

TRANSPORTATION 2000
SPENT FUEL TRANSPORTATION TRENDS IN THE NEW
MILLENNIUM

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ABSTRACT

The paper will provide a comparison of foreign research reactor spent fuel transportation today versus the assumptions used by the Department of Energy in the Environmental Impact Statement. In addition, it will suggest changes that are likely to occur in transportation logistics through the remainder of the U.S. spent fuel returns program. Cask availability, certification status, shipment strategy, cost issues, and public acceptance are among the topical areas that will be examined. Transportation requirements will be assessed in light of current participation in the returns program and the tendency for shipment plans to shift toward spent fuel return toward the end of the 13 year period of eligibility.

SUMMARY

In February of 1996, the U.S. department of Energy issued its Final Environmental Impact Statement for "Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Fuel." The EIS projected impacts of the foreign research reactor fuels return program on the environment, shipment schedules, costs and other elements of interest to the research reactor operators and the transportation community. There have now been 12 shipments in the FRR program encompassing 70 cask loads of fuel with over 2000 assemblies shipped to the Savannah River Site and approximately 1000 assemblies and pins shipped to the Idaho National Engineering and Environmental Laboratory. Based on the experience accumulated to date, it is possible to project what issues the program may face during the balance of the 13 year period that the policy encompasses.

Major barriers have been encountered during the initiation of the program such as public acceptance, cask supply and cask licensing. Significant progress has been made in bringing these issues under control. Domestic transportation routes for receipt facilities in South Carolina and Idaho have been demonstrated. Cask certification for most fuel types to be transported by the program are in place. DOE has developed new storage capability and enhanced cask unloading capability to improve fuel handling efficiency. For other issues, such as the allowable number of casks per ship and the timing and level of participation by eligible countries, the resolutions are still evolving. Outcomes for these issues can effect the material flow that can be accommodated by the transportation infrastructure. The reduction in the number and types of casks authorized for research reactor shipments, and the tendency for many reactor operators to delay shipment as long as possible, suggest logistical constraints toward the conclusion of the program.

PARTICIPATION

The EIS and associated Record of Decision authorized return of spent fuel from research reactors in 41 countries. A total of approximately 22,000 fuel elements and pins were eligible for return. Approximately 18,000 were aluminum based elements slated for shipment to the Savannah River Site (SRS) while the remainder were TRIGA pins for which the Idaho National Engineering and Environmental Laboratory (INEEL) was the designated receipt site. The number of projected returns has been reduced by DOE to reflect those reactors which, at present, have chosen not to participate in the FRR program. Consequently, the total number of elements and pins shown now is approximately two thirds that covered by the policy. The largest percentage of the reduction represent fuel from France and Canada. Participation by Canada remains under active consideration and, should they chose to return their fuel, could have a significant effect on post year 2000 transportation and fuel receipt requirements.

CASK ASSESSMENT

The DOE EIS postulated a lengthy list of potential casks for marine and land transport. Table 1.1 summarizes Tables B-13 and B-15 of the EIS. A total of 14 different cask types were considered potentially usable for the spent fuel transport. (This did not include the Japanese casks since they were not projected to be available for alternative country use.) Of these, less than half have seen service performing transportation for the FRR program due to issues relative to certification for international use. The active casks include the LHRL-120, GNS-11, IU-04, TN-7, NAC-LWT, and GE-2000. The IU-04 is being removed from service and has been replaced by the TN-MTR. In addition, the GNS-16 and three additional NAC-LWT casks are being added to the program. Consequently, there is a fleet in excess of 15 casks available at any one time to perform FRR shipments. While the identity of the casks is different than that projected in the EIS, the number available appears well matched to the current shipment rate. Given the current participation in the program and the limitation on the rate of DOE facility unloading of approximately 1-2 casks per week, it appears that there are sufficient casks available to support the program.

The EIS projected that each cask shipment would be able to transport approximately 30 MTR elements or TRIGA pins. The casks have proven far more efficient than envisioned, particularly for TRIGA fuel. MTR shipments have averaged about 40 assemblies per cask while those of TRIGA fuel have been approximately 90 pins per cask. The latter is particularly significant since it implies a reduction in the number of land shipments to INEEL by a factor of three. In addition to reducing the cost to DOE and to research reactor operators, this improvement has significant benefits in terms of political and public involvement.

LICENSING

At the time the program was initiated, cask certifications for research reactor fuel were primarily limited to European casks and associated fuel forms and enrichments. Early shipments were frequently impacted by the need for amendment of a cask certificate due to differences in fuel form, enrichment, burn-up or cooling time. This has been largely resolved during the first three years of the program. The casks in service today generally cover the spectrum of fuel forms most likely to be encountered. New entries such as the TN-MTR are still in the process of obtaining all the needed certifications.

However, other changes are occurring in the licensing arena that will have a increasing impact on the program. In the past, the U.S. Nuclear Regulatory Commission accepted responsibility for performance of security assessments of domestic shipment routes. In a newly released policy, NRC announced that it will hold the shipper responsible for this function. Routes require re-approval every two years, requiring transit of the entire route by qualified security personnel. Companies such as NAC are equipped to perform this function but the cost and time must be reflected in FRR planning.

ROUTING

Other than the previous requirement, the routing of FRR fuel in the United States is now well in place. Last year at this time, NAC had just completed the shipment of TRIGA fuel through the port of Concord, California to the INEEL. This year, NAC performed the first shipment of TRIGA fuel by truck from the Savannah River Site (SRS) to the Idaho National Engineering and Environmental Laboratory (INEEL). When combined with the early shipment NAC performed of fuel from McMaster University in Canada to SRS, these shipments demonstrate the use of all overland U.S. routes required by the FRR program. There has been some informal consideration of transport of TRIGA fuel from Mexico City by land to INEEL rather than utilizing marine transport. If this is pursued, the U.S. land route corresponds with a route DOE is utilizing for the Waste Isolation Pilot Plant so much of the inspection and emergency preparedness infrastructure is in place. Consequently the routing outlook is very positive for the program.

PUBLIC AND STAKEHOLDER INVOLVEMENT

The release of the EIS and resumption of fuel returns from foreign research reactors spawned significant public attention to the program and triggered several law suits by affected States and local jurisdictions. As a result of this attention, early shipments were marked by heavy press coverage, environmental protests, and, on occasion, legal interruption. The initial shipments were conducted in what might best be described as a "circus" atmosphere with a fleet of law enforcement vehicles tracking the train shipment and helicopter surveillance during the transit. This level of attention was counter to safeguards objectives relative to securing the safety of the fuel shipments. Much of this attention had subsided for the train shipments from Charleston to SRS as of last year. However, the shipment into Concord, California once again triggered active public involvement and legal action. The precision with which the shipment was completed, however, led to favorable press coverage for DOE and NAC, and appears to have had a lasting effect on the preparation and execution of the cross-country shipment from SRS to INEEL. The cross-country shipment was marked by positive interaction and cooperation among the affected States and with DOE and NAC. The shipment was conducted without the excesses in law enforcement and press coverage that had characterized the earlier shipments from Charleston and Concord. Newspaper reports following the shipment were almost non-existent. With the exception of a much closer working relationship between DOE, NAC as transportation agent, and the States, the conduct of the shipment appeared not too different from those of the 1990 time frame. By all appearances, spent fuel transportation in the U.S. has begun its return to "normalcy".

From this account, there is much that is encouraging when looking forward to transportation in the next millennium. It appears that the transportation infrastructure is in place to support the program and that it is well matched in terms of capacity. Should countries uncertain of their participation later choose to ship their fuel, the full capacity of the infrastructure could be tested. Improvements in shipment efficiency are being

reflected as decreases in the cost and number of shipments required to support transportation requirements. Shipments into the port of Concord and across country to INEEL have been successfully accomplished, and have been characterized by favorable response by the press and State and local officials. Shipments into SRS from Charles occur almost without public notice. Fundamental to this change in public attitude is the safety and precision with which the shipments have been accomplished. As long as this record is sustained, the prognosis for successful transportation during the remainder of the FRR program is very encouraging.