HIGHWAY ROUTING OF COMMERCIAL SPENT FUEL SHIPMENTS:

LOCAL INPUT TO THE PROCESS

Louis G. Coakley
Southern States Energy Board
Atlanta, Georgia

ABSTRACT

Highway routing of commercial spent fuel shipments is a complex planning issue involving federal, state and local governments. Of particular concern is how state and local governments will participate in the route selection process and influence routing regulations within their jurisdictions. This paper analyzes the significance of local routing as it pertains to the shipment of commercial spent fuel from a reactor site to an interstate highway. Using the federal government's HIGHWAY computer routing model, this paper identifies the hypothetical routes based on shortest distance from reactor sites which will require truck transportation to the nominated repository sites and monitored retrievable storage facility, if approved by Congress. The amount of local routing will illustrate the significance upon which local government participation may be necessary. In addition, southern state routing agencies will be examined to determine their organization and role in designing and selecting local highway shipping routes.

INTRODUCTION

The highway routing of commercial spent fuel continues to be an area of important concern to local, state and federal government. State and local government have important roles in the development of routing regulations for commercial spent fuel.

Federal routing guidelines and regulations have established how state and local governments may select and influence the determination of highway routes. However, few efforts have been made to investigate which specific highways may potentially be used to ship spent fuel from reactor sites to proposed waste management sites. In addition, while federal routing regulations have prescribed the activities of state and local jurisdictions during the selection of routes, there has been few assessments made regarding the effectiveness of current state and local routing programs.

HIGHWAY ROUTING

The eventual shipping of commercial spent fuel from the nation's reactors to a repository and monitored retrievable storage (MRS) facility, if approved by Congress, will require a mix of truck and rail transportation modes. All of the nation's 93 commercial reactor sites that are either currently operating, shutdown, or under construction, are capable of shipping commercial spent fuel by legal weight truck. However, because of the economic advantage of transporting more spent fuel per shipment using a rail cask versus a truck cask, it is expected that reactors with rail shipping cask handling capabilities will use such casks. Currently, 32 commercial reactor sites are incapable of shipping by rail. The availability of a rail spur to the site or other minor modifications, however, could provide rail access for an additional five reactors. Thus, only 27 reactor sites or 29 percent of the national total will likely move commercial spent fuel by truck. Table I lists the truck shipping reactor sites.

TABLE I
Truck Shipping Reactor Sites

Reactor Site	Location
Browns Ferry 1,2,3	Decatur, Alabama
Diablo Canyon 1,2	Avila Beach, California
San Onofre 1,2,3	San Clemente, California
Haddam Neck	Haddam Neck, Connecticut
Crystal River 3	Florida City, Florida
St. Lucie 1,2	Hutchinson Island, Florida
Turkey Point 3,4	Florida City, Florida
Pilgrim 1	Plymouth, Massachusetts
Yankee Rowe	Rowe, Massachusetts
Calvert Cliffs 1,2	Lusby, Maryland
Palisades	South Haven, Michigan
Grand Gulf 1	Port Gibson, Mississippi
Callaway1	Fulton, Missouri
Fort Calhoun 1	Fort Calhoun, Nebraska
Hope Creek 1	Salem, New Jersey
Oyster Creek	Forked River, New Jersey
Salem 1,2	Salem, New Jersey
Ginna	Ontario, New York
Indian Point 2,3	Indian Point, New York
Shoreham	Brookhaven, New York
Trojan	Prescott, Oregon
Peach Bottom 2,3	Peach Bottom, Pennsylvania
Oconee 1,2,3	Seneca, South Carolina
Surry 1,2	Gravel Neck, Virginia
WNP 2	Hanford, Washington
Kewaunee	Carlton, Wisconsin
Point Beach 1,2	Two Creeks, Wisconsin

While no routes have been designated or selected for use in shipping commercial spent fuel to a repository or MRS, methods are available to project the highway routes which could be used to move spent fuel from reactors to such waste management sites. At the request of the U.S. Department of Energy (DOE), Oak Ridge National Laboratory (ORNL) has developed and currently maintains a transportation highway routing model designed to predict hypothetical routes.

Created in 1983, the HIGHWAY routing model is essentially a computerized road atlas that includes over 18,000 highway segments, 13,000 intersections

and descriptions of more than 240,000 miles of roadway in the continental U.S. The data base includes detailed information on the interstate highway system, all U.S. highways (except those parallel to an interstate), most principal state highways and a large number of county and local roads. Each highway segment can be identified by distance, estimated driving speed, toll charges and its designation, including interstate and U.S. highway, state highway and turnpike, and county and local road. The model also recognizes roadways which are state approved for transporting spent fuel. Finally, the model incorporates commercial reactor sites and proposed waste management disposal sites as identified by DOE.

The HIGHWAY model is capable of identifying routes sensitive to distance, driving time, number of drivers, any geographic or population areas of more than 100,000 people, as well as state and local legislative restrictions. The model has been proven to select routes very similar to those that would be chosen by common carriers using consistent criteria. In addition, the model is currently designed to use two drivers and calculate routes based upon the shortest distance, using the state approved "preferred routes" to the greatest extent possible.

According to the HIGHWAY model, the total mileage for commercial reactor sites requiring truck spent fuel transport to a repository and/or MRS, as identified by DOE, would be considerable. The total distance for all 27 commercial reactors could range up to 63,140 miles. The four possible destinations are listed below in Table II.

TABLE II

Total Distance from Commercial Reactors Shipping by Truck to Possible Repository Sites and an MRS Facility

Hanford, WA Repository	63,140 miles
Yucca Mountain, NV Repository	59,870 miles
Deaf Smith, TX Repository	41,951 miles
Clinch River Breeder Reactor site, TN (MRS)*	16,259 miles

*only eastern reactors shipping to MRS

The federal highway system will certainly dominate the designated roadways used for truck transportation of commercial spent fuel. Regardless of the four possible destinations, over 97 percent of the projected routes may be on interstate and U.S. highways. State roads could account for approximately two percent while local roads may total less than one percent. Table III illustrates the specific roadways used and their total milage from truck shipping reactor sites to the four potential waste management sites.

Other than federal and state roadways likely to be used in shipping reactor spent fuel, county and municipal roadways would account for a very minor amount of the total route distance. According to HIGHWAY model projections, county and local roads would be used only when leaving the origin reactor site and when entering the destination waste management site. Regardless of the destination, only three reactor sites would use county designated roads, Browns Ferry, Shoreham and Surry. In the case of local jurisdiction roads, a Yucca Mountain repository would require the largest total amount of local routing, 536 miles. An MRS at the Clinch River breeder reactor sites would likely use 134 miles of local roads, while both Hanford and Deaf Smith would each probably use 104 miles.

The local routes used in the vicinity of the waste management sites could vary greatly. The largest amount of local routing entering a waste management area would occur at Yucca Mountain. The Nevada site would likely use 16 miles of local jurisdiction roadway to enter the site. The Deaf Smith repository site and the Clinch River MRS site would probably require travel on three and two miles of nearby use of local roads, respectively. The Hanford repository, meanwhile, would not be expected to require travel on any locally governed roads when entering the site.

When departing the reactor sites, the use of local routes would involve 17 of the 27 truck shipping sites for a total of 104 miles according to HIGHWAY projections. Pilgrim, St. Lucie, Fort Calhoun, Oyster Creek, Indian Point, Trojan, Oconee, San Onofre and Kewaunee represent reactors which are predicted not to ship on any county or local roads. As mentioned earlier, Surry would likely use five miles of county road but would not require travel on any local roads.

ROLE OF LOCAL GOVERNMENT IN HIGHWAY ROUTING

On January 19, 1981 the U.S. Department of Transportation (DOT) published a final rulemaking, HM-164 (49 FR 5298, 1981), on highway transportation of radioactive materials. The rulemaking was done under the authority of the Hazardous Materials Transportation Act (49 CFR 1801 et. seq.) in order to clarify the relationship among federal, state and local regulatory authority over radioactive materials transportation. DOT announced that all state and local regulations which effectively redirect or otherwise significantly restrict or delay the highway transport of radioactive materials are invalid. However, the rulemaking did provide a role for state and local jurisdictions in selecting alternate routes under certain guidelines.

Under HM-164, DOT required shipments of commercial spent fuel to use preferred highways. A preferred or alternate highway is any roadway designated by an appropriate state-wide agency and any interstate highway for which the state has not designated an alternative route. HM-164 authorized states to create routing agencies to select alternative routes for spent fuel highway shipments. DOT encouraged states to designate preferred routes to supplement the federal interstate highway system, thereby reducing transit time since states would be the most capable of determining the safest highway routes available. In addition, DOT recognized that few reactor sites and possible waste management destination facilities are located on interstate highways. Because of their better understanding of local and state transportation safety issues, DOT realized the advantage of state routing agencies selecting access routes instead of the federal government determination.

To designated an alternative route, the state routing agency would have to perform a comparative radiological risk assessment of the proposed alternate and interstate highway routes. To perform a routing safety analysis, a significant amount of local information would be required from local sources. Such data could include accident rates, population statistics, conditions of roadways, emergency response and evacuation capabilities, property values, and the lo-

TABLE III

Roadway Milage from Truck Shipping Reactor Sites to Repository and MRS Locations

Repository/MRS	Interstate	U.S. Highway	State Roads	State Turnpike	County Road	Local Road	Total
Hanford, WA	60,140	1,212	1,598	127	15	104	63,140
Yucca Mountain, NV	54,812	3,987	627	63	15	536	59,870
Deaf Smith, TX	40,006	1,075	695	56	15	104	41,951
Clinch River Breeder Reactor Site, TN*	15,313	365	396	56	15	134	16,259

*only eastern reactors shipping to MRS.

cation of schools and hospitals. The state would likely require consultation with appropriate local authorities to obtain such information.

Prior to determining alternate routes, HM-164 requires "substantive consultation" between the state routing agency and "affected local jurisdictions" as well as other affected states to "ensure consideration of all impacts and continuity of designated routes" (49 CFR §171.8). The rule further mandates the "solicitation and substantive consideration of views from each affected jurisdiction including local jurisdictions and other states" (49 CFR §177, Appendix A). As part of the HM-164 rulemaking, DOT supported, but did not mandate, the formation of local routing advisory groups in each state composed of local officals (49 Fed. Reg. 5302, 1981). The routing advisory groups would meet periodically to review the effectiveness of state and local consultation. DOT also viewed such advisory groups as providing some oversight function which would continually assist and improve the state routing program.

CURRENT LOCAL GOVERNMENT ACTIVITIES IN HIGHWAY ROUTING

A 1987 survey of 16 southern states was conducted by the Southern States Energy Board, an interstate compact organization, to evaluate current state and local government activities involving highway routing of commercial spent fuel shipments. State routing agencies, along with individuals responsible for receiving advanced notification information on nuclear waste shipments under 10 CFR §71 and §73 were contacted.

As of June 1985, 10 of the South's 16 states had U.S. Nuclear Regulatory Commission (NRC) approved shipping routes totalling 4,737 miles. In order to ship commercial spent fuel, NRC licensees are required to submit proposed shipment routes to the NRC for approval before such a route can be used. NRC approval is based upon DOT routing regulations including the use of interstates or preferred highways as designated by the state routing agency. Thus, a number of southern states have been active to varying degrees concerning commercial spent fuel highway shipments.

The development of state routing agencies can be described as premature because of the relatively few number of spent fuel highway shipments. Because of the limited amount of spent fuel shipped thus far, several southern states have not formally organized their state routing agencies. Until the shipping of commercial spent fuel becomes an issue of significant public safety, several states do not foresee a need to operationalize a designated routing agency.

Other states, meanwhile, have established specific lead agencies to handle routing, with assistance from numerous support agencies also available. In these cases, the designated routing agency falls under the jurisdiction of either the state Highway, Transportation, Health, Emergency Management, Natural Resources and Public Safety Department; Office of Radiation Control; Public Service Commission; or State Police. Three southern states, Florida, Maryland and South Carolina, currently use more than one state agency to function as a designated routing agency.

To date, there has been little involvement by local governments in state routing decisions. Only in Maryland, North Carolina, Virginia and West Virginia have local jurisdictions participated in or shown interest in highway routing. Maryland, for example, has called hearings and provided comment periods for local input regarding possible designation of alternate highway routes.

Local governments in the remaining southern states have expressed little or no interest in commercial spent fuel routing. Nearly all states without major spent fuel transportation believe that it is again premature to call for local routing consultation. In addition, some state agencies fear that undue influence by individual local jurisdictions now may adversly impact other surroundings jurisdictions who do not participate or are unaware of such routing activities. Thus state routing agencies are being careful not to raise unnecessary alarm over what many consider a premature public safety issue. Many southern states, such as North Carolina, do foresee the eventual establishment of local advisory groups as an important part of evaluating state and local routing issues.

The survey also indicated only a minor understanding by state routing authorities of the extent to which local, state and federal highways may be used in shipping commercial spent fuel from not only the state's indigeous reactor site(s), but also the corridor effect of outside shipments passing through to a possible repository or MRS site. The HIGHWAY model may assist routing agencies in determining their potential overall level of risk for spent fuel shipments under different transportation scenarios.

CONCLUSION

A little more than a quarter of all U.S. reactor sites are expected to ship commercial spent fuel using truck transportation. Highway shipments may likely use over 97 percent of federal highways. Locally controlled roadways would account for less

than one percent of the total route mileage. However, local governments in the vicinity of a waste management site or individual reactor site could be greatly affected by the volume of traffic using their roads. Under DOT routing guidelines, procedures have been established allowing local government input into the routing process. Since only a limited number of spent fuel shipments have so far taken place, both state and local governments have found little necessity in organizing a formal state routing system. However, as the issue of highway routing becomes more pronounced with possible reactor-to-reactor transshipments of spent fuel and the eventual shipping program to a repository and/or MRS, if approved by Congress, states need to recognize the role and value of the participation of local jurisdictions. DOT and the U.S. Department of Energy may be wise to investigate whether states need assistance in developing efficient routing agencies since only minor efforts have been made so far.

REFERENCES

1. P. J. Raffaniell, "Case Studies of the Impact of the United States Department of Transportation's Highway Routing Regulation, HM-164," Washington, D.C. Resource Department Associates (1982).

2. D. S. Joy and P. E. Johnson, "HIGHWAY, A Transportation Routing Model: Program Description and Revised Users' Manual," ORNL/TM-8758, (1983).

3. S. A. Mullen, M. J. Welch, and B. W. Welles," HM-164, Radioactive Materials; Routing and Driver Training Requirements," SAND85-7160, International Energy Associates Ltd. (1986).

4. Federal Register, Vol. 46, No. 12, January 19, 1981, p. 5298-5318.

5. Code of Federal Regulations, Title 49, Part 171, General Information, Regulations, and Definitions," Government Printing Office (1984).

6. Code of Federal Regulations, Title 49, Part 177, "Carriage by Public Highway," Government Printing Office (1984).

7. P. M. Darling, et. al., "Spent Nuclear Fuel Shipping Cask Handling Capabilities of Commercial Light Water Reactors," PNL-5384, Pacific Northwest Laboratory (1985).