SAFE BUT CONTROVERSIAL--

A STUDY OF RECENT HIGH-VISIBILITY

SPENT FUEL SHIPPING CAMPAIGNS

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ABSTRACT

Since the need to move radioactive materials is at the core of every part of the fuel cycle, it is not surprising that the waste management program also has a critical transportation link. Yet, in spite of a nearly flawless safety record, transportation of spent fuel is an extremely controversial and emotional issue. There are reactions at every political level and pressures from special interest groups across the Nation. In many cases the courts make the final decisions. An example is the DOE program to move spent fuel from Brookhaven National Laboratory which took ten years to accomplish and wound up being decided by the U.S. Supreme Court. Two other DOE shipping campaigns now underway contain all of the same elements of controversy. About 35 - 40 rail shipments are intended to move the damaged Three-Mile Island core to DOE's Idaho facility. In addition, approximately 50 shipments of spent fuel will be made from the VEPCO plant at Surry, Virginia, to Idaho for use in testing above-ground storage methods. This paper traces the background of the campaigns and the controversies generated. Comparisons and contrasts of "routine" shipments of recent years with problems of today, including lawsuits to prevent shipment, will be offered along with implications for the future.

BACKGROUND

In spite of the fact that spent fuel from our nation's reactors has been transported over our highway and rail system for many years and has compiled an enviable safety record, this effort has during the 80's become highly visible and has attracted much public attention. While the attention level is high, there is not a corresponding level of public education on the subject. There seems to be little recognition that over 6,000 shipments of spent fuel have been made in the U.S. over the past 30 years without a single accident in which the radioactive material was released. In fact, in the 40 years of shipping radioactive materials there has never been an accident which produced an injury (much less a death) as a result of the radioactive nature of the cargo. The U.S. NRC has commissioned numerous studies to evaluate the risks of transporting radioactive materials (including spent fuels) and has repeatedly found that the risks are low by any method of comparison. These studies and testing programs have determined that even in very severe accidents there is an extremely small likelihood of any release of contents, especially when the contents are spent fuel.

In spite of all this background and experience there is still public anxiety at the prospect of shipping spent fuel.

CURRENT SHIPPING CAMPAIGNS

DOE has been engaged in three recent shipping campaigns which have demonstrated the public's concern and have provided a valuable learning experience for all those involved. All of these involve DOE research programs and affect DOE programs conducted in the Eastern States. The oldest program involves shipments from Brookhaven National Laboratories on Long Island to the Idaho National Engineering Laboratory. The newest program involves shipments from the Surry reactor in Virginia (part of the VEPCO system) to Idaho. The third of these campaigns involves the transportation of the damaged core of the Three-Mile Island reactor in Pennsylvania also to Idaho. Each of these provide some interesting information in the area of public interaction.

Brookhaven

The shipments from the Brookhaven National Laboratory are of interest because they were the first to encounter serious state and local resistance. The shipping route begins in Long Island, New York and proceeds through Pennsylvania, Ohio, Indiana, Illinois, Iowa, Nebraska and Wyoming, to Idaho. These shipments are necessary to support essential DOE programs including the recovery of high enrichment Uranium and rare gasses available only from the reprocessing of spent fuels. While this reprocessing could be accomplished either in Idaho or at South Carolina, the obstacles to transportation remain the same. Furthermore, the shipments are necessary because the reactor at Brookhaven has limited storage space and, if that space is used up, DOE would have to shut down that reactor and its broad array of scientific research programs. After a nine-year hiatus, the shipments are again being made in an NRC certified shipping cask (GE-700). DOE intends to continue these shipments for the foreseeable future.

The Brookhaven problems began in 1976 when after 15 years of moving these spent fuel elements, New York City effectively stopped shipments by enacting an ordinance prohibiting transport of spent fuel through the city. Prior to that time, a total of 330 shipments had been made in the HFBR (High Flux Beam Reactor) and MH-1A casks (both NRC certified). Subsequently, at the suggestion of the New York City officials, DOE made six additional shipments using a ferry from Long Island to Bridgeport, Connecticut. Quite logically, the state of Connecticut raised a legal obstacle to the rerouting since New York had simply exported the problem to another state.

During the protracted legal proceedings that followed, several disputes were resolved by the courts and other problems arose. DOT in a rulemaking procedure developed a national routing policy which eventually wound up in the Supreme Court. In 1984, the policy was upheld. As a result of the Supreme Court decision, DOE and New York City executed an agreement on reracking the rods in the storage pool to delay shipping for 6 months. In the meantime the certification of the MH-1A had lapsed and efforts were initiated to get it recertified by NRC. In 1985 DOE, exercising its self-certification prerogative, issued a certification for the MH-1A and shipments resumed. Later that same year the NRC raised some questions on the MH-1A (which by that time had been under consideration for five years) and DOE switched from the MH-1A to the GE-700 cask (which does hold an NRC certificate). Although shipments were suspended again in April of 1986 for budgetary reasons, they are expected to resume during the summer of 1987.

Two other concerns brought up by the Brookhaven shipments involve pre-notification and physical protection. New York City (and many other municipalities) have expressed a desire to be notified in advance of each shipment so they can alert their emergency personnel to be ready for what they feel to be the inevitable accident. DOE's generic notification policy did not provide for such notice. DOT prohibits pre-notification requirements which are different from its own regulations. New York City requirements did not follow DOT regulations. In addition, pre-notification makes the task of physical protection more difficult to control. Generally, pre-notification is intended to address emergency response functions. DOE and NYC make separate arrangements for emergency response requirements on BNL shipments.

Surry-Vepco

The shipments from the VEPCO reactor at Surry, Virginia to Idaho are part of the DOE program to test alternative methods of storing spent fuel. Under study is the use of large above-ground storage casks which eventually might be used for temporary storage (i.e., 20 years) of spent reactor fuel elements on the reactor site where they were generated. Such a capability could have a very significant impact upon the entire Civilian Radioactive Waste Program. Studies necessary for successful completion of this research include evaluations of the performance of consolidated versus unconsolidated fuels. (Consolidated fuel elements have been disassembled so the individual fuel pins can be stacked together in a more compact geometry to reduce the volume of storage space needed, the handling, and the eventual transportation requirements and the costs involved.) During the campaign which began in 1985 and should be completed in 1987, approximately 50 shipments of three assemblies each will be made. All shipments are being made in the TN-8L overweight truck cask which has been certified by the U.S. NRC for this use.

Shipments have followed two very different routes as shown in Fig. 1. Fourteen shipments to date have travelled the southern route which essentially follows Interstate 85 through Virginia to I-40 in North Carolina, crossing Tennessee, Arkansas, and Oklahoma. The shipments turn north on I-135 to meet I-70 in Kansas. Completing the southern route, the shipment crosses Colorado, Wyoming, and Utah into Idaho.

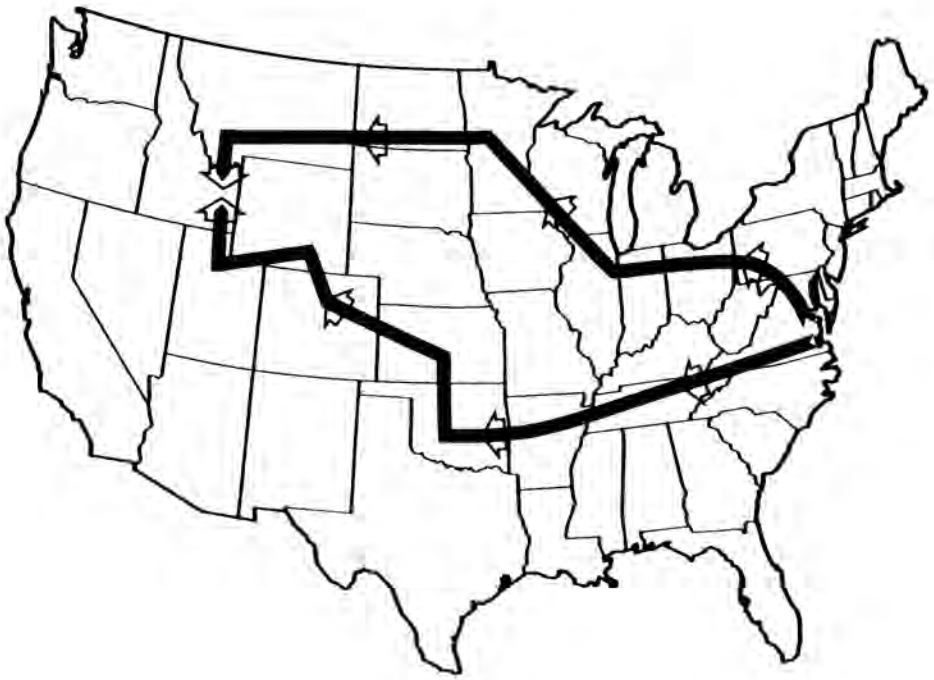

Fig. 1. Alternate Routes Used in Surry-VEPCO Campaign.

The Northern route used Interstate highways in Virginia, West Virginia, Maryland, Pennsylvania, Ohio, Indiana, Illinois, Wisconsin, Minnesota, North Dakota, Montana and Idaho. While this is 400 miles shorter than the Southern route it takes two days longer to travel.

This campaign began in April of 1985 when DOE issued a press release detailing the planned shipments and stating the purposes for the shipments. The following June the primary routes had been determined and as a courtesy these had been identified to each state along the routes. Because of the overweight nature of the shipments, it was necessary to request special permits and in some cases exemptions from weight restrictions on certain bridges. Such permits are handled on a state-by-state basis. Problems in obtaining these overweight permits caused some modification of the routes chosen. The very first shipment developed a mechanical problem in the vehicle causing a delay in New Kent County, Virginia. This breakdown was picked up by the press and given widespread adverse publicity in July 1985. Routing continued to be a problem so in late 1985 the route was changed to avoid delays imposed by some states. Also drawing criticism about a year after the campaign began was the fact that DOE was utilizing a shipment plan for these interstate shipments that differed from the plan worked out by Vepco for its own intrastate shipments (Surry to North Anna). The shipments were suspended in 1986 due to problems with the testing program at the Idaho National Engineering Laboratory but DOE plans to resume shipping during the summer of 1987.

Several important problem areas have surfaced during this campaign. The use of overweight trucks reduces the number of shipments but introduces serious delays and additional opportunity for interruption by the states. As in the Brookhaven shipments, concerns have been expressed about the perceived differences between the DOE and NRC physical protection rules. The early breakdown raised an issue about vehicle inspection and maintenance. Inherent in this issue is the question of what role the states are to play in the inspection process and whether this can, in fact, introduce enough delay so as to constitute an interference in interstate commerce. The state of Illinois has instituted a fee of $1,000 per cask and other states are in the process of developing similar fees. Should this become universal it would add $290,000 to the costs of the Northern route and $348,000 to the costs of travelling the Southern route for the remainder of the shipments. Finally, the controversy over pre-notification versus courtesy notification has again surfaced in this campaign.

Three-Mile Island

The recovery process at Three-Mile Island (TMI) following the 1979 reactor accident involves removing the damaged reactor core. Once that is done, the remainder of the cleanup can be completed rather speedily. In addition, that core material is essential to the investigation of the accident. Analysis of the core debris will allow researchers to determine the behavior of the core materials in power reactors in far off-normal conditions and enable them to better analyze other reactors and how they might behave in other postulated accidents. Shipments leaving TMI travel across Pennsylvania, through Ohio, Indiana, Illinois, Missouri, Kansas, Nebraska, Colorado, and Wyoming on their way to Idaho. This route differs from that taken by the Vepco shipments because these are being made by rail instead of by truck. This is an example of the planning that went into the TMI shipping program. By using a rail cask instead of a truck cask, the number of shipments was reduced from about 250 to 40 or less. Because of the reduced number of shipments required, it was expected that the shipping campaign could be completed in about two-and-one-half years. Further, a specially designed shipping cask was developed for this specific application. The cask, designated as the NUPAC-125B has been certified by the NRC for this application. Still another attempt to reduce public concern was the early use of expedited train service in an attempt to shorten the time in transit. Special agreements were reached to coordinate inspection of the cask and the track over which it would pass. Even the route of the train was the subject of a series of public meetings held by DOE. In spite of all these precautions, the campaign is not without some controversy.

In February 1986, courtesy communications with the involved states began. These communications were intended to prevent any surprises by either the DOE or the states. In July of that same year the first shipment left TMI only to be halted by the governor of Nebraska for five hours in support of his claim that he had not been notified of the shipment. Through the end of the year an additional six shipments have been made without experiencing delays. Still these shipments have produced a flurry of activity in the press and an increase in negative press reports on the nuclear utilities along the routes.

As indicated before, in spite of extraordinary precautions to prevent negative reactions, these shipments have also generated their share of controversy. The issue of how safe these casks are has been repeatedly raised in spite of the fact that the NRC has addressed that question several times and from several perspectives over the past three decades. There have been demands for even more environmental analysis and more detailed risk analysis in an attempt to generate fear and delay the shipments. As in the other campaigns, the state fees (in Illinois and Pennsylvania) have become an issue. Likewise the issue of written pre-notification versus the oral courtesy communications used by DOE has been raised as an issue. Further, because these shipments are being made by rail, the railroads have renewed their insistence on special train service. This demand includes restricting speeds, stopping the train whenever another train passes the spent fuel shipment and yielding to all other traffic. The special train service also includes an increase in the charges by the railroads of about $20.00 per mile.

RESOLUTION OF THE CONTROVERSIES?

One primary conclusion that must be drawn from the DOE experience in recent years is that there are some controversies which defy solution. For the short term there will continue to be issues which will attract a popular following no matter what DOE does to calm public anxiety. Eventually the public will in all likelihood grow less uneasy about these shipments and many of today's issues will fade from the scene. In the meantime there are actions which DOE must take in order to decide some issues even if they cannot be fully resolved.

Fee structures

The fee structure covering high level radioactive materials shipments imposed by several states and becoming the model for others must continue to be challenged. To impose these fees against a single type of hazardous material which has not historically caused any problem and to apply fees for providing extra care and protection is simply not fair. DOE must try to persuade DOT to reconsider their rule making which found the fee structure of the state of Illinois not

inconsistent with the Hazardous Materials Transportation Act. This statute delays shipments, causes rerouting and encourages other states to follow suit. As pointed out above, such fees add substantial costs to the DOE programs to say nothing of the added delays and the corresponding increases in public radiation exposure.

Inspections

A related issue is that of inspections. When each state insists upon inspecting all vehicles carrying spent fuel, there is a significant total delay added to each trip. Again this delay increases public exposure. (In fact stops are the largest single contributor to public radiation exposure.) Several avenues are available for addressing this problem. One is DOE's current effort encouraging the use of the Commercial Vehicle Safety Alliance (CVSA) approach where, once inspected, a vehicle is immune from further inspection for a fixed period of time. The approach DOE would prefer would be to have the state of origin inspect the shipments as they leave the reactor (or MRS) and for the destination state to again inspect the shipments as they arrive. All of the other states through which the shipment passes would then depend upon these two inspections by highly trained inspectors to provide the assurance of regulatory compliance desired by the state.

Overweight shipments

When balancing the risks involved in shipping hazardous materials of any kind, there is a trade-off between the reduction of the number of trips possible by shipping larger quantities (using overweight vehicles), and the sometimes monumental effort involved in obtaining permits for these overweight shipments (based upon increased highway wear and tear). There are advocates of both the overweight and legal weight approach. While DOE does not see a clear advantage to either type of shipment, the necessity for permitting these movements in several states leaves great opportunity for delay and other complications. A decision compatible with the interests of both the DOE and the states involved needs to be reached.

Rail Routing

Through a long and involved process taking about a decade, the DOT has developed a national highway routing policy for the shipment of "Highway Route Controlled Quantities" of radioactive materials. This policy has withstood all the challenges of local and state ordinances working its way through the court system to the U.S. Supreme Court. But there is no similar policy as regards the U.S. rail system. Nor would it be a simple matter to develop one since the factors involved in rail transportation are vastly different from those surrounding highway movements. Still, it would be of great advantage to the DOE if such a policy on rail routing existed.

Since the 1960's DOE and the railroads have been disputing the issue of "Special Trains" versus regular train service. The railroads contend that special trains are required because of the hazardous nature of these spent fuels and because the regulations do not provide enough protection against rail accidents. For the past several decades, the U.S. NRC has studied this problem of regulatory adequacy and has repeatedly found that the existing regulations do provide a very high level of protection for these shipments even in the railroad environment. Further, the ICC has consistently found that the issue is not one of safety but one of economics. DOE, operating in the public trust, simply feels that they cannot spend the additional public funds required for special trains when all the competent studies show that there would be no measurable increase in safety. In order to maintain the rail option and to take advantage of its benefits of larger shipping weight and reduced number of shipments, some resolution of this issue needs to be achieved.

GOOD PROGRESS IN MANY AREAS

There are several areas in which good progress is being made. For, example, ever since NRC and the DOE were formed from the old AEC, DOE has had the authority to certify the packagings used by its contractors in the same fashion that NRC has the authority to certify the packagings utilized by their licensees. Both agencies utilize regulations which are intended to be essentially identical. Further, DOE is required by DOT regulations to assure that the packages certified by DOE provide "equivalent safety". For many years the DOE certification procedure was not perceived as being as rigorous as NRC's but recent changes in the DOE Orders and the DOE organization have assured careful and thorough review of all package designs.

Another sign of improvement is the fact that DOE and NRC are moving closer to a uniform set of rules for the physical protection of spent fuel shipments. Much of this progress is the result of research on the sabotage problem.

DOE's continued reliance upon the DOT highway routing rules has all but eliminated routing as a major issue.

Enhanced Budgets

Perhaps most important of all the actions by DOE is the added attention given these problems as a result of the experience. As with all Federal agencies, the true test of importance is budget and DOE has provided enhanced budgets to address several additional critical issues. Increased attention is being devoted to development of how to address the states' needs in the emergency response area. What kind of Federal help do the states need and want? What levels of training are necessary? And the perennial question which needs to be addressed: Who pays for it? Additional study is being directed at the problems of environmental review and risk analysis. Many states would like more specific environmental review to the point of an analysis for each shipping campaign. Studies conducted by DOE and other agencies have shown that generic environmental analyses indicate so little impact that specific studies are unnecessary. Likewise, risk analysis as used by DOE (and others) is questioned for its lack of "route specific" emphasis. Several efforts are underway to develop "refined" methodologies. Here again DOE is concerned that the models may be so much better than the data available that the results may not be as accurate as claimed.

One aspect of any shipping campaign that needs constant attention is the area of public information. Much of the public concern is based upon a lack of accurate information which they can understand. DOE is committed to improving their relations with state and local officials and to overcoming the barriers to information dissemination. One step in this direction is the continued communication with state and local officials on the movements of spent fuel in their areas.

Satellite Tracking System

Technology will be used to further improve the quality of information available. DOE has, in an

advanced stage of development, a real-time satellite based tracking system called TRANSCOM which should keep everyone involved continually informed of unclassified large quantity radioactive materials shipments.

This tracking system will be able to supply instant information for the states, the shippers, DOE, and other responsible parties as to the location (within 50 feet), content, and status of any tagged shipment. This capability is envisioned as significantly enhancing the emergency preparedness posture of the states and DOE. Since the system is computer based it is possible to collect significant statistical data for analysis in an effort to streamline operations and reduce risk. Because it is a real-time system and could be made available to the states possessing the proper equipment, it is possible that this tracking system could eliminate the need for pre-notification, thus eliminating yet another contention between DOE and the states.

CONCLUSIONS

Continued safe transportation of radioactive materials, and particularly spent fuel, is critical to the successful functioning of the nuclear fuel cycle. The safety record for this activity is one envied by every other commodity. That record alone demonstrates the effectiveness of the current regulations. Not only are these regulations deemed adequate for use by the United States but the same regulations with only minor variations are in place world wide and have been found to provide a very high level of protection for the public. With that legacy it certainly should be possible to solve the problems facing these shipments. Experience has shown this to be true even if difficult. Transportation of spent fuel remains safe but controversial.