TRANSPORTING SPENT AND DAMAGED FUEL IN THE UNITED STATES: RECENT EXPERIENCE AND LESSONS LEARNED RELATED TO THE EVOLVING TRANSPORTATION POLICY OF THE U.S. DEPARTMENT OF ENERGY

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October 22–28, 1989

1989 Joint International Waste Management Conference, Kyoto, Japan
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ABSTRACT

The U.S. Department of Energy, through its Office of Civilian Radioactive Waste Management, is preparing for a large-scale transport effort of shipments of commercial spent nuclear fuel from power reactors to the Federal repository for high-level radioactive waste by developing new cask systems and engaging in a major public outreach program. This paper summarizes experience gained from recent transport actions of the Department of Energy, relates lessons learned therefrom to an evolving policy in the Department, and discusses some aspects of public involvement in such transport activities.\textsuperscript{1}

COMPLETED, CONTINUING, AND FUTURE TRANSPORT ACTIONS

Three Mile Island Unit 2 (TMI–2) Transport Campaign—The March 28, 1979, accident at the Unit 2 reactor of the Three Mile Island Nuclear Power Station (TMI) near Harrisburg, PA, resulted in significant damage to the nuclear fuel. The Department of Energy (DOE) entered into an agreement with General Public Utilities (GPU) Nuclear to assist in cleanup of the reactor. The TMI-2 Campaign involves transporting damaged fuel from the Unit 2 reactor to the Idaho National Engineering Laboratory (INEL) of the DOE near Idaho Falls, ID, for storage and research (Reno, 1986; Schmitt and Reno, 1986; and Harmon, 1989). The damaged fuel campaign, transported in casks by railroad across 10 states, began in July 1986. To date, 20 shipments (43 cask loads or about 80% of the TMI–2 core) have been completed. (At first, several trains transported one or two casks each; present practice is three casks per train.)

Virginia Power (VP) Fuel Transfer Campaign—The VP Campaign involved moving 60 spent fuel assemblies from the Surry Nuclear Power Station of Virginia Power Company and 17 from the Engine Maintenance Assembly and Disassembly facility of the Nevada Test Site via public highways to the INEL (Gertz et al., 1986). The latter assemblies originated from the Turkey Point Nuclear Power Station of Florida Power and Light Company. The shipments were part of a cooperative agreement among the DOE, Virginia Power Company, and Electric Power Research Institute to test metal storage casks and demonstrate dry rod storage of spent fuel assemblies. The transport campaign was accomplished in 1986.

Battelle Columbus Division (BCD) Fuel Transfer Campaign—The BCD Campaign involved moving two complete fuel assemblies and parts of a third from the Battelle Columbus Division near Columbus, OH, to the Idaho National Engineering Laboratory for storage. The fuel was transported via public highways. The campaign was completed in 1987.

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Nuclear Fuel Service (NFS) Fuel Transfer Campaign—The NFS Campaign is part of the NFS Spent Fuel Transportable Storage Cask Demonstration Project of the Office of Civilian Radioactive Waste Management. The project will demonstrate the use of two dual-purpose, transport/storage, spent fuel casks. The Transnuclear–Big Rock Point (TN–BRP) cask is designed to transport (and eventually store) 85 boiling water reactor assemblies of the BRP Nuclear Power Station of Consumers Power Company from their present location at the West Valley Demonstration Project of the DOE near Buffalo, NY, to the INEL. The Transnuclear TN–REG cask is designed to transport (and eventually store) 40 pressurized water reactor assemblies of the Robert E. Ginna Nuclear Power Station of Rochester Gas and Electric Corporation, between the same Federal facilities. The TN–BRP cask was reviewed by the U.S. Nuclear Regulatory Commission (NRC), and cask certification was received from the Commission in April 1989 for the transport action. The TN–REG cask is presently under review. The NFS Campaign involves moving each cask, restricted by the Commission to half loads of spent fuel assemblies because of criticality concerns in postulated transport accidents, via railroad from New York to Idaho. Each cask will make two round trips between facilities. Once all fuel reaches Idaho, each cask will be filled to capacity and tested in a storage demonstration. Data collected during storage may be used by the NRC in certification of such casks for transport/storage. The NFS Fuel Transfer Campaign schedule is presently under review and may not occur until 1991.

EVOLUTION OF TRANSPORT ACTIONS

Although a simplification, the following text provides a framework for discussing certain strategies used by the Department of Energy in resolving issues related to transport of high-level radioactive wastes (including spent nuclear fuel). Principal issues have or presently include: (a) communications with State and local officials; (b) interactions with State and Federal legislators, and the public; (c) design, safety, and certification of cask systems; (d) emergency preparedness and response by local, State, and Federal governments; (e) compliance with the National Environmental Policy Act of 1969; (f) selection of routes and scheduling; (g) safety of operations during transit; (h) types of carrier service (dedicated versus routine freight); (i) indemnification in case of accident; and (j) legality and authority for conducting transport actions. These issues are too numerous and exhaustive to detail in one paper, although some have been explored in other contributions [e.g., Schmitt et al., 1987 and Smith (in press)]. This paper focuses on five issues, namely (a) through (e) and (h).

Issue (a)—DOE, in preparing for the TMI–2 Campaign, recognized that transport of damaged fuel from Pennsylvania would attract considerable attention. Therefore, an extensive effort was conducted to communicate with each state and the public regarding the rail route from Three Mile Island to Idaho. Details of that effort are included in Smith (in press). In essence, the Department provided written notification of its intent to each affected state, followed by a telephone call to the appropriate state official. DOE also conducted press conferences pertaining to the campaign, met publicly with state officials, participated in public meetings, provided technical information as requested, accommodated inspections of the transport system by individual states, and displayed the cask publicly. That approach, however, did not allay all concerns.

In one case, the Governor of the State of Nebraska stopped the first train from Three Mile Island within the State of Kansas. He claimed that Nebraska was notified improperly as to when the train would enter his state. Upon clarification, the presumed "improper notification" was shown to result from ineffective communication within the state government. Nonetheless, adverse publicity arising from that situation cast a negative light on efforts by DOE.

Despite that situation and other minor inconveniences, working with the states in effecting transport of damaged fuel from Three Mile Island has been positive and, in large part, the reason why the TMI–2 Campaign has been successful. Informed public officials were instrumental in educating their constituents and allaying public apprehension concerning the campaign.

Before the TMI–2 Campaign, the policy used by DOE in communicating with the States and public and governmental officials about transport of radioactive material was regarded generically as "courtesy communications". That is, a telephone call was placed to the governor (or his/her designee) of each state, informing him/her of the planned action and that a shipment was in progress. Presently, based in part on experience from the TMI–2 Campaign, seven–days' written prenotification is provided to the governor or designee before initiation of a shipment. Prenotification includes information pertaining to when the train
enters, traverses, and exits the state. If the actual schedule varies more than six hours from that included in the prenotification, the state is notified of the variance by telephone.

For the BCD Campaign, DOE used the strategy developed for the TMI-2 Campaign. Correspondingly, the experience gained from those two campaigns will be used for the NFS Campaign. In addition, DOE plans to (1) notify states adjoining those through which shipments will pass as to the planned actions and (2) brief congressional and legislative delegations of each State.

**Issue (b)—**The TMI-2 Campaign resulted in possibly the largest exchange of information ever witnessed between the DOE and the public regarding transportation. In the beginning, planners of the campaign did not anticipate the large number of requests for information related to issues (a) through (h). Nor did those individuals have the resources to formulate written responses in a timely manner. Requests were received from congressmen, investigative entities of Congress, State and local officials, local emergency planning and action organizations, special interest groups, organized critics, and private citizens. Requests numbered in the thousands.

To avoid a similar deluge for future actions, DOE is requiring that a Transportation Plan be prepared for each transport campaign. For the NFS Campaign, that plan reflects lessons learned from the TMI-2 Campaign. It provides details concerning authority for conducting the action, rationale for selecting the transportation route, procedures for notifying each state, strategy for briefing legislative organizations of each state, public relations, transport packages, compliance with the National Environmental Policy Act, emergency preparedness and definitions of local and state responsibilities, and the campaign per se. In other words, the Transportation Plan is a comprehensive document intended to demonstrate to organizations and individuals that the transport action is planned in ways to cause the least impact on all parties.

**Issue (c)—**In planning the TMI-2 Campaign, existing cask systems were reviewed, but none was available that met the requirements of 10 CFR 71 for transport of damaged fuel. Consequently, DOE decided to procure new rail casks. Three casks were designed and fabricated and are being used to transport damaged fuel from Pennsylvania to Idaho. The three Nuclear Packaging, Inc. (NuPac) 125-B rail casks are certified by the NRC as providing double containment of containerized fuel debris.

Although the casks are certified Type B packages, critics vigorously questioned the design and certification process, attempting to disrupt and/or curtail the TMI-2 Campaign. Perhaps the most objectionable criticism focused on the expeditious (21 months) design, fabrication, and certification of the cask system. Translation of that criticism to a safety issue was simple: “When heretofore it took five or more years to certify and build a cask, anything that can be done in that short of time must be flawed; hence, the package must be unsafe.” The criticism, however, failed to recognize the massive effort put forth by DOE and its contractors to design a safe system. In fact, the Department had enough confidence in the design of the NuPac 125-B rail cask that it authorized fabrication in parallel with certification, a time saving not realized in production of other Type B casks. The criticism also fails to acknowledge that the 125-B cask was subjected to NRC certification just as were those other Type B casks taking 5 years or more to build and certify.

Another time saving was realized by subjecting a 1/4-scale model of the NuPac 125-B cask system to a series of drop tests, as outlined in 10 CFR 71 (Subpart H). Although those tests confirmed analytical predictions of cask behavior accident analysis, critics conjectured that actual confirmation required testing a full-scale model of the cask. Presumably, tests using scale models will be part of the cask development program being developed by the Office of Civilian Radioactive Waste Management.

DOE has been perceived by some critics as not having a review/certification process for its cask systems equivalent to the process used by the NRC. The Department has taken steps to remove that perception. First, the Certification Office of the Department reviews applications for cask certification, according to rules and regulations of the NRC. Then, the applications are forwarded to the Commission for review and issuance of Certificates of Compliance, where appropriate. Whereas the NuPac 125-B and other cask systems still in development are reviewed for licensing by NRC from applications submitted directly by cask vendors, one can anticipate that, foreseeably, the certification processes and strategies of both DOE and NRC will become indistinguishable.
Issue (e)—The National Environmental Policy Act (NEPA) has proven to be a powerful tool used by detractors of certain proposed projects or transport actions. In the case of the TMI-2 Campaign, DOE was questioned repeatedly regarding compliance with the NEPA, from both inside and outside the federal government. The Department anticipated such questioning and responded simply and appropriately. Environmental documentation prepared before and after the accident at Three Mile Island clearly addressed transport actions analogous to that between Pennsylvania and Idaho. Moreover, the study by Fischer et al. (1987) updated information contained in documentation prepared before the accident. Additional details concerning compliance are given in Reno (1986), Schmitt and Reno (1986), and Schmitt et al. (1987).

Within DOE, considerable review and reevaluation of policy governing compliance with the NEPA is ongoing. Present philosophy indicates that an environmental assessment will be performed for each major transport campaign. Logical future activities include revision of NUREG-0170 (1977) by the NRC and preparation of generic environmental documentation for transport of spent nuclear fuel. After acceptance/approval of those documents, each transport action would be addressed in an environmental assessment that tiers upon the generic document. That approach is consistent with 40 CFR 1502.20, wherein the Council on Environmental Quality recommended tiering one environmental document upon another, where appropriate.

Issue (h)—Transport of spent nuclear fuel over public highways is well defined in existing policy of the DOE. (That policy guided actions of the VP and BCD Campaigns.) However, transport of spent fuel by railroad is another matter—policy and actions sometimes do not coincide. For the TMI-2 Campaign, for example, the railroad companies (i.e., Consolidated Rail Corporation and Union Pacific Railroad) initially agreed to transport the damaged fuel by means of dedicated trains. That service was accepted by DOE, since doing otherwise (i.e., transporting the damaged fuel as routine rail freight) might disrupt the defueling schedule of the utility. After the first three shipments, the utility agreed to absorb the incremental costs of “exclusive-use train service” over routine freight, since such service was perceived as accelerating the defueling schedule. DOE agreed but noted that, TMI-2 notwithstanding, spent fuel should be transported as routine rail freight, unless the use of dedicated trains facilitates compliance with other constraints.

The use of dedicated trains in transporting spent (or damaged) fuel offers some advantages. For instance, the public perceives use of dedicated trains as providing an extra measure of safety and, therefore, more acceptable. Also, prenotification procedures and train schedules in and between states are easier to maintain (hence, avoiding misunderstanding such as occurred with the State of Nebraska). Finally, from a programmatic perspective, dedicated trains result in simpler logistical arrangements (escorts, communications, guards, etc.) and, generally, more expeditious service between points A and B.

Nonetheless, the use of dedicated trains for transporting spent fuel can be much more costly with the incremental costs ultimately borne by the user/rate-payer. Safety features are designed and built into the cask systems which provide equivalent safety during both routine and dedicated service.

The type of train service for future shipments of spent fuel is still being debated. Present plans for the NFS Campaign include dedicated train service, which will provide a comparison with the “exclusive-use train service” of the TMI-2 Campaign. The policy used for shipment to the federal repository will be derived from experience discussed herein and other ongoing DOE studies.

PERSPECTIVES

Several perspectives are evident. First and foremost is the approach taken by DOE to enhance communications and interactions with State and local officials and the public at large regarding present and planned transport actions. The kinds of information being discussed with, and disseminated to, the public are unprecedented in the history of the Department. Moreover, public involvement in development of cask systems speaks positively of commitments by DOE to openly discuss transport actions. Second, the Department is enhancing its efforts to demonstrate to the public that packages now developed and being developed for transport of spent fuel and high-level radioactive waste are safe. That is reflected in the willingness of DOE to encourage public observance of the testing of packages recently developed for transport actions. Third, the Department is implementing changes in several policies, particularly those related to transportation planning and environmental assessment for each major transport campaign. Those changes could alleviate public
apprehension concerning transport actions. Finally, criticism related to design/certification regulations and procedures of the Department being less stringent than those of the NRC has resulted in changes that make the regulations and procedures of those two organizations indistinguishable.

REFERENCES


