The Utility Industry's Perspective on the Department of Energy's Cask Acquisition Program

J.E. Flaherty[1]

Edison Electric Institute/UWASTE, Washington, DC, United States of America

Introduction

Every year, electric utilities generate more spent fuel for ultimate disposal by the U.S. Department of Energy's Office of Civilian Radioactive Waste Management ("DOE" or "OCRWM"). Every year utilities pay more money into the Nuclear Waste Fund. And every year the date for operating a repository is delayed.

DOE's plans for developing a spent fuel transportation system under the Nuclear Waste Policy Act of 1982, as amended by the Nuclear Waste Policy Amendments Act of 1987 ("NWPA")[2] are, therefore, of considerable interest to the Electric Utility Companies' Transportation Working Group, a segment of the Utility Nuclear Waste and Transportation Program, or "UWASTE".[3] One of the TWG's principal missions at this time is to promote the successful implementation of the transportation-related provisions of the Nuclear Waste Policy Act. To carry out this mission, the TWG serves as the electric utility industry's primary contact with the OCRWM for interactions on transportation issues. This paper will present the perspective and consensus position of the electric utility industry on the OCRWM transportation program, and, in particular, the cask acquisition program.

Importance of Transportation Issues to the Utility Industry

The first order of business is to provide an answer to a very basic question: "Why do we care?" Under the NWPA, DOE has been charged by Congress with the responsibility to

design and operate a transportation system for moving large volumes of commercial spent fuel to a repository, and potentially a Monitored Retrievable Storage facility ("MRS"). DOE has the contractual obligation to procure an adequate supply of NRC-certified casks in sufficient time to support its shipping schedule, take title to the spent fuel at the reactor gates, serve as the shipper of record, and transport the spent fuel from the reactor to an MRS or a repository. Under these circumstances, shouldn't the spent fuel storage and transportation problem now rest totally in DOE's lap? For several reasons, the inescapable answer to this question is "No".

First, the transportation system being developed by the DOE is the sole physical interface between utilities and the federal waste disposal system. Unless utilities' needs and constraints are considered fully in developing the NWPA transportation system, we could be subject to substantially increased costs -- through the Nuclear Waste Fund and otherwise -- for storing and shipping spent fuel. Perhaps even more important, an optimum transportation system is not achievable without significant utility input to the development process.

Second, transportation will be the NWPA activity which is the most visible to the largest number of people. If a serious accident were to occur during a spent fuel shipment -- whether or not there were a release of radioactivity -- it could seriously damage the entire waste disposal program. Moreover, even though DOE will be the shipper of record for these shipments, the utility industry will continue to be responsible in the eyes of the public and will ultimately have to answer for DOE's mistakes.

Third, the DOE transportation program is financed out of the Nuclear Waste Fund, which is made up of contributions from consumers of nuclear-generated electricity. It is a fairly common misconception that utilities have no stake in the level of DOE's expenditures under the NWPA because the utilities' fees are ultimately passed on to their customers. However, there is no absolute guarantee that this rate treatment will continue under all circumstances, and, even if there were such guarantee, utilities have a responsibility and an obligation to ensure that their customers' contributions to the Nuclear Waste Fund are utilized wisely by DOE in developing a safe, efficient, and cost-effective transportation system.

Fourth, nuclear waste transportation is not something that will be happening for the first time under the NWPA. Rather, it is an ongoing activity. Even though large-scale

shipments of spent fuel are not likely to take place until at least the late 1990's, and probably later, utilities have previously shipped significant quantities of spent fuel and are likely to continue making shipments during the interim period. Perhaps even more important, the number of low-level waste shipments will inevitably increase, and the distinction between low-level and high-level radioactive waste is not perceived by most members of the public. The ability of utilities to conduct vital ongoing shipping activities in support of operating power reactors may ultimately be determined by DOE's successes and/or failures during the next decade in developing the NWPA transportation system.

Finally, DOE's implementation of the NWPA, including its cask acquisition program, is expected to have a significant impact on utilities' near term spent fuel storage plans. Many utilities, unable to wait for DOE to pick up their fuel, will be forced to resort to interim actions to expand their storage capacity, such as rod consolidation, reracking, transshipment, or on-site dry storage. DOE's actions in implementing the NWPA could influence a utility's choice among these options. For example, if DOE were to decide to utilize dual-purpose casks, including those purchased by utilities, in the NWPA program, or to consolidate all spent fuel at an MRS, there would undeniably be a significant impact on utility spent fuel management programs. It is therefore vital that DOE be aware of, and accommodate, the needs of utilities (in essence, DOE's customers) in its development of the NWPA transportation system.

The Transportation Provisions of the NWPA

Although the NWPA charges DOE with the responsibility for transporting commercial spent fuel from civilian reactor sites, it provides DOE with little direction as to the specific elements of the transportation system it is to establish. While Congress granted DOE significant discretion under the NWPA, it did direct DOE to utilize private industry to the fullest extent possible in transportation activities. This Congressional directive to rely on the private sector is attributable to the fact that a transportation system is already in place, developed by private industry under existing federal laws and regulations, which has proven itself to be capable of shipping spent fuel in a safe, efficient, and economical manner.

As can be seen in Table I, there have been 4,887 off site shipments of commercial spent fuel assemblies between

1964 and 1986, using both the highway and rail mode of transport. On average, this amounts to approximately 90 shipments per year. The precise split between the number of actual rail and truck shipments cannot be determined, because carriers and shippers are not required to report such data to any central federal authority. Table II summarizes the type of shipments that have been made to and from commercial reactor sites. Hundreds of individual spent fuel shipments involving thousands of assemblies have been made in this county by private industry, and significantly more shipments of spent fuel have been made in Europe and elsewhere. Thus, we are not dealing with an industry in its infancy.

The NWPA also recognized the safety record for spent fuel shipments, particularly as compared to shipments of other hazardous materials. As can be seen in Table III, over 20 years of spent fuel shipping in the United States has produced only five accidents, not one of which involved any damage to the casks or a release of radioactivity. This exemplary shipping record is attributable to three factors -- the safety of the casks, the adequacy of the regulatory regime governing the shipments, and the extreme care taken by shippers and carriers in making these shipments.

The NWPA as enacted made clear Congress's intent that DOE not alter the current relationship among federal and state regulation of spent fuel transport. A comprehensive system of regulations governing spent fuel shipments, promulgated primarily by the Nuclear Regulatory Commission ("NRC") and the Department of Transportation ("DOT")[4] pursuant to their enabling statutes, has historically ensured the safe shipment of spent fuel. Thus, recognizing the existence of a safe, efficient, and economical transportation system upon which DOE could build its program, the NWPA, as well as the 1987 amendments, provided DOE no specific direction on the business interface.

While the amendments did mandate that DOE use NRC-certified casks for commercial spent fuel shipments, and that it comply with NRC prenotification regulations for all NWPA shipments, DOE's prior commitment to both of these requirements as a matter of policy caused the amendments to have little practical import.

The DOE's Implementation of Its Transportation Responsibilities Under the NWPA

In January of 1986, DOE issued the Transportation Business Plan, the purpose of which was to outline DOE's plans for the development and implementation of the technical

aspects of the NWPA transportation system. Included in the Business Plan was a strategy for the acquisition of casks to support the NWPA program, with or without an MRS.

As defined in the Business Plan, the first of several cask procurement activities is the development of casks which can be used to remove most of the spent fuel from reactor sites, or what is known as "from-reactor casks". The fact that DOE intends to procure a new fleet of casks should not be perceived as an indication of any technical or regulatory barrier to the continued use of existing NRC-certified casks. Rather, it indicates DOE's desire to develop and procure casks that are more efficient in terms of both capacity and compatibility with DOE and utility facilities.

On July 31, 1986, the DOE issued a request for proposals for the design, engineering, certification, testing and prototype fabrication of from-reactor casks. In June of 1987, DOE announced the selection of several companies for the negotiation of contracts to develop a new generation of shipping casks. In particular, DOE indicated its intention to award contracts for the development of two legal weight and two overweight truck casks, three rail/barge casks, and two dual purpose casks. DOE estimated that the cost for cask development would be in the range of five to twelve million dollars per cask, and that the development effort would be completed in the mid-to-late 1990's. At a Transportation Coordination Group meeting in October 1987, DOE announced that it might reconsider the variety and number of casks to be developed in the from-reactor cask procurement in light of changes in the overall NWPA program schedule and any legislation that might be enacted. As a result, DOE announced its decision to reduce the scope of the from-reactor cask procurement to two legal weight truck casks and three rail/barge casks. These five casks are now nearing the end of their preliminary design phase.

The TWG has been evaluating DOE's announced from-reactor cask development program, taking into account, among other things, the current pace of the rest of the NWPA program and the recent redirection of the program by Congress. In light of all of these factors, the TWG's view is that the current pace of the from-reactor cask procurement is not justified. More specifically, the TWG believes that the most appropriate course for DOE to follow is to complete the preliminary design phase for the casks currently under development and re-evaluate the cask procurement schedule in light of the repository and linked MRS schedule slippages. In addition, the Department should explore in more detail the potential role of existing NRC-certified casks in the NWPA transportation system, particularly in the early years of operation of a receiving facility, or de-linked MRS.

Recognizing that the TWG's position is not necessarily supported by every member of this audience, I would like to explain in more detail the rationale for our position. Before I do, however, I should stress that the TWG's position is based on several underlying premises, and should these premises change, our recommendation might be altered.

Schedule For Commencement of Shipments

In the TWG's view, the primary goal of DOE's cask acquisition effort should be to provide an adequate supply of NRC-certified casks to support the shipment, when needed, of spent fuel and high-level radioactive waste to a repository and/or an MRS in a safe, efficient, and cost-effective manner. Under DOE's most recent schedule, of which we are aware, shipments of spent fuel to the repository are not expected to commence until at least 2003. If an MRS were to be constructed under the provisions of the NWPA, as amended, acceptance of spent fuel would be unlikely to begin before 1998. The relevant point is that DOE will not begin shipping spent fuel until at least two, and possibly five or more, years later than the date envisioned when the Transportation Business Plan and the RFP were developed. Given these schedule delays, we cannot help but question the need for, or desirability of, a large-scale cask procurement a minimum of 10-15 years in advance of the anticipated commencement of shipments.

One of the most prevalent arguments for initiation of a broad-based cask development effort at this time is the expectation of significant delays in obtaining NRC certification of a cask design. We consider the Business Plan allowance for a period of two years from application to certification of from-reactor casks to be achievable; the amount of time it will actually take, however, will depend on several factors, including the applicant's familiarity with and conformance to NRC regulations and procedures, the novelty of the cask design and materials, the extent to which the applicant works closely with the NRC prior to submitting the application, and the number of applications pending before the NRC.

Recent history demonstrates that a two year period for certification is realistic. For example, certification of the TMI cask was issued in a little less than one year after the application date. In the case of the FFTF cask, the entire process from the initiation of design concepts to actual cask delivery, including NRC certification, took approximately 3-1/2 years. Given this recent history, and assuming shipments under the NWPA commence in 2003, filing

of an application for cask certification in the late 1990's would still provide sufficient time to obtain the certification and procure the necessary casks. Moreover, if a state or tribe agreed to host an MRS that could receive spent fuel significantly earlier than 1998, there would be adequate time available for OCRWM to procure a sufficient number of casks of straightforward design to service the limited receiving capacity of this facility in its early years of operation without the necessity for commencing a large-scale procurement at this time.

In this connection, two points should be emphasized. First, as noted previously, spent fuel shipments have been taking place in this county for over 20 years in NRC-certified casks. If the current generation of casks has received NRC certification and compiled an exemplary record of safe transportation of spent fuel, as it has, then it should not take 10 years to design and certify a new generation of casks. The second point is that most tasks expand to fill the time and resources which are available. If DOE allots 10 years to get the job done, then it will likely take 10 years. On the other hand, experiences such as those involving the TMI and FFTF casks demonstrate that where a project must be completed in a limited amount of time, the time constraints can be met in an efficient and cost-effective manner.

In the event that DOE has not procured a sufficient number of casks to support operations when an MRS or repository is ready to begin accepting shipments, then it could use the existing generation of NRC-licensed casks as additional support for the early shipments. We are obviously not advocating exclusive reliance on these casks to support DOE's shipping activities. Our point is simply that DOE should be cognizant of the fact that these casks exist and can be used as a backup to support the early years of shipments to the repository or the MRS if the full fleet of new casks is not procured prior to the commencement of shipments. The Group also supports the use of the existing fleet of casks to ship non-standard materials, and has formally expressed this view to DOE in its comments on the Business Plan.

The Lack of Data Necessary For Optimum Cask Design

As I indicated earlier, one of the primary motivations for developing a new generation of spent fuel casks is the desire to maximize payload capacity and minimize turnaround time. In order to achieve this worthwhile objective, it will

be necessary to possess a reliable and comprehensive data base on waste configurations, facility interfaces, and operational constraints. The physical interface between utilities and the NWPA transportation system is currently comprised of 109 civilian nuclear power plants at 77 sites, no two of which are exactly alike. DOE is faced with the formidable task of procuring a fleet of casks and designing a transportation system which is capable of accommodating the unique spent fuel handing characteristics at each facility or site -- characteristics such as cask weight limits, pool configurations, vertical clearances, and restrictions on movement. DOE has subcontracted with Nuclear Assurance Corporation to gather the necessary site and facility data through an effort known as the Facility Interface Capability Assessment ("FICA"). The FICA has visited most utility sites, and is scheduled to publish its initial findings by the end of this year. Work on the DOE infrastructure study has not been initiated.

Accommodation of cask handling characteristics at utility sites, however, will not, by itself, enable DOE to optimize cask designs. What will continue to be missing is reliable data on spent fuel configurations for storage, transport, and disposal, as well as the facility requirements for the repository and, if approved, an MRS. Given the perceived and sometimes acknowledged, delays in the repository and MRS programs, utilities will have no choice but to expand on-site storage capacity, employing whatever methods -- and configurations -- are appropriate for their unique circumstances. In addition, the relative magnitude of the investments in the MRS and repository in comparison to the investment in the NWPA transportation system makes it difficult to believe that the interface requirements for those facilities will not be afforded substantial deference by DOE in any cask design. In short, DOE's current cask design data base appears to be inadequate and/or incomplete; the likely result of premature reliance on such data is the development of transportation casks which may require significant modification when the final requirements are known. Therefore, the TWG believes that re-evaluation of the cask procurement schedule, following the completion of the preliminary design phase is both prudent and appropriate.

The Need to Conserve Resources

Another important factor underlying the TWG's position is the need to conserve the limited resources of all of the various groups who are interested in the cask procurement effort (i.e., DOE's "stakeholders"). Forging ahead with a

large scale cask procurement at this time, when there are still so many uncertainties, could result in an unproductive use of resources. For example, there are important issues that need to be resolved with the Nuclear Regulatory Commission regarding the use of new cask materials and the consideration of spent fuel operating histories (i.e., burnup credit) in performing criticality analyses. Proceeding with the development of several cask designs before these issues can be resolved introduces a significant risk of a sub-optimum outcome.

By proceeding to develop several cask designs at the same time, OCRWM is committing not only a substantial amount of its own resources, but also those of its contractors, other federal, state and tribal agencies, utilities and special interest groups. On the other hand, adoption of the TWG's recommendation to re-evaluate the current procurement schedule would provide additional time to acquire important information on key design concepts, new materials and analytical techniques that will be of significant value in the NRC certification process. In addition, this course of action better conserves the resources of DOE's stakeholders, and ultimately the consumers of nuclear-generated electricity, by facilitating the application of lessons learned in the initial cask development effort to subsequent development of future designs. The current NWPA transportation program is in a state which can best be described as its "infancy". As such, it seems prudent to make sure we have mastered the art of walking before we unequivocally commit to run.

Recent Developments

The Department of Energy sponsored a Cask System Development Program workshop for nuclear utilities in April of this year where the cask contractors gave presentations on the status and details of their preliminary cask designs. A number of issues have been identified for resolution that should be addressed prior to proceeding to the final design phase. Among them are:

- Fuel Exposure Criteria -- the fuel burnup used in the preliminary design is not representative of the fuel that is likely to be in pools when shipping commences. As a result, the loading capacity of all the preliminary design casks is greatly reduced in order to meet dose rate limits. The Department has recently recognized this problem and is working with the TWG to define burnup populations.

- o Shielding Margins -- most of the cask designs cut the shielding margins too thin such that the dose rates bump right up against the regulatory limit. When you consider that normal shielding designs are good to approximately plus-minus 30-50%, there is potential that loaded casks could exceed the limit. Also, DOE needs to stress uniformity among vendors in the area of source term calculation methodology.

- o Accommodation of Non-Fuel Bearing Components -- it seems that many of the designs may not accommodate fuel with control elements inserted or BWR fuel channels.

The workshop was viewed by the TWG as a positive exchange of technical information on the cask system development program and the Department has agreed to future meetings of a similar nature.

Conclusions

The TWG feels that the conclusion of the Preliminary Design Phase of the Cask System Development Program is the appropriate time for the Department of Energy to assess the direction and schedule of cask procurement activities. The Transportation Program is running perhaps decades ahead of the other segments of the Department's High-Level Waste Disposal Program. This time should be used to gather information on Utility/DOE waste system interface questions and design adequacy issues to assure that the common goals of the utility industry and the Department of Energy are achieved.

TABLE 1

OFF SITE

COMMERCIAL

SPENT FUEL

SHIPMENTS

1964 - 1986

YEAR	TOTAL ASSEMBLIES	# ASSYS. TRUCK	BY RAIL	EST # TRUCK	SHIPM'TS RAIL	EST TOTAL # SHIPMENTS
1964	9	1	8	1	1	2
1965	231	-	231	-	19	19
1966	421	124	297	124	23	147
1967	174	-	174	-	15	15
1968	137	-	137	-	11	11
1969	287	80	207	80	14	94
1970	289	41	248	41	25	66
1971	178	16	162	16	15	31
1972	102	102	-	102	-	102
1973	274	202	72	121	9	130
1974	346	333	13	222	2	224
1975	262	198	64	146	4	150
1976	470	146	324	146	21	167
1977	530	123	407	122	29	151
1978	158	46	112	46	16	62
1979	130	25	105	23	15	40
1980	54	22	32	22	5	27
1981	25	12	13	12	2	14
1982	14	14	-	14	-	14
1983	94	94	-	94	-	94
1984	396	342	54	181	3	184
1985	283	283	-	92	-	92
1986	23	23	-	8	-	8
TOTALS	4,887	2,227	2,660	1,615	229	1,844

TABLE II

NATURE

OF

SPENT FUEL

SHIPMENTS

1964 - 1986

DESTINATION	NO. OF ELEMENTS
TRANSFERRED TO/FROM OFF-SITE POOLS	339
SHIPPED TO/FROM AFR STORAGE	1,491
SHIPPED TO/FROM REPROCESSOR	3,001
SHIPPED TO/FROM RESEARCH FACILITY	56
TOTAL	4,887

TABLE III

TRANSPORTATION ACCIDENTS

INVOLVING

COMMERCIAL SPENT FUEL

DATE	LOCATION	DESCRIPTION	RESULTS
12/08/71	near Oak Ridge Tennessee	Truck driver left road during rain storm to avoid head on with car. Truck rolled--cask thrown free landing in mud in ditch. Driver killed.	Cask not damaged. No release of contents.
3/29/74	N. Carolina	RR tank car derailed and struck cask on another track.	Superficial damage. No release of contents.
2/09/78	Illinois	As cask crossed RR track the extra stress caused trailer to collapse due to broken weld.	Cask not damaged. No release of contents.
8/13/78	New Jersey	As empty cask being placed onto trailer the trailer deck failed due to broken weld.	Cask not damaged. No release of contents.
12/09/83	border between Indiana and Illinois	As truck started moving while in construction zone, free standing trailer separated from tractor. Brakes locked and trailer stopped within 3 feet.	Cask not damaged. No release of contents.

1. Program Manager, Utility Nuclear Waste and Transportation Program. This paper was co-authorized by Mr. Howard Shimon, Superintendent of Nuclear Fuel and Budgets, Wisconsin Electric Power Company, and Chairman of the Utility Nuclear Waste and Transportation Program's Transportation Working Group and Mindy A. Buren, Esq., counsel to the law firm of LeBoeuf, Lamb, Leiby and MacRae attorneys for the Utility Nuclear Waste and Transportation Program. The paper will be presented by Mr. Flaherty.

2. 42 U.S.C Section 10101-10226 (1982), as amended, 133 Cong. Rec. H121168 (daily ed. December 21, 1987).

3. The Transportation Working Group is comprised of 52 utilities responsible for the construction or operation of 104 reactors located around the country. The original reason for forming the Group was a growing concern among utilities about actions being taken by state and local officials and others that could hamper or preclude utilities' ability safely and efficiently to transport nuclear fuel cycle materials, especially spent fuel. While the activities of the Group have evolved considerably over the past decade, the Group's purpose has always been to facilitate the development of utility industry policy and position on the many technical and institutional issues that have arisen with respect to the transportation of nuclear fuel cycle materials, and to present those views to the cognizant authorities.

4. NRC regulations are issued pursuant to the NRC's authority under the Atomic Energy Act of 1955, as amended. 42 U.S.C. Section 2100-2284 (1982 & Supp. III 1986). DOT regulations are issued pursuant to DOT's authority under the Hazardous Materials Transportation Act. 49 U.S.C. Section 1801-1812 (1982 & Supp. III 1986).