from the reactors for consolidation and specialized packaging before transfer to the repository for final disposal. The MRS facility could also be used for temporary storage of the spent fuel if repository schedules or fuel acceptance rates indicated such a need.

If the DOE proposal is approved by Congress, most shipments of intact spent fuel would be to the MRS facility in Tennessee. After consolidation of the fuel, the cross-country transfer of the fuel to a repository would be made. Spent fuel stored at reactors located near the repository could be shipped directly, however, as could defense high-level waste that is currently stored at DOE facilities. This proposed arrangement would reduce the cask miles[a] required in the system due to the consolidation of the fuel at a location central to the majority of the

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[a]A cask mile is the distance traveled by a cask regardless of cask capacity (e.g., a mile traveled by a cask carrying two assemblies would be counted as one cask mile as would a mile traveled by a cask carrying 14 assemblies).

reactors and the resulting reduction in required shipments from the MRS facility to the repository. An additional system benefit having implications for shipping cask designs would be the production at the MRS facility of a uniform fuel package that could be used for either final disposal or for interim handling. The improved performance transportation system is depicted in Fig. 1.

TRANSPORTATION PROGRAM ORGANIZATION

OCRWM has divided the activities associated with development of the transportation system into two major categories:

- o technical development of the hardware and related equipment and procedures to support system operation, and
- o reinforcement of an institutional climate that will allow the system to develop and function effectively.

To bring focused attention to both elements of the program, OCRWM has recently reorganized its transportation effort at DOE Headquarters in Washington to be task-oriented. Support at the operations office level follows a similar organizational delineation. The Idaho Operations Office is responsible for development of transportation equipment such as casks and transporters. The Chicago Operations Office has the assignment to implement the institutional and economic/environmental programs. Looking into the future when the NWPA transportation system begins operation, the Oak Ridge Operations Office has been asked to examine and evaluate some of the long-range transportation options, such as use of a full-service contractor to operate the system. All of these organizational units will work together to ensure the timely development of a transportation system that is safe, efficient, economical, and publicly acceptable.

TECHNICAL DEVELOPMENT

Several recent OCRWM actions have initiated the effort to acquire the transportation system. In January, the Transportation Business Plan was released. This document presents information concerning the expected business methods and strategies that OCRWM will employ to establish the transportation capability. A draft of the Business Plan, published in August 1985, was reviewed by the public and the comments and suggestions received were incorporated, as appropriate, in the January publication. A draft Solicitation Package was released in February to inform interested parties of the requirements of the cask development program. A two-day Cask Acquisition meeting will be held later this spring in Salt Lake City to provide further information on the cask fleet that will be required for the NWPA transportation system. These activities are preparatory to the release of a Request for Proposals (RFP) for the first phase of cask procurement.

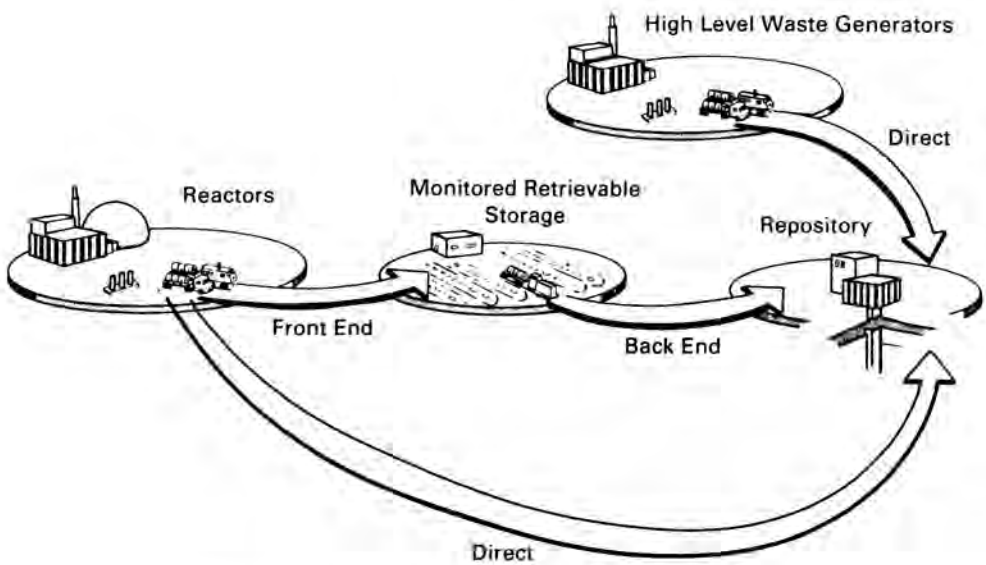

Fig. 1. The improved performance transportation system.

Briefly, the casks to be developed will fall into three categories: 1) casks for moving fuel from reactors to a repository or to an MRS facility (if approved); 2) casks for moving fuel from an MRS facility to a repository; and 3) casks for transporting non-standard fuel and non-fuel components.

The current phase of cask design activity is focusing on the "from-reactor" casks, which will constitute the major part of the fleet and will be capable of carrying at least 80 percent of the fuel to be shipped. While it is projected that the destination of these casks will be the MRS facility, if such a facility is not approved by Congress, the casks can be used for direct shipping to a repository. Because the "from-reactor" casks must be shipped from over 100 different nuclear plants, the interface requirements will present significant design challenges. The objective will be to minimize the number of different casks required while maximizing cask capacities and safety.

All surface modes of transportation (truck, rail, and barge) will be considered in designing the "from-reactor" cask. Both overweight and legal weight truck cask designs will be pursued. Rail casks will have 100-ton weight limits to ensure a gross vehicle weight that will allow unrestricted travel in general commerce. Because not all reactors are accessible by rail, truck cask designs that facilitate intermodal transfer to railcars are encouraged. The expected maximum number of "from-reactor" casks that will be required is 120 for truck mode only or 70 for rail mode only.[b]

A second phase of design effort will be for a "from-MRS" cask. This design can embody standardized features to accommodate identical interfaces at the origin and also at the destination of the shipment since there will be a single source as well as a single destination. In addition, the consolidation and other fuel package preparation that takes place at the MRS facility will permit design of a cask that will have a uniform content.

The primary focus of the "from-MRS" fleet will be rail. Design features for these rail casks would include weights of up to 150 tons, integration of the cask into the rail car, and potential cask capacities of 25 MTU. It is projected that cask handling will be by automated remote control equipment. Current estimates are that as many as 30 of the "from-MRS" casks will be needed for the transfer of the fuel to the repository. The proposed use of dedicated nuclear trains to ship the fuel from the MRS facility to the repository will facilitate operations and significantly reduce cask miles.

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[b]These estimates are based on a truck-cask capacity of 2 pressurized water reactor (PWR) spent fuel assemblies or 5 boiling water reactor (BWR) assemblies and a rail-cask capacity of 14 PWR or 36 BWR assemblies.

A third and smaller design phase will be for casks to accommodate non-standard fuel and radioactive non-fuel components which will be shipped directly to the repository. Development of these casks will have secondary priority in the program until the "from-reactor" cask design phase is well advanced. As previously stated, should Congress fail to approve the DOE proposal for an MRS facility, the "from-reactor" cask will be used to ship spent fuel directly to the repository.

The design of casks for the shipment of defense high-level waste and commercial waste currently stored at West Valley, New York will be coordinated among OCRWM and DOE's Offices of Nuclear Energy and Defense Programs. The defense waste will constitute approximately 10 percent of the waste (on a radioactivity basis) to be shipped to a repository.

OCRWM has initiated several complementary technical programs that will support the cask development process. A stringent quality assurance program is being defined to maximize safety and efficiency. In addition, a comprehensive cask testing program is being designed to ensure compliance with all safety requirements. Engineering testing, design verification testing, acceptance testing, and operational testing will be included in the cask development program. Engineering tests will be required on all cask designs to provide data to characterize material performance or performance of cask components. Design verification testing of full-scale component sections or of scale models that are at least one quarter of actual size will be performed to demonstrate design safety and to aid in certification. Design verification testing will be used to evaluate cask performance relative to design criteria of the Nuclear Regulatory Commission (NRC). After each cask is fabricated, a set of acceptance tests, which are described in each cask's safety analysis report, must be performed before shipments can be made in the cask. Acceptance testing includes post-fabrication inspections and nondestructive performance evaluations (e.g., measurement of shielding effectiveness). After passing the acceptance tests, operational tests will be conducted; these tests include handling the cask at a variety of facilities, monitoring cask system performance during transit, and transferring the cask between transportation modes. In addition, a currently unspecified fraction of the prototype casks may be subjected to a full-scale regulatory test and/or confirmatory demonstrations.

OCRWM has a high level of confidence in the success of the technical program just described. Several influencing factors reinforce this confidence. The estimated period of at least 10 years before shipping begins allows sufficient time to develop the required hardware and procedures. In addition, unlike the repository program which must blaze some scientific and technical trails, the transportation program has a firm basis for technical development already in place. A system for shipping radioactive

materials has been functioning safely and efficiently for years. Consequently, the technical task is one of adapting the existing capabilities to meet the unique requirements of the NWPA. A greater programmatic challenge is the task of establishing the institutional climate that will permit smooth development and operation of the transportation system.

INSTITUTIONAL DEVELOPMENT

Several existing attitudes offer significant impediments to understanding and support of the OCRWM transportation program. The general public perception of any activity associated with nuclear energy has traditionally been one of mistrust and fear. The destructive implications of the atomic bomb have overshadowed the benefits of nuclear power which supplies 15 percent of this country's electricity, of nuclear medicine which has saved the lives of countless citizens, and of the many other constructive uses of energy from the atom. This anti-nuclear sentiment can also extend to negative public reactions concerning disposal of nuclear waste. What must be clarified is that the waste cannot continue to be stored indefinitely at multiple reactor sites throughout the country. Someday it must be moved. Passage of the NWPA by our elected representatives signaled a national resolve to address the problem of nuclear waste by establishing a safe, secure, and permanent system for its disposal. Failure to implement this mandate would be a gross neglect of our national responsibility both to ourselves and to future generations.

A further deterrent to the smooth establishment of the NWPA transportation system is the diverse and frequently conflicting interests and views of the affected parties. The States, Indian Tribes, and localities through which the waste will pass are understandably committed to ensuring that any system developed be as safe as possible. In a few cases, this attitude has been extended to a commitment that no additional risk be incurred, entailing the prohibition of any high-level waste transportation through a particular jurisdiction. This position is untenable in a modern technical society.

A different perspective is provided by the utilities who are primarily interested in a safe system but who are also concerned that money from the Waste Fund be spent as judiciously and as efficiently as possible. Finally, many members of the transportation industry tend to view fears regarding safe transportation of radioactive waste as being far out of proportion to the actual risks that will be encountered. These professionals feel that the safe record of high-level waste transportation -- no deaths or injuries or damage to the environment from nuclear aspects of the shipping process -- speaks for itself. They feel completely adequate to the task of designing, developing, and operating a safe system and are somewhat impatient with the high level of assurances that are being demanded by other affected parties including DOE.

The requirement to foster program participation and cooperation by these various groups is an agenda of imposing proportions for OCRWM. Because of the diversity of the prospective participants and the acknowledged sensitivity of the program mission, it is an institutional challenge that is perhaps unique in the Federal Government experience of managing a major development program.

To assist in the task, a Draft Transportation Institutional Plan was released for public comment in September 1985. The Draft Plan sets forth the policies and principles that will guide the establishment of the capability to ship the waste, describes the transportation system as it is expected to evolve, and discusses the DOE's expected interactions with the various affected parties. The draft Plan further identifies the projected institutional activities throughout the acquisition of the transportation system and correlates them with the planned technical activities. To reinforce informed program participation by affected parties, a program to develop the necessary informational resources is suggested and the mechanisms through which the resources will be disseminated are described.

Central to cooperative interaction -- and ultimately to establishment of the transportation system -- is the effective management of issues that confront program implementation. Accordingly, the Draft Institutional Plan also discusses the procedures that the DOE will follow to identify, address and resolve the transportation issues in a manner which balances responsiveness to group concerns with prudent management of the transportation program and the moneys by which it is funded. The primary consideration in all deliberations, however, is and will remain the safety of the system to be developed.

To encourage further broad-based participation in its institutional planning, in November 1985, OCRWM held a Transportation Institutional Workshop in Atlanta. The format of the Workshop was to divide the approximately 400 attendees into working groups to discuss in depth one or two transportation issues of their choice. A spokesman selected by the group reported back to the reassembled workshop on the discussions that had taken place. Significant changes are being made to the draft Institutional Plan as a result of both the workshop recommendations and the written comments received demonstrate OCRWM's commitment to be responsive, where possible, to the suggestions of interested parties. The revised version of the Plan will be issued later this Spring.

At this time, we anticipate a process whereby the Transportation Business Plan, the Transportation Institutional Plan, and a projected system operations plan will be integrated into a single comprehensive Transportation Plan. The Plan will be updated as needed, based on the influencing events that occur, policy decisions that are made, and

comments and suggestions that are received from interested parties. A series of issue discussion papers that OCRWM has initiated for public review and comment will provide guidance for all institutional planning. The latest versions of these discussion papers will be included in the Transportation Institutional Plan to be released this Spring.

At this stage of the program, much of OCRWM's regular interaction with institutional groups will take place through representative organizations. DOE has already contracted with two organizations representing western and southern states. Plans are underway for near-term arrangements with regional organizations representing the remaining states. In addition, OCRWM is considering contracts with groups that can represent tribal and local interests. The purposes of these contractual arrangements are to apprise OCRWM of State, Tribal and local concerns and to allow transportation issues to be addressed from regional perspectives. In no way, however, are these contractual arrangements meant to replace direct interaction with interested State, Tribal, and local governments. To ensure this direct liaison, OCRWM will continue to seek political and technical points of contact within the various governments. As the NWPA facility siting process becomes more focused, OCRWM could initiate contractual relations whereby the States, Tribes and localities could work cooperatively toward resolution of issues. These arrangements, of course, would be in addition to the NWPA-directed Consultation and Cooperation Agreements with potential host states and affected tribes.

A second form of interaction that is being initiated is a series of study groups to address and develop solutions for specific issues. A contract will be awarded to an organization recognized as having an expertise related to the specific issue under consideration. The selected organization, in turn, will assemble study group participants having various views or experience with the subject issue. These participants potentially will be from other Federal agencies; State, Tribal, or local governments; the transportation industry; the utilities; special interest groups, or other affected parties. After in-depth analysis by the study group, the organization coordinating the group activities will supply OCRWM with a report of the discussions and findings. OCRWM will use these reports as important input to its policy decisions regarding the particular issue.

CONCLUSION

Although the NWPA assigns the task of managing development of the waste disposal capability to OCRWM, implementation of the Act's mandate is a shared responsibility of all who are affected. No matter how innovative and technically correct the waste program might be, the ultimate achievement of objectives will depend in large measure on the degree of understanding and support that can be generated. OCWRM believes that the key to success lies in the combination of consistent excellence in performance of program activities, early and continued participation in program planning by interested parties, and effective communication of program principles and progress to the concerned public. The challenge to all who share this national responsibility is to work together cooperatively and productively to reach our goal.