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## ROUTE SELECTION ISSUES FOR NWP A SHIPMENTS

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## ROUTE SELECTION ISSUES FOR NWPA SHIPMENTS

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### ABSTRACT

Questions surrounding the designation of routes for the movement of spent nuclear fuel (SNF) and high-level radioactive waste (HLW) by the Office of Civilian Radioactive Waste Management (OCRWM) have broad implications. Federal regulations prescribe rules to be applied in the selection of highway routes. In most cases, these rules will lead to a clear selection of one route between an origin and destination point. However, in other cases, strict application of the regulations does not result in a clear choice of a preferred route. The regulations also provide discretion to State governments and carriers to select alternative routes to enhance the safety of the shipment. Railroad shipments of radioactive materials are not subject to Federal routing regulations. Since the railroads operate on private property, it has been assumed that they know the best way to move freight on their system. This discretion, while desirable for addressing unique local safety concerns or for responding to temporary safety concerns such as road problems, weather conditions, or construction areas, leads to significant opportunity for misunderstandings and uneasiness on the part of local residents.

### I. STATEMENT OF THE ISSUE

Although the U.S. Department of Energy (DOE) has stated that it will comply with U.S. Department of Transportation (DOT) regulations in the selection of routes for shipments of SNF, several important routing issues need to be addressed and resolved before shipments of SNF and HLW begin. This resolution would help ensure that shipments will not be subject to interruption by disputes concerning the process of route selection. These issues are:

- Until a site for a Monitored Retrievable Storage (MRS) facility or a Nuclear Waste Repository is selected, it is not possible to identify the routes that will be used. As a result, the time between identification of routes and implementation of the first shipments of SNF may not be sufficient for other required activities of OCRWM such as the preparation of State and Tribal emergency response capabilities.
- Strict application of Federal highway routing regulations may result in the selection of routes that are inconsistent with the intent of the regulations and the general policy to limit risk of public exposure to radioactive materials and ionizing radiation.

- Especially for long distance shipments, the selection of routes that will reduce time in transit is highly dependent upon factors such as the sophistication of the routing model used and assumptions made about average speeds, effects of congestion, and other variables. Unless route selection criteria are developed (in concert with States and Tribes) and consistently applied, this can be expected to lead to disputes with and among the jurisdictions through which the selected routes and feasible alternative routes pass.
- There is uncertainty regarding future regulations for routing of SNF and HLW shipments by rail and water.

In addition, route selection decisions, which must reflect the mode of transport to be used, could influence the level of emergency preparedness required at State, Tribal, and local levels.

### II. REGULATORY BACKGROUND

Federal regulations have been promulgated by the DOT for the selection of highway routes for the shipment of Highway Route Controlled Quantity (HRCQ) radioactive materials. The only regulations governing the routing of shipments by rail or waterway are those promulgated by the NRC (which also apply to highway route selection) that appear at 10 CFR 73.37. While 10 CFR 73.37 does require NRC approval of the route selected, the NRC has stated that, "For highway shipments, the licensee must propose a route that conforms with DOT's routing rules."<sup>1</sup> The regulation is concerned primarily with in-transit physical safeguards considerations.

#### A. Highway Routing

DOE has committed to follow the Federal routing regulations promulgated by the DOT and codified at 49 CFR 173.22 and 177.825. In addition to specifying routing procedures (carriers must use "preferred routes"), these regulations require that carriers provide specialized driver training and comply with NRC requirements.

The routing regulations state that "a carrier or any person operating a motor vehicle that contains a radioactive material for which placarding is required... shall (1) ensure that the motor vehicle is operated on routes that minimize radiological risk; (2) in determining the level of radiological risk, consider available information on accident rates, transit time, population density and activities, and the time of day and day of week during which transportation will occur; and (3) tell the driver which route to

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take and that the motor vehicle contains radioactive materials." [49 CFR 177.825(a)].

The regulation states that these three criteria do not apply when there is only one practicable highway route available or when the truck is operated on a preferred highway under the following conditions: "...a carrier or any person operating a motor vehicle containing a highway route controlled quantity (HRCQ) of radioactive materials [this includes SNF shipments]...shall operate the motor vehicle only over preferred routes. Those routes must be selected by the carrier or that person operating a motor vehicle containing a highway route controlled quantity of radioactive materials to reduce time in transit over the preferred route segment of the trip. An Interstate System bypass or Interstate System beltway around a city, when available, shall be used in place of a preferred route through a city, unless a State routing agency has designated an alternative route." 49 CFR 177.825(b) (italics added). To summarize, the regulation directs that HRCQ shipments of radioactive materials shall move on preferred routes and those routes shall be chosen to reduce time in transit.

The regulation then defines a preferred route as either an Interstate System highway for which an alternate route has not been designated by the State routing agency or a State-designated route selected by the State routing agency in accordance with DOT guidelines that are published in "Guidelines for Selecting Preferred Highway Routes for Highway Route Controlled Quantity Shipments of Radioactive Materials." These guidelines ensure, among other things, consideration of all impacts, interaction with affected jurisdictions, and continuity of designated routes across State lines. To date, seven states (Arkansas, Colorado, Iowa, Kentucky, Nebraska, Tennessee, and Virginia) have designated alternate preferred routes.

A carrier is allowed to deviate from a preferred route only when emergency conditions make continued use of the preferred route unsafe; for necessary rest, fuel, and vehicle repair stops; and to pick up, deliver, or transfer HRCQ of radioactive material. The definition of a permissible deviation for pick up or delivery of radioactive material has been further refined to limit the discretion available to motor carriers through a rulemaking that was finalized on May 8, 1990 and promulgated as 49 CFR 177.825(b)(2)(i) and (ii).

#### B. Rail Routing

There are no existing rail-routing regulations or official rail route selection criteria, although NRC regulations do require advance NRC approval of routes to be used for rail shipments of SNF. In general, railroads select routes to maximize the distance travelled on their own lines. This can result in indirect routing and the quality of track used over the entire shipment may not be the optimal quality track available. The recent trend toward detailed contract negotiations for shipments has included, among other things, the right of the shipper to provide input on route selection, expedited services, and minimal times for interchange and classification.

Questions arose concerning the route selection criteria utilized by DOE in moving fuel core debris shipments from the Three Mile Island Nuclear Plant (TMI) to the Idaho National Engineering Laboratory (INEL). DOT examined the criteria used in selecting the route and identified three categories: safety, schedular efficiency, and cost effectiveness. Since then, guidelines have been developed and implemented by DOE for traffic

managers to use in the selection of rail routes. The DOT assessment is discussed later in this paper.

During the drafting of the recently enacted Public Law 101-615, the Hazardous Materials Transportation Uniform Safety Act (HMTUSA) [which amends the Hazardous Materials Transportation Act (HMTA)], there was extensive discussion concerning the possible imposition of rail-route selection criteria for shipments of SNF. Eventually, the HMTUSA was passed with the requirement that DOT conduct a study evaluating the effects on the safety of the general public of modal selection and route selection for the transport of radioactive materials. It is anticipated that rail-route selection criteria may eventually result from this study. If this happens, DOE will be subject to the Federal regulations for routing its OCRWM shipments of SNF.

#### C. Barge Routing

There are no Federal regulations pertaining to the routing of hazardous or radioactive materials on the Nation's waterways. Barge transportation is analogous in some respects to highway routing and in some respects to rail routing. As with highway transport, barge transport occurs on publicly maintained thoroughfares that are available to many different users. On the other hand, the limited number of routing options and the limited influence of State authorities is similar to rail transport. Barge routing criteria would likely be developed and implemented by the Army Corps of Engineers or the U.S. Coast Guard. Barge transport has been demonstrated to be technically feasible.

### III. RECENT DEVELOPMENTS

This section presents information dealing with developments resulting from recent legislation, regulatory changes, and other DOE projects either underway or completed.

#### A. Hazardous Materials Transportation Uniform Safety Act

The HMTUSA, Public Law 101-615, was signed into law on November 16, 1990. This law is an amendment to the HMTA which has been in effect since 1974.

1. Routing and Modal Study. An issue that was extensively debated during deliberations on the HMTUSA was the question of whether routing regulations analogous to those applied to highway transport should be imposed on railroad transport. The eventual compromise to this question appears in Section 1813, §116 of the HMTA as amended. This paragraph directs the DOT to conduct two studies. One is a study of the effects of modal and route selection for the transport of radioactive materials on the safety of the general public. The second is an analysis of the safety implications of dedicated train vs. regular freight service for transport of radioactive materials. The Mode and Route Study is to assess "which factors, if any, should be taken into consideration by shippers and carriers in order to select routes and modes which, in combination, would enhance overall public safety related to the transportation of high-level radioactive waste and spent nuclear fuel." The DOT is directed to assess various factors including, but not limited to, population densities, types and conditions of modal infrastructures (such as highways, railbeds, and waterways), quantities of high-level radioactive waste and spent nuclear fuel, emergency response capabilities, exposure and other risk factors, terrain considerations, continuity of routes, available alternative routes, and environmental impact factors.

The Secretary of Transportation is directed to amend existing regulations, as deemed appropriate, after the study on dedicated v.s. regular freight trains, there is no such direction related to the Mode and Route Study for which the final product is a report to Congress. The studies will provide answers to some of the questions being discussed in this paper and could result in regulations being issued by the DOT. Any final policy development by the DOE will be dependent upon the outcome of these studies.

2. Designation of Routes for Hazardous Materials. The HMTUSA also provided for the development and implementation of guidelines for the designation of specific routes for the highway transport of hazardous materials. This provision appears in Section 1804, §105 of the HMTA as amended. The law outlines requirements for analysis and route designation procedures that are quite similar to the Federal standards for route selection and designation for HRCQ shipments of radioactive materials. The HMTUSA directs that the standards are to be established not later than 18 months after enactment of the HMTUSA (i.e., May 31, 1992) and that they take effect not later than May 31, 1994.

The HMTUSA states that "nothing in this subsection shall be construed to require the Secretary [of Transportation] to amend, modify, or reissue regulations issued by the Department of Transportation before the date of the enactment of this paragraph and in effect on such date with respect to highway route designations over which radioactive materials may and may not be transported by motor vehicles...". In that sense, there is little applicability to the OCRWM program. However, the Act requires that Federal routing requirements for hazardous materials be established and implemented by mid-1994 and that the States be responsible for ensuring that political subdivisions of the State establish, maintain, and enforce the requirements and for resolving disputes between those political subdivisions. From this, it can be concluded that many States will participate in routing exercises and address many issues related to route designation, whether local OCRWM shipments are expected to occur in their jurisdiction or not. Current OCRWM plans call for designation of the first routes in 1993, with additional routes designated each following year as dictated by the OCRWM waste acceptance schedule. The OCRWM is exploring options for its participation in routing activities for hazardous materials to ensure that any issues related to hazardous materials routing that also apply to radioactive materials routing can be resolved concurrently.

#### B. U.S. Department of Transportation Routing Regulations

The DOT has issued new regulations concerning the designation of alternative preferred routes and the selection of pickup and delivery routes for HRCQs of radioactive materials. The following action illustrates the types of problems these amendments to the regulations were trying to address. This case involves a 1988 contested DOT enforcement action involving the designation of a nuclear route in the State of Nevada for overweight shipments being made from Nevada to Idaho [In the Matter of Tri-State Motor Transit Company, No. 87-22-RMC (DOT, filed September 9, 1988)]. The DOT proposed the imposition of a civil penalty on the carrier for not using a route identified for nuclear shipments in a letter from the Governor of Nevada to the DOT. That route would have taken the shipments through the city of Las Vegas. The Las Vegas route was initially authorized in the Nevada overweight permit. In the face of objections from the city of Las Vegas, and following consultations between the shipper (DOE), the carrier, and the

Governor's office, the initial overweight permit was revoked and reissued authorizing use of a different route that circumvented Las Vegas. This new route was 100 miles further from the nearest interstate highway. Eventually, the DOT Administrative Law Judge (ALJ) ruled that the route originally designated by the State of Nevada (through Las Vegas) was not a properly designated preferred route because it did not evidence any prior routing analysis, prior consultations with affected jurisdictions, or that the Governor was authorized to act as the State routing agency. Furthermore, even if the route had been properly designated, the issuance of the overweight permit by the Governor's office for the alternate route would have effectively revoked the designation. The ALJ found that the carrier could have justifiably chosen the route on the basis of reducing radiological risk even though the route was longer.

The significance of the case discussed above is that it eventually resulted in the promulgation of HM-164C and an amendment to the routing regulations. The DOT had already amended its routing rules (Docket HM-164A) in May 1988 to require that State designations of alternative preferred routes for HRCQ shipments be effective only upon notice to the DOT. This amendment also clarified the procedures the States are authorized to use in designating alternative preferred routes. Docket HM-164B required carriers rather than shippers to provide route plans and other required documentation to DOT. Docket HM-164C was a rulemaking adopted in May 1990 to ensure that HRCQ radioactive materials are transported to and from preferred routes via the shortest pickup or delivery route. It also provided means for calculating permissible deviations from the shortest pickup or deliver route in cases that would minimize radiological risk to the public.

These rulemakings, which have been implemented to amend the DOT routing regulations, have further refined the route selection procedure and clarified some of the issues that may have been facing the OCRWM before their promulgation.

#### C. Waste Isolation Pilot Plant (WIPP) Project

The WIPP Project is expected to begin shipments from INEL to the WIPP site near Carlsbad, New Mexico in 1993. The OCRWM program maintains close liaison with the WIPP Project because it is understood that many precedents being set for this program may become standard practices for the OCRWM program. Route selection for the first series of shipments was a fairly routine process resulting from strict application of DOT routing regulations to choose the preferred highway routes providing the shortest time in transit. The affected States then had the option to designate alternative preferred highway routes at their discretion. Only one State, New Mexico, has exercised that option. On August 23, 1991, the State of New Mexico filed its alternative route designation with the DOT. On September 3, 1991, DOT acknowledged receipt of that designation and it became the preferred route for shipments into the WIPP facility.

#### D. TMI to INEL Route Selection Analysis

Between 1986 and 1990, DOE made rail shipments of core debris from the damaged reactor at TMI Unit 2 in southeastern Pennsylvania to INEL. After an incident involving the improper placarding of a rail car next to the car carrying the radioactive material, DOT conducted an analysis of the rail route selection by DOE. DOT was able to reconstruct DOE's route selection criteria and concluded that the route selected by DOE was reasonable, given the criteria that were used.

DOE subsequently formally adopted the following guidelines for its traffic managers to use in route selection:

- Minimize time, distance, number of carriers, and interchange points
- Maximize use of best track class
- Apply lowest through rates and other charges consistent with requirements
- Obtain alternate routes from the Oak Ridge National Laboratory's INTERLINE model
- Coordinate final route selection with DOE Transportation Management Division

Although the guidelines listed above have been implemented, they do not provide any ranking in order of importance nor do they provide relative weights to be applied to the various criteria.

#### IV. DOE PROGRAM INITIATIVES TO ADDRESS THE ISSUES

This section is divided into two subsections. The first summarizes the major issue elements as originally identified in the *Transportation Institutional Plan* and modified based on developments during the intervening period and upon input from regional cooperative agreement groups. The second subsection reviews activities that have been or are being implemented to address these issues.

##### A. Identification of Issue Elements

The following issue elements identified in the *Transportation Institutional Plan* apply to the Program:

1. Highway Routing Issue Elements. Issues related to actual route selection procedures for OCRWM shipments and the relationship between the DOE and State and Tribal governments in designating alternate preferred routes include:

- What is OCRWM's role in working with the States and Tribes in the designation of alternate preferred routes?
- Is there a role for DOE in reviewing, and possibly revising, the route selection methodology provided in the DOT guidance document for States and Tribes in designating alternate preferred routes?
- What should OCRWM's role be in the development and implementation of routing procedures to be applied to OCRWM shipments?
- What will be the degree of control maintained by OCRWM, acting as the shipper, in determining the specific highway routes to be used? What sanctions could be invoked by DOE if the carrier violates any DOT regulations?
- What is the appropriate timing for route selection and its relationship to other elements of the OCRWM Program [e.g., 180(c) support and acquisition of carrier support]?

- What assumptions can OCRWM make concerning route-specific data in performing cost and risk analysis for the repository and/or MRS environmental impact statement?

2. Railroad Routing Issue Elements. Routing issues related to railroads differ fundamentally from those related to highway routing. Issue elements taken from the *Transportation Institutional Plan* have been revised to reflect recent developments and current programs:

- What is the appropriate role for OCRWM in the Mode and Route Selection study mandated in HMTUSA and subsequent development of rail routing regulations?
- In the absence of Federal routing regulations, how much control can DOE maintain over rail route selection? How does this relate to type of rail service selected for OCRWM shipments?
- What assumptions can OCRWM make concerning route-specific data in performing cost and risk analysis for the repository and/or MRS environmental impact statement?

3. Barge Routing Issue Elements. Barge transport exhibits characteristics of rail and highway when selecting routes. Like rail, there are relatively few options in selecting waterways from Point A to Point B. However, barges operate on waterways that are publicly owned like the highways. Basic issues identified for barge routing are:

- Are there any significant routing restrictions associated with emergency response and cask recovery considerations?
- What are the various permitting and regulating authorities related to barge transport and what powers, if any, do they wield in route selection?
- What are emergency response and 180(c) implications of barge route selection?
- What assumptions can OCRWM make concerning route-specific data in performing cost and risk analysis for the repository and/or MRS environmental impact statement?

##### B. Routing Activities

Several initiatives are in place to allow OCRWM to effectively address some of the major routing issues. Computer models have been developed by DOE to determine potential routes and perform routing risk analysis. In addition, the OCRWM has developed an extensive network to promote timely interaction with affected or interested parties, including the States and Indian Tribes.

1. HIGHWAY. DOE funded development of a computerized highway routing model, HIGHWAY.<sup>2</sup> This model was developed by Oak Ridge National Laboratory (ORNL) using a proprietary data base whose copyright is now held by Rand McNally. The HIGHWAY network data base represents all of the nation's interstate highways and most Federal and major State highways. These highways are defined as links between nodes. There are over 20,000 links and over 13,000 nodes in the data set. All of the nation's nuclear power plants and their

access roads, all DOE facilities, and many sites related to DOE projects are included as nodes. Routes can be selected based on a number of criteria, including the shortest time in transit, the shortest distance, conformance with DOT routing regulations for radioactive materials, hazardous materials routing (essentially avoiding all tunnels and certain posted roads), and others. HIGHWAY will provide specific route, time, and distance information for each route generated. The model also has the capability to calculate alternative routes, to generate routes that avoid any specified link(s) or node(s) or a particular state or population center, and to generate routes in compliance with various regulatory standards. HIGHWAY also contains population data for the various links which can be used in risk assessment models like RADTRAN.

Efforts are underway to update the documentation that supports HIGHWAY. DOE currently is licensed to install three copies of HIGHWAY on its computers. Two of those copies are at ORNL and Sandia National Laboratories. The third copy has been installed on a system in the Washington, D.C. area to support OCRWM Headquarters work.

2. INTERLINE. DOE also funded development of the computerized railroad routing model INTERLINE.<sup>3</sup> INTERLINE was developed by ORNL and is designed to run on both mainframe and personal computers. (It can be accessed on the TRANSNET system at Sandia National Laboratories.) INTERLINE has features that help it model shipper and carrier behavior. For example, INTERLINE assumes that the first railroad to accept a shipment will attempt to maximize the distance the shipment travels on its own track (a common routing practice of railroads to maximize revenue). INTERLINE also assesses penalties for each interchange with a different railroad, and it uses a similar system to penalize the use of lightly travelled track and prioritize heavily travelled track. This logic is based on the assumption that railroads maintain their heaviest used track in the best condition; therefore, this should be the track of choice for OCRWM shipments. INTERLINE consists of 96 subnetworks: 94 rail subnetworks and 2 waterway subnetworks (one for shallow draft waterways (rivers, intercoastal waterway, etc.) and one for deep draft waterways (Great Lakes, St. Lawrence Seaway, Panama Canal, Atlantic Ocean, etc.)). By activating the two waterway subnetworks, INTERLINE can generate either unimodal or intermodal (barge/rail) routes.

The program assesses a potential route and then develops a rating based on penalties assessed on the total number of miles travelled, type of track used, number of interchanges between rail companies, interchanges between modes, and other factors. The best route is assumed to be the route that minimizes the value of all the penalty factors. The values of the penalties assessed for each of the factors mentioned above can be adjusted by the user. INTERLINE does not calculate time in transit. As with HIGHWAY, INTERLINE's documentation has recently been updated.

3. RADTRAN. RADTRAN can be used to analyze the radiological impact of transporting radioactive material along different routes using different modes or combinations of modes.<sup>4</sup> Two principal computations are performed by the code: radiological impact due to "incident-free" transport of radioactive material and radiological impact of vehicular accidents involving radioactive material shipments. RADTRAN allows the user to select a shipment scenario and shipment type which is specified by parameters such as material being transported,

dispersion characteristics, curie content, Transport Index, type of packaging, number of shipments, distance per shipment, and shipment mode. RADTRAN incorporates several models that calculate economic impacts, radiological impacts due to accidents, and radiological impacts due to incident-free transportation.

The output of RADTRAN is expressed in health effects and economic consequences from transportation accidents and dose in person-rem from incident-free transportation. Individual shipments can be analyzed for their contribution to the total radiological impact. The code has been developed to handle changes in modes, packaging changes, or routing changes. RADTRAN is currently undergoing peer review through OCRWM to validate and verify the program to the strictest quality assurance standards.

4. Interaction With States. OCRWM has implemented and maintained cooperative agreements with three regional State organizations that provide comment and interaction on issues such as route selection. The three organizations, the Southern States Energy Board (SSEB), the Midwestern Office Council of State Governments (MOCSSG), and the Western Interstate Energy Board (WIEB), have all developed documents providing their perspectives on various routing issues. WIEB has encouraged OCRWM to initiate the development of route selection criteria at the earliest possible time.<sup>5</sup> OCRWM is currently assessing the appropriate approach to developing route selection criteria and the appropriate role in supporting the States in designating alternate preferred routes. The cooperative agreement groups have also raised questions regarding issues such as who should actually designate routes (the regulations assign route designation to the carrier, but DOE is expected to play a major role in this) and when should routes be designated. [In order to meet 180(c) requirements, it may be necessary to designate routes before a carrier has been selected.]

OCRWM recognizes that the selection of routes is a sensitive topic and that the routing regulations will not always identify a demonstrably better route when two or more interstate routes serve the same origin and destination points. Furthermore, in some circumstances, the requirement that the motor vehicle travel exclusively on preferred routes may lead to inefficient routing decisions (e. g., sometimes two preferred routes may cross each other, but be connected by a short non-interstate connector route). In these cases, a cooperative working arrangement between DOE and the involved State could lead to the designation by the State of an alternate preferred route that would have the effect of enhancing safety while improving the operational efficiency of the OCRWM transportation system. Early interactions between DOE and the States could lead to the mutual development of a set of route-selection criteria or guidelines to be applied when rigorous application of DOT routing guidelines does not provide a clearly superior route. As origin and destination sites are clarified, DOE should continue working with affected States to designate desirable alternate preferred routes for specific shipment campaigns.

OCRWM plans for, and has already begun, extensive interaction with the State groups related to 180(c) support. The location and nature of this support is largely dependent upon the routes selected and mode of transport used. To the extent that route selection and 180(c) support are related, OCRWM should address both issues in the same forum.

## V. SUMMARY AND OUTSTANDING ISSUES

Issues related to route selection for OCRWM shipments are complex and impact several other institutional issue areas. The various modes expected to be available to OCRWM present vastly different routing issues. Route selection for highway transport is regulated through DOT regulations, but these regulations assign extensive authority and responsibility to State governments. Furthermore, DOT routing regulations, if applied rigorously, can, in a limited number of cases, lead to the selection of routes that are not in the best interest of either OCRWM, the State, the local government, or the affected public. For these cases, cooperative interaction with State and local governments will be required. For those cases where DOT regulations lead to an ambiguous route selection, detailed route selection criteria should be developed in cooperation with representatives of the State governments.

Rigorous application of Federal routing regulations may impact DOE's ability to discharge its obligations in other areas. DOE plans to work with involved parties at the earliest opportunity to work out answers to these questions. Work should begin first on non-route-specific issues. This work should involve the development of procedures and criteria and the establishment of working relationships with involved parties. DOE should proceed to route- and site-specific issues as the OCRWM program establishes specific sites for the system's facilities.

Outstanding issues remaining to be addressed are summarized below:

- Route-specific work is not meaningful until destination sites have been chosen for the shipments. DOE must resolve potential conflicts related to the timing of siting facilities, selecting routes, implementing the waste management system, and supporting the enhancement of emergency response capabilities for some early shipments.

- A mechanism for interaction between affected States, Tribes, and DOE needs to be established to support the timely designation of alternative preferred routes in those cases where strict application of DOT routing regulations leads to route selections that are inconsistent with the intent of the regulation and the general policy to limit risk of public exposure to radioactive materials and ionizing radiation.
- DOE must develop detailed route selection criteria and establish a cooperative review process for those cases where DOT route selection regulations lead to an ambiguous choice of the preferred route.
- Implementation of the various provisions of HMTUSA may affect future regulations for routing of SNF and HLW shipments by rail and water. DOE should track developments in this area and ensure their incorporation into plans for the OCRWM transportation system.

## VI. REFERENCES

1. "Public Information Circular for Shipments of Irradiated Reactor Fuel," NUREG-0725, Rev. 7, January 1991.
2. *HIGHWAY, A Transportation Routing Model: Program Description and Revised Users' Manual*, ORNL/TM-8759.
3. *INTERLINE, A Railroad Routing Model: Program Description and Users' Manual*, ORNL/TM-8944.
4. *RADTRAN III User's Guide*, SAND-84-0036.
5. "Proposed Resolution: Highway Routing of High-Level Waste Shipments Under the Nuclear Waste Policy Act," Western Interstate Energy Board.