STATE OF NEVADA

NWPO-TN-001-88

AGENCY FOR NUCLEAR PROJECTS/ NUCLEAR WASTE PROJECT OFFICE

NWPO-TN-001-88

NWPO-TN--001-88

DE92 017707

A Report on High-Level Nuclear Waste
Transportation: Prepared Pursuant
to Assembly Concurrent Resolution No. 8
of the 1987 Nevada Legislature

By

The Nevada Agency for Nuclear Projects/
Nuclear Waste Project Office

December, 1988

BOB MILLER
Governor

ROBERT R. LOUX
Executive Director

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

NRPC-75-01-2

**A Report on High-Level Nuclear Waste
Transportation: Prepared Pursuant
to Assembly Concurrent Resolution No. 8
of the 1987 Nevada Legislature**

By

**The Nevada Agency for Nuclear Projects/
Nuclear Waste Project Office**

December, 1988

Reprinted 1991

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

MASTER

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

JP

ASSEMBLY CONCURRENT RESOLUTION NO. 8 COMMITTEE ON NATURAL
RESOURCES, AGRICULTURE AND MINING

FEBRUARY 6, 1987

Referred to Committee on Natural Resources, Agriculture
and Mining

SUMMARY--Directs Nevada Agency for Nuclear Projects to study regulation of transportation
of high-level nuclear waste and develop plan addressing issues related
thereto. (BDR R-1213)

EXPLANATION--Matter in italics is new. Matter in brackets [] is material to be omitted.

ASSEMBLY CONCURRENT RESOLUTION--Directing the Nevada Agency for Nuclear
Projects to study the regulation of the transportation of high-level nuclear waste and
develop a plan addressing the issues related thereto.

- 1 WHEREAS, If a repository for nuclear waste is located at Yucca Mountain
2 or elsewhere in the West, the highways and railroads of Nevada will be
3 significantly involved with the transportation of high-level nuclear waste;
4 and
5 WHEREAS, The State of Nevada must be prepared to regulate adequately
6 the various means of transportation of nuclear waste to assure maximum
7 safety for its residents and to minimize disruption of existing systems of
8 inspection; now, therefore, be it
9 RESOLVED BY THE ASSEMBLY OF THE STATE OF NEVADA, THE SENATE
10 CONCURRING, That the Nevada Agency for Nuclear Projects is directed to
11 review thoroughly all state and federal laws and regulations governing the
12 shipment of radioactive materials, scrutinize the Department of Energy's
13 plans relating to such transportation and develop, in cooperation with the
14 affected local governments and the committee on high-level radioactive
15 waste, a comprehensive plan addressing the issues relating to the
16 transportation of nuclear waste if a repository for nuclear waste is located in
17 this state; and be it further

- 2 -

- 1 RESOLVED, That the Nevada Agency for Nuclear Projects report its plan
2 and its recommendations, including any proposed legislation, to the
3 committee on high-level radioactive waste; and be it further
4 RESOLVED, That the Chief Clerk of the Assembly prepare and transmit
5 copies of this resolution to the Nevada Agency for Nuclear Projects; and be
6 it further
7 RESOLVED, That this resolution becomes effective upon passage and
8 approval.

3

TABLE OF CONTENTS

<u>Topic</u>	<u>Page</u>
Assembly Concurrent Resolution No. 8	i
Executive Summary	vii
Preface	xii
Direction to the Agency for Nuclear Projects Under Assembly Concurrent Resolution No. 8	xii
Organization and Content of the Report	xiv
1.0 The DOE Transportation System	1
1.1 DOE Statutory Responsibilities for Nuclear Waste Transportation	1
1.2 DOE Transportation Plans and Schedules	3
1.3 Characteristics of Nuclear Waste to be Shipped to a Repository	12
1.4 Amount of Waste and Number of Nuclear Waste Shipments to a Repository	21
1.5 Modal Mix and Routing Considerations	33
1.6 Nuclear Waste Transportation Safety Issues	42
1.7 Institutional Issues Associated with Nuclear Waste Transportation	47
1.7.1 Issues Identified in DOE's Transportation Institutional Plan and NWPO Responses	47
1.8 Summary	53
1.8.1 Consideration of Transportation in the Site Selection Process	53
1.8.2 General Institutional Issues	56
1.8.3 Critical Uncertainties Regarding DOE'S Transportation Plans	57
1.8.4 Issues Which Need to be Addressed by the State of Nevada	59

<u>Topic</u>	<u>Page</u>
2.0 The Regulatory Environment for Nuclear Waste Transportation	62
2.1 Overview of Current Federal, State and Local Laws, Regulations, Roles and Responsibilities	62
2.1.1 Federal Structure	63
2.1.2 State of Nevada and Local Government Authorities, Laws, Regulations and Ordinances	75
2.1.2.1 State of Nevada	75
2.1.2.2 Local Governments	78
2.2 Regulation by Indian Nations and Tribes	79
2.3 Summary of Regulatory Issues Which Should be Addressed by the State of Nevada	79
2.3.1 Federal Laws	79
2.3.2 Nevada's Statutes	80
2.3.3 Nevada Local Governments	81
2.3.4 Indian Nations	81
3.0 State of Nevada Plans for Addressing High-Level Radioactive Waste Transportation to a Repository	82
3.1 The NWPO Plan for High-Level Radioactive Waste Transportation Study and Management	82
3.1.1 Goal and Guiding Principle of the Plan	82
3.1.2 Structure and Content of the Plan	82
3.1.3 Activities of the NWPO Under the Plan for High-Level Radioactive Waste Transportation Study and Management	84
<u>Policy and Program Management</u>	84
<u>Regulatory Studies</u>	87
<u>Technical Reviews and Studies</u>	89
<u>Institutional Relationships</u>	95
3.2 NWPO Transportation Program Review by Affected State Agencies, Local Governments, Indian Tribes and Independent Experts	100
4.0 Recommendations	101

	<u>Topic</u>	<u>Page</u>
5.0	References	108
6.0	Appendices	
1.	THE STATE OF NEVADA AGENCY FOR NUCLEAR PROJECTS/ NUCLEAR WASTE PROJECT OFFICE (NWPO)	
	STRUCTURE AND ORGANIZATION	A-1
2.	REGIONAL, STATE AGENCY, LOCAL GOVERNMENT AND TRIBAL REPRESENTATION ON NWPO STUDY, PLANNING, REVIEW OR ADVISORY GROUPS	A-4
3.	GLOSSARY OF TERMS	A-6
4.	UNIVERSITY OF NEVADA, LAS VEGAS, NUCLEAR WASTE TRANSPORTATION RESEARCH CENTER	A-11
	SHORT TERM WORK PLAN - October 1988-June 1989	

LIST OF FIGURES AND TABLES

	<u>Figures</u>	<u>Page</u>
1.1	DOE Waste Management System	9
1.2	MRS Facility Storage Concept	10
1.3	Reference Nuclear Fuel Assemblies	14
1.4	Comparison of Fuel Consolidation Concepts	15
1.5	Reference Spent Fuel Disposal Canister for Repository at Yucca Mountain, With and Without Rod Consolidation	16
1.6	Locations and Total Volumes of HLW Through 1986	20
1.7	Savannah River Plant HLW Canister	20
1.8	Shipping Cask (NFS-4) Mounted on Truck Trailer	27
1.9	Shipping Cask (IF-300) for 7 PWR or 18 BWR Spent Nuclear Fuel Assemblies	27
1.10	Shipping Cask (IF-300) Mounted on Rail Car	27
1.11	DOE Proposed Cask for Shipping Spent Fuel to MRS or Repository by Rail; Capacity 14 PWR or 36 BWR Assemblies	28
1.12	DOE Proposed Cask for Shipping Solidified HLW to Repository by Truck; Capacity 1 Canister	28
1.13	Location of Existing and Proposed Nuclear Power Plants	31
1.14	Weighted Distribution of Spent Fuel at Nuclear Power Plants - First 70K MTU	31
1.15	Possible Combination of Rail and Truck Routes to MRS Located in Tennessee and Repository Located in Nevada	32
1.16	Possible Routes for Truck Shipments of Spent Fuel to Repository Located in Nevada--100% Truck Shipments	32
1.17	Potential Highway and Rail Routes to a Yucca Mountain Repository (Southern Nevada)	35
1.18	Potential Highway and Rail Routes to a Yucca Mountain Repository (Northern and Central Nevada)	36
A.1	State of Nevada Agency for Nuclear Projects Functional Organizational Chart	A-3

List of Tables and Figures (con't)

<u>Tables</u>	<u>Page</u>
1.1 Near Term Schedule of DOE Planned Activities Regarding Nuclear Waste Transportation	6
1.2 Long Range Schedule of DOE Planned Activities Regarding Nuclear Waste Transportation	7
1.3 Total Amount of Nuclear Waste to be Shipped to the Repository	23
1.4 Approximate Total Nuclear Waste Shipments to the Repository--DOE Base Case, Four Shipment Scenarios	24
1.5 Approximate Annual Nuclear Waste Shipments to the Repository During Full Operation (2008-2025) -- DOE Base Case, Four Shipment Scenarios	25
1.6 Comparison of Transportation Impacts for Potential First Repository Candidate Sites	54

EXECUTIVE SUMMARY

This report has been prepared by the staff of the State of Nevada Agency for Nuclear Projects/Nuclear Waste Project Office (NWPO) in response to Assembly Concurrent Resolution No. 8 (ACR 8), passed by the Nevada State Legislature in 1987. ACR 8 directed the NWPO, in cooperation with affected local governments and the Legislative Committee on High-Level Radioactive Waste, to prepare this report which scrutinizes the U.S. Department of Energy's (DOE) plans for transportation of high-level radioactive waste to the proposed Yucca Mountain repository, which reviews the regulatory structure under which shipments to a repository would be made and which presents NWPO's plans for addressing high-level radioactive waste transportation issues.

The report is divided into three major sections, each of which addresses one of the three directives cited above. Section 1.0 provides a review of DOE's statutory requirements, its repository transportation program and plans, the major policy, programmatic, technical and institutional issues and specific areas of concern for the State of Nevada.

Section 2.0 contains a description of the current federal, state and tribal transportation regulatory environment within which nuclear waste is shipped and a discussion of regulatory issues which must be resolved in order for the State to minimize risks and adverse impacts to its citizens. Among other issues, this section addresses emergency management, liability for accidents, state permitting and fees, and consistency of State and local regulation with federal law.

Section 3.0 contains the NWPO plan for the study and management of repository-related transportation. The plan addresses four areas, including policy and program management, regulatory studies, technical reviews and studies and institutional relationships. A fourth section provides recommendations for consideration by State and local officials which would assist the State in meeting the objectives of the plan.

The report reflects NWPO's current understanding of DOE's repository transportation plans in view of the absence of a comprehensive planning document from DOE. In 1986, DOE published two separate transportation plans relating to institutional issues and cask development initiatives. However, these plans do not reflect the 1988 amendments to the Nuclear Waste Policy Act (NWPA) which make a monitored retrievable storage facility (MRS) a critical component of DOE's transportation program. Since DOE is not scheduled to issue a Draft Comprehensive Transportation Plan until late 1989, at the earliest, it was necessary for NWPO to make certain assumptions about DOE's transportation plans, activities and schedules for the purposes of this report.

DOE's Draft Mission Plan Amendment calls for the shipment of 70,000 metric tons (MTU) of nuclear waste to Yucca Mountain over the 30-year operating life of the repository commencing in the year 2003. Using DOE assumptions that an MRS is included in the waste management system and that spent fuel is to be consolidated, NWPO has estimated that there would be shipments of 65 dedicated trains, 130 general freight rail shipments and 430 truck shipments every year of repository operations. If a MRS facility is not included in the waste management system, nuclear waste would be shipped directly from utility reactors and DOE facilities to the repository, resulting in 404 rail shipments and 1,330 truck shipments annually. If DOE fails to achieve rail access to Yucca Mountain and all waste transportation must be by truck, this could result in as many as 3,800 truck shipments during each year of full repository operation.

DOE plans to ship spent nuclear fuel (SNF) and defense high-level radioactive waste (HLW) that is at least 10 years old. Even after this cooling period, both waste forms remain highly radioactive and thermally hot and must be transported in heavily shielded casks under strict precautions.

There are open questions in Nevada and throughout the United States about certain technical aspects of DOE's repository transportation plans. These include, (1) the potential of radiation exposure from routine operations and from severe transportation accidents or incidents, and (2) apparent inadequacies in current licensing standards for shipping casks which must be resolved before DOE develops a new generation of larger shipping casks with reduced shielding which are proposed for use in the transportation of waste to Yucca Mountain. Specific Nevada concerns include (1) the limited interstate highway and rail routes within Nevada which require that virtually every shipment of nuclear waste to Yucca Mountain would pass through the Las Vegas Valley, a region which contains almost two-thirds of the population of Nevada and, (2) the absence of rail access to Yucca Mountain and severe environmental and institutional constraints on each of the potential rail access routes identified by DOE in its preliminary screening process.

There are a number of concerns which have been identified by State, local and tribal governments regarding institutional aspects of DOE's transportation program. First, DOE plans to delay the selection of specific rail and highway routes and the determination of the modal mix of shipments until the late 1990s. This is much too late to allow states, local governments and tribes to engage in meaningful analyses of risks and impacts or to prepare for regulation, planning, management, infrastructure improvement, training and other activities which would mitigate identified risks and adverse impacts. Second, DOE is not implementing on a timely basis its directives under Section 180(c) of the NWPA to provide financial and technical assistance for emergency preparedness to states which would be affected by repository shipments. Third, DOE

has failed to provide firm commitments for financial and technical assistance to Nevada Indian tribes which would be affected by nuclear waste transportation. Without such concrete schedules or commitments, affected states and tribes may not effectively participate in the repository program, as is their right under the NWPA.

Under the NWPA, DOE must adhere to all current federal, state and local regulations which relate to nuclear waste transportation. However, a review of the federal transportation regulatory structure has revealed certain ambiguities which may allow DOE shipments of nuclear waste to be conducted in a manner which is unacceptable to states, local governments and tribes. Currently, DOE continues to operate within the confines of present federal regulation and has not responded to State requests to actively pursue the modification of certain rules and regulations which would enhance the safety of the proposed repository transportation system. DOE's reluctance to take an active stance is also seen in its willingness to join the federal Department of Transportation inconsistency proceedings which challenge state, local and tribal attempts to regulate nuclear waste transportation in their own jurisdictions.

In response to these concerns, the NWPO has developed a five-year plan for the study and management of high-level nuclear waste transportation. The plan's guiding principle is that transportation is a critical part of a comprehensive repository program and needs to be addressed in a timely manner. The responsible federal agencies must view transportation in the comprehensive sense; that is, to consider and analyze not only site-specific issues but also national, regional, State, local and tribal geopolitical, legal, socioeconomic and environmental impacts. The DOE must recognize its obligation to the State to carefully plan and undertake initiatives which will reduce real and perceived risks and allay potentially adverse effects of the transportation of nuclear wastes to Yucca Mountain.

The goal of the plan is to establish a framework for State action which would help ensure that the health and safety of Nevadans and the unique physical and socioeconomic environment of the State and its communities are fully protected from risks and adverse impacts of high-level nuclear waste transportation. The plan addresses four areas: policy and program management, regulatory studies, technical reviews and studies, and institutional relationships. Each plan area contains its objectives, issues to be addressed and a description of completed, ongoing and planned activities. The College of Engineering, University of Nevada, Las Vegas (UNLV) has entered into a contract with NWPO to conduct the technical reviews and studies set forth in the plan. Planned institutional and regulatory activities will be conducted by NWPO staff.

The report concludes with nine recommendations for DOE, State and local government action. These recommendations should be examined and implemented in the context of the respective roles and responsibilities of State and local officials who are concerned about the transportation of nuclear waste and its impacts. Implementation of these objectives may be accomplished in a variety of ways, depending upon policy, regulatory or institutional authorities and responsibilities of the entities involved.

The recommendations are:

1. The State of Nevada should encourage the federal government to fulfill its responsibility to see that the State and its citizens are fully protected from any adverse impacts resulting from the transportation of nuclear waste to a Yucca Mountain repository.
2. The State of Nevada should encourage the DOE to immediately establish a mechanism that will result in the early identification of national highway and rail routes to be used for the shipment of nuclear waste to a Yucca Mountain repository.
3. The State of Nevada should encourage the DOE to determine, as soon as possible, the mix of truck and rail shipments which will be required to move spent nuclear fuel and defense high-level radioactive waste from reactors, defense facilities and temporary storage sites to a Yucca Mountain repository.
4. The State of Nevada should encourage the DOE to proceed immediately to plan for needed physical infrastructure improvements and new construction, once modal and routing decisions are made. Such improvements should be planned in conjunction with the State and affected local and tribal governments.
5. The State of Nevada should strongly recommend that the DOE be required to examine regional and national transportation issues in the impact report that is mandated under Section 175 of the Nuclear Waste Policy Amendments Act of 1987, and in subsequent Environmental Impact Statement scoping efforts.
6. The State of Nevada should encourage the DOE to immediately implement Section 180(c) of the NWPA which provides for financial support for states in emergency preparedness planning and training. The DOE should also be encouraged to support Nevada Indian tribes in such planning for lands under their jurisdictions.

7. Where appropriate, the State of Nevada should actively recommend desirable changes and provide State positions regarding existing and proposed federal laws and regulations which affect high-level nuclear waste transportation.
8. In conjunction with local governments and tribes, the State of Nevada should develop a comprehensive structure for the regulation of transportation of nuclear waste to a Yucca Mountain repository. Further, it is important that State, local and tribal planning for nuclear waste transportation be integrated with planning for the management and transportation of other radioactive and hazardous materials.
9. The State of Nevada, local governments and Indian tribes within Nevada should continue to work cooperatively in overseeing federal repository-related transportation activities and in assuring that any such transportation within the State will be carried out as safely and uneventfully as possible.

PREFACE

Direction to the Nevada Agency for Nuclear Projects Under Assembly Concurrent Resolution No. 8

On the recommendations of the Nevada Commission on Nuclear Projects and the Legislature's Interim Study Committee on High-Level Radioactive Waste, the 1987 Nevada Legislature passed and approved Assembly Concurrent Resolution No. 8 (ACR 8) which directed the Agency for Nuclear Projects/Nuclear Waste Project Office (NWPO), "to review thoroughly all state and federal laws governing the shipment of radioactive materials, scrutinize the Department of Energy's (DOE) plans related to such transportation and develop, in cooperation with affected local governments and the committee on high-level radioactive waste, a comprehensive plan addressing the issues relating to the transportation of nuclear waste if a repository for nuclear waste is located in this state;..."

The Resolution and two others, AB 47 and AB 352, reflect the Legislature's interest in sound planning, analysis, regulation, administration, training and operations regarding radioactive waste and other hazardous materials which travel within and through Nevada. ACR 8 further underscores the Legislature's foresight in anticipating the need for planning, preparation and mitigation approaches to ensure the safe and uneventful transportation of spent nuclear fuel and defense high-level radioactive waste (HLW) which would be necessary should the repository finally be located in Nevada.

The NWPO is the State agency responsible for the oversight of all federal activities and the planning and management of State-sponsored studies regarding the proposed HLW repository at Yucca Mountain. In preparing this report, the NWPO consulted with representatives of the Nevada Legislature's Legislative Study Committee on High-Level Radioactive Waste, State agencies, and local and tribal governments which would be affected by transportation of nuclear waste to a Yucca Mountain repository.

Consultation with affected State agencies, the Legislative Council Bureau, and local governments and tribes took place under the auspices of the State/Local Planning Group (SLGPG) which was established in 1983 as a steering, coordinating and review committee for NWPO-sponsored socioeconomic and transportation studies.

Local jurisdictions represented on the SLGPG include those which have been identified as highly likely to experience socioeconomic and transportation impacts which would result from repository activities. These include the counties of Clark, Lincoln and Nye, and the cities of Las Vegas, North Las Vegas, Henderson and Caliente. Representation on this group consists of persons from county or city departments of planning, public works, economic

development or emergency management as selected by the governing bodies of the member jurisdictions. In addition, the Legislative Council Bureau has had representation on the SLGPG since the Group's inception.

Since 1983, NWPO has provided ongoing financial support to these local governments for a wide range of activities, including identification and prioritization of key HLW transportation issues, monitoring DOE's transportation plans and establishing and maintaining institutional interactions. Independent studies of transportation issues by individual local jurisdictions have also been funded by NWPO.

Although recent Congressional action now provides independent funding for the situs county (Nye) and contiguous counties, it is expected that the SLGPG will continue to function as presently organized.

In 1987 and 1988, the NWPO entered into cooperative agreements with the Western Shoshone National Council and the Moapa Band of Paiutes to enable them to study and establish their roles in transportation to a repository in Nevada. Each of these tribes is affected by transportation, and it is incumbent upon the State to clarify intergovernmental roles and responsibilities and cooperative policy and actions regarding the shipments of HLW which would pass through Indian lands. Both the Western Shoshone National Council and the Moapa Band of Paiutes are now members of the State/Local Government Planning Group.

The NWPO transportation program has been strengthened by ongoing cooperation with other State of Nevada departments or divisions such as the Department of Transportation, Division of Emergency Management, Department of Motor Vehicles and Public Safety (Highway Patrol Division), Department of Health (Radiological Health), Department of Commerce (Fire Marshal Division) and the Public Service Commission. Representatives of these agencies function as ad hoc members of the SLGPG in transportation matters.

The mandates and functions of these agencies involve them in regulation, management, planning, monitoring or other activity relating to HLW transportation. (See Section 2.1.2.1, above). Most of these entities have entered into inter-local agreements with NWPO which allow their staff members to attend meetings sponsored by DOE or NWPO and to work with NWPO, the SLGPG or local government staff in relevant aspects of the transportation program.

The input and commentary to this report of all the SLGPG members is part of an ongoing process of consultation undertaken by NWPO regarding transportation issues. In this way, the NWPO may assure that these entities' concerns and viewpoints are reflected in state policy development, plans and activities.

Organization and Content of the Report

This report addresses each of the three directives provided under ACR 8 to the NWPO.

Section 1.0 of this report is a discussion of DOE's roles and responsibilities for transportation under the Nuclear Waste Policy Act of 1982 (NWPAA) and the Nuclear Waste Policy Amendments Act of 1987 (NWPAA), and its planned system for the transportation of high-level waste (HLW) to a Yucca Mountain repository. This section identifies specific concerns of the NWPO regarding the shipment of HLW to a repository and summaries of the policy, programmatic, technical and institutional issues which need to be addressed by the State.

Section 2.0 contains a review and discussion of the current federal, state, local and tribal regulatory environment within which HLW is shipped. A summary of regulatory issues which should be addressed by the State of Nevada is included in this section.

Section 3.0 contains the NWPO plan for addressing the transportation issues summarized in Sections 1.0 and 2.0.

Section 4.0 contains recommendations to Nevada leaders for consideration in the development of policies to assure the safe and uneventful transportation of spent nuclear fuel and defense HLW should a repository be located in Nevada.

Appendix 1 is designed to assist the reader in understanding the mission, roles, responsibilities and structure of the NWPO.

Appendix 2 is a listing of regional, state agency, local government and tribal representatives on study, planning, review or advisory groups which work with the NWPO.

Appendix 3 is a glossary of technical and commonly used terms within the report.

Appendix 4 contains the Short Term Work Plan for the Nuclear Waste Transportation Research Center, (NWTRC) University of Nevada, Las Vegas. The NWTRC has been selected by NWPO as the major contractor for technical studies in repository-related transportation.

1.0 THE DOE TRANSPORTATION SYSTEM

1.1 DOE Statutory Responsibilities For Nuclear Waste Transportation

The Nuclear Waste Policy Act of 1982 (NWPAA) gives DOE sole responsibility for shipment of commercial and defense program nuclear waste to the repository and a monitored retrievable storage (MRS) facility¹, and directs DOE to obtain the necessary transportation services by contracting with private industry. The Nuclear Waste Policy Amendments Act (NWPAA) of 1987 makes DOE transportation activities subject to Nuclear Regulatory Commission (NRC) cask certification and shipment prenotification regulations, and directs DOE to provide financial and technical assistance to potential repository and MRS transportation corridor state.

The Nuclear Waste Policy Act of 1982

The NWPAA establishes the DOE as the shipper of record for nuclear waste transportation to the repository or any interim storage or MRS facility constructed under authority of the Act. Section 123 gives DOE legal title to spent nuclear fuel or HLW, including defense nuclear waste, accepted for disposal. Section 136 authorizes DOE to accept civilian nuclear waste for shipment to interim storage facilities. Section 302 authorizes DOE to enter into contracts with nuclear utilities for acceptance of title to spent fuel and nuclear waste and subsequent transportation to a repository or MRS facility.

The NWPAA requires DOE to rely on private industry for transportation of civilian nuclear waste to a repository or storage facility. Section 137(a)(2) mandates that DOE "shall utilize by contract private industry to the fullest extent possible in each aspect of such transportation." Federal transportation services may only be used if DOE and the U.S. Department of Transportation (DOT) determine that "private industry is unable or unwilling to provide such transportation services at reasonable cost."

Under the NWPAA, DOE created a new office to carry out the provisions of the Act, including transportation activities. This Office of Civilian Radioactive Waste Management (OCRWM) is headed by a Director appointed by the President with the advice and consent of the Senate.

1. The MRS facility is an above-ground facility where spent fuel can be repackaged and temporarily stored prior to shipment (primarily by rail) to a repository. The MRS facility, if built, would be located in the eastern portion of the country in proximity to most of the nuclear power plants which generate waste.

The NWPA provides funding for DOE transportation activities from the Nuclear Waste Fund established under the Act. Section 302(d)(4) authorizes DOE to make expenditures from the Waste Fund for "any costs that may be incurred... in connection with the transportation, treating, or packaging" of spent nuclear fuel or HLW for disposal in a repository or storage at a federal facility.

Regarding application of federal regulations to DOE transportation activities, Section 137(a) requires that DOE transportation of spent fuel to a federal interim storage facility "shall be subject to licensing and regulation by the [U.S. Nuclear Regulatory] Commission and by the Secretary of Transportation as provided for transportation of commercial spent fuel under existing law." Although there are no comparable provisions of the NWPA requiring full compliance with NRC and DOT regulations for DOE shipments to a repository or MRS facility, the NWPA specifically provides that it does not affect federal, state or local laws.

The Nuclear Waste Policy Amendments Act of 1987

The Nuclear Waste Policy Amendments Act of 1987 (NWPAA) created a new subtitle to govern DOE transportation activities. The NWPAA extends certain NRC regulations to DOE transportation activities. Section 180(a) requires DOE to use packages (shipping casks) certified by the Nuclear Regulatory Commission (NRC) for all shipments of nuclear waste. Section 180(b) requires all shipments to comply with NRC regulations regarding advance notification of state and local governments along the shipping routes. Taken together, these new provisions expand the scope of NRC regulation to DOE shipments of defense HLW waste and civilian spent nuclear fuel to an MRS facility or a repository.

The NWPAA requires DOE to provide financial and technical assistance to transportation corridor states. Section 180(c) requires DOE to provide "technical assistance and funds to states for training public safety officials of appropriate units of local government and Indian tribes through whose jurisdictions the Secretary plans to transport spent nuclear fuel or high-level radioactive waste" to a repository or MRS facility. The Amendments Act does not define "public safety officials." "Training shall cover procedures required for safe routine transportation of these materials, as well as procedures for dealing with emergency response situations." DOE is authorized to use the Nuclear Waste Fund for these activities.

In addition to the language in Section 180(c), the Report of the Senate Energy and Natural Resources Committee reflects Congress' intent that there be a strong state role in implementation of federal nuclear waste transportation programs. The Committee Report specifies that programs conducted under this provision are "to focus on prevention of accidents as well as emergency response after an accident." In carrying out these programs, "it would be

up to the State to coordinate training for local officials and to determine how funding for emergency response training should be spent;" and, "it should be up to the State to determine the appropriate delineation of state and local responsibility in such matters."

The NWPAA requires DOE to report to Congress on the potential social and economic impacts of locating a repository at Yucca Mountain and methods and sources of funding for mitigating adverse impacts. Section 175(b)(10) and (11) directs DOE to address transportation impacts in the Report, including:

"any roads, terminals, airports, bridges or railways associated with the facility and the repair and maintenance of roads, terminals, airports, bridges or railways damaged as a result of the construction, operation, and closure of the facility; and, equipment and training of State and local personnel in the management of accidents involving high-level radioactive waste."

DOE is to submit the Section 175 report to Congress by December 1988.

The NWPAA also directs DOE to consider the impacts of nuclear waste shipments to the repository in selecting a site for the MRS facility. Section 142(a) authorizes DOE to site, construct, and operate one MRS facility, subject to certain conditions. Among these conditions is that in surveying potential MRS sites, DOE shall consider the extent to which a particular location would "enhance the reliability and flexibility" of the spent fuel and nuclear waste disposal system established under the Act, and "minimize the impacts of transportation and handling of such fuel and waste."

1.2 DOE Transportation Plans and Schedules

There is no statutory requirement that DOE prepare a nuclear waste transportation plan. The NWPA did, however, require DOE to prepare a Mission Plan detailing the Department's plans for implementing the major provisions of the Act, including transportation. The Mission Plan, published in 1985, proposed a three-part strategy for development of the transportation system required in order for DOE to meet its responsibilities under the NWPA. Intergovernmental aspects of transportation are to be developed in accord with a transportation institutional plan. Technical development of the transportation system, particularly the development of new shipping cask designs, is to be directed by a transportation business plan. Operation and management of the transportation system is to be spelled out in a transportation operations plan.

DOE Transportation Plans

DOE published the Transportation Business Plan in January 1986. The Business Plan followed the NWPA directive that DOE rely upon the private sector for provision of equipment and services. Several key issues, such as DOE versus private ownership of the new generation of shipping casks, were left unresolved. In July 1986, DOE issued a Request for Proposals for the cask development program. Based on responses to this Request for Proposals, DOE in June 1987, contracted with six companies for development of casks for shipments from reactors to the repository or MRS.

DOE published the Transportation Institutional Plan in August 1986. The Institutional Plan identified 16 specific issues of concern to State, Tribe, and local governments, but did not provide a specific mechanism for resolution of intergovernmental conflicts over these issues. The Institutional Plan included a comprehensive schedule for development of the transportation system. The schedule called for NRC certification of the new "from reactor" cask designs by the end of 1990, resolution of truck and rail routing issues by the end of 1990, cask fabrication beginning in 1994, and the beginning of shipments to the repository in 1998.

The Institutional Plan schedule for development of the transportation program is apparently no longer valid as a result of congressional redirection of the nuclear waste program with passage of the NWPA. DOE published a new schedule for implementation of the NWPA changes in the Draft 1988 Mission Plan Amendment. The transportation program direction and schedule is also complicated by internal developments within DOE. In March 1988, DOE reorganized the staff at headquarters. The Office of Storage and Transportation Systems was abolished, and transportation planning was reassigned to a new Office of Systems Integration and Regulations. Some transportation responsibilities apparently have been shifted from DOE Headquarters to the DOE Nevada Operations Office in Las Vegas, but DOE has provided few details. The transportation responsibilities of DOE's Chicago Operations Office, Oak Ridge National Laboratories, and Sandia National Laboratories, also appear to have been reexamined and possibly changed, but again DOE has provided few details. Questions about the DOE transportation program may be resolved with publication of the Draft Comprehensive Transportation Plan, now tentatively scheduled for late 1989.

Transportation Schedule Based on the Draft 1988 Mission Plan Amendment

DOE published the Draft 1988 Mission Plan Amendment (DMPA) in June 1988. The DMPA reflects the program changes required by the NWPA: all geologic repository efforts are focused on Yucca Mountain, and the MRS facility is to be an integral part of the waste management system. DOE's new program schedule calls for MRS and repository

operations to begin in 2003, a five-year delay compared with previous DOE schedules. The DMPA does not include a new comprehensive schedule for the transportation program. The DMPA states that a Draft Comprehensive Transportation Plan will be published by the end of 1988 (the draft plan is now expected in late 1989). The DMPA includes a very general schedule for some aspects of the cask development program, which appears to delay development of the "from reactor" casks by about two years compared to the schedule in the Institutional Plan. The DMPA provides no specific dates for selection of repository shipping routes or implementation of the technical and financial assistance provisions in Section 180(c) of the NWPA; the DMPA suggests that these activities will begin about five years before shipments begin, about 1998 under the current schedule, although planning for MRS shipments could begin as early as 1995. The DMPA includes a revised waste acceptance schedule, which provides some information on the timing of transportation operations. The DMPA is silent regarding DOE transportation planning activities associated with repository development at Yucca Mountain. There is, for example, no schedule of activities necessary to provide rail access to the repository site, although the DMPA assumes the rail access will be achieved by 2003 when shipments are scheduled to begin.

At the present time, no official DOE transportation activities schedule is available. Table 1.1 presents a schedule of near-term DOE transportation activities compiled by NWPO based on information provided by DOE and its contractors. Table 1.2 presents a schedule of long range DOE transportation activities compiled by NWPO based on information in the DMPA. Both schedules are likely to be revised following publication of DOE'S Comprehensive Transportation Plan.

Table 1.1

Near Term Schedule of DOE Planned Activities Regarding Nuclear Waste Transportation

Month/Year	Repository & MRS--General	Transportation--General	Transportation--Yucca Mountain
9/88	Draft Report on Dry Cask Storage at Reactor Sites		
10/88	Draft Sec. 175 Report on SE Impacts and Mitigation	DOE Model Conference, Oak Ridge, TN (10/3-7)	
11/88		WIEB Workshop on NRC Modal Study and Cask Development QA, Denver, CO (11/9-11)	Draft Nevada Highway Routing Study Interim Report: Scoping Study Rail Access Spur Options
12/88	Final Report on Dry Cask Storage at Reactor Sites Final Sec. 175 Report on SE Impacts and Mitigation	Transportation Coordinating Group Meeting, Place TBD (mid-December)	Draft U.S. Air Force Overflight Study
1/89	Final Site Characterization Plan(SCP)	Draft Transportation Comprehensive Plan	
2/89		Waste Management '89 Conference, Tucson, AZ (2/26-3/2)	
3/89	Begin Scoping for Repository Environmental Impact Statement(EIS) (Earliest expected date; could begin 6/89)	Workshop on Emergency Response Resources, Issues, and Needs (Date tentative; could be much later in year)	
4/89		TRANSCOM Test for NW Pacific States (Tentatively scheduled for "Spring")	
5/89		Preliminary Cask Design Report (Date tentative)	
6/89	MRS Commission Report to Congress	PATRAM '89 Conference (Packaging and Transportation of Radio-active Materials), Wash., DC (6/11-16)	
7/89	Begin MRS Site Survey	Tentatively Scheduled for 2nd Half of 1989: CVSA Report on Vehicle Inspectn. Management Configuration Study Draft Cask Testing Plan	
8/89			

Year	Repository & MRS--General	Transportation--General	Transportation--Yucca Mountain
1989	Final SCP (1Q) EIS Scoping (2Q) MRS Siting Survey (2Q)		
1990	Begin In-Situ Testing at Yucca Mtn. (4Q)	Cask Preliminary Design Review (3Q)	
1991		Submit Cask Safety Analysis Report to NRC (2Q)	
1992	Identify MRS Candidate Sites (1Q)		
1993	Draft Repository EIS	NRC Certification of Cask Designs	
1994	Final Repository EIS Selection of MRS Site		
1995	Submit Repository & MRS License Applications to NRC	Possible Early DOE Implementatn. of Sec.180(c) for Shipments to MRS	
1996			
1997	NRC Grants License for MRS		
1998	NRC Grants Construction Authori- zation for Repository Start Construction	"Transport Capability Established"	DOE begins Implementation of Sec. 180(c) (Technical & Finan- cial Assistance to States)
1999			
2000	Possible Early MRS Start-up - Receive and Store Spent Fuel	Possible Spent Fuel Shipments to MRS	
2001			
2002			
2003	Begin Repository Phase 1 Operations Begin MRS Operations	"Fleet Operational"	Begin Spent Fuel Shipments from MRS (400 MTU per year)
2004			
2005			
2006	Begin Repository Phase 2 Operations		Spent Fuel Shipments from MRS Reach 900 MTU per year
2007			Spent Fuel Shipments from MRS Reach 1300 MTU per year
2008			Spent Fuel Shipments from MRS Reach 1700 MTU per year (Low Shipments begin 1400 MTU) Reactor Shutdowns begin 1100 MTU

The MRS Facility and Repository Transportation Planning

DOE's current plans for construction and operation of an MRS facility create major uncertainties in plans and schedules for waste shipment to a repository at Yucca Mountain. The NWPA originally directed DOE to study the MRS concept as a backup in case a repository was not available to receive spent fuel under DOE's contracts with the nuclear utilities. DOE developed a proposal for an MRS which was integrated with the repository system, and identified a preferred MRS site near Oak Ridge, Tennessee. The NWPA authorized DOE to construct an integrated MRS facility, but it negated DOE's Oak Ridge site proposal, it created a congressionally-appointed commission to review the entire MRS concept, and it placed numerous restrictions on the MRS effectively preventing the MRS from serving as a backup for the first repository. It is the opinion of the NWPO staff and contractors that MRS siting and construction according to the provisions of the NWPA is extremely doubtful, given the political sensitivity of the facility and the strong congressional opposition to it on behalf of key eastern states.

As Figure 1.1 illustrates, the MRS would have a major impact upon transportation within the DOE nuclear waste management system. The MRS would receive spent nuclear fuel from eastern reactors by rail, truck, and possibly by barge. Western reactors might also ship spent fuel to the MRS, or ship spent fuel directly to the repository. Under DOE's current proposal, spent fuel would be consolidated and repackaged at the MRS, then stored for a period of several years in large concrete casks. Figure 1.2 illustrates the proposed design for dry storage casks to be used at the MRS. When repository operations begin, spent fuel would be retrieved from the dry storage casks, loaded into large shipping casks, and transported to the repository by dedicated (unit) trains.

FIGURE 1.1. DOE Waste-Management System, including MRS, authorized by the Nuclear Waste Policy Amendments Act (DOE/RW-0187)

The preferred storage concept for the MRS facility: monitored surface storage in large sealed concrete casks. Each cask would house several spent-fuel canisters; it would be 22 feet high and 12 feet in diameter. The temperature probe and the air-sampling tube would allow continuous monitoring.

FIGURE 1.2. MRS Facility Storage Concept(DOE/RW-0035/1-Rev. 1)

The transportation implications of an MRS have been addressed on a number of studies (DOE, 1986f; DOE, 1987,c; Cashwell, 1986; Colglazier, 1985; Halstead, 1986; Hoskins, 1987; Joy, 1986; and WIEB, 1988b). After reviewing these studies, NWPO staff and contractors believe that the construction and operation of an MRS, and the details of MRS operation, would have major implications for virtually every aspect of waste transportation to a repository at Yucca Mountain:

1. Modal Mix. All spent fuel would be shipped to Yucca Mountain by rail if the MRS serves all reactors. Even if western reactors ship spent fuel directly to Yucca Mountain, the share of truck shipments would be greatly reduced.
2. Number of Shipments. Use of dedicated trains for shipping spent fuel would greatly reduce the total number of waste shipments to Yucca Mountain.
3. Routing. The location of the MRS will dictate the primary shipping route or routes to Yucca Mountain. If the MRS handles all spent fuel, the number of rail and truck routes used for shipping spent fuel to Yucca Mountain would be reduced; however, some western reactor spent fuel would probably travel through Nevada when shipped to the MRS.
4. Cask Design. If all spent fuel is handled at the MRS, reactor/cask interface considerations will be eliminated as a design constraint. If spent fuel is consolidated at the MRS, this will be a major consideration in cask design.
5. Risk Assessment. Risk assessment for shipments to the repository will be significantly affected by MRS impacts on modal mix, number of shipments, routing, cask design, and waste form (consolidation or intact fuel assemblies and wastes generated by consolidated at the MRS).
6. Emergency Response Planning. Emergency response planning for shipment to the repository will be significantly affected by MRS impacts on modal mix, number and frequency of shipments, routing, cask design, and waste form.
7. Transportation Control Center. The need for, number of, functions of, and location of the transportation control center or centers will be greatly influenced by the location and functions of the MRS.

8. Fleet Maintenance Facilities. The need for, number of, functions of, and location of fleet maintenance facilities will be greatly influenced by the location and functions of the MRS.

In the opinion of NWPO staff and contractors, the MRS provisions of the NWPAA further complicate the difficult task of planning for waste transportation to a repository at Yucca Mountain. The NWPAA authorizes construction of an MRS, but does not guarantee that an MRS will be constructed. Congress must still appropriate funds for construction. Considering the strong congressional opposition to DOE's Oak Ridge MRS siting proposal, congressional appropriation for construction of an MRS facility in the eastern United States is by no means certain. Congressional opposition from potential MRS transportation corridor states might be sufficient to sustain a host state siting veto. NWPAA limitations on MRS benefits payments (\$10 million per year during operations) and the conditions attached to an MRS benefits agreement create little or no incentive for any state to volunteer. Even if the Office of the Nuclear Waste Negotiator created by the NWPAA is implemented and successfully negotiates an agreement between a potential host state and DOE, the resulting agreement and an environmental assessment must still be submitted to Congress, and the agreement must be enacted as law.

1.3 Characteristics of Nuclear Waste to be Shipped to the Repository

Two different types of high-level nuclear waste - spent fuel from nuclear power reactors (SNF) and solidified wastes from the reprocessing of spent nuclear fuel (HLW) - will be shipped to the repository. Transuranic wastes, referred to as TRU wastes, which may exist as MRS rod consolidation and packaging by-products commercially reprocessed waste or reactor decommissioning by-products could also be shipped to the repository.

About 90% of the nuclear waste shipped to the repository will be spent fuel (SNF) from civilian nuclear power plants, primarily pressurized water reactors (PWRs) and boiling water reactors (BWRs). Because there are dozens of different SNF designs, DOE has designated a "reference" PWR fuel assembly and a "reference" BWR fuel assembly for planning purposes. The "reference" PWR and BWR fuel assemblies are shown in Figure 1.3. The "reference" PWR fuel assembly used in DOE planning documents is about 13 feet long and 8.5 inches wide and deep. It holds almost 300 long, thin fuel rods containing 0.46 metric tons of uranium (MTU). The reference BWR

assembly has a slightly different configuration and contains less uranium fuel (0.19 MTU).² (DOE, 1980)

The repository will receive spent fuel assemblies of more than two dozen different standard designs, and fuel that is defective or damaged or that requires special handling because of unusual design. Design differences aside, all of the spent fuel types share two common characteristics - they are highly radioactive for thousands of years, and thermally hot for several hundred years. (DOE, 1980; Roddy, 1986; DOE, 1987a)

Spent fuel assemblies may be consolidated and repackaged before shipment to the repository. The consolidation process would involve removal of the fuel rods from the fuel assembly structural skeletons. Fuel rods (also referred to as fuel pins) from as many as twelve assemblies, depending upon the waste package design, would be grouped together in one specially designed canister. The leftover structural hardware would be compacted and placed in a separate canister. The intense radioactivity of the spent fuel assemblies requires that the consolidation process be performed by remote control in a heavily shielded environment, such as in the water-filled storage pool at a reactor or in a hot cell at the MRS facility. (Hoskins, 1987; DOE 1987c)

DOE's current plan calls for transporting spent fuel from civilian reactors to a MRS facility where the fuel rods will be removed from the assemblies and consolidated into disposal containers. (DOE, 1987c) Figure 1.4 illustrates how spent fuel would be consolidated at a reactor for further storage or at the MRS for disposal in a repository. For disposal in a tuff repository at Yucca Mountain, DOE's Consultation Draft Site Characterization Plan (1988) assumes that the MRS would prepare canisters containing consolidated rods from 6 PWR assemblies, but a final decision on consolidation details will not be made for several years. Figure 1.5 shows DOE's reference spent fuel container for a repository at Yucca Mountain and four configuration alternatives for consolidated and intact assemblies. If an MRS is constructed, DOE plans to ship canisters of consolidated fuel to the repository in dedicated trains (called 'unit' trains by DOE) along with canisters of radioactive hardware and secondary wastes resulting from disassembly operations. If the MRS is not constructed, DOE expects most reactors to be ship intact spent fuel assemblies directly to the repository, although some utilities are planning to consolidate their fuel at reactor sites prior to shipment.

²Throughout the remainder of this report, discussion of spent fuel characteristics refers to the reference PWR assembly, since this will be the predominate waste form shipped to the repository.

FIGURE 1.3. Reference Nuclear Fuel Assemblies (Not to scale; DOE/EIS-0046F)

CONSOLIDATION COMPARISON

FIGURE 1.4. Comparison of Fuel Consolidation Concepts (Not to scale; DOE, 4/13/87)

FIGURE 1.5. Reference Spent Fuel Disposal Canister for Repository at Yucca Mountain, with and without Rod Consolidation (DOE, 4/13/87)

Whether intact or consolidated, spent reactor fuel will remain highly radioactive and thermally hot even after ten years of cooling in water-filled storage pools at reactor sites. As a result of nuclear fission inside a reactor, some of the original uranium fuel is transformed into other uranium isotopes, isotopes of plutonium and other transuranic elements, and fission products such as strontium-90 and cesium-137. Fission products account for most of the radioactivity in spent fuel during the first hundred years after removal from a reactor, (DOE, 1987a) and are therefore the major source of radiological concern during transportation to the repository. These fission products emit both beta and gamma radiation and are a potential source of exposure and contamination during routine transportation operations or in the event of an accident or terrorist attack.

DOE's contracts with the utilities specify that spent fuel is to be cooled at least five years before shipment to the repository. However, DOE expects that, initially, spent fuel will be ten years out of reactor by the time it is shipped. While it is possible that the average waste age could be as great as 15-20 years, this Report assumes an average waste age of 10 years. (DOE, 1988c).

Ten years after discharge, the total radioactivity in one spent fuel assembly has declined from more than a million curies to about 180 thousand curies. (DOE, 1987a) Despite this decrease, the spent fuel assembly is still potentially very dangerous to human beings and other living things. One measure of the hazards associated with SNF is the potential for radioactive exposure. A person standing one yard away from an unshielded 10 year-old PWR assembly would receive a lethal dose of radiation (about 500 rems) in less than 3 minutes. A thirty-second exposure (100 rems) at the same distance would result in significantly increased risk of cancer and/or genetic damage. (Resnikoff, 1983; Lipschutz, 1980)

Another measure of potential health hazards is the amount of water needed to dilute the radionuclides in the spent fuel to a level deemed safe for human consumption by federal regulatory agencies. (Lipschutz, 1980) For example, there are about 26 thousand curies of strontium-90 in a 10 year-old PWR assembly. (DOE, 1987a) Using dose factors established by the International Commission on Radiological Protection, the NRC and the Environmental Protection Agency (EPA) have adopted a maximum permissible concentration for strontium-90 in water of 3×10^{-7} curies per cubic meter (about 1×10^{-9} curies per gallon.) (Lipschutz, 1980) Using these concentration factors, NWPO staff calculate that it would take more than twice the volume of water in Lake Mead (23 trillion gallons) to dilute just the strontium-90 in one 10 year-old spent fuel assembly down to the maximum permissible concentration.

About 10 percent of the waste to be shipped to the repository will be solidified HLW resulting from the reprocessing of spent nuclear fuels. During reprocessing all but trace amounts of the uranium

and plutonium are removed, leaving behind a mixture rich in strontium-90, cesium-137, and other fission and activation products. (DOE, 1980; DOE, 1987a; ORNL, 1987) From the standpoint of geologic disposal, HLW may be a preferable waste form to spent fuel, since the very long-lived isotopes of uranium and plutonium and the products of their radioactive decay have been removed. From a transportation standpoint, however, HLW is no less dangerous than spent fuel, and possibly more dangerous, since fission products are present in larger quantities per metric ton of uranium (MTU) of waste shipped.

Figure 1.6 shows the present location and relative volume of HLW stored at four facilities, the former Nuclear Fuel Services plant at West Valley, New York, where civilian nuclear fuel was reprocessed between 1966 and 1972; and three DOE facilities - the Hanford Reservation in Washington, the Idaho National Engineering Laboratory (INEL) in Idaho, and the Savannah River Plant (SRP) in South Carolina - where spent fuel from weapons production, naval propulsion, and research reactors is reprocessed. Most HLW is presently in liquid form, stored in underground tanks. DOE plans to construct vitrification (solidification) facilities at each of these four sites during the 1990s to prepare the waste for shipment to the repository. The vitrification facility at SRP could begin operation in 1990. (ORNL, 1987; DOE, 1987a)

Certain characteristics of the HLW to be shipped to the repository are not known at this time. Future weapons production and reprocessing plans at DOE facilities are uncertain, and DOE has provided little information regarding HLW composition at INEL because of alleged national security considerations. DOE has yet to decide whether certain categories of defense HLW stored at INEL and Hanford will require shipment to the repository. It is also possible that civilian reprocessing might be resumed. (DOE, 1987a)

In spite of these uncertainties, some important characteristics of defense HLW can be anticipated. At each of the four sites, DOE plans to mix the HLW into molten borosilicate glass inside 10-foot high stainless steel canisters. The SRP waste canister is shown in figure 1.7. The loaded canisters will weigh about 4800 pounds each. Each canister is roughly equivalent to a spent fuel assembly in terms of radioactivity and thermal output. (DOE, 1987a)

Given DOE's schedules for on-site vitrification and construction of the repository, it appears likely that most solidified HLW will be 10 years old (10 years after canister filling) when shipped to the repository. As is the case with spent fuel, the radioactivity in solidified HLW decreases considerably during the 10-year cooling time. The total radioactivity in a canister of SRP waste would decline from about 234 thousand curies to about 146 thousand curies over 10 years. However, the remaining radioactivity is sufficient to make 10-year old HLW extremely hazardous. In fact, one canister of 10-year old SRP waste contains 37 thousand curies of strontium-

90, 40 percent more than a 10-year-old spent fuel assembly. (DOE, 1987a) NWPO staff calculate that it would take almost three times the volume of water in Lake Mead to dilute that quantity of strontium-90 to the safe drinking water level (maximum permissible concentration) established by the EPA.

In addition to SNF and HLW, DOE has identified several categories of "miscellaneous" wastes which may be shipped to the repository. "These (miscellaneous) wastes are neither spent fuel nor conventional high-level waste (as presently defined) but may not be appropriate for shallow-land burial for various reasons. Although most of them would probably be suitable for intermediate-depth disposal, the absence of such facilities may destine these materials for a geologic repository." These include transuranic wastes from the MRS facility, West Valley, and often commercial operations; reactor decommissioning wastes; radioisotope capsules; and greater than Class C (GTCC) wastes from routine reactor operations. (DOE, 1987a)

FIGURE 1.6 Locations and Total Volumes of HLW through 1986 (DOE/RW-0006, Rev.3)

FIGURE 1.7. Savannah River Plant HLW Canister (Not to scale; DOE/RW-0184)

1.4 Amount of Waste and Number of Nuclear Waste Shipments to a Repository

To date, DOE has published only partial details about anticipated nuclear waste shipments to the repository. NWPO staff believe this is due partly to uncertainties about whether, when, and where an MRS facility will be constructed and to DOE's inability or unwillingness to make early decisions about new shipping cask designs, shipment modal mix, (i.e., truck vs. train), routing, and other matters. However, three aspects of shipments to the repository seem certain: A large quantity (on the order of thousands of tons) of nuclear waste will be shipped to the repository each year. The number of annual shipments to the repository will be determined primarily by the role of the MRS facility and the carrying capacity of the shipping casks. Many states will be affected by shipments to the repository regardless of whether a MRS facility is constructed and regardless of the transportation modal mix.

Amount of Waste Shipped

The total amount of nuclear waste shipped to the repository is shown in Table 1.3. Shipments total 70,000 metric tons of uranium (MTU)³ in the DOE base case presented in the DMPA. Table 1.3 also shows the total amount - 114,640 MTU - which might be shipped to the repository if a second repository is not built and if maximum defense waste shipments are assumed. This total could be even larger if higher nuclear power growth rates are assumed. (DOE, 1987b, 1987e) Before this could occur, the NWPA must be amended to eliminate the 70,000 MTU capacity limit of Yucca Mountain. Approximate total shipments to the repository, by truck, rail and dedicated trains, for four shipment scenarios are shown in Table 1.4. Table 1.5 shows the approximate annual shipments to the repository during full operations (2008 to 2025) for the DOE base case and four shipment scenarios.

According to DOE's DMPA, once the repository reaches full-scale operations (about the year 2008, as predicted by DOE), the amount of waste shipped to the repository annually will exceed the cumulative amount of nuclear waste shipped to all off-site locations in the United States during the years 1964 to 1986. DOE's waste acceptance schedule indicates about 3,000 MTU of civilian spent nuclear fuel will arrive at the repository each year. Of this amount, 2,700 MTU would be shipped from a MRS facility and 300 MTU would be shipped directly from 12-15 reactors

³MTU refers to the initial mass of uranium present in the fuel assembly before it is inserted into a reactor. For purposes of this report, MTU is interchangeable with the units MTHM (metric tons of heavy metal) and MTHM (metric tons of initial heavy metal).

in western states. This compares to only 2,200 MTU of spent fuel which was shipped off-site in the U.S. between 1964 and 1986. (NAC, 1986; Grella, 1987) The repository will also receive about 800 canisters containing 400 MTU of solidified HLW each year.

In addition to SNF and HLW, significant quantities of miscellaneous wastes may also be shipped to the repository. Using the assumptions in the waste characteristics report (DOE/RW-0134, Vol. 1), the assumptions in the DMPA regarding MRS operations, and the EIA 1987 "no-new-orders" scenario for commercial nuclear operations, the Nevada NWPO staff has calculated the following maximum potential quantities of transuranic and greater-than-Class-C (GTCC) wastes which may require disposal in a repository by the year 2020: 1) OCRWM generated waste from rod consolidation at the MRS: 4,700 cubic meters; 2) transuranic waste from West Valley, commercial reactors, and other industrial and institutional facilities: 1,500 cubic meters; 3) reactor decommissioning: 1,600 cubic meters; 4) radioisotope capsules (including Hanford): 500 cubic meters; and 5) GTCC wastes from routine reactor operations (no-new-orders case, 1990-2020): 8,500 cubic meters. The total quantity of miscellaneous wastes possibly requiring deep geologic disposal by 2020 is estimated to be 16,800 cubic meters; the total is about 20,600 cubic meters if EIA's "upper reference" case for nuclear power is assumed.

The Oak Ridge characteristics report further states: "If these (miscellaneous wastes) are disposed of in HLW-type canisters, 2 ft in diameter by 10 or 12 ft long, one canister could hold up to 1 cubic meter". Using this assumption, it appears that if miscellaneous wastes require deep geologic disposal, as now seems the case (absent other disposal facilities for "intermediate level" wastes), the repository could receive 16,800 to 20,600 canisters of waste in addition to the amounts shown in Table 1.3.

Table 1.3

Total Amount of Nuclear Waste to be Shipped to the Repository
(Metric Tons of Uranium)

	<u>DOE Base Case^a</u>	<u>No Second Repository/ Maximum Defense Waste Case^b</u>
Spent Nuclear Fuel	63,020	87,000
Civilian HLW ^c	640	640
Defense HLW ^d	<u>6,340</u>	<u>27,000</u>
Total	70,000	114,640

^a - Based on DOE, Draft 1988 Mission Plan Amendment, Waste Acceptance Schedule, Table 2.2, and 70,000 MTU capacity limit.

^b - Assumes no second repository, 70,000 MTU capacity limit removed, and EIA spent fuel inventory projected for "no new orders" scenario through 2036 [Draft 1988 Mission Plan Amendment, p.11]; and maximum defense waste scenario (including Hanford single-shell tank wastes) through 2020 based on DOE/RW-0184.

^c - 1 canister equals 2.0 MTU.

^d - 1 canister equals 0.5 MTU.

Table 1.4

Total Nuclear Waste Shipments to the Repository
DOE Base Case, Four Shipment Scenarios
(70,000 MTU to Repository)

	DOE Proposed Plan - MRS ^a	DOE Alternative - No MRS ^b	Minimum Shipment Scenario MRS, Rail ^c	Maximum Shipment Scenario No MRS, Truck ^d
Dedicated Trains ^e	1,388	0	570	0
Rail Casks ^f	2,091	7,978	2,579	0
(Spent Nuclear Fuel)	(415)	(6,302)	0	
(HLW)	(1,648)	(1,648)	(2,536)	
(Civilian HLW)	(28)	(28)	(43)	
Truck Casks ^g	7,243	26,600	0	76,000
(Spent Nuclear Fuel)	(2,700)	(22,057)		(63,020)
(HLW)	(4,438)	(4,438)		(12,680)
(Civilian HLW)	(105)	(105)		(300)

- ^a - Based on DOE, Draft 1988 Mission Plan Amendment; 57,620 MTU of spent fuel shipped to Repository from MRS in 100-ton casks, capacity 8.3 MTU consolidated spent fuel in disposal containers suitable for direct emplacement in repository, per Yucca Mountain EA, DOE/RW-0073, Vol. 2, p.A-12; 5,400 MTU of intact spent fuel shipped directly from western reactors to repository, 50 percent rail/50 percent truck, based on current reactor rail capability; 12,680 canisters of defense HLW, shipped 65 percent rail/35 percent truck; and 300 canisters of civilian HLW, shipped 65 percent rail/35 percent truck.
- ^b - Based on DOE, Draft 1988 Mission Plan Amendment; No MRS; all spent fuel shipped direct to repository, 65 percent rail/35 percent truck; defense and civilian HLW shipped 65 percent rail/35 percent truck.
- ^c - All spent fuel shipped to repository from MRS in 150-ton casks, capacity 22.1 MTU consolidated spent fuel in canisters, not overpacked for disposal; defense and civilian HLW shipped 100 percent rail.
- ^d - No MRS; all spent fuel shipped directly to repository by legal-weight truck; defense and civilian HLW shipped 100 percent by legal-weight truck.
- ^e - Each train consists of 5 spent fuel casks and 5 hardware/secondary waste casks. (SAND85-2715)
- ^f - Rail cask capacities: spent fuel, 6.5 MTU; HLW, 5 canisters; and civilian HLW, 7 canisters. (DOE/RW-0073).
- ^g - Truck cask capacities: spent fuel, 1.0 MTU; HLW, 1 canister; and civilian HLW, 1 canister. (DOE/RW-0073).

Table 1.5

Annual Nuclear Waste Shipments to the Repository
During Full Operation (2008 - 2025)
DOE Base Case, Four Shipment Scenarios
(70,000 MTU to Repository)

	DOE Proposed Plan - MRS ^a	DOE Alternative - No MRS ^b	Minimum Shipment Scenario MRS, Rail ^c	Maximum Shipment Scenario No MRS, Truck ^d
Dedicated Trains ^e	65	0	25	0
Rail Casks ^f	127	404	160	0
(Spent Nuclear Fuel)	(23)	(300)	(0)	
(HLW)	(104)	(104)	(160)	
Truck Casks ^g	430	1,330	0	3,800
(Spent Nuclear Fuel)	(150)	(1,050)		(3,000)
(HLW)	(280)	(280)		(800)

^a - Based on DOE, Draft 1988 Mission Plan Amendment; 57,620 MTU of spent fuel shipped to Repository from MRS in 100-ton casks, capacity 8.3 MTU consolidated spent fuel in disposal containers suitable for direct emplacement in repository, per Yucca Mountain EA, DOE/RW-0073, Vol. 2, p.A-12; 5,400 MTU of intact spent fuel shipped directly from western reactors to repository, 50 percent rail/50 percent truck, based on current reactor rail capability; 12,680 canisters of defense HLW, shipped 65 percent rail/35 percent truck; and 300 canisters of civilian HLW, shipped 65 percent rail/35 percent truck.

^b - Based on DOE, Draft 1988 Mission Plan Amendment; No MRS; all spent fuel shipped direct to repository, 65 percent rail/35 percent truck; defense and civilian HLW shipped 65 percent rail/35 percent truck.

^c - All spent fuel shipped to repository from MRS in 150-ton casks, capacity 22.1 MTU consolidated spent fuel in canisters, not overpacked for disposal; defense and civilian HLW shipped 100 percent rail.

^d - No MRS; all spent fuel shipped directly to repository by legal-weight truck; defense and civilian HLW shipped 100 percent by legal-weight truck.

^e - Each train consists of 5 spent fuel casks and 5 hardware/secondary waste casks. (SAND85-2715)

^f - Rail cask capacities: spent fuel, 6.5 MTU; HLW, 5 canisters; and civilian HLW, 7 canisters. (DOE/RW-0073).

^g - Truck cask capacities: spent fuel, 1.0 MTU; HLW, 1 canister; and civilian HLW, 1 canister. (DOE/RW-0073).

Shipping Cask Capacity

Shipping cask capacity is restricted by safety requirements. Safe transportation of spent nuclear fuel requires heavy shielding to prevent excess radiation exposure during routine operations and rugged structures capable of containing the spent fuel in the event of an accident. The cask must be designed to prevent the spent fuel from forming a critical mass which could sustain a fission chain reaction. Even after 5 years cooling, the heat produced by the spent fuel must be considered in cask design. These considerations result in heavy casks (22-36 metric tons for trucks, and about 60 metric tons for rail) with relatively small carrying capacities. (DOE, 1979) Legal weight truck casks such as the NFS-4 model (Figure 1.8) can carry 1 PWR or 2 BWR assemblies. Overweight truck casks are available with a capacity of 3 PWR or 7 BWR assemblies. The IF-300 rail cask (Figure 1.9, 1.10) can carry 7 PWR or 18 BWR assemblies. Other casks are currently available for special purposes, such as shipping reactor cove debris from the Three Mile Island reactor.

For shipments to the repository, and to the MRS if constructed, DOE is planning to develop a new generation of spent fuel shipping casks with carrying capacities at least twice as great as the current casks. (Cask capacities are indicated in Table 1.5.) Current casks are designed for hauling spent fuel which may be as little as 6 months out of the reactor. By designing and gaining NRC certification for new casks for spent fuel 5 years or more out of reactor, DOE plans to increase capacity by reducing shielding and cooling requirements. Figure 1.11 shows the type of cask DOE hopes to use for rail shipments to the MRS or the repository; its capacity would be 14 PWR or 36 BWR assemblies. A corresponding legal weight truck cask would carry 2 PWR or 5 BWR assemblies; legal weight truck cask designs with capacities of up to 4 PWR and 9 BWR assemblies are under consideration. (DOE, 1986; 1988c; Callaghan, 1988; Meyer, 1988) The larger cask capacities (4 PWR/9 BWR for truck; 26 PWR/62 BWR for rail) proposed by DOE contractors involve allowance for "burnup credit" in criticality design. (Sanders, 1987; Su, 1988) DOE is also planning to develop new casks for shipping canisters of solidified HLW. Figure 1.12 shows a design concept for a truck cask capable of carrying one canister. The corresponding rail cask would have a capacity of 5 to 7 canisters.

FIGURE 1.11 DOE Proposed Cask for Shipping Spent Fuel to MRS or Repository by Rail; Capacity 14 PWR or 36 BWR Assemblies (DOE/RW-0073)

FIGURE 1.12 DOE Proposed Cask for Shipping Solidified HLW to Repository by Truck; Capacity 1 Canister (DOE/RW-0073)

Shipping Scenarios

The number of annual shipments to the repository will be determined not only by the amount of waste and the shipping cask capacities, but also by the modal mix of shipments; that is, by the percentage of shipments by truck and rail; and the role of a MRS in the national waste system, and, whether spent fuel is consolidated at the MRS before shipment to the repository.

Because of uncertainties about the modal mix and MRS role, NWPO staff believe that planning for nuclear waste transportation to the repository must consider at least four scenarios: DOE's proposed plan, DOE's proposed alternative, an all-rail shipping plan, and an all-truck shipping plan.

Under DOE's DMPA plan, 90% of the spent fuel is to be shipped to the repository from the MRS by dedicated trains after consolidation and 10% is to be shipped directly to the repository from western reactors by rail if the reactor is rail-accessible, otherwise by truck. Regarding dedicated trains, previous DOE reports have assumed a 10-car train composed of 5 railcar casks containing consolidated spent fuel and 5 railcar casks containing compacted fuel assembly hardware, high-activity wastes and transuranic wastes resulting from consolidation at the MRS facility. (Cashwell, 1986) The number of dedicated trains could increase by almost 30% if spent fuel is not consolidated at the MRS prior to shipment. Solidified defense HLW is to be shipped to the repository from the four current storage sites, predominantly by rail. It is assumed that 65% of the HLW is shipped by rail. Under DOE's proposed plan (including an MRS and a new rail spur to Yucca Mountain), the following annual shipments can be expected - 65 dedicated trains, 130 rail casks delivered by regular rail service and, 430 truck shipments.

Under DOE's proposed alternative (no MRS and a new rail spur to Yucca Mountain) all spent fuel is to be shipped directly to the repository, with the shipping mode determined by reactor accessibility. Spent fuel is assumed to be shipped intact, although, in reality, cancellation of the MRS might result in extensive at-reactor consolidation prior to shipment. HLW shipments are the same as under the proposed plan. Under DOE's proposed alternative, the following annual shipments can be expected - 405 rail casks delivered by regular rail service and 1,330 truck shipments.

In addition to DOE's proposed and alternative plans, two other scenarios should be considered. A minimum shipment scenario for the repository would have all spent fuel sent first to the MRS, then shipped to the repository by dedicated trains, and all HLW shipped directly to the repository by rail. The number of dedicated trains can be reduced by almost 60% if the final packaging operations are performed at the repository rather than the MRS. Under the minimum shipment scenario, the repository would receive 25 dedicated trains and 160 rail casks per year.

A second alternative scenario should be considered if the repository site does not have rail access, or if technical and institutional barriers prohibit construction of rail access to the site. Under a truck shipment only scenario, the repository would receive about 3,800 legal weight truck shipments per year. Given the major institutional, environmental and scheduling problems associated with any of the proposed rail spur alternatives, the truck-only scenario should be considered as the most likely scenario unless DOE is able to demonstrate the feasibility of rail access to Yucca Mountain.

Because of the location of reactors and storage sites, nuclear waste shipments to a national repository are guaranteed to affect a large number of transportation corridor states regardless of the modal mix and MRS role. Figure 1.13 shows the current location of existing and proposed nuclear power plants, and Figure 1.14 shows the anticipated weighted distribution of spent fuel during the period of repository operations. Spent fuel is currently stored at about 70 sites in 34 states, mostly east of the Mississippi River. HLW is stored at sites in Washington, Idaho, New York, and South Carolina. (ORNL, 1987) Shipping all of these wastes to one central facility in the east or west by any mode would mean many long distance shipments along many different routes through highly populated and environmentally sensitive areas, and through many state, tribe and local government jurisdictions.

A two-repository system, one in the East and one in the West, could reduce the system-wide transportation impacts considerably. The decision to construct only one repository in the West results in many additional shipments even when an eastern MRS is included in the system. Figures 1.15 and 1.16 show two possible approaches for routing shipments to a repository in Nevada with and without a MRS facility in Tennessee. In either case, perhaps as many as 45 states could be affected to some degree by DOE nuclear waste shipments.

FIGURE 1.13 Location of Existing and Proposed Nuclear Power Plants
(DOE/RW-0006, Rev. 3)

FIGURE 1.14 Weighted Distribution of Spent Fuel at Nuclear Power Plants
--First 70,000 MTHU (DOE/RW-0023)

FIGURE 1.15 Possible Combination of Rail and Truck Routes to MRS
Located in Tennessee and Repository Located in Nevada
(WIEB, 1985)

FIGURE 1.16 Possible Routes for Truck Shipments of Spent Fuel to
Repository Located in Nevada--100% Truck Shipments
(WIEB, 1985)

1.5 Modal Mix and Routing Considerations

The full range of issues associated with routing nuclear waste shipments to a repository at Yucca Mountain cannot be precisely determined at this time because of uncertainties in the DOE nuclear waste program. The role and location of the MRS facility and the modes and routes selected for nuclear waste shipment to Yucca Mountain, will determine which routes within Nevada will be affected. DOE is scheduled to issue draft reports on highway and rail routing and potential implications of U.S. Air Force operations for the selection of routes by the end of 1988.

Issues associated with transportation access to Yucca Mountain are sufficiently complex that DOE is currently evaluating the option of preparing an independent EIS on transportation (Gertz, 1988c). This section of the report is, of necessity, based on DOE's 1986 Environmental Assessment (EA) and preliminary rail routing analyses (MacDougall, 1987; DOE, 1988d; Gertz, 1988b) documents which DOE acknowledges are inadequate for current planning purposes. In preparing this section, NWPO staff and contractors also relied upon an analysis of alternative rail corridors proposed for Lincoln County and the City of Caliente (Rowe, 1988), the Nevada Rail Plan, 1987 Updates, and written comments prepared by the Nevada Department of Transportation (Barry, 1988), informal discussions with members of the SLGPG, and field surveys of highway and rail routes in Clark, Lincoln and Nye Counties.

Highway Routes

DOE's EA for Yucca Mountain assumes that the repository will be connected to regional and national highway networks by construction of a new access road from the repository site to U.S. Highway 95 near Amargosa Valley, approximately 84 miles north of Las Vegas. The EA identifies 6 existing routes which connect various points of entry along Nevada's borders with the repository via U.S. Highway 95. These routes are shown in figures 1.17 and 1.18.

Three of these routes connect to U.S. Highway 95 in Las Vegas:

1. Interstate 15 southbound - Waste shipments would enter Nevada from Utah at Mesquite, and travel southbound on I-15 to the intersection with U.S. Highway 95 in Las Vegas (82 miles).
2. Interstate 15 northbound - Waste shipments would enter Nevada from California at Mountain Pass south of the Town of Jean, and travel northbound on I-15 to the intersection with U.S. Highway 95 in Las Vegas (59 miles).

3. U.S. Highway 93 northbound - Waste shipments would enter Nevada from Arizona at Hoover Dam, and travel northbound on U.S. 93 to the intersection of I-15 and U.S. Highway 95 in Las Vegas (41 miles).

DOE also has identified three potential shipping routes which approach Yucca Mountain from the northern part of the State:

4. Interstate 80 eastbound - Waste shipments would enter Nevada from California at Verdi, travel eastbound on I-80 to Fernley, southbound on U.S. 50 Alternate and U.S. 95 Alternate to Schurz, then southbound on U.S. 95 to the DOE access road near Amargosa Valley (370 miles).
5. U.S. Highway 95 southbound - Waste shipments would enter Nevada from Oregon at McDermitt, travel southbound on U.S. 95 to I-80 at Winnemucca, then eastbound on I-80 to Battle Mountain, southbound on State Route 305 to Austin, eastbound on U.S. 50 to Manhattan, southbound on State Route 376 to Tonopah Summit, westbound on U.S. Highway 6 to Tonopah, then southbound on U.S. 95 to the DOE access road near Amargosa Valley (451 miles).
6. State Route 373 northbound - Waste shipments would enter Nevada from California near Devil's Hole, and travel northbound to the DOE access road near Amargosa Valley (16 miles).

Figure 1.17 - Southern Nevada

- 1, 2, 3, 6 DOE Postulated Highway Routes [to be analyzed]
- - - A, B (UP) DOE Postulated Mainline Rail Routes [to be analyzed]
- - - (A1) (A2) Potential Rail Access Spurs [DOE Preliminary Screening]

- 4, 5 DCE Postulated Highway Routes [to be analyzed]
- +++ C (sp) DCE Postulated Mainline & Branchline Rail Routes [to be analyzed]
- +++ (A3) Potential Rail Access Spur [DCE Preliminary Screening]

The DOE EA evaluated two scenarios for 100% truck transportation of nuclear waste to Yucca Mountain. Scenario I (routes chosen to minimize mileage between origins and destinations) would use all six routes identified in the EA. NWPO staff and contractors have revised DOE's Scenario I based on the new waste acceptance schedule in the DMPA and the legal-weight truck cask capacities and shipment numbers presented in Section 1.1.4 of this Report. While further analysis is required, NWPO staff and contractors believe that the following distribution is probable if all waste is delivered to Yucca Mountain by truck and if the motor carriers are allowed to use all six routes identified in the EA. Under revised Scenario I, the following numbers of shipments will be made during the repository's operating lifetime:

1. Interstate 15 southbound would be the most heavily affected route, carrying about 37,500 truck shipments. I-15 is the major connector route for spent fuel from reactors in the Northeast, and North Central regions, and for HLW from Idaho National Engineering and from West Valley, New York.
2. Interstate 15 northbound would carry about 6,900 shipments of spent fuel originating at reactors in California and Arizona.
3. U.S. Highway 93 northbound would be the second heaviest-impacted route, carrying about 26,500 truck shipments. U.S. 93 is the major connector for reactors in the Southeast and Southwest, and for HLW shipments from the SRP.
4. Interstate 80 eastbound would carry about 600 spent fuel shipments from a reactor in California.
5. U.S. Highway 95 southbound would carry about 3,200 shipments of spent fuel from reactors in Washington and Oregon, and HLW from Hanford.
6. State Route 373 northbound would carry about 1,300 shipments of spent fuel from reactors in California.

Scenario II in the DOE EA evaluates a 100 percent truck shipment scenario where shipments are restricted to the Interstate highway system as much as possible. As with Scenario I above, NWPO staff and contractors have revised Scenario II based on the shipment numbers presented in Section 1.1.4 of this Report. While further analysis is required, NWPO staff and contractors believe that the following distribution of shipments is probable if all waste is delivered to Yucca Mountain by truck and the motor carriers are restricted to the Interstate highway system as much as possible. Under revised Scenario II, the following numbers of shipments will be made during the operating lifetime of the repository:

1. Interstate 15 southbound carries about 40,500 shipments.
2. Interstate 15 northbound carries about 9,000 shipments.
3. U.S. Highway 93 northbound remains unchanged, carrying more than 26,500 shipments.

Until and unless DOE makes otherwise limiting decisions, both scenarios I and II must continue to be evaluated for planning purposes. Given the present absence of rail access to Yucca Mountain, a 100 percent truck shipment scenario is a realistic possibility. Current federal regulations would permit the routing postulated by DOE in both scenarios.

Neither DOE's 1986 EA nor any subsequent DOE studies have yet considered the routing implications of the plan proposed in the DMPA. NWPO staff and contractors have prepared a preliminary analysis based upon the DMPA assumptions, the shipment numbers and modal mix presented in Section 1.1.4. of this report, and previous DOE routing analyses of national shipments. (Philpott, 1985a, 1985b) Under DOE's DMPA, total truck shipments to the repository are dramatically reduced because most spent fuel is shipped by rail from the MRS facility. About 4,500 truck shipments of HLW and about 2,700 truck shipments of spent fuel from western reactors would be received during the operating lifetime of the repository. NWPO staff and contractors believe that the most probable distribution of these shipments, assuming maximum use of the Interstate highway system, would be:

1. Interstate 15 southbound would carry about 2,300 truck shipments of HLW from Hanford, Idaho, and West Valley, and about 1,000 truck shipments of spent fuel from reactors in Oregon and Washington.
2. Interstate 15 northbound would carry about 1,700 truck shipments of spent fuel from reactors in California and Arizona.
3. U.S. Highway 93 northbound would carry about 2,200 truck shipments of HLW from the SRP.

Because of the preliminary stage of routing decisions by DOE, it is difficult to fully assess the impacts of truck shipments to the repository and to develop realistic impact mitigation plans. However, NWPO staff and contractors believe that available information suggests further study in two areas:

1. Impact of truck shipments through Las Vegas. Under the DOE proposed plan, which relies heavily on rail transportation, about 7,200 truck shipments would go through Las Vegas during the lifetime of the repository. Under the 100 percent truck shipment scenario, which NWPO

believes is a realistic possibility, the number of truck shipments through Las Vegas could be as great as 76,000. According to NDOT, any assessment of truck shipments through Las Vegas, "needs to include the fact that in 1987, the movement of I-15 south to U.S. 95 west is at 260% of capacity, by the year 2008 it will be in the area of 500 percent of capacity, greatly increasing the probability of accidents." (Barry, 1988) NWPO feels that DOE must demonstrate that these shipments can be conducted without unacceptable risks to public health and safety, and that the perceived risk of transportation will not result in unacceptable socioeconomic impacts. NWPO further believes that DOE should evaluate the comparative costs and risks of relocating highway routes to bypass highly populated areas and avoid route segments with highly congested traffic patterns.

2. Impact of truck shipments through Boulder City and Henderson. Under the DOE proposed plan, about 2,200 truck shipments would go across Hoover Dam and through Boulder City and Henderson during the operating lifetime of the repository. Under a 100 percent truck shipment scenario, the number of truck shipments across Hoover Dam and through Boulder City and Henderson could be as great as 26,500. According to NDOT, any assessment of truck shipments through Boulder City and Henderson, "needs to indicate that in the near future the capacity of the Dam is expected to only handle 25 percent of the expected loading. This will greatly increase the probability of an accident at the Dam." (Barry, 1988) Shipments on U.S. 93 across Hoover Dam are permissible under current federal routing regulations, and NWPO is not aware of any formal commitment by DOE that this route will not be used for shipments to Yucca Mountain.

Rail Routing

Rail routing of shipments to Yucca Mountain is somewhat less complicated than highway routing because there are fewer options for national shipments to Nevada. On the other hand, rail routing is complicated by the need to construct at least one new rail access spur. DOE's 1986 EA postulated only two possible rail routes to Yucca Mountain, both on the Union Pacific system, linked to the repository by a new 100-mile long rail spur connecting with the Union Pacific at Dike Siding, North of Las Vegas. The two routes identified by DOE in the EA shown in Figure 1.15, are:

1. Union Pacific westbound - Waste shipments would enter Nevada from Utah near Panaca Summit, and travel westbound through Caliente and Moapa to Dike Siding (135 miles).

2. Union Pacific eastbound - Waste shipments would enter Nevada from California south of the town of Jean and travel eastbound through Jean, Arden, Las Vegas, and North Las Vegas to Dike Siding (57 miles).

DOE subsequently (March, 1988) dropped consideration of a new rail connection at Dike Siding in favor of Valley Siding, also north of Las Vegas; it identified an alternative connection on the Union Pacific at Jean (Stateline) Siding, south of Las Vegas; and it identified a new alternative connection with the Southern Pacific mainline at Schurz via the Schurz-Mina branchline and construction of a new 200 mile long access spur to Yucca Mountain (DOE, 1988d). These routes are shown in Figure 1.15. Lincoln County has also identified four alternative corridors for connecting Yucca Mountain with the Union Pacific. (Rowe, 1988) The Lincoln County alternatives, two of which involve inter-modal transfer (rail to truck), would bypass Las Vegas. On July 20, 1988, DOE indicated that it would not consider rail or highway access to Yucca Mountain via the Lincoln County routes, although DOE later informed Lincoln County that the additional alternatives would be studied. (Gertz, 1988d)

DOE's EA for Yucca Mountain evaluated two scenarios for 100 percent rail shipments to Yucca Mountain with and without an MRS facility. The distribution of shipments by route was identical:

1. Union Pacific westbound carries about 74 percent of the spent fuel shipments and all of the HLW shipments.
2. Union Pacific eastbound carries about 26 percent of the spent fuel shipments.

Neither DOE's 1986 EA nor any subsequent DOE studies have yet considered the routing implications of the plan proposed in the DMPA. NWPO staff and contractors have prepared a preliminary rail shipment analysis based on the assumptions in DOE's DMPA and the shipment numbers presented in Section 1.1.4 of this report. While further analysis is required, NWPO staff and contractors believe that the following distribution is probable, if the MRS is located east of the Mississippi River and if a new rail spur is, in fact, built to Yucca Mountain. The following numbers of shipments will occur during the repository's operating lifetime:

1. Union Pacific westbound carries 1,388 dedicated trains of consolidated spent fuel and hardware/secondary wastes from the MRS; 147 rail casks of spent fuel from reactors in Washington; and 1,676 rail casks of HLW from Hanford, Idaho, Savannah River, and West Valley.
2. Union Pacific eastbound carries 268 rail casks of spent fuel from reactors in California.

Because of the preliminary stage of routing decisions by DOE, it is difficult to fully assess the impacts of rail shipments to the repository and to develop realistic mitigation plans. However, NWPO staff and contractors believe that the available information indicates several areas requiring further study:

1. Impact of rail shipments on Caliente, Moapa, and other towns along the Union Pacific westbound;
2. Impact of rail shipments on Las Vegas, especially if the repository access spur is built at Jean (Stateline) Siding;
3. Impact of rail shipments on North Las Vegas if Union Pacific rail yards are relocated;
4. Feasibility of rail transportation to Yucca Mountain. The site presently lacks rail access. A minimum of 100 miles of new rail spur must be constructed to connect with the nearest mainline railroad, and more than 200 miles of new construction and upgrading may be required depending upon the access route selected. Three of the six initial access routes selected by DOE failed a preliminary environmental screening (DOE, 1988d). Each of the three routes still under consideration involve one or more major problems such as difficult terrain, Indian reservation lands and ceded lands subject to treaty claims, environmentally sensitive areas including areas designated for wilderness study, and land use conflicts with U.S. Air Force and private industrial operations. Land acquisition and environmental approval may be extremely difficult and time consuming if not impossible. Even if rail transportation proves feasible, NWPO staff and contractors believe that the cost of rail transportation may greatly exceed the cost of all truck transportation or the cost of intermodal transportation with rail-to-truck transfer at a location along an existing mainline railroad.
5. Potential conflicts with U.S. Air Force operations. This is a potential concern regarding rail access to Yucca Mountain. DOE's 1986 EA identified proximity of the proposed Dike Siding - Yucca Mountain rail spur to U.S. Air Force bombing ranges in the vicinity of Indian Springs as a potentially adverse condition. The potentially adverse condition was stated by DOE as, "Any local condition that could cause the transportation-related costs, environmental impacts, or risk to public health and safety from waste transportation operations to be significantly greater than those projected for other comparable siting options." (p. 6-109)

DOE's EA concluded, "Since the risk associated with the proximity of the rail spur to the USAF bombing ranges has yet to be quantified, it cannot be concluded that Yucca Mountain does not possess this potentially adverse condition. Consequently, the evidence indicates that this potentially adverse condition is present at Yucca Mountain." (p. 6-110)

While DOE has dropped the Dike Siding option, NWPO staff and contractors believe that the same concern applies equally to the Valley Siding option identified by DOE (DOE, 1988d), and may also apply to DOE's other rail access routing options.

6. Impacts of rail transportation on Nevada Indian Tribes. The vast majority of rail shipments to Yucca Mountain are expected to occur on the Union Pacific railroad through the Moapa Paiute Indian Reservation. Construction of new rail access to Yucca Mountain may affect the Moapa Paiute Indian Reservation, the Walker River Indian Reservation, and ceded treaty lands claimed by the Western Shoshone Nation. NWPO believes that DOE must evaluate the impacts of shipments through the construction of Indian lands, and the implications of potential tribal regulation of shipments to Yucca Mountain.

1.6 Nuclear Waste Transportation Safety Issues

Throughout much of the United States, state, tribal and local officials and members of the general public are concerned about the safety of nuclear waste shipments to a repository and to a MRS facility. Evidence of this concern is overwhelming. Since 1983, 24 states and 20 Indian tribes have been involved in DOE's repository and MRS siting programs. These states and tribes have been unanimous in their concern about transportation safety and have submitted hundreds of pages of critical technical comments on DOE's transportation plans, EAs for the first repository and MRS facility, and the Draft Area Recommendation Report for the Crystalline Repository Project. (See for example DOE, 1980, 1985, 1986a, 1986b, 1986c, 1986d, 1986e, 1986g, 1986h, 1987d, 1988c) Nevada and 17 other states and local governments joined the State of Wisconsin's 1984 petition for rulemaking to the NRC seeking comprehensive licensing and stricter regulation of all spent fuel shipments. (Felton, 1985) The NRC denied the request in October, 1986. (Chilk, 1986). In July 1988 the governors of 19 western states adopted a resolution urging DOE to evaluate regional transportation safety impacts as part of the environmental impact statement for a repository at Yucca Mountain. The safety concerns of states, tribes, and local governments have also been documented in studies and reports funded by DOE. (Pellettieri, 1985; Coakley, 1987; Foster, 1987; WIEB, 1988)

In response, DOE has argued that state and public concerns about safety reflect an exaggerated perception of risk. The DOE insists that the actual risk of nuclear waste transportation is extremely low compared to other hazards, and that the level of risk is socially acceptable. (DOE, 1985, 1986e, 1986g, 1986h, 1986i, 1987c) DOE's position is supported by a number of reports and studies. (see for example OTA, 1985, 1986; NRC, 1977; Fisher, 1987, LaHS, 1987; Sandoval, 1983; Cashwell, 1986) NWPO staff and contractors have reviewed these documents, as well as others listed in the reference section of this report. Based on these reviews, NWPO believes that DOE's position is based primarily upon the following supporting arguments:

1. the nuclear industry has had an excellent safety record in transporting spent nuclear fuel over the past three decades - accidents have occurred, but there have been no significant radiation releases and no deaths or injuries from radiation exposure (Grimm, 1987; Brodnick, 1988; McClure, 1988);
2. the radiation emitted by shipping casks during routine operations is insignificant compared to natural background radiation and will not result in adverse health effects - the maximum annual dose to a person residing 100 feet from a transportation route would be 0.002 to 0.008 rem (DOE, 1986e);
3. the probability of a severe transportation accident is extremely low - about one severe accident every ten years is expected at the anticipated level of annual shipments to the repository (Fisher, 1987, LaHS, 1987; LaHS, et al, 1987);
4. The NRC and the DOT have established a comprehensive system of safety regulations which reduce the likelihood of severe accidents during nuclear waste transportation; these regulations will be reviewed, and revised if necessary, prior to the beginning of shipments to a repository; (DOE, 1986h)
5. even in the event of a severe accident, the shipping cask is expected to prevent any significant radioactive releases or exposures - the maximum dose received by an individual at the scene of the most severe accident would be about 10 to 25 rems (no adverse health effects are expected from exposures less than 50 rems), and a worst-case accident in an urban area involving widespread dispersal of released radionuclides and no cleanup would produce no more than 13 to 22 cancer deaths over 50 years. (DOE, 1986e)

DOE's position has been criticized by a number of recent reports and studies, some conducted by or prepared for states under consideration for repository siting or located along transportation

corridors to potential repository sites. (see for example, Audin, 1987; Halstead, et al, 1987; Kleinhans, 1987; Liverman, 1985; Resnikoff, 1983) NWPO staff and contractors have reviewed these documents, as well as others listed in the references section of this report. Based on these reviews, NWPO believes that the following criticisms of DOE's supporting arguments merit further investigation:

1. The nuclear industry's transportation safety record is excellent, but it is not perfect - accidents have occurred, equipment has failed during shipments, and there has been at least one case of attempted sabotage of a rail shipment. (Audin, 1987, Brodnick, 1988; Earl, 1986; Friederich, 1986) The industry's past record cannot be used to predict the safety of future shipments because of major changes in the number of shipments (up to 3,800 truck shipments per year to the repository, compared to less than 1,800 truck shipments between 1964 and 1986); anticipated increases in the average distance of shipments to a repository at Yucca Mountain compared to the average distances of past shipments (NWPO estimates that the average truck shipment to Yucca Mountain would be about 2,000 miles under the 100% truck scenario, compared to an average of about 450 miles for utility truck shipments between 1984 and 1986; dedicated train shipments from an MRS at Oak Ridge to a repository at Yucca Mountain would be about 2,400 miles long, compared to an average of about 550 miles for utility dedicated train shipments between 1984 and 1986); (Cashwell, 1986; Grella, 1987) and other potential changes in the transportation environment resulting from higher speed limits, deregulation of the rail and trucking industries and potentially higher rates of infrastructure failures. Moreover, there is little evidence to suggest that DOE's transportation safety record will be as good as that of the nuclear utilities. DOE's accident rate for shipments of defense nuclear materials is slightly below the national average for accidents involving heavy trucks. (Coyle, 1988) A recent report by the U.S. General Accounting Office documented numerous safety-related concerns with some of the containers used for DOE nuclear materials shipments, and reported that DOE used and uncertified cask for 13 shipments of spent reactor fuel through New York City in 1985. (GAO, 1988) During recent DOE shipments of spent fuel and core debris to INEL, there have been at least one instance of equipment failure, one violation of special train operating rules, and one gradecrossing accident. (Grimm, 1987; Battelle Memorial Institute, 1988; Zegel, 1988)
2. Radiation exposure and/or contamination from shipping casks may exceed federal limits during routine operations as a result of equipment failure or human error; in the past casks have operated with excessive levels of surface

contamination. (Audin, 1987; NRC, 1981b, 1983b) Exposure to low levels of radiation may cause health effects less obvious than cancer. Certain segments of the human population - young children, pregnant women, and persons with long-term exposure to elevated background radiation resulting from radon in soil or radium in drinking water - may be vulnerable to adverse health effects from any additional exposure. (Liverman, 1985)

3. The computer models and data sources used in DOE-sponsored probabilistic risk assessments (PRA), and the appropriate use of PRA results in communicating risk to the general public, are hotly debated topics among professional risk analysts. (Liverman, 1985; Freudenberg, 1988) Changes in assumptions and data can produce significant changes in PRA results. The probability of severe transportation accidents may be significantly higher than calculated by DOE, particularly since DOE's probability estimates are based on national accident data rather than accident data for the specific routes that will be used for shipments to the repository, and since DOE has not taken into account unusual hazards along specific routes which could make accidents more severe and/or make emergency response measures more difficult. One study conducted for the State of Utah concluded that reasonable changes in assumptions and data resulted in a scenario which "doubled" the routine risks, and increased accident risks 1250 times. (Liverman, 1985)
4. Enforcement of existing NRC and DOT regulations is currently inadequate at a time when the number of shipments is relatively small compared to the number of shipments expected once repository operations begin. (Halstead, 1987) Between 1983 and 1986, there were about 360 truck shipments of civilian spent fuel by NRC licensees. NRC inspected only 43% at origin or destination. (Grella, 1987) In 1984, DOT employed only 41 full-time inspectors nationally for all rail and truck shipments at all hazardous materials, including radioactive materials. A recent OTA study concluded that, "the number of inspectors is insufficient to ensure adequate inspection levels." (OTA, 1986)

Concern about inadequate federal enforcement has led several states to establish their own inspection programs for spent fuel shipment. (Nash, 1985; McDonnell, 1987; Mortensen, N.D.)

5. the assumption that shipping casks will survive severe accidents or terrorist incidents is not convincing, since the performance standards used in cask licensing may not reflect credible worst case accident or attack conditions,

and since none of the casks currently in use have actually been tested to determine if they comply with current standards. (Audin, 1987; Resnikoff, 1983, 1986; Furber, 1988) Tests conducted with full-sized, obsolete models did not subject the casks to worst case accident and sabotage conditions. (Audin, n.d.; Strohl, 1984; Resnikoff, 1984; Halstead, 1986) Once operational, casks may not perform according to design standards. Several casks certified by the NRC have experienced problems such as excess surface contamination, faulty pressure relief valves, and questionable fuel basket performance, etc., forcing the NRC to withdraw certification or restrict cask use. (Audin, 1987; Resnikoff, 1983, 1984, 1986; Furber, 1988; Halstead, 1986; NRC, 1981b; Strohl, 1984)

Perhaps the most important area of technical dispute between DOE and the states involves DOE's plan to develop a new generation of shipping casks for transporting nuclear waste to the repository and the MRS facility. NWPO staff and contractors believe that the entire range of safety issues should be reexamined before DOE finalizes plans for the new casks. These issues include: performance of consolidated spent fuel and solidified HLW in the event of a severe accident; implications of reduced cask shielding and cooling requirements; inadequacy of the current NRC performance standards and the of NRC requirements for physical testing of full scale casks prior to certification; and quality assurance and quality control programs for cask manufacture, operation, and maintenance. Related safety issues include certification of operating personnel, early selection of safest routes for shipments by DOE, inspections and escorts for shipments enroute, emergency response planning and training, and protection of shipments from terrorist attack or sabotage.

In a recent fact sheet, "Yucca Mountain: Transportation to a Repository," published in March 1988, NWPO summarized its concerns, some of which have been acknowledged by DOE (Callaghan, 1988; Kouts, 1988; WIEB, 1988a), about the performance of the proposed new shipping casks:

Crash tests of older, heavier shipping containers or casks (not filled with spent fuel) demonstrated that, if properly built and maintained, they could withstand tremendous impacts. However, the casks that would be used for repository shipments would be built of lighter materials and their response to accidents is yet untested. Knowledge of potential cask response is most important since the unprecedented volume of nuclear waste shipments on Nevada's present transportation system would likely result in accidents. That would increase risk to the population along the routes and raise the specter of disaster among the public.

1.7 DOE Institutional Issues Associated With Nuclear Waste Transportation

There are many institutional issues associated with nuclear waste transportation to a repository, including crosscutting issues which may also be categorized as policy, regulatory, technical and operational. The basic, underlying institutional issue involves state, local, Indian tribe and public participation in DOE transportation planning activities. More specific issues are discussed in DOE's Transportation Institutional Plan published in August 1986.

1.7.1 Issues Identified in DOE's Transportation Institutional Plan and Nevada's Responses

DOE's 1986 Transportation Institutional Plan identified 16 crosscutting issue areas, each treated by a separate discussion paper. These issues were, in fact, largely formulated and clarified as a result of intensive states/tribes intervention in the process by which the Institutional Plan was developed.

Some of these issues have been at least partially resolved by the new transportation provisions of the NWPA, reauthorization of the Price-Anderson Act, DOE agreements with other federal agencies, and by agreements between OCRWM and DOE Defense Programs. Some of these issues cannot be fully addressed at the present time, however, because of uncertainties about the MRS proposal, DOE's delayed schedule for important transportation program decisions, and upcoming Congressional consideration of Hazardous Materials Transportation Act (HMTA) reauthorization.

NWPO staff and contractors have prepared the following summaries of the 16 issue areas identified in the Transportation Institutional Plan. The DOE positions were summarized directly from the Transportation Institutional Plan, except where superceded by federal legislation or federal interagency agreements. The Nevada positions represent positions adopted or recommended by NWPO.

1. Transportation of Defense Waste

- a. DOE-Stated Issues: Defense waste shipments are not subject to all NRC and DOT regulations which apply to civilian SNF shipments. Defense shipments may be classified for national security reasons. Accident liability is unclear.
- b. DOE position: Defense shipments will comply with "applicable Federal regulations." Defense HLW shipments "will not be classified." Liability coverage is provided under carrier insurance and Price-Anderson.

- c. NWPO Position: Defense shipments should be subject to all NRC and DOT regulations. Defense shipments should not be classified. Current liability provisions of Price Anderson do not explicitly apply to certain transportation situations (such as sabotage or terrorist attacks) and do not adequately address contractor negligence.

2. Prenotification

- a. DOE-Stated Issues: NRC regulations require prenotification to states for civilian SNF shipments. NWPA extends these regulations to defense shipments, but not to DOE SNF and HLW shipments for research and development activities.
- b. DOE position: DOE will comply with NRC regulations where required. Some Defense shipments may be classified. DOE will provide "courtesy" notification on shipments for research and development. DOE is developing real-time tracking technologies, including satellite tracking, which may eliminate need for prenotification.
- c. NWPO position: NRC prenotification regulations should apply to all DOE shipments. Research on real-time tracking should continue.

3. Physical Protection Procedures

- a. DOE-Stated Issues: NRC regulations designed to protect SNF shipments from theft or sabotage apply only to civilian shipments by NRC licensees. They do not apply to DOE shipments.
- b. DOE position: DOE has adopted guidelines which are "as effective" as NRC regulations in limiting possibility of theft and sabotage.
- c. NWPO position: NRC physical protection requirement should be strengthened. All DOE shipments should be subject to NRC regulations.

4. Highway Routing

- a. DOE-Stated Issues: DOT has established routing regulations (HM-164) for highway shipments of SNF and HLW which generally restrict shipments to Interstate highway system or state-designated alternative route.
- b. DOE position: DOE supports current DOT regulations, but will review highway routing issues and develop routing criteria prior to shipments to the repository.

- c. NWPO position: Current DOT regulations are inadequate because they allow unrestricted shipments through highly populated areas along the Interstate highway system and because carriers are allowed to select routes actually used. DOE should designate routes to allow for proper planning by State and local governments. State and local governments should be permitted to protect their citizens by regulating as permitted under federal laws.

5. Rail Routing

- a. DOE-Stated Issues: No Federal rail routing regulations have been promulgated.
- b. DOE position: DOE supports the current DOT position that rail routing regulations are not needed, but will review issues and develop routing criteria prior to shipments to the repository.
- c. NWPO position: DOT should promulgate rail routing regulations, DOE should designate routes, in compliance with such regulations. States and Indian Tribes should be full participants in the formulation of DOT regulations and in the selection of routes.

6. Highway and Rail Inspection and Enforcement

- a. DOE-Stated Issues: NRC and DOT regulations provide for inspections and enforcement. States may participate in DOT programs and enforce federal regulations. State fees to support enforcement and inspection programs have unclear legal status.
- b. DOE position: DOE will review the adequacy of current inspection regulations and take necessary actions prior to shipments to a repository.
- c. NWPO position: NRC and DOT regulations are not adequate. There is inadequate federal enforcement because there are too few federal inspectors. States must have inspection programs which are funded by fees.

7. Emergency Response

- a. DOE-Stated Issues: Emergency response needs, capabilities, and resources require further study. DOE and states interpret Section 180(c) of NWPPA differently, especially congressional intent regarding timing of implementation.

b. DOE position: DOE is working with FEMA, DOT, state, tribes, regional organizations, and carriers to assess emergency response needs and capabilities. DOE will provide technical and financial assistance to states 3 to 5 years prior to shipments to the repository.

c. NWPO position: Section 180(c) should be implemented immediately to provide funding to corridor states for emergency response planning. Current training opportunities are inadequate. DOE should designate routes so that route-specific emergency response plans, drills, and exercises may be conducted. Many operational issues remain unresolved, such as availability of specialized personnel and equipment, and ownership of equipment.

8. Liability Coverage for Transportation to NWPA Facilities

a. DOE-Stated Issues: Current carrier insurance requirements and Price-Anderson Act provisions may not adequately compensate accident victims and may not adequately protect affected state, local, and tribal governments.

b. DOE position: Current carrier insurance requirements and Price-Anderson Act coverage are adequate.

c. NWPO position: Legal liability of State, local governments and tribes needs to be analyzed.

9. Cask Design and Testing

a. DOE-Stated Issues: DOE policy regarding public participation in the DOE cask development program is unclear. Current NRC performance standards for cask design may or may not adequately reflect credible worst-case accident conditions. The need for physical testing of full scale casks prior to certification by NRC is a highly controversial matter.

b. DOE position: Cask development program has adequate provisions for public participation. NRC performance standards are adequate. Full-scale testing is not required, but DOE will review issues and adopt position on cask testing.

c. NWPO position: Early implementation of Section 180(c) financial and technical assistance needed to facilitate state, tribe, and local participation in cask development program. Current NRC performance standards (crash, drop, fire and immersion tests) do not adequately reflect credible worst-case accident conditions. Full scale third-party testing should be required prior to NRC certification of new designs.

10. Overweight Truck Shipments

- a. DOE-Stated Issues: Potential costs and benefits of overweight truck reduction in number of highway shipments, highway damage, state permit requirements, and safety impacts are not well documented.
- b. DOE position: DOE plans to study overweight truck issues and make decision on possible use for shipments to repository and MRS in early 1990s. Development of OWT cask designs has been deferred.
- c. NWPO position: Without extensive improvements, Nevada's highways cannot absorb overweight loads for a long period of time. State will reserve its right to regulate and/or restrict overweight truck shipments.

11. Rail Service Analysis

- a. DOE-Stated Issues: Comparative costs and risks of regular rail service, dedicated train service and special train service (operating under speed limits and special passing rules) require further study.
- b. DOE position: DOE is evaluating regular and dedicated rail service. DOE opposes special train service requirements.
- c. NWPO position: DOE studies should include special trains, particularly experience of recent shipping campaigns (Cooper Station-Morris, Monticello-Morris, and TMI-Idaho). Studies should include route specific inventories of rail condition, rail bed and rail crossings, bridges, and tunnels.

12. Mixture of Transportation Modes

- a. DOE-Stated Issues: What is the most desirable mix of shipments by truck, rail, and barge, given relative costs and risks.
- b. DOE position: DOE is studying full range of issues and will determine appropriate modal mix prior to awarding contracts for cask fleet development.
- c. NWPO position: DOE should specify modal mix as early as possible in the planning process so that a systems engineering approach can be applied to transportation planning. Selection of mode should be based on safety considerations. DOE should evaluate cost of expanded use of rail transportation for reactors which currently lack rail access. DOE studies must acknowledge the

current absence of rail access to Yucca Mountain and develop contingency plans if rail access is not available.

13. Infrastructure Improvements

- a. DOE-Stated Issues: Unresolved issues include the need for and cost of infrastructure improvements in the vicinity of the repository and facilities shipping SNF and HLW to the repository and Federal responsibility for funding.
- b. DOE position: DOE will study infrastructure needs but "believes that NWPAs transportation will not create any unique needs for infrastructure improvements."
- c. NWPO position: Improvements will be necessary to protect public health and safety and the environment, including possible major projects such as highway bypass around Las Vegas. DOE should be responsible for obtaining Federal funding for needed improvements, and for demonstrating that such funding will be available before adopting plans which assume infrastructure improvements.

14. OCRWM Training Standards

- a. DOE-Stated Issues: What are appropriate training standards for personnel involved in loading and unloading, vehicle operation, equipment maintenance, emergency response, and other related activities.
- b. DOE position: DOE is studying requirements and will establish uniform training standards and programs.
- c. NWPO position: State, tribe, and local governments should be involved in development of training standards and certification procedures.

15. Transportation Operational Procedures

- a. DOE-Stated Issues: When and how should operational procedures for materials handling, routing, inspections, maintenance, training, and other related activities be developed, implemented and monitored.
- b. DOE position: DOE will study requirements and publish operational plan. DOE is currently studying general issues such as carrier rate negotiation based on operational experience of DOE weapons programs, electric utilities and transport companies, and such specific issues such as use of truck convoys, safe havens, and stop time restrictions.

- c. NWPO position: DOE and Nevada studies should cover entire range of operational issues including federal versus private ownership of casks and other equipment, assessment of the future viability of the nation's Interstate highway system and associated bridges, and potential rail system mergers.

16. State, Tribal, and Local Regulation of Radioactive Waste Transportation

- a. DOE-Stated Issues: What are appropriate levels of State, tribal and local regulation.
- b. DOE position: Federal regulations generally preempt State, Tribal and local regulations. DOE will comply with "all applicable and valid" State, Tribal, and local regulations.
- c. NWPO position: State, tribal, and local regulations may be necessary to protect public health and safety and the environment where Federal regulations are inadequate or not enforced. Tribal authority could be a special problem in Nevada if DOE proposes to build new rail access routes across Indian reservation lands.

1.8 Summary

1.8.1 Consideration of Transportation in the Site Selection Process

From the standpoint of transportation impacts, DOE's own analysis in the 1986 Environmental Assessments indicates that Yucca Mountain is one of the least desirable locations among those considered for a national nuclear waste repository. Table 1.6 summarizes the site-related transportation impacts documented in the environmental assessments for the first repository. Compared to other sites considered by DOE, Yucca Mountain was judged to have the worst accessibility to the national transportation network, the most difficult construction requirements for access to the national rail network, and the greatest system transportation costs and risks of non-radiological accidents.

TABLE 1.6

COMPARISON OF TRANSPORTATION IMPACTS FOR POTENTIAL 1ST REPOSITORY CANDIDATE SITES

IMPACT ISSUES	POTENTIAL SITES				
	DAVIS CANYON, UTAH	DEAF SMITH, TEXAS	HANFORD, WASHINGTON	RIGHTON MISSISSIPPI	YUCCA MOUNTAIN, NEVADA
PROXIMITY TO NATIONAL TRANSPORTATION NETWORK					
Nearest Mainline Railroad (miles)	74	25	51	17	100
Nearest Alternative Carrier					
Mainline Railroad (miles)	NA	40	101	26	265
Nearest Interstate Highway (miles)	89	14	28	26	100
Nearest Alternative Route Interstate Highway (miles)	198	200	72	84	208
MINIMUM REQUIREMENTS FOR ACCESS TO THE NATIONAL TRANSPORTATION NETWORK					
<u>Rail Access</u>					
New Construction (miles)	39	26	3	26	100
Cost (Million 1985 Dollars)	142	21	6	16	151
<u>Truck Access</u>					
New Construction (miles)	25	1	3	4	16
Upgrading (miles)	0	4	0	23	0
Cost (Millions of 1985 Dollars)	79	2	6	9	12
SYSTEM IMPACTS OF SPENT FUEL SHIPMENTS FROM THE MRS FACILITY TO THE REPOSITORY*					
<u>Total Cask Miles for Shipments</u>					
100-ton Casks (one-way million miles)	20.6	15.3	25.0	6.3	26.3
150-ton Casks (one-way million miles)	6.7	5.0	8.7	2.1	11.2
<u>Total Transportation Cost</u>					
100-ton Casks (Million 1985 Dollars)	881	771	876	509	974
150-ton Casks (Million 1985 Dollars)	386	344	431	252	569
<u>Nonradiological Accident Risk**</u>					
Injuries	216	156	230	57	266
Fatalities	20	15	22	5	25

* Assumes Oak Ridge, TN location for MRS; all spent fuel shipped to the repository from the MRS by dedicated trains; includes casks carrying secondary wastes from rod consolidation at the MRS

** Assumes shipment in 100-ton casks, spent fuel shipments only

Source: DOE, 1986a, 1986b, 1986c, 1986d, 1986e

Proximity to the national transportation network is highly desirable in siting a repository. The key measures are distance from the Interstate highway system and distance from the mainline rail system. Access to the national transportation network enhances transportation safety and reliability and reduces costs. Rail access is particularly important because DOE plans to use rail for all spent fuel shipments from the MRS to the repository, and for most of the defense waste shipments to the repository. Yucca Mountain has the poorest primary rail and highway access of all the sites considered for the first and second repositories. Yucca Mountain is not only farther from the interstate highway and national rail systems than any other site, but the Nevada site also has fewer viable alternative connections than any site except one.

Construction and upgrading requirements for access to the national transportation network are an important consideration in siting a repository. Short distance and gentle terrain usually mean less environmental disruption, fewer institutional conflicts and lower costs. Rail access to Yucca Mountain will require more miles of new spur construction and higher costs than any other previously-screened first repository site. Only one site is comparable in terms of difficulty of terrain, potential land use conflicts and environmental disruption, and this site (Davis Canyon) was dropped from further consideration in large part because of these factors. Costs for truck access to Yucca Mountain are exceeded only by one previously screened site. However, DOE's cost figures for truck access do not include building a bypass around Las Vegas or any upgrading of existing highways in Nevada, to which DOE has committed informally in discussions with State and local officials. DOE's cost figures also do not include land acquisition for rail or truck access.

Reduction in system-wide transportation impacts is also an important consideration in repository siting. Of the five sites considered for the first repository, DOE's environmental assessments show that Yucca Mountain is the least desirable site for a waste system in which spent fuel is first shipped to an eastern MRS facility, then shipped by dedicated trains from the MRS to a repository. The results of DOE's analysis could be significantly different if the MRS facility location changes, or if the MRS ships waste to the repository by truck. However, to the extent that DOE's calculations are valid, locating a repository at Yucca Mountain rather than one of the other sites means more casks will be required to travel more miles, more dollars will be spent on transportation, and by DOE's own estimates more people will be injured in nonradiological accidents.

1.8.2 General Institutional Issues

In the 1985 Mission Plan, DOE committed to develop the institutional and technical aspects of the national nuclear waste transportation system through an interactive process addressing and resolving the concerns of, "[i]ndividuals who live along potential transportation routes," and, "the State, tribal, and local officials representing them." After initially prohibiting states from using DOE grants to study transportation impacts, DOE allowed state participation in the development of the Transportation Business Plan (January 1986) and the Transportation Institutional Plan (August 1986). NWPO staff believe that the general success of these efforts was due to DOE's new willingness to encourage state input and to the active and collective involvement of the states and tribes under consideration for repository and MRS siting. With the deferral of second repository siting activities in May 1986, DOE continued the rhetoric of broad state participation, but began to withdraw the financial assistance necessary for state involvement. DOE offered instead to fund regional transportation planning groups, an alternative rejected by most of the second repository states. Potential transportation corridor states received no direct funding from DOE, and were able to participate only to the extent that funding was made available by DOE to regional state bodies such as the National Conference of State Legislatures [NCSL], the Southern States Energy Board and the Western Interstate Energy Board [WIEB] or by the State of Nevada to individual corridor states. The withdrawal of DOE funding from the first repository states after elimination of their sites further reduced opportunities for meaningful state involvement in national transportation planning.

In the opinion of NWPO staff, DOE has abandoned its earlier commitment to widespread public involvement. DOE's retreat from public participation has occurred at the very time that DOE is beginning the most important phase of transportation system development - the development of routing plans, new shipping cask designs, and operational procedures for shipments to a repository at Yucca Mountain. NWPO staff believe that broad public participation in transportation planning is seriously hindered by DOE actions and inactions in three areas:

1. DOE has not formally adopted the procedures to be used in selecting routes for nuclear waste shipment to the repository and to the MRS. While identification of routes between the MRS and the repository must await designation of the MRS site, there is no reason for delaying identification of the preferred routes for shipments by each mode under consideration (highway, rail, barge) from reactors to the repository in a system without an MRS, the preferred routes for direct shipments by rail and truck from western reactors to the repository and the preferred routes for shipments by rail and truck from West Valley, New York, and the three DOE defense waste storage

facilities to the repository. Until these actions are taken, potentially affected states and tribes cannot be identified and will lose the opportunity for involvement in development of DOE's Section 175 Report on transportation impacts and emergency response needs; scoping for DOE's EIS on repository development at Yucca Mountain; and development of the shipping casks and operational procedures which will directly affect them once shipments to Yucca Mountain begin. DOE's 1988 Draft Mission Plan Amendment contains no definite schedule for identification of routes - a crucial first step in any meaningful HLW transportation planning process.

2. DOE has interpreted Section 180(c) of the NWPAA requiring technical and financial assistance to states for risk reduction and emergency response planning in a manner which would limit rather than expand public participation. DOE's 1988 Draft Mission Plan Amendment focuses upon federal and contractor activities, a clear departure from congressional intent that the states should play the key role in developing programs for tribal and local officials. Moreover, DOE plans to provide assistance to the states "3 to 5 years before shipments begin," which by DOE's schedule means about 1998 to 2000 for both the repository and the MRS. Delaying assistance to states and tribes denies financial resources necessary for the whole range of transportation planning activities intended by Congress, and could prevent all states except Nevada from participating in the transportation planning process until after all of the important decisions have been made.
3. DOE has made no provisions for transportation planning assistance to Nevada Indian tribes affected by shipments to repository at Yucca Mountain. NWPO believes that Congress intended earlier implementation of Section 180(c), which would make the State of Nevada responsible for assisting the Tribes. If DOE adheres to its plan of delaying Section 180(c) assistance to the State, DOE is responsible for providing direct funding to the Tribes as soon as possible.

1.8.3 Critical Uncertainties Regarding the DOE Transportation Plan

The Draft 1988 Mission Plan Amendment provides only partial details about DOE's proposed system for nuclear waste transportation. The transportation system proposed in the Mission Plan Amendment reflects changes in the national program mandated by the NWPAA of 1987. The most significant change is congressional authorization of a MRS facility. The transportation system proposed by DOE in the Mission Plan Amendment is based upon the assumption that a MRS will be included in the national waste management system and that all or

most of the nation's civilian spent fuel will be shipped to the repository from the MRS facility by dedicated trains. The current plan calls for defense and civilian HLW to be shipped directly to the repository, predominately by rail, but to some undefined extent also by truck. Inclusion of a MRS facility in the transportation system raises questions about the relevancy of previous DOE transportation plans, including the transportation analysis in the 1986 EA, the 1986 Transportation Business Plan, and the 1986 Transportation Institutional Plan. The following critical uncertainties that remain open are:

1. Where will the MRS be located?
2. Will the MRS serve all reactors or will spent fuel from western reactors be shipped directly to Yucca Mountain?
3. Will spent fuel be consolidated at the MRS?
4. Will spent fuel be shipped from the MRS to the repository in canisters ready for geologic disposal or will canisters be overpacked at the repository?
5. How will consolidation and overpacking at the MRS affect the technical criteria for design of shipping casks for transportation to the repository?
6. What route(s) will be used for shipping spent fuel from the MRS to the repository?
7. What routes will be used for shipping spent fuel from western reactors to the repository, if this spent fuel is not first shipped to the MRS?
8. What modal mix (percentage of shipments by rail and truck) will be used for shipment of HLW to the repository?
9. Will the same modal mix be used for shipment of HLW from each of the four HLW storage sites - Hanford, Idaho, Savannah River, and West Valley?
10. What routes will be used for shipping HLW to the repository?
11. If HLW is shipped to the repository by truck, will DOE designate the routes to be used, or will actual routing decisions be made by the carriers?

"While Congress authorized DOE to proceed with the identification of a site for an MRS, it attached strong conditions to the construction of an MRS facility. Significantly, no funds were appropriated for MRS construction. NWPO staff and contractors believe that, given the conditional authorization and lack of funding, DOE cannot now count on an MRS as part of a repository system.

12. Will DOE use over-weight trucks for shipping HLW or spent fuel to the repository?

1.8.4 Issues Which Need to be Addressed by the State of Nevada

NWPO staff and contractors believe the State of Nevada must begin planning now for nuclear waste shipments to Yucca Mountain in spite of critical uncertainties regarding DOE's transportation plans. Following are the most important issues which will be addressed in the NWPO Transportation Plan (Section 3.0 of this Report):

A. Policy and Program Issues

1. When will DOE identify/designate shipping routes to Yucca Mountain?
2. When will DOE implement Section 180(c) of the NWPA, which requires DOE to provide technical and financial assistance to states affected by transportation to the repository and MRS.
3. How will DOE ensure participation by transportation-affected states in the cask development program and in development of the transportation operations plan?
4. How will DOE address transportation issues in the Section 175 report required under NWPA?
5. How will DOE address transportation issues in scoping for the Environmental Impact Statement required under the NWPA?
6. Will DOE classify information regarding defense HLW shipments for national security reasons?

B. Institutional Issues

1. What types of State, Tribe, and local transportation regulations are desirable and possible?
2. How should Nevada participate in DOE transportation planning activities?
3. How should Nevada interact with other federal agencies - NRC, DOT, Federal Emergency Management Agency (FEMA)?
4. How should Nevada interact with local governments and Indian tribes, given the NWPA support to affected counties?
5. How should Nevada interact with other states affected by nuclear waste transportation?
6. How should Nevada ensure public information, education, and participation regarding transportation planning?

C. Technical Issues

1. How should transportation risks be assessed generally?
2. What methodologies should be used for comparative risk assessment of specific shipping modes and routes?
3. What data are necessary for assessing the probability and consequences of severe transportation accidents?
4. Are the present NRC performance standards adequate for certification of shipping casks to be used for transportation to Yucca Mountain?
5. How will extended fuel burnup and fuel consolidation affect cask design?
6. What type of physical testing should be required prior to cask certification, and who should be responsible for cask testing?
7. What methodologies should be used to determine need for infrastructure improvements and new construction?
8. What criteria and methodology should be used in evaluating potential rail access corridors to Yucca Mountain?
9. What criteria and methodology should be used in evaluating medical facilities for radiological emergencies?
10. How should human factors be incorporated in all aspects of technical analysis?
11. Should shipping casks, and other transportation equipment such as dedicated train sets, be owned by DOE?
12. What quality assurance/quality control programs will be needed for manufacture and maintenance of shipping casks?
13. What operational procedures will be needed to ensure safety?
14. What personnel recruitment, training, and certification procedures will be needed to ensure safe operations?
15. What human factors research and evaluation will be conducted for continuous review and improvement of operational procedures?
16. What physical protection procedures will be used to protect shipments from terrorist attack or sabotage?

17. What type of shipment tracking and communications systems will best meet the needs of State, Tribe, and local authorities?

D. Regulatory Issues (To be addressed in Section 2.0)

2.0 THE REGULATORY ENVIRONMENT FOR NUCLEAR WASTE TRANSPORTATION

2.1 Overview of Current Federal, State and Local Laws, Regulations, Roles and Responsibilities

Laws and regulations are vital to the proper functioning of the nuclear waste transportation system, for they establish the standards by which the system is measured and provide authority to enforce the standards. The regulatory structure governing the nuclear waste transportation system is multifaceted, involving a variety of laws and regulations, several layers of government, each of which may regulate to at least some extent and several modes of transportation, each of which may be regulated.

A number of federal laws and regulations (hereinafter jointly referred to as the "Federal Laws") govern one or more components of the transportation system. They include: the Commercial Vehicle Safety Act (CVSA), the Surface Transportation Assistance Act (STAA), the Interstate Commerce Act (ICA), the Federal Motor Carrier Safety Act (FMCSA), the Federal Railroad Safety Act (FRSA), the Disaster Relief Act (DRA), the Hazardous Materials Transportation Act (HMTA), and the Atomic Energy Act (AEA), the Nuclear Waste Policy Act (NWPA) and the Nuclear Waste Policy Amendments Act (NWPAA). Other federal laws, such as the Clean Air Act (CAA) may govern both repository and transportation issues.

An important aspect of the federal regulatory system is that it is dynamic, not static. The regulations governing transportation of nuclear waste can be, and have been, changed either by legislation or by rulemaking, often fueled by states' concerns. There are a numerous examples of changes over the past decade, such as the adoption of advance notification requirements and routing restrictions for highway shipments of nuclear waste which were adopted by NRC and DOT, respectively, in response to state concern. Every aspect of the regulatory system is potentially subject to revision, requiring constant monitoring of the system.

Federal law, under the doctrine of preemption, takes precedence over state law in many instances. It may preclude state, tribal and local regulation within their respective jurisdictions. Pursuant to HMTA and the Federal Hazardous Materials Regulations, DOT has established a procedure whereby it offers an advisory opinion, known as an inconsistency ruling, addressing whether a state or local law in DOT's view is inconsistent with and, hence, preempted by HMTA. Although the inconsistency rulings do not carry the weight of a judicial ruling, most parties have accepted DOT's determinations and many jurisdictions craft their laws to be consistent with the rulings.

In 1987, NWPO reviewed and analyzed 17 of the 23 inconsistency rulings published to date by DOT. The analysis has raised several

concerns about DOT's application of proper legal principles in its rulings. For example, DOT's authority, if any, is limited to deciding whether HMTA has preempted a state or local law. This relates to the Supremacy Clause of the U.S. Constitution, under which state and local governments cannot take action which conflicts with valid federal law.

In the 1987 study, NWPO staff found that DOT has often incorrectly relied on Commerce Clause principles to find that a state or local law is preempted by HMTA. However, as the DOT has acknowledged, the Commerce Clause of the U.S. Constitution vests power in Congress to regulate commerce among the states. This means that such issues may be only be resolved by the Courts, not within a regulatory agency. Again, this has been acknowledged by DOT, but in a number of the inconsistency cases reviewed by NWPO, it was found that DOT continually uses the Commerce clause as a basis to determine that at state or local regulation is not consistent with federal law.

At some point, Nevada may find it necessary to challenge the legal basis of DOT's rulings should they adversely affect the prospects for new State or local government regulation.

The two modes of nuclear waste transportation that will affect Nevada's citizens are highway and rail. Within these modes, many elements comprising a transportation system have been identified and described. They include: carriers - motor and rail, driver qualifications, emergency response, escorts, inspection and enforcement, overweight shipments, packaging - cask designs, permits and fees, physical protection of the shipments (from sabotage and terrorism); placards; prenotification; routing - highway and rail, shipment monitoring, shipping papers, training and vehicle stoppage. These categories provide the organizational construct for NWPO's examination and cataloging of elements of the current federal transportation regulatory structure which relates to nuclear waste.

2.1.1 Federal Structure

Although each component of the transportation system is governed by myriad federal laws and regulations, only a few federal agencies are involved. The DOE, of course, is involved as the shipper of record pursuant to the NWPA and NWPA. Other agencies which play a major role in establishing the many standards regulating the entire system include DOT, the Interstate Commerce Commission (ICC), the Federal Emergency Management Agency (FEMA), and the Nuclear Regulatory Commission (NRC). Regulations promulgated by DOT under the Commercial Vehicle Safety Act, the Surface Transportation Assistance Act, the Federal Motor Carrier Safety Act, the Federal Railroad Safety Act, and the Hazardous Materials Transportation Act are found within Title 49 of the Code of Federal Regulations (49 CFR). Regulations promulgated by FEMA under the Disaster Relief Act are found in Title 44 of CFR. The NRC has adopted regulations

under the Atomic Energy Act and the DOE has adopted regulations under the NWPA, both of which are found in Title 10 of CFR.

The following sections identify federal laws and regulations relevant to nuclear waste transportation.

Driver Qualifications

Commercial driver qualifications are governed by the Commercial Vehicle Safety Act, 49 USCS Appx. 2701, et seq. (Cum. Suppl. 1987). Among other things, the CVSA requires drivers to possess only one license, to notify the state and employers of violations and suspensions, and to take and pass both a written and driving test. It also establishes qualifying factors for obtaining a license. Regulations promulgated pursuant to this Act are found at 49 CFR Part 383 (1987).

The Surface Transportation Assistance Act of 1982 regulate the length and width of commercial motor vehicles 49 USCS App. 2301, et seq. (Cum. Supp. 1987). Regulations promulgated pursuant to this Act are found at 49 CFR Part 350 (1987) and 23 CFR Part 658 (1987).

Both the Interstate Commerce Act, 49 USCS 11101 (1979), and the Federal Motor Carrier Safety Act, 49 USCS 3102 (Cum. Supp. 1987), regulate qualifications, hours of service, safety and equipment standards. Regulations promulgated pursuant to these Acts are found at 49 CFR Parts 391-399 (1987).

Emergency Response

Pursuant to the Disaster Relief Act of 1974, 42 USCS 5121, et seq. (1982), the President of the United States is authorized to establish a program of disaster preparedness that utilizes the services of all appropriate federal agencies, and includes:

1. preparation of disaster preparedness plans for mitigation, warning, emergency operations, rehabilitation and recovery;
2. training and exercises;
3. post disaster critiques and evaluations
4. annual review of programs;
5. coordination of federal, state and local preparedness programs;
6. application of science and technology; and,
7. research.

FEMA has promulgated regulations pursuant to the Disaster Relief Act that are found at 44 CFR Parts 350 and 351 (1987). Part 350 establishes procedures for review and approval of state and local emergency preparedness plans for the off-site effects of a radiological emergency at a commercial nuclear power plant. Part 351 sets forth the roles and tasks of the various federal agencies when providing federal assistance to state and local governments that may respond to a fixed site or transportation radiological accident. Federal agencies' responsibilities for responding to a radiological accident are addressed in the "Federal Radiological Emergency Response Plan," published at 50 Fed. Reg. 46,452 (1985).

FEMA has also promulgated regulations pursuant to Executive Order 12148, 44 Fed Reg. 43,239 (1979), that provide assistance to the states for training and education in comprehensive emergency management. 44 CFR Part 360 (1987). States may request financial support from FEMA and negotiate an agreement with FEMA for the training of state and local officials. Where FEMA reaches an agreement with a state, the state must offer radiological defense training as part of its program. 44 CFR 360.1(b) (1987).

FEMA has entered into a Memorandum of Understanding (MOU) with the NRC. Pursuant to the MOU, FEMA provides NRC with assessments and determinations of the adequacy of state and local government emergency preparedness plans for use in a licensing procedure. A nuclear power reactor cannot obtain a license unless the NRC has received reasonable assurances that adequate protective measures can be taken in the event of a radiological emergency. 10 CFR 50.47 (1987).

During 1987, FEMA also entered into a MOU with the DOT. The MOU delineates each agency's role and responsibilities, and establishes joint programs for emergency response planning, training, and information development, dissemination and exchange.

Although DOT may have the authority to promulgate emergency response regulations pursuant to the Hazardous Materials Transportation Act (HMTA), 49 USCS 1801, et seq. (1981), thus far, the Department has acted only to require drivers to receive written training on, "procedures to be followed in case of an accident or other emergency," as part of its routing requirements. 49 CFR 177.825(d) (1987). The Commercial Motor Vehicle Safety Act requires drivers to demonstrate a working knowledge of the operation of emergency equipment used in responding to hazardous materials incidents and of the appropriate emergency response procedures to be followed. 49 USCS Appx. 2704 (Cum. Supp. 1987).

The Federal Motor Carrier Safety Regulations identify emergency equipment requirements for power units. 49 CFR 393.95 (1987). The requirements include: a fire extinguisher, spare fuses, and warning devices for stopped vehicles.

Escorts

Escorts for spent fuel shipments are required by NRC for physical protection purposes. 10 CFR 73.37 (1987) Physical protection does not include emergency response.

Inspection and Enforcement

Pursuant to the Surface Transportation Assistance Act of 1982, 49 USCS Appx. 2301 et seq. (Cum. Supp. 1987), states are encouraged to adopt and enforce the Federal Motor Carrier Safety Regulations (49 CFR Parts 390-399) and the Federal Hazardous Materials Regulations (49 CFR Parts 107-178). States that do so and fulfil other requirements are eligible for federal grants. 49 CFR Part 350 (1987).

General qualifications for state rail inspectors are found at 49 CFR 212.201-212.227 (1987). States are permitted to adopt more stringent requirements than those adopted by the federal government. 49 CFR 212.201(a) (1987).

Liability

The underlying purposes of the Price-Anderson Act, 42 USCS 2210 (1978), are two-fold - to encourage private sector development of nuclear energy and to ensure a source of funds to pay public liability claims resulting from a "nuclear incident." A nuclear incident may occur at certain licensed facilities or contractor-operated facilities, or during the course of transportation between certain facilities, and is defined as:

any occurrence, including an extraordinary nuclear occurrence within the United States causing, within or outside the United States, bodily injury, sickness, disease, or death, or loss of or damage to property, or loss of use of property, arising out of or resulting from the radioactive, toxic, explosive, or other hazardous properties of source, special nuclear, or byproduct material.... (42 USCS 2014(q)).

To entice the private sector's active participation in the development of nuclear energy, the Act limits the liability of the nuclear industry (the power plants) to a fund generated by an insurance and indemnity system.

The Act establishes a source of funds to pay claims by imposing insurance requirements on industry participants. Licensed nuclear power plants with a capacity to generate more than 100 megawatts of electricity (MWe) must provide financial protection in an amount equal to the maximum amount of insurance commercially available - currently \$160 million. In the event damages from a single incident exceed \$160 million, the NRC may impose a retroactive premium on each licensed facility. The total fund originally available will

thus be limited by the number of licensed facilities having a capacity of 100 MWe or more. For example, under the provisions of the Act prior to current amendments, with 101 such facilities, there would be a total of \$665 million available to compensate for damages. For damages exceeding the mandated sums, Congress is required to review the incident and take action. It should be noted that recent Congressional changes to the Price-Anderson Act have increased the maximum potential liability for a nuclear incident to \$7 billion.

Under the indemnification system, the government indemnifies its contractors and certain licensees, such as non-profit educational institutions, for certain activities. The indemnification agreements furnish coverage similar to that offered under insurance policies, but DOE generally does not allow its contractors to obtain insurance, because the cost of the insurance would be passed on to DOE under its contracts.

The Act does not address the standard of liability to be used in prosecuting a court action. Therefore, the law of the appropriate state will control the issue. Under state law, certain defenses may be available to the defendants. These may include the statute of limitations, which can bar an action if it is instituted after the time permitted by the relevant statute; assumption of risk, which prevents recovery if a court finds the plaintiff was aware of the risk involved and voluntarily agreed to accept it; contributory negligence, which prevents recovery if a court finds the plaintiff was partially responsible for his injuries; comparative negligence, which can limit recovery to the degree that the plaintiff was partially responsible for his injuries; and sovereign immunity, which can bar an action against a governmental entity. These defenses are required to be waived by all parties insured or indemnified under the Act, if the NRC declares an incident be an extraordinary nuclear occurrence.

If payments are to be made under the indemnity agreements, the NRC is required to consult with the indemnified person. That person may take charge of, settle or defend any action brought for damages. Persons indemnified shall not collect expenses in settling claims with the NRC. The NRC has settlement authority for the United States.

The NRC is authorized to establish procedures for the prompt handling, investigation and settlement of claims. Credit against a judgment shall be given for payments made.

In its preliminary review of the Price-Anderson Act in 1987, NWPO staff and contractors raised a number of points which must be addressed in a more thorough analysis of the Act and its reauthorization. For instance, it is not clear whether the provisions of the Act extend to all transportation incidents or whether they extend to all consequences of a nuclear incident. The Act only references the transportation of radioactive material from a licensee within the United States to a licensee outside the United States.

Therefore, it appears to NWPO that the authority of DOE and NRC to indemnify licensees or contractors from liability arising from a transportation incident within the United States is unsettled. Moreover, even if DOE and NRC are authorized to provide such indemnification, the terms of the indemnification agreements as well as insurance policies terminate coverage if the shipment is diverted from its course. Should a nuclear incident occur as the result of sabotage or terrorist activity that diverts a shipment, it is the opinion of NWPO that citizens will have no source for recovery.

It is also the opinion of NWPO that citizens will also lack a source of recovery if the incident arises out of transportation between facilities that are neither insured nor indemnified. Certain interim storage facilities, such as General Electric's facility at Morris, Illinois fall within this group. There are no such facilities within the State of Nevada.

NWPO staff feel that this uncertainty of coverage also extends to the consequences of a nuclear incident. Emergency response costs, according to the federal government, are not recoverable, because state and local governments have a duty to respond to nuclear transportation incidents. The source of this duty is not identified. By contrast, a spokesperson for American Nuclear Insurance (ANI), one of the two insurance pools providing coverage for the nuclear industry, has stated that it will reimburse any cost for which a court imposes liability. Therefore, if a court bases a finding of liability for emergency response costs on a statutorily-imposed duty, the insurance carrier should pay the costs. An insurance carrier can, however, always dispute the exact nature and extent of the policy's coverage. Assuming that it does not, state and local governments will be faced with the anomaly of the federal government refusing emergency response claims under their indemnity agreements while insurance companies pay identical claims.

It is the opinion of the NWPO that clean-up costs should be reimbursable under either the indemnification agreements or the insurance policies, for both provide coverage for property damage. As with emergency response costs, both the federal government and the insurance carriers can dispute this provision as well.

On August 20, 1988, the President signed legislation re-authorizing the Price-Anderson Act. The NWPO understands that the potential liability for a nuclear incident has been increased to \$7 billion. The legislation must be reviewed to determine its full impact on transportation issues.

Overweight Truck Shipments

The nation's roads are controlled by the states in which they are located. However, the Surface Transportation Assistance Act of 1982 amended the Federal-Aid Highway Act, 23 USCS 127 (1983), to establish a national, uniform weight limit. States are required to allow up to 80,000 pounds gross vehicle weight on the interstate system or be penalized by the loss of federal highway funds. State permitting for overweight loads is also allowed. Exceptions are provided for loads that cannot be easily dismantled or divided, and for state limits that were in effect on certain dates prior to the adoption of the law. The weight requirement does not apply to roads that are not part of the interstate system.

Packaging - Cask Design

There are essentially two types of shipping containers for radioactive materials: Type A and Type B. Type A packages, used for radioactive material in small quantities or having low radioactivity, are designed to withstand normal transport conditions. The standards for these packages are within DOT's realm of responsibility and can be found at 49 CFR Part 173, Subpart I (1987), along with the general standards and requirements for all radioactive materials packages.

Type B packages, which must be used when the radioactivity exceeds the Type A limit, are designed to withstand severe accidents without release of the radioactive contents. Commonly referred to as a "shipping cask," Type B packages are regulated by the NRC. The NRC standards, found at 10 CFR Part 71 (1987), were developed by a group of scientists almost thirty years ago. Although casks are not subjected to actual testing, they must be designed to withstand, in sequence, the following hypothetical accident conditions.

1. Free Drop. A free drop of nine meters, or thirty feet, onto a flat, essentially unyielding service, striking the surface in a position for which maximum damage is expected.
2. Puncture. A free drop of the cask from a distance of one meter, or forty inches, onto the upper end of a vertical steel bar. The bar must be 15 cm (six inches) in diameter and not less than 20 cm (eight inches) long with its top edge rounded to a radius of not more than six mm (one-quarter of an inch).
3. Thermal. The entire cask must be exposed for not less than thirty minutes to a heat flux of not less than 800 degrees C (1475 degrees F).

4. Immersion-Fissile Packages. For fissile material, which includes the waste to be shipped to a repository, the cask must be immersed in at least 0.9 meters (three feet) of water for at least eight hours in the position in which maximum leakage is expected.
5. Immersion-All Packages. All casks must be immersed in at least 15 meters (fifty feet) for at least eight hours.

10 CFR Section 71.73 (1987). In addition to the above hypothetical accident conditions, a licensee must demonstrate that the cask meets the following normal conditions of transport.

1. Heat. An ambient temperature remaining constant between minus 29 degrees C (minus 20 degrees F) and plus 38 degrees C (100 degrees F).
2. Cold. An ambient temperature of minus 40 degrees C (minus 40 degrees F).
3. Reduced External Pressure.
4. Increased External Pressure.
5. Vibration. Normal to transport.
6. Water Spray. A spray that simulates exposure to rainfall of approximately five cm (two inches) per hour for at least one hour.
7. Free Drop. A free drop from 0.3 to 1.2 meters (one to four feet), depending on the weight of the cask.
8. Compression. A certain compressive load is applied for 24 hours.
9. Penetration. The hemispherical end of a vertical steel cylinder of 3.2 cm. (1 1/4 inches) in diameter and six kg (13 lbs.) of mass is dropped from a height of one meter (forty inches) onto the exposed surface of the package that is expected to be most vulnerable to penetration.

10 CFR Section 71.71 (1987).

Prior to the first use of a cask, the licensee must conduct a visual exam and certain pressure tests to verify the cask's structural integrity. 10 CFR Section 71.85 (1987). Finally, prior to each shipment, the licensee must make certain determinations to ensure that the package and its contents comply with the NRC requirements. 10 CFR Section 71.86 (1987).

Permits and Fees

Under HMTA, DOT has the authority to promulgate regulations for permits and fees. It has not done so. It has issued a policy statement announcing that state permits and fees are preempted by HMTA. 49 CFR Part 177, Appendix A (1987). DOT's policy statement is not a regulation and has no preemptive effect under HMTA. State permit and fee requirements in Illinois and Nevada were upheld by the courts in 1987 and 1988.

Placards

Placards, diamond-shaped posters, are required to appear on the outside of transport vehicles to aid in communicating the hazard of the cargo. DOT's hazardous materials regulations, promulgated pursuant to HMTA, describe general placarding requirements; the size, location, and content of the placards; the person responsible for placarding; and special requirements for rail, freight containers, aircraft unit load devised, cargo tanks and portable tanks. 49 CFR 172.500-172.558 (1987). HLW and spent fuel would have to be placarded appropriately.

Prenotification

At least four days prior to the transportation of spent fuel within or through a state, the Governor receives written information regarding the shipment. The receipt of this information is commonly referred to as "prenotification."

Prenotification requirements (for the purposes of physical protection) are imposed by the NRC and are, thus, applicable only to NRC licensees. 10 CFR 71.97 and 73.37(f) (1987). DOE is not subject to NRC licensing for transportation and has submitted a equivalent plan to DOT for approval. 49 CFR 173.22 (1987). Although DOE's plan contains no prenotification requirement whatsoever, DOT has determined it to be equivalent. During 1988, however, DOE adopted an internal policy, requiring DOE to provide prenotification consistent with NRC requirements.

Routing - Highways

DOT's routing regulation for the transportation of highway route-controlled quantities of radioactive materials is found at 49 CFR 177.825 (1987). It is often referred to by its docket number, HM-164. The regulation instructs carriers to operate vehicles on routes that minimize radiological risk, unless only one practicable route is available or the vehicle is operated on a preferred highway. A preferred highway is defined as an interstate highway or a state-designated alternative route. Alternative routes must be selected by states in accordance with DOT guidelines, which require a safety analysis. Deviations from preferred routes are permitted in the event of emergencies or to make necessary stops.

The number of deviations or the number of miles taken in a detour is not specified. in the regulation.

The carrier must prepare a written route plan and provide a copy of it to the driver and the shipper. Deviations from the written plan must be reported to the shipper within 30 days.

Until this year, shippers were required to notify DOT of the routes used, unless the shipments complied with NRC's physical protection plans. See 49 CFR Section 173.22(d) (1987). In response to problems encountered by shippers, DOT promulgated a new regulation, imposing the notification requirement on the carrier. The new requirement is found at 49 CFR Section 177.825(f).

Although the NRC requires routes to be approved in advance, 10 CFR 73.37(b)(7) (1987), the goal is to protect against radiological sabotage or theft. DOT's routing requirement is designed to minimize radiological risks.

Routing - Rail

The federal regulations contain no routing regulations specifically applicable to rail.

Sabotage/Terrorism (Physical Protection)

NRC regulates the physical protection plans for its licensees. The requirements, found at 10 CFR 73.37 (1987), include the following:

1. prenotification to the NRC;
2. procedures for responding to threats to damage the shipments;
3. monitoring of the shipment by a communications center;
4. a written log for recording shipment and event information;
5. arrangements with local law enforcement agencies to respond to emergencies;
6. advance route approval;
7. plans to avoid intermediate stops;
8. at least one escort to maintain visual surveillance of the shipment, when the vehicle is stopped;
9. training for escorts that follow the requirements established in Appendix D to 10 CFR Part 73;
10. calls to the communications center every two hours by the escorts;

11. prenotification to governors; and
12. protection of the information from disclosure.

There are additional specific requirements for shipments by road, rail and sea.

Because DOE is not a licensee of the NRC, it is not governed by NRC regulations. However, in accordance with 49 CFR 173.22(c), DOE submitted and obtained DOT approval of its "equivalent" plans. DOE's requirements include the following:

1. a driver and escort for each shipment. The escort may be a second driver.
2. the driver or escort to remain with the shipment at all times.
3. the shipment to be equipped with a communication device for contact with a central communication center, state or local law enforcement agency or other reliable contacts to permit a timely response to a security incident involving the shipment.
4. communications every four hours with a central control station.
5. a method to enhance the ability to locate the vehicle if an incident occurs.
6. to effect unimpeded traffic flows, periodic contact with state officials and local law enforcement agencies. Information is to be provided about the nature of irradiated spent fuel shipments and appropriate emergency procedures.
7. a current list of emergency coordination telephone numbers and contact points.
8. to the maximum extent practicable, carriers will use interstate or limited access divided state highways.
 - a. high density urban areas are to be avoided where feasible.
 - b. circumferential interstate quality highways are to be used.
9. the carrier must inform DOE officials of route information that could have an impact on shipment security or safety.

10. DOE is required to check the package and transport vehicle to ensure that no conditions exist that could compromise the security of the equipment.

A 1988 NWPO comparison of DOE's plans to the NRC's requirements reveals deficiencies in DOE's equivalent plans. Included among the deficiencies are the following:

1. there is no requirement for procedures for responding to threats to damage a shipment,
2. there is no requirement for a written log,
3. there is no requirement to avoid intermediate stops,
4. there is no requirement that escorts be trained in accordance with 10 CFR Part 73, Appendix D, and
5. there is no requirement to prenotify governors.

NWPO understands that DOE is in the process of amending its equivalent plans. The amendments may resolve some of the deficiencies, though NWPO is unable to determine this. Thus far, NWPO has not been able to obtain a copy of any DOE proposals.

Shipping Papers

Pursuant to HMTA, DOT has adopted regulations governing the applicability and contents of shipping papers (49 CFR 172.200-172.205, 1987). Among other things, the shipping papers must include the material's proper shipping name, hazard class, identification number, and total quantity. Additional information is required for radioactive materials, including the name of each radionuclide, a description of the physical and chemical form of the material, and the activity contained in each package.

Vehicle Stoppage

The Federal Motor Carrier Safety Regulations govern certain aspects of stopped vehicles. Part 392 of 49 CFR governs stops at railroad crossings and stops in the event of hazardous conditions. Attendance, surveillance and parking of motor vehicles containing Class A or Class B explosives are regulated at 49 CFR 397.5 and 397.7 (1987). Section 397.5 provides an exception to its requirements for vehicles located in a "safe haven." A safe haven is defined as "an area specifically approved in writing by local, state, or federal governmental authorities for the parking of unattended vehicles containing Class A or Class B explosives." 49 CFR 397.5(e) (1987). No other guidance of what constitutes a safe haven is offered.

2.1.2 State of Nevada and Local Government Authorities, Laws, Regulations and Ordinances

The State of Nevada has adopted the federal hazardous materials regulations (HMR, at 49 CFR Parts 107-178) in whole. Although the regulations are fairly comprehensive, they do not regulate all aspects of the transportation of hazardous materials, such as permits and fees. However, the HMR provide a good foundation for state and local government regulation.

Nevada's regulatory structure is analogous to the federal structure in that there are only a few state agencies regulating the transportation system. Each agency is responsible for its area of expertise. Nevada's structure has been strengthened with the creation of the State/Local Planning Group (SLGPG) described above. The SLGPG provides a mechanism by which each agency can actively participate in the planning process, identify current and future agency needs, and provide input to and receive feedback from other agencies. This ongoing interactive process will allow the State, local governments and tribes to cooperate in the development of a comprehensive and consistent regulatory structure to address the impacts that will occur from transporting nuclear waste to a repository.

2.1.2.1 State of Nevada

A number of State agencies, commissions or committees, have functional and/or regulatory authority regarding the transportation of nuclear waste through and within Nevada.

The Agency for Nuclear Projects/Nuclear Waste Projects Office (NWPO) has been delegated all duties related to overseeing federal repository activities, including being the lead agency for liaison with the DOE and other federal agencies, and evaluating potentially adverse affects of a repository. Toward this end, the NWPO is mandated to and does interact with the Commission on Nuclear Projects, the State legislature, and other State agencies and local governments. NRS 459.0094 - 459.0098(3).

The Commission on Nuclear Projects, a seven-member group, established by NRS 459.0092, is authorized to report to the governor and the legislature on issues regarding the disposal of nuclear waste and to make recommendations on such issues. Further, the Commission formulates the administrative policies of the NWPO and advises the State and local governments on litigation related to radioactive waste.

NRS 459.0085 created a seven-member Legislative Study Committee on High-Level Radioactive Waste, which is authorized to study and evaluate information, strategies or any other policies related to the disposal of HLW. The Committee makes reports to the Nevada

Legislative Commission and interim finance committee, as needed, and may recommend legislation.

The roles and responsibilities of other state agencies involved in nuclear waste transportation, either by legislative mandate or executive order, are outlined below.

1. The Public Service Commission of Nevada (PSCN) is responsible for issuing permits (at no charge) to motor carriers for transporting nuclear waste (NRS 706.441), and for the regulation of rail transportation of hazardous materials, including nuclear waste (NAC 705). The PSCN has adopted safety standards for drivers and vehicles involved in the transportation of hazardous materials and radioactive waste and may conduct safety inspections (NRS 706.173). The PSCN has adopted the federal hazardous materials regulations.
2. The Department of Transportation (NDOT) is responsible for conducting risk analyses and selecting highway routes to be used in the transportation of highway-route-controlled quantities of radioactive materials, including nuclear waste (NRS 459.125). NDOT may also issue permits for over-dimensional highway loads (NRS 484.743) and may promulgate regulations for the selection of alternate routes for shipments of nuclear waste or other placarded nuclear materials (NRS 408.206). NDOT, pursuant to A.B. 47, is presently in the process of analyzing routes (1987) and is expected to promulgate selecting routes during 1989.
3. The Department of Motor Vehicles and Public Safety (DMV), through the Highway Patrol Division, is responsible for permitting persons carrying hazardous materials by highway; inspection of vehicles carrying these commodities; the maintenance of records of highway accidents and incidents involving hazardous materials; maintaining a computerized repository for hazardous materials management information; and, receiving notification from shippers who intend to transport controlled quantities of nuclear materials (NRS 459.700 et seq.). The Highway Patrol, under the State Emergency Plan, responds to all highway accidents and incidents involving radioactive materials. DMV is now developing regulations for the above issues under A.B.352 (1987).
4. The Department of Human Resources, Health Division (Radiological Health Section), is designated by the Governor to receive notification from shippers who intend to transport HLW (NRS 459.730). This section is also responsible for licensing and regulating the management and disposal of low-level radioactive waste and other materials under NRS 459.030, .201 and .221. Under the

State Emergency Plan, the Health Division is designated as the State radiation control agency and responds to any incident or accident involving radioactive materials.

5. The Department of Military, Division of Emergency Management (DEM), is responsible for the coordination of all organizations for emergency management within the State and the liaison and cooperation with other states and the federal government in emergency management (NRS 414.040). Under the State Emergency Plan, the DEM provides coordination support, equipment, technical expertise and support of containment for any radiological incident or accident. The DEM presently maintains a radiological instrumentation program under which the Division provides the Nevada DOE Operations Office with instruments to be used in the training of Nevada Highway Patrol personnel who are then supplied with instrument kits to be used in responding to radiological incidents or accidents. The DEM also provides training for State agency first responders and medical personnel in radiation monitoring.

The DEM provides fiscal management of FEMA funds for local governments and coordinates, assists or provides oversight (when appropriate) to local government emergency management coordinators in planning and training activities. The DEM also provides direct training to local government officials, employees and volunteers. DEM staff works closely in information management and emergency planning with the State Emergency Response Commission (SERC) which was established by the federal Superfund Amendments and Reauthorization Act, Title III (1986). The SERC has appointed local emergency planning committees to oversee the development of emergency response plans for each county and city within its jurisdictions.

6. The Department of Commerce, Fire Marshal Division, is responsible for the provision of assistance and materials for the training and education to local authorities in fire prevention and the management of hazardous materials, including radiological materials (NRS 477.030). In 1988, pursuant to Title III of the Superfund Amendments Reauthorization Act (SARA), the Fire Marshal Division established a regional training center. According to the Fire Marshal Division, the training is available to both the public and private sectors. Under NRS 477.030, the State Fire Marshal may regulate the design, construction and use of parking areas or safe havens for hazardous materials. (To date, federal regulations for safe havens apply only to Explosives A and B. See, also, Vehicle Stoppage, Section 2.1.1, above.)

2.1.2.2 Local Governments

Under NRS 373.030, any county within the State may create a Regional Transportation Commission (RTC). Among other responsibilities, an RTC may receive and disburse federal funds for transit purposes, submit project applications and programs of projects to federal agencies and enter into project agreements with the U.S. DOT. Further, a RTC may hold public hearings on transit and other highway transportation matters. Under NRS 373.1161, a RTC may conduct studies, develop plans and conduct public hearings to establish and approve short-range and regional plans for transportation. While an RTC may be funded and staffed by a county, governing boards are comprised of representatives of incorporated cities and the county.

Thus far, representatives of two regional transportation commissions (Clark and Washoe) have been involved in repository transportation activities. Representatives of the Clark County RTC have been active in the transportation functions of the State/Local Government Planning Group described in Section 3.0 and Appendix I of this Report.

Three local governments through which nuclear waste will pass under DOE's present postulated routes have adopted ordinances which pertain to nuclear waste transportation.

Clark County's Ordinance No. 960, (County Code 75.30) adopted on January 7, 1986 regulates highway and railroad transportation of hazardous materials, which are defined to include radioactive materials. Ordinance No. 960 includes several measures. It adopts the federal hazardous materials regulations (HMR) and certain NRC regulations, imposes a data collection requirement on the Fire Chief with annual reports to the Board of County Commissioners, requires a certificate for the transportation of hazardous materials, requires shippers to adhere to routing requirements for which a fee may be charged, requires carriers to pay clean-up costs, and it imposes misdemeanor criminal penalties for violations. The intent of the ordinance is to prevent shipments of hazardous materials through urban, residential and tourist-oriented areas.

Ordinance No. 3190, adopted by the City of Las Vegas on September 6, 1985, also regulates the transportation of hazardous materials and contains very similar provisions to those set forth in Clark County Ordinance 960.

The City of North Las Vegas also has an ordinance regulating hazardous materials. Ordinance No. 880, adopted on October 7, 1987, governs a wide range of hazardous materials' issues. Within the context of transportation, Ordinance No. 880 addresses only the routing of hazardous materials' shipments, and it does not adopt the HMR.

2.2 Regulation by Indian Nations and Tribes

There are several Indian tribes in Nevada which will be affected by nuclear waste shipments to a Yucca Mountain repository. These include the Western Shoshone Nation, the Moapa Band of Paiutes, the Walker River Paiute Reservation and the Las Vegas Paiute Colony. Nevada must consider these governments in attempting to develop a comprehensive plan. While a negotiated agreement is the best method for addressing any issues that may arise between Nevada and the Indian Nations, it is essential for Nevada to understand the Indian Nation's regulatory structure and its relationship to federal and state laws. The Indian nations' regulatory structure is affected by federal law, including the United States Constitution, statutes and treaties, and by each nation's own constitution and codes.

NWPO understands that no Indian Nation potentially affected by repository-related transportation has yet promulgated regulations for the management or transportation of hazardous or radioactive materials. However, the Moapa Band of Paiutes and the Walker River Paiute Tribe are in the process of drafting regulations. In addition, the Las Vegas Paiute Colony has acquired land along highway and rail routes proposed by DOE.

2.3 Summary of Regulatory Issues Which Should be Addressed by the State of Nevada

Each component of the nuclear waste transportation system generates concerns that must be governed by laws and regulations. By addressing the concerns at each level of government - federal, state, tribal and local - the regulatory structure can aid in minimizing potential consequences of radiological and non-radiological incidents and accidents, and can aid in maximizing public confidence in the nuclear waste transportation system. With this goal in mind, the following recommendations for further study are made. Each of the questions or recommendations below are addressed in the NWPO Plan for High-Level Radioactive Waste Transportation and Management, Section 3.0, below.

2.3.1 Federal Laws.

Because the Federal Laws will significantly affect Nevada's plans, it is necessary that the State, Tribal and local governments monitor and, where appropriate, vigorously participate in Congressional activity relating to each law. For example, Congress is in the process of considering the reauthorization of HMTA, which regulates major aspects of the transportation of nuclear waste. Nevada should participate in this process both through its Congressional delegation and through the offering of testimony and other non-testimonial information to ensure that the State's right to regulate is not circumscribed. The State should also seek appropriate amendments to the Federal Laws to ensure the maximum protection of its citizens.

The issue of State, local and tribal government liability for transportation incidents or accidents is also a major concern. The role of these governments within the structure of the Price-Anderson Act must be clarified, and recommendations for modification put forward, if appropriate.

A further concern to the State is the equivalency of DOE transportation regulations with those of NRC and DOT. Since DOE is not subject to NRC transportation requirements, there appear to be inconsistencies which must be modified in order to assure the safety of citizens along shipment routes. These inconsistencies must be fully identified modified.

Because federal law, under the doctrine of preemption, takes precedence over state law, the federal law may preclude state, tribal and local regulation of an area. An understanding of what areas the federal law preempts is, therefore, essential to Nevada's legislative process. Nevada should continue to monitor relevant case law in the area as well as DOT's inconsistency rulings. Moreover, it should participate in appropriate inconsistency proceedings to protect against the continued use of rulings based on improper legal principles.

As part of the preemption issue, Nevada must also obtain answers to the following questions:

1. To what extent do federal laws other than HMTA, e.g., the Atomic Energy Act, preempt state and local governments from regulating the transportation of nuclear waste?
2. To what extent, if any, does the Federal Railroad Safety Act preempt state and local governments from regulating the transportation of nuclear waste?
3. To what extent, if any, does federal law preempt Indian Nations from regulating the transportation of nuclear waste?
4. To what extent do federal regulations overlap or conflict with each other such that responsibilities or tasks are being duplicated?

2.3.2 Nevada's Statutes

The State's statutes must be carefully reviewed for the following issues:

1. Do the statutes comprehensively address all of the state's concerns arising out of the transportation of nuclear waste?

2. Do the statutes and regulations promulgated thereunder provide clear guidance to the relevant members of the public?
3. Do the statutes overlap or conflict with each other such that tasks or responsibilities are being duplicated?
4. Does the statutory structure make the best use of each agency's resources?

As part of the statutory review, Nevada's statutes and regulations must be compared to the federal regulatory structure to identify regulatory gaps or deficiencies. DOT's inconsistency rulings should be accepted to the extent that Nevada agrees with DOT's analysis. To the extent Nevada does not agree with DOT's analysis, Nevada should evaluate its statutes and regulations using preemption, commerce clause and equal protection clause principles.

2.3.3 Nevada Local Governments

A complete analysis should be conducted of all relevant local ordinances. This review would assist in determining the extent to which Nevada's local governments are preempted by federal and state law from regulating the transportation of nuclear waste.

2.3.4 Indian Nations

The relevant federal laws and Indian Nations' constitutions and codes should be reviewed to determine the extent to which the transportation of nuclear waste in Indian country may be regulated.

3.0 STATE OF NEVADA PLANS FOR ADDRESSING HIGH-LEVEL RADIOACTIVE WASTE TRANSPORTATION TO A REPOSITORY

3.1 The NWPO Plan for High-Level Radioactive Waste Transportation Study and Management

3.1.1 Goal and Guiding Principle of the Plan

The goal of the NWPO Study and Management Plan for High-Level Nuclear Waste Transportation is to establish a framework for State action which would help to ensure that the health and safety of Nevadans and the unique physical and socioeconomic environment of the State and its communities are fully protected from risks and adverse impacts of transportation of nuclear waste in the event that a repository is constructed and operated at Yucca Mountain.

The guiding principle for this Plan is that transportation is an important and unique issue within the repository program. The responsible federal agencies must view transportation in a comprehensive sense; that is, they must consider and analyze not only technical site-specific issues, but also national, regional, State, local and tribal geopolitical, legal, socioeconomic and environmental impacts. The federal government, especially DOE, must recognize its obligation to the State to carefully plan and undertake initiatives which will reduce risks and allay potentially adverse impacts of repository transportation on the citizens and governments of Nevada.

In addition, the State must conduct its own program to monitor DOE's initiatives and address specific statewide, local and tribal concerns and needs related to transportation to a repository.

For the fiscal year, 1988-1989, the U.S. Congress imposed a limit of 1.5 million dollars for repository transportation studies by the State of Nevada. All of the activities within the following plan are contained within that limit. This includes contractor costs and all costs associated with the establishment and start-up of the Nuclear Waste Transportation Research Center at the University of Nevada, Las Vegas.

3.1.2 Structure and Content of the Plan

Sections 1.0 and 2.0 of this report provided descriptions, schedules, reviews and summaries of the DOE planned transportation system for Yucca Mountain and the regulatory environment which governs nuclear waste transportation. These sections also presented issues which should be addressed by federal, State, local and tribal governments as well as certain State of Nevada concerns in the policy, regulatory, institutional and technical areas.

In 1987, NWPO staff developed a list of transportation issues and worked with the State/Local Government Planning Group to establish priorities for studying these issues. Of 21 issues listed, the following were rated by the SLGPG as most important: [no order implied]

Policy and Program Management Issues

- Development of a Transportation Management Information and Analysis System
- Specification of Operational Procedures
- Development of Training Standards and Programs
- Development of National Routing Process (Rail and Highway)

Regulatory Studies

- Notification of shipments to State and local governments
- Inspection and Enforcement
- Permits and Fees

Technical Reviews and Studies

- Infrastructure Improvements and New Construction Needs
- Analysis of Rail Service Options
- Siting of Rail and Highway Access Routes to Yucca Mountain

Institutional Relationships

- Emergency Management and Preparedness, including State/local Communication System
- Cooperation among State of Nevada, Local Governments, Tribes and Other States

The NWPO plan reflects the priorities within the above four categories. Other issues and priorities identified through a NWPO-sponsored transportation needs assessment (1988) are also addressed in the plan.

Each plan area is described according to its objectives, issues to be addressed (including those identified by the SLGPG and the needs assessment) and continuing, completed and planned activities. Table 1.1 (Section 1.0, above) provides short-term and long-term schedules of planned DOE activities regarding repository transportation. Where appropriate, the plan describes activities which will be undertaken to respond to DOE or other federal schedules.

3.1.3 Activities of the NWPO Under the Plan for High-Level Radioactive Waste Transportation Study and Management

A. Policy and Program Management

Objectives

1. Develop and recommend policy positions to State executive and legislative leaders regarding transportation issues related to the Yucca Mountain repository.
2. Review and monitor federal policies and decisions related to transportation of nuclear waste to a Yucca Mountain repository.
3. Integrate and coordinate all State-sponsored technical, regulatory, institutional and program management studies and activities related to HLW transportation to a Nevada repository, as guided by State policies.

Topics to be Addressed. The following policy or program management issues have been identified for consideration and action by NWPO:

Defense Waste - policy regarding liability, classification, regulation, selection of modes and routes, equivalency of DOE policies and procedures for civilian and defense waste shipments.

Rail and Highway Routing - roles and responsibilities of DOE in identifying routes and timing of routing decisions;

Monitored Retrievable Storage (MRS) - uncertainties regarding construction, impact on transportation system;

DOE Schedule for Implementation of Mandates and Initiatives - decisions on modal mix, implementation of NWPAA Section 180(c), addressing of transportation issues in NWPAA Section 175 Report and EIS Scoping; and,

State of Nevada Transportation Program Development and Management - planning, coordination, supervision and evaluation of transportation initiatives and projects undertaken under State auspices.

Completed and Continuing Activities. Since 1983, the executive director of the NWPO, or his designees, has maintained ongoing contact with Nevada's Congressional delegation to assure appropriate information-sharing, coordinated State policy development and planning and interaction with DOE. As certain legislation regarding HLW transportation has been considered in Congress, the NWPO executive director and staff have been in close contact with Nevada's

Congressional delegation to relate information and to coordinate policy positions.

Through meetings, conferences, workshops, personal interaction with federal officials and review and comment on all federal working papers, documents and other information, NWPO staff have been able to remain abreast of all pertinent federal governmental activity pertaining to transportation and to provide the cognizant agencies (e.g., DOE, DOT, NRC) with State positions and concerns on a number of transportation policies, plans and activities. For example, NWPO staff has been monitoring DOE's repository transportation system policies and planning, decision time lines, MRS policy development, response to Congressional mandates, institutional planning and activities and transportation program management to assure that Nevada's concerns are addressed.

The NWPO director, or his designee, has provided policy recommendations to the Governor's Office, the Nevada Commission on Nuclear Projects and the Legislature's Study Committee on High-Level Radioactive Waste through interaction, reports and testimony, on a regular or as-needed basis.

NWPO planning staff has provided coordination, supervision and advisement to all contractors who are working within the transportation program, and has worked closely in planning and monitoring activities with other State agencies, the State/Local Government Planning Group, Indian tribes, the Nevada public and others who may be affected by repository transportation.

Planned Activities. NWPO staff will continue to work toward its objectives in the policy and program management areas by:

- a. developing and providing policy recommendations regarding repository transportation to the Governor's Office, the Nevada Commission on Nuclear Projects and the Legislative Study Committee on High-Level Radioactive Waste in coordination with other State agencies and affected local governments and Nevada Indian tribes. These recommendations will be based upon findings of regulatory, technical and institutional studies conducted under NWPO auspices; [Continuing activity]
- b. providing information to Nevada's congressional delegation regarding legislative policy decisions; [Continuing activity]
- c. remaining aware of all policies, decisions, schedules and other information developed by DOE, NRC, DOT or other federal agencies who establish policy and conduct programs affecting nuclear waste transportation, including, but not limited to, defense waste transportation, the MRS, routing and DOE decision schedules and planning or activity time lines through participation in workshops, meetings, conferences or other means and forums and review of appropriate documentation and publications; [Continuing activity]

- d. developing an information base to include integrated descriptions and analyses of DOE's policies, plans, decision schedules and activities regarding the:

- 1) transportation of defense waste and potential impacts upon the system, classification of defense shipments [1989-1990],
- 2) MRS development and impacts on the transportation system, [1989-1990],
- 3) DOE roles in modal mix and routing decisions [1989-1990],
- 4) inclusion of transportation issues in the EIS scoping process and the NWPAA Section 175 Report [1989],
- 5) implementation of NWPAA Section 180(c) [1989-1990], and,
- 6) participation of transportation-affected states and tribes in the cask development program and the development of the transportation operations plan; [1990-1992];

Note: Informational aspects of the above task will be developed in conjunction with the Nuclear Waste Transportation Research Center (UNLV) activities, described below.

- e. providing commentary or related information to federal agencies in order to assure that Nevada concerns are addressed in the development of national policies or decisions which may affect transportation of waste to a repository; this includes issues identified in d. (above) and others as they emerge; [Continuing activity]
- f. coordinating and facilitating participation of NWPO staff, State agencies, commissions, legislative committees, local and tribal governments in meetings, conferences and workshops, and commentary and review of policies, plans and actions of DOE, NRC, DOT, FEMA and other federal agencies which are involved in nuclear waste transportation; [Continuing activity]
- g. managing, coordinating, supervising and integrating all State-sponsored studies and initiatives within the NWPO transportation program; and, [Continuing activity]
- h. maintaining regular contact with other State agencies responsible for study, regulation and management of hazardous and radioactive materials to assure coordination and integration of NWPO transportation policies, plans and activities within the State context. [Continuing activity]
- i. developing and publishing annual reports regarding NWPO transportation activities within Agency reports to DOE, the Commission on Nuclear Projects and the Legislative Study Committee on High-Level Radioactive Waste. [June 30, each year]

Costs for these activities are contained within NWPO operating, staff and transportation contractor budgets.
[Contractor: R. Halstead]

B. Regulatory Studies

Objectives

1. Remain abreast of all federal, State, Nevada local governmental and tribal laws, regulations, rules and related actions pertaining to nuclear waste transportation.
2. Determine the legal liability of the State, local governments and Indian Nations and tribes within Nevada for decisions and actions regarding participation in the DOE program, and the planning and operational aspects of nuclear waste transportation to a Yucca Mountain repository
3. Develop and recommend a State regulatory structure which will assure the safe and uneventful transportation of nuclear waste to a Yucca Mountain repository.

Topics to be Addressed. The following regulatory issues have been identified for consideration and action by NWPO:

Federal Law - impact of federal law on State, local and tribal regulation, adequacy of regulations for highway routing, implications of lack of federal regulation for rail routing, reauthorization of the federal Hazardous Materials Transportation Act and potential effects on State law, rulemakings by federal agencies regarding hazardous and radioactive materials transportation; Price-Anderson Act reauthorization and effect on State, local and tribal liability; equivalency of DOE regulations for defense waste and civilian waste transportation.

State of Nevada Statutes - comprehensiveness, clarity, overlap, maximization of agency resources, consistency with federal law, model statewide structure;

Local Government Regulation - consistency with federal and State law, model local government structure;

Indian Law - extent of tribal regulatory rights and responsibilities within Indian Nations' constitutions and federal and State legal structures.

Completed and Continuing Activities. In 1988, NWPO reviewed 17 of the 23 advisory inconsistency rulings made by the U.S. DOT regarding nuclear waste transportation regulations passed by state or local governments. NWPO staff also completed a review and

analysis of State, local government and tribal regulations which revealed some gaps which must be addressed within the statewide structure. For instance, under NRS 459.730, it appears that there are no State prenotification requirements for shipments of low-level radioactive waste, TRU waste or low-specific-activity materials. Further, there appears to be no formal structure for interaction among agencies in prenotification for highway-route-controlled quantities of radioactive materials. It has also been noted that Indian tribes which may be affected by repository shipments do not yet have regulations in place. Local ordinances which have the effect of rerouting nuclear materials through neighboring jurisdictions or impeding commerce may also be subject to inconsistency proceedings brought before the U.S. DOT.

The NWPO has provided input to the Nevada Department of Transportation as it develops regulations under A.B. 47 (1987) for routing of highway-route-controlled quantities of radioactive materials throughout the State. Information was also provided to the Legislature as it developed and passed A.B. 352 (1987), the act which designated the Nevada Department of Motor Vehicles and Public Safety (DMV) as the lead agency in hazardous materials management. NWPO staff has continued to consult with DMV personnel who are developing regulations under this act.

Planned Activities. The NWPO will continue to work toward its objectives in the regulatory area by:

- a. reviewing and maintaining cognizance of any DOE, NRC, DOT, FEMA, EPA or other federal agency's regulations and rulemaking processes or initiatives which may affect repository transportation through regular interaction with these agencies, review of federal documents and other information; [Continuing activity]
- b. providing input and commentary to the above agencies through formal and informal means to assure that Nevada positions are integrated into the process and final rules or orders; [Continuing activity]
- c. continuing the analysis of the DOT's inconsistency rulings as they may affect repository transportation in Nevada; [1989 and continuing]
- d. analyzing federal and state law regarding State, local government and Indian tribal liability for policy, decisions, planning and activity regarding nuclear waste transportation to a Yucca Mountain repository. Liability areas to be considered are decisions or actions taken by governmental officials in the areas of routing, emergency preparedness and response, infrastructure construction and maintenance, permitting, enforcement, inspection, contingency planning, among others; provide a basis for decision-making at each governmental level

regarding participation in each aspect of the program based on potential liability; [1989-1990]

- e. reviewing Indian constitutional and tribal laws to determine tribal regulatory rights within the federal and State structures; [1989] and,
- f. developing a draft framework for State, local governmental and tribal regulation of nuclear waste transportation (as it relates to the proposed repository), taking into account the current federal, State, local and tribal regulatory environment. [1989-1991]

Issues to be addressed within this framework include:

- State and local government liability for routing decisions, emergency management, preparedness and response, and others to be identified;
- permits and fees;
- notification to State, local and tribal governments;
- inspection, escorts and enforcement;
- parking areas; and,
- communication, monitoring and reporting.

Costs for these activities are contained in NWPO operating, staff and transportation contractor budgets. [Contractor: F. Phillips]

C. Technical Reviews and Studies

Objectives

1. Monitor and evaluate all DOE technical plans, initiatives and studies related to transportation of radioactive waste to a Yucca Mountain repository.
2. Conduct a comprehensive study of potential risks, impacts, management and mitigation approaches regarding transportation of radioactive waste to a Yucca Mountain repository.
3. Facilitate statewide response (i.e., mitigation and compensation plans and recommendations) in taking into account the results of the above study.

Topics to be Addressed. The following technical issues have been identified for consideration and action by NWPO:

State Capability for Technical Studies - staffing and development of University of Nevada, Las Vegas Nuclear Waste Transportation Research Center (UNLV/NWTRC), development of technical resources (i.e., library, research equipment), curriculum development for academic and staff training programs, development of quality assurance program;

Transportation Management Information and Analysis System - (TMIAS) - interactive system for State, local tribal agencies, hardware and software procurement and development, data needs and sources, risk and impact models, uses of data, information and models, establishment and maintenance;

Monitoring and Review of DOE Transportation Activities - review of various decisions and documentation, development of information for scheduled DOE and other federal agency decision points and activities;

Rail Access Options - review of DOE screening process for access route(s), State, local government, tribal involvement in selection, timing and schedules for planning and pre-construction activities;

Emergency Preparedness - assessment of State, local, tribal, DOE capabilities and needs, interaction among all government levels;

Risk, Impact and Routing Models - approaches, methodologies, relationship to socioeconomic findings, data needs, physical protection needs, infrastructure and new construction needs, evaluation of potential access routes, emergency response needs, human factors analysis;

Shipping Cask Development - review of standards, design and testing procedures, human factors in fabrication, State, local government and tribal involvement in development process;

Operational Considerations - quality assurance/control in manufacture and maintenance of casks, safety assurance (training, certification, supervision, equipment standards, maintenance), human factors review and evaluation, tracking and communications systems, physical protection procedures.

Completed and Continuing Activities. In 1986, NWPO began preparations for a comprehensive transportation risk and impact study to be conducted under the direction and coordination of its planning division. The planning division also coordinates the ongoing socioeconomic impact and mitigation study which began in 1986 and is in a position to integrate the work and results of the two studies.

As part of the socioeconomic study, research was conducted on transportation risk modelling, potential impacts on State and local governments (costs, resources, functions). A preliminary evaluation of transportation risks was carried out, together with a thorough review of DOE's principal risk assessment model (RADTRAN III). In addition, an initial examination of the potential impacts of repository-related transportation on infrastructure (roads, rail lines) in Nevada was undertaken.

Under contract with NWPO, agency staff of the States of Colorado, Nebraska and New Mexico have completed or will shortly complete a number of technical studies in repository-related transportation. Colorado is now completing a preliminary study on criteria which may be used by states to determine safest rail routes and will suggest a state regulatory structure which may be adapted to assure appropriate use of the criteria. In 1987, Nebraska completed a review of human error issues which need to be considered in monitoring the cask development program. New Mexico is now finishing a survey of emergency response capabilities and needs in potential transportation corridor states near Nevada. The survey procedures and results may be used to assist the State of Nevada, local governments and tribes to design similar surveys, establish a statewide information base and develop mutual aid plans.

In 1988, the NWPO hired an independent contractor to complete a transportation needs assessment to identify and place into priority major issues to be studied within a comprehensive State transportation program. The major tasks of the needs assessment included the:

- a. description and critique of DOE's planned transportation system,
- b. development and description of transportation system options which would maximize safety and minimize adverse impacts and risks to Nevada,
- c. comparison of the two systems to identify areas of research which need to be addressed, and,
- d. development of a framework for a comprehensive transportation study based upon the above descriptions and comparisons, work completed by NWPO, local governments and others, and a review of the professional literature which pertains to HLW waste transportation.

Draft work products for each of these tasks have been submitted for review and final products are due before the end of 1988. The preliminary results of this work, combined with the efforts of the State/Local Government Planning Group, have provided a comprehensive framework for the NWPO transportation program, and plans are now underway for the implementation of the work.

Planned Activities. A comprehensive program must be undertaken by NWPO to address the large array of technical issues related to repository transportation. With advisement of the SLGPG, the NWPO has selected the University of Nevada, Las Vegas (UNLV) College of Engineering as its contractor for technical transportation studies. UNLV has established a Nuclear Waste Transportation Research Center (UNLV/NWTRC) under whose auspices the technical program will be conducted. Initiatives will proceed on short-term (1988-1990) and long-term bases, depending upon information needed to respond to DOE activities or other research work deemed important by the State, local governments or tribes. The short-term or long-term nature of each of the following activities is indicated, as is the agency with the major responsibility for the activity. As these activities get underway, the capacity and capability of the NWTRC will be enhanced by the hiring of new staff and the provision of technical assistance on various first year tasks by recognized experts in the field. See Appendix 4, UNLV/NWTRC Short Term Work Plan and first-year Task Work Plans. Costs, staffing and schedules for the following activities are contained in the Task Work Plans.

The total budget for first year NWTRC activities is approximately \$1,050,000.

NWPO and UNLV/NWTRC will work toward the technical objectives by:

- a. reviewing and analyzing DOE planned repository transportation systems and alternatives with reference to DOE organization, areas addressed, schedules and relationship to transportation system options as determined by the State; [NWPO, Short- and long-term]
- b. continuing to review, monitor and comment upon DOE transportation technical initiatives and documentation, especially with regard to the potential impacts on Nevada of generic technical issues as cask development and testing, modal mix, rail service analysis, national routing processes and methodology, operational procedures and training, sabotage/terrorism, satellite tracking, overweight trucks, defense waste operations policies and plans, and other technical studies regarding transportation; [NWPO, Short- and long-term]
- c. integrating the results of the transportation needs assessment for use in the development of a work plan for the comprehensive transportation risk and impact study; [NWPO and UNLV/NWTRC, Short-term]

- d. assuring the full participation of affected State agencies, local governments and tribes in the review of transportation program technical activities, as conducted by UNLV/NWTRC, other contractors and NWPO staff through regular meetings and communication; [NWPO, continuing activity]
- e. integrating the results of transportation technical studies with those of related areas of the ongoing socioeconomic impact study; [NWPO, continuing activity]
- f. coordinating and supervising the activities of UNLV/NWTRC and integrating the processes and results with those of other aspects of the transportation program and the socioeconomic impact studies; [NWPO, Short- and long-term]
- g. developing and recommending State policy and response to technical study results through interaction with the Governor's Office, the Nevada Commission on Nuclear Projects, the Legislature, State agencies, local governments and tribes, and transportation contractors; [NWPO, continuing activity]
- h. developing and conducting technical study programs in the following areas:

[Note: The following tasks are anticipated to 1993 in view of proposed DOE schedules. Tasks may be added or modified, as appropriate. UNLV/NWTRC task work plans must be approved by NWPO prior to commencement of work on each task]

Preparation for or Response to DOE Activities (Short-Term)

[UNLV/NWTRC has the major responsibility for each of the following activities]

1. Review DOE Draft Sec. 175 Report. Comment on inclusion of appropriate transportation information (Fall '88);
2. Develop transportation information for EIS scoping hearings (Winter, Spring '89);
3. Review and comment upon DOE/YMPO reports:
 - a. Highway Routing Study (Spring '89)
 - b. Rail Access Study (Spring '89)
 - c. Aircraft Overflight Study (Spring '89)
4. Review preliminary DOE cask design report (Summer '89, tentative);
5. Review DOE methodology and criteria for modal mix, including weather sensitivity of modes, security and safety, comparative risks of modes, assessment of options,

equipment and vehicle standards, availability of routes (1989); and,

6. Review criteria and methodology for selection of rail and highway access routes (1989); and,
7. Review CVSA Report on Highway Vehicle Inspection Standards (1989).

State Initiatives (Short-Term)

1. Develop State of Nevada capacity for technical transportation studies (Fall '88 - Spring '89);
2. Develop Transportation Information and Analysis System (TMIAS), including modelling capabilities, to meet needs of State, local, tribal governments, (Fall '88 - Summer '89);
3. Assess State, local, tribal emergency preparedness capabilities and needs (Winter, Spring '89); and,
4. Review NDOT data and risk analyses for routing of highway-route-controlled quantities of radioactive materials for possible use in repository transportation modelling (Winter - Summer '89).

Preparation for or Response to DOE Activities (Long-Term)

1. Review present NRC performance standards for certification of shipping casks (1989);
2. Determine effects of extended fuel burnup credits and fuel consolidation on cask design (1989 - 1990);
3. Review adequacy of existing physical testing plans and requirements for cask certification (1989 - 1990);
4. Participate in DOE Preliminary Cask Design Review (1990);
5. Review and comment on Transportation Management Configuration Study (1990);
6. Review and comment upon DOE Safety Analysis Report (1991);
7. Monitor NRC cask design certification application process (1992 - 1993); and,
8. Review and comment upon DOE Draft EIS regarding comprehensiveness and adequacy of transportation analyses (1993).

State Initiatives (Long-Term)

1. Design and establish quality assurance programs (to professional engineering standards) for all transportation technical analyses (1989);
2. Review and develop methods for transportation risk and accident/incident consequence assessment, identify data and model needs and sources (1989 - 1990);
3. Determine methodologies and models to assess impacts of repository-related transportation on State, local, tribal governments, including costs, functions, infrastructure and construction needs, personnel and training needs (1989 - 1990);
4. Determine methodology to incorporate human factors into all aspects of technical analysis (1989 - 1990);
5. Develop criteria and methodologies for route designation, review existing models, determine data, regulatory and institutional needs, conduct pilot studies (1990 - 1993);
6. Conduct tests of DOE shipment monitoring system, assess system in relationship to State, local, tribal needs, develop and assess alternatives (1990 - 1993);
7. Conduct, integrate or assist in other transportation studies as requested by NWPO, local and tribal governments (1989 -).

D. Institutional Relationships

Objectives

Maintain appropriate institutional relationships between the NWPO and:

1. federal departments and agencies involved in nuclear waste transportation.
2. other State agencies, commissions, legislative committees and other State-related entities involved in nuclear waste transportation.
3. affected local governments and Indian tribes within Nevada.
4. interstate groups, other states, boards and associations interested in or affected by repository transportation.

Issues to be Addressed. The following institutional issues have been identified for consideration and action by NWPO:

State, Local, Tribal and Public Involvement in DOE Transportation Planning Activities - DOE schedule for technical and financial support for participation of affected entities, the nature of DOE interaction with interested and affected parties;

[Note: A summary of institutional issues identified by DOE and Nevada concerns is contained in Section 1.0 of this report]

State of Nevada Interaction with Local Governments, Tribes, Other States - issues to be addressed cooperatively and independently, financial assistance, nature of relationships.

Completed and Continuing Activities. NWPO staff has maintained ongoing relationships with the DOE, its Yucca Mountain Project Office (YMPO) and other federal agencies involved in the planning for transportation of waste to a repository. NWPO staff have participated in all appropriate workshops, meetings, policy and rulemaking processes which may have an effect on Nevada planning and activity in the transportation area. The TCG meetings, scheduled two to three times a year, were formerly open only to staff of DOE offices, laboratories and contractors, but recently have been open to states, local governments and tribes.

NWPO prepared written comments on the DOE Transportation Institutional Plan (1986) and coordinated the commentary from local governments and potential western corridor states. The major comments reflected concerns that, (1) DOE scheduling for routing and modal mix decisions did not allow states and local governments the necessary time for emergency response preparation, (2) DOE funding for participation of potential corridor states and tribes in program activities is inadequate, (3) the nature of participation in the repository transportation program by states, local governments and tribes is ambiguous, and (4) the institutional and technical aspects of the DOE transportation program is not well integrated.

The DOE Transportation Business Plan (1986) was also reviewed by NWPO staff. Comments centered on assuring state, local and tribal government participation in the contracting and review process.

The NWPO program also includes ongoing commentary and review of transportation policy regulations, activities and documents emanating from the NRC, DOT, FEMA, EPA or other federal agencies. Participation by NWPO staff in conferences, workshops or other presentations by any federal agency involved in nuclear materials transportation also contribute to information exchange between the federal, state, tribal and local governments affected by repository-related transportation.

With regard to tribal involvement in federal and state programs, NWPO contracted with the State of New Mexico for the development

of a pilot institutional project which is designed to bring affected tribes into the repository transportation program. The results of this project will be shared with the State of Nevada, local governments and tribes in late 1988.

Since 1983, the NWPO has been involved in working relationships with other western states which may be affected by repository-related transportation. Through the Western Interstate Energy Board [WIEB] and the Western Governor's Association (WGA), NWPO cooperates in regional planning and policy review of transportation issues which affect the entire western region of the United States.

The State of Nevada is potentially affected by many transportation regulations which are promulgated by its neighboring states. Further, certain regional geographic, climatological and political characteristics lead to common concerns among western states which may be addressed most effectively through cooperative action. Each of the states are also subject to federal law and policy which affect State and local regulation of transportation of HLW and other hazardous materials.

Continued cooperation with other states has been complicated by congressional decisions which have the effect of eliminating financial assistance to other states which share Nevada's interests and concerns regarding nuclear waste shipments to Yucca Mountain. The elimination of the second repository program and the phase-out of activities at other first repository states means the elimination of DOE funds to support state and tribal participation in the planning for nuclear waste transportation. The DOE budget appropriation for FY 89 specifically prohibits Nevada from supporting transportation analysis by other states which would be affected by shipments to Yucca Mountain. DOE has not yet implemented the provisions of the NWPAA which would make financial assistance from the Waste Fund available to potentially affected states and tribes. Taken together, these congressional and DOE decisions could severely limit the participation of other states and tribes in the nuclear waste planning process.

NWPO staff has worked closely with the Western Interstate Energy Board's (WIEB) High-Level Waste Committee in developing regional policy on behalf of the respective member states with regard to the transportation of HLW to a repository. In 1988, WIEB presented a recommended process for routing to DOE which reflected western state concerns regarding the timing and federal process for route selection. WIEB suggested that a highway route designation process be established under the leadership of DOE in cooperation with states. The suggested process called for the early establishment of methodologies for route selection and an interactive process among DOE and states to establish intra-state or multistate alternatives to national routes. The WIEB committee has worked under contract to DOE to study a number of issues related to HLW

transportation and to provide federal agencies with western states' perspectives on all aspects of repository-related transportation. The Nevada governor has designated the NWPO executive director as his delegate to the HLW Transportation Committee of the Western Governors Association (WGA). The WGA HLW committee passed two resolutions in 1988. The first recommended the same highway routing process as that suggested by WIEB (above) and the second strongly urged western states' participation in the development of DOE's Section 175 Report and EIS scoping, especially to assure that transportation issues were fully considered.

NWPO staff has coordinated its transportation activities with those of the staff of the NCSL and has exchanged information and study results with NCSL staff who are working on this issue.

The important and invaluable roles of the State/Local Government Planning group and other State of Nevada agencies have been discussed in detail elsewhere in this report and the NWPO plans to continue working closely with these jurisdictions and entities in all its transportation program activities. For example, Lincoln County/City of Caliente has conducted a pilot study of the physical condition of a mainline rail segment within the county and has made the results available to NWPO and other members of the SLGPG. Other counties or cities remain in the planning or monitoring stages and will share study plans and results as work commences. The State of Nevada Department of Transportation has maintained close contact with the NWPO in its work on risk analysis for the transportation of highway-route-controlled quantities of radioactive materials (under AB 47) and has shared its work with members of the SLGPG.

Planned Activities. The NWPO will continue to work toward its objectives in the institutional areas by:

- a. maintaining continuous interaction with DOE, its various components and other federal agencies through ongoing monitoring, evaluation and review of all federal initiatives and plans, participation in federally-sponsored meetings and involvement in other related activities; [Continuing activity]
- b. determining the nature of State of Nevada participation in DOE transportation planning activities and those of other federal agencies involved in the repository transportation program; [Continuing activity]
- c. maintaining ongoing contact with the WIEB High-Level Waste Committee, the WGA and the NCSL in order to:
 - 1) provide the Nevada perspective to regional policy development, resolutions, work tasks or any other activities undertaken by these entities regarding HLW transportation;

- 2) assist in developing and promoting western HLW transportation policies and perspectives and making recommendations to DOE or other responsible federal agencies;
 - 3) advise State, tribal and local officials on regional policy and interstate or interlocal agreements in the areas of regulation, institutional relationships, technical activities and program management and development;
 - 4) define and place into priority regional HLW transportation research issues; cooperate in research programs, correlate processes and results of such work;
 - 5) present regionally-based findings and recommendations to State, tribal and local officials or groups and to DOE or other responsible federal agencies;
- d. maintaining ongoing communication with neighboring states to identify concerns and issues in HLW transportation and work cooperatively to develop solutions which would be mutually beneficial to each state. Examples of concerns are continuity of routing between states, mutual aid agreements in the event of a transportation emergency, inspections, and so on; [Continuing activity]
- e. working with other State agencies, local governments and Nevada tribes in:
- 1) developing and maintaining a viable mechanism for coordination of the ongoing review of transportation issues and priorities, policy development, planning, research, and mitigation strategies among State offices, agencies, legislative bodies, local governments and tribes [1988-1989]
 - 2) establishing and maintaining formal or informal relationships with local governments in view of direct funding to affected counties under NWPAA; [1988-1989]
 - 3) developing strategies for cooperative study and review programs in repository transportation areas, including inspection and enforcement, escorts, notification, parking areas, route selection, infrastructure and construction needs, impact assessment, local training needs; [1988-1990]
 - 4) developing a Statewide regulatory structure (See Regulatory Studies, Planned Activities, f., above); [1989-1993]

- 5) developing cooperative emergency management and preparedness plans, cleanup capabilities and responsibilities for mitigation; [1989-1993]
- 6) assuring public information, education and participation in transportation planning and studies. [1988 and continuing]

3.2 NWPO Transportation Program Review by Affected State Agencies, Local Governments, Indian Tribes and Independent Experts

All NWPO transportation policy, planning and sponsored research work is subject to the scrutiny of the State/Local Government Planning Group and affected State agencies. Each of these entities examine NWPO transportation program activities for their potential effects on their respective jurisdictions and agency functions.

Since 1986, a technical review committee, consisting of international and national experts in social, economic and transportation impact and risk assessment and mitigation, has regularly reviewed NWPO's socioeconomic and transportation efforts. This committee has been especially helpful in establishing and maintaining a high level of scientific and technical rigor in each aspect of NWPO planning division programs.

4.0 RECOMMENDATIONS

From the preceding discussion, it is clear that there are numerous issues which must be addressed in the State of Nevada's policies, plans and activities in assuring safe and uneventful transportation of high-level radioactive waste to a Yucca Mountain repository.

The recommendations which follow are predicated on three fundamental concepts:

- (1) the goal of the entire transportation system should be the safe and uneventful transportation of nuclear materials,
- (2) the State, local governments and tribes stand ready to initiate planning, analysis, training and management activities to facilitate this goal, and,
- (3) the State of Nevada, local governments and tribes must be kept whole (i.e., indemnified, compensated or otherwise protected from any adverse impacts) in any system for transportation of nuclear waste to a repository.

The following recommendations should be examined and implemented in the context of the respective roles and responsibilities of State and local officials who are concerned about the transportation of nuclear waste and its impacts. Implementation of these recommendations can be accomplished in a variety of ways depending upon policy, regulatory or institutional authorities and responsibilities of the entities and organizations involved. Implementation of the recommendations will facilitate the accomplishment of State nuclear waste transportation planning goals and objectives.

RECOMMENDATIONS

1. THE STATE OF NEVADA SHOULD ENCOURAGE THE FEDERAL GOVERNMENT TO FULFILL ITS RESPONSIBILITY TO SEE THAT THE STATE OF NEVADA AND ITS CITIZENS ARE KEPT WHOLE IN A NATIONAL PROGRAM THE OF TRANSPORTATION OF NUCLEAR WASTE TO A YUCCA MOUNTAIN REPOSITORY.

Rationale: From records of Congressional debate on the Nuclear Waste Policy Act of 1982, it is clear that Congress intended that states, tribes and local communities be "kept whole" in relation to the nuclear waste disposal program. Congress made it very clear that all costs associated with nuclear waste disposal should be borne by the generators of the waste - not by host states, tribes or local governments. Under the current DOE approach to the repository program, especially the transportation aspects, it is possible that state, local and tribal governments could be expected

to take on responsibilities, roles and costs which are appropriately within the purview of the federal government. For example, the DOE must clarify its intentions regarding the liability of states, local governments and tribes as joint decisions are made regarding routing, modal mix, emergency management, inspection, enforcement and operational aspects of the transportation program. DOE must make concrete commitments regarding funding for infrastructure improvements and new construction, and the development and maintenance of State resources to monitor the program to assure safe and uneventful transportation. Any adverse socioeconomic and environmental impacts of transportation identified by the State must be considered fully by the federal government and clear plans made for mitigation or compensation for such impacts.

2. THE STATE OF NEVADA SHOULD ENCOURAGE THE DEPARTMENT OF ENERGY (DOE) TO IMMEDIATELY ESTABLISH A MECHANISM THAT WILL RESULT IN THE EARLY IDENTIFICATION OF NATIONAL HIGHWAY AND RAIL ROUTES TO BE USED FOR THE SHIPMENT OF NUCLEAR WASTE TO A YUCCA MOUNTAIN REPOSITORY. THIS MECHANISM SHOULD BE IN PLACE PRIOR TO DOE APPLICATION FOR LICENSING FOR A REPOSITORY OR A MRS.

Rationale: Before effective State and local planning for repository-related nuclear material shipments can begin in earnest, the routes over which such shipments will travel must be known. Route selection is the first step in planning for highway/rail safety, emergency response, inspection and enforcement, infrastructure improvement and most other aspects of waste transportation. In the absence of the unambiguous designation of national routes, Nevada and other states are forced to consider each interstate and U.S. highway and each main line rail road as a possible nuclear waste route. This is an untenable situation that can - and must - be remedied by the early identification of principal routes to the proposed repository site.

The Nuclear Waste Policy Act and the National Environmental Policy Act (NEPA) require DOE to prepare an Environmental Impact Statement (EIS) relative to the proposed repository. This EIS must, statutorily, address the transportation implications related to the operations of such a facility. Without a clear designation of routes - and the consequent identification of states, local communities and conditions along those routes - it is not possible to adequately analyze potential transportation effects as required in the EIS.

3. THE STATE OF NEVADA SHOULD ENCOURAGE THE DOE TO DETERMINE, AS SOON AS POSSIBLE, THE MIX OF TRUCK AND RAIL SHIPMENTS WHICH WILL BE REQUIRED TO MOVE SPENT NUCLEAR FUEL AND DEFENSE HIGH-LEVEL RADIOACTIVE WASTE FROM REACTORS, DEFENSE FACILITIES AND TEMPORARY STORAGE SITES TO A YUCCA MOUNTAIN REPOSITORY.

Rationale: In addition to knowing which routes are likely to be used for nuclear waste shipments, it is crucial that states, tribes and local governments know whether the waste is to be transported by truck or rail and in what proportions.

If most waste is to come into Nevada (or other states) by truck, planning requirements will be markedly different than if most of the material were to be shipped by rail. These differential planning needs derive directly from the different character of rail and truck shipments and the diverse characteristics of rail and highway routes. For example, preparations required to address potential accidents in a situation where most of the radioactive materials are transported by rail - with larger casks and fewer numbers of shipments - will be different from circumstances where local communities must prepare for lower capacity, higher volume shipments by truck. Personnel, equipment and training needs would differ, as would State and local preparation for inspection, enforcement, escorts and related activities. In the absence of realistic modal mix information, State and local planning is seriously hindered.

4. THE STATE OF NEVADA SHOULD ENCOURAGE THE DOE TO PROCEED IMMEDIATELY TO PLAN FOR NEEDED PHYSICAL INFRASTRUCTURE IMPROVEMENTS AND NEW CONSTRUCTION, ONCE ROUTING AND MODAL DECISIONS ARE MADE. SUCH IMPROVEMENTS SHOULD BE PLANNED IN CONJUNCTION WITH THE STATE AND AFFECTED LOCAL AND TRIBAL GOVERNMENTS. THESE PLANS SHOULD BE IMPLEMENTED BEFORE ANY WASTE IS SHIPPED TO A REPOSITORY.

Rationale: Changes in transportation system infrastructure, especially those requiring land acquisition and new construction, tend to require extensive lead times. It is not uncommon for a bypass or new section of highway to take 15, 20 or more years from conception to completion.

If large amounts of nuclear waste are to pass through southern Nevada along I-15, it is probable that the heavily populated Las Vegas metropolitan area will have to be bypassed in some fashion. Likewise, if rail transportation is to be an option, a new rail spur will have to be constructed to Yucca Mountain. Infrastructure projects such as these are extremely time-intensive and require long lead times just for planning, environmental studies, land acquisition, permitting and construction, not to mention federal authorization for funding the projects.

In order for needed infrastructure to be in place by the 2003 - 2005 time frame (when DOE plans to have a repository in operation), serious planning work should begin in the very near future. The transportation network of roads and rail lines in Nevada must be ready and adequate at the onset of operations. The current example of the Waste Isolation Pilot Plant (WIPP) in New Mexico, which was scheduled to open in October 1988 without even commencing work on needed infrastructure projects, is not a reassuring precedent.

5. THE STATE OF NEVADA SHOULD STRONGLY RECOMMEND THAT THE DOE BE REQUIRED TO EXAMINE REGIONAL AND NATIONAL TRANSPORTATION IMPLICATIONS IN THE IMPACT REPORT THAT IS MANDATED UNDER SECTION 175 OF THE NUCLEAR WASTE POLICY AMENDMENTS ACT OF 1987 (NWPAA), AND IN SUBSEQUENT ENVIRONMENTAL IMPACT STATEMENT SCOPING EFFORTS.

Rationale: Under its own guidelines for site selection, DOE is directed to consider transportation safety factors involved in moving waste to a repository. Section 175 of the NWPAA directs the DOE to submit a report to Congress which identifies the potential impacts (including transportation) of locating a HLW repository at Yucca Mountain and DOE's recommendations for the mitigation of such impacts.

DOE has chosen to interpret this directive in the narrowest sense and has failed to consider the national character of the required nuclear waste transportation system in its impact assessment work to date.

National and regional aspects of the repository transportation system directly affect nuclear waste transportation in Nevada - and Nevada's ability to adequately plan for and safeguard such transportation. Routing decisions on the part of other states could affect how and even when waste will be shipped to Nevada. "National" components of the waste system, such as the design of shipping casks, safeguards to be used, route selection procedures and others will have implications for Nevada and must be addressed in any examination of repository-related impacts.

In completing its Section 175 Report, failure by DOE to adequately evaluate the transportation effects of a Yucca Mountain repository in a system-wide manner could result in congressional misunderstanding of the truly national character of transportation impacts.

6. THE STATE OF NEVADA SHOULD ENCOURAGE THE DOE TO IMMEDIATELY IMPLEMENT SECTION 180 (c) OF THE NWPA WHICH PROVIDES FOR FINANCIAL SUPPORT FOR STATES IN EMERGENCY PREPAREDNESS PLANNING AND TRAINING. THE DOE SHOULD ALSO BE ENCOURAGED TO SUPPORT NEVADA INDIAN TRIBES IN SUCH PLANNING FOR LANDS UNDER THEIR JURISDICTIONS.

Rationale: Under Section 180(c) of the NWPA, DOE is required to provide financial assistance for emergency preparedness training to states through which repository waste would be shipped. This training is to be provided to officials of local and tribal jurisdictions within the affected states. Although the NWPA was passed almost one year ago, DOE has not yet begun to implement this directive. Effective emergency response training programs require long lead times for planning, development and equipment procurement. Implementation of these programs require especially long training schedules in states with large rural areas or a large percentage of volunteer emergency responders. The earlier that DOE assistance is provided, the greater benefit will accrue to the affected states and tribes.

In view of Indian tribes' desires to be viewed by DOE as governmental entities separate from state jurisdiction, it may also be appropriate that DOE provide separate funding to each Indian nation or tribe which would be affected by repository-related transportation.

7. WHERE APPROPRIATE, THE STATE OF NEVADA SHOULD ACTIVELY RECOMMEND DESIRABLE CHANGES AND PROVIDE STATE POSITIONS REGARDING EXISTING AND PROPOSED FEDERAL LAWS AND REGULATIONS WHICH AFFECT HIGH-LEVEL RADIOACTIVE WASTE TRANSPORTATION.

Rationale: It has become apparent that there are significant deficiencies within the federal regulatory structure which may have a deleterious effect on the State of Nevada. For instance, the NRC's transportation regulations apply only to its licensees and not to DOE. DOE has adopted transportation procedures and guidelines said to be equivalent to those of NRC, but such action is discretionary and the results ambiguous, even where DOE's guidelines are included in interagency agreements. Such a situation unnecessarily exposes Nevada's citizens to increased risk of the consequences of a transportation radiological incident or accident.

Federal law determines the extent and nature of the state and local laws, regulations or ordinances which may be enacted or adopted. The State of Nevada must protect against federal encroachment upon those areas of law that have been traditionally regulated by states. If Congress broadens the areas preempted by federal law, as encouraged by DOE and DOT, Nevada's ability to protect its citizens will be hampered. To prevent this, the State of Nevada, local governments

and tribes should actively participate in the federal legislative process.

Nevada should also participate in DOT inconsistency proceedings to protect its interests. In attempts to protect their citizens, several states have adopted legislation regulating the transportation of radioactive material. DOT, DOE or members of the nuclear or transportation industries have challenged many of these laws. It is therefore likely that Nevada's laws regarding the transportation of spent nuclear fuel or high-level radioactive waste will also be challenged. The State of Nevada, affected local governments and tribes should participate in DOT inconsistency proceedings in an attempt to assure that DOT, DOE and others understand and act upon the proper legal principles which control the issue of federal preemption.

8. IN CONJUNCTION WITH LOCAL GOVERNMENTS AND TRIBES, THE STATE OF NEVADA SHOULD DEVELOP A COMPREHENSIVE STRUCTURE FOR THE REGULATION OF TRANSPORTATION OF NUCLEAR WASTE TO A YUCCA MOUNTAIN REPOSITORY. FURTHER, IT IS IMPORTANT THAT STATE, LOCAL AND TRIBAL PLANNING FOR NUCLEAR WASTE TRANSPORTATION BE INTEGRATED WITH PLANNING FOR THE MANAGEMENT AND TRANSPORTATION OF OTHER RADIOACTIVE AND HAZARDOUS MATERIALS.

Rationale: A number of State statutes and local government ordinances which regulate the management and transportation of hazardous materials, including radioactive waste, have been enacted over the last several years. Notable among these are Nevada statutes developed under A.B. 47 and A.B. 352 (1987) and ordinances passed by Clark County and the cities of Las Vegas and North Las Vegas (1987, 1988). While these actions provide an excellent base for a comprehensive structure, there remain questions of duplication of State agency functions, gaps in areas covered and the effects of the actions of one jurisdiction upon another. A further concern relates to the Indian tribal standing vis-a-vis the State regulatory system.

It is also extremely important to have institutional, regulatory and operational integration for nuclear waste and other hazardous materials planning. There is significant commonality among the two areas which provides opportunities for developing an integrated hazardous material transportation system within the State. Such a system should incorporate the special regulatory and planning needs of nuclear waste transportation. It is crucial that it be approached from an integrative perspective.

A comprehensive structure, within which the State, local governments and tribes may fold in existing regulation or enact new laws or ordinances would provide guidance in establishing a consistent, fair and effective state-wide regulatory environment which would withstand any constitutional or preemptive challenges. Further, such a regulatory structure would allow the State of Nevada to assume a

proactive regulatory position as federal decisions are made regarding the transportation of waste to Yucca Mountain.

9. THE STATE OF NEVADA, LOCAL GOVERNMENTS AND INDIAN TRIBES WITHIN NEVADA SHOULD CONTINUE TO WORK COOPERATIVELY IN OVERSEEING FEDERAL REPOSITORY-RELATED TRANSPORTATION ACTIVITIES AND IN ASSURING THAT ANY SUCH TRANSPORTATION WITHIN THE STATE WILL BE CARRIED OUT AS SAFELY AND UNEVENTFULLY AS POSSIBLE.

Rationale: If Yucca Mountain is developed as a repository, nuclear waste transportation will have effects which are felt at the State, county and community levels. While certain areas of the State may be impacted more intensely or more directly, the interrelated nature of the systems and institutions involved will result in transmission of effects within the State. For example, routing decisions will affect not only those areas through which the waste must pass, but also intercounty and State-County relationships as these pertain to the route selection process, the availability of resources for emergency response infrastructure improvements, and many other areas. There are also numerous operational as well as political interrelationships among jurisdictions which will be affected in some way by waste transportation within the State.

Since its inception in 1983, the State NWPO has worked closely with local governments and (more recently) Indian tribes which would be affected by transportation of spent fuel and defense high-level radioactive waste to Yucca Mountain. The NWPO has involved these jurisdictions in its decision-making and other activities through the State/Local Government Planning Group and has provided continuous funding for planning, liaison and technical activities, and monitoring of the DOE transportation program.

It is extremely important that this cooperation continue as nuclear waste transportation planning intensifies. No single entity can effectively address the range of transportation implications posed by a repository at Yucca Mountain. Effective planning requires not only cooperation, but also joint and shared decision-making and planning. Only by working together can the affected entities maximize available resources and minimize possible negative effects of waste shipments upon the State and its citizens.

5.0 REFERENCES

References used for Section 1.0.

Ardila-Coulson, M.V., 1988. Nuclear Materials Transportation Investigation: Phase I, Prepared by University of Nevada-Reno, Engineering Research and Development Center, for the Nevada Department of Transportation, Reno, NV.

Audin, L., 1987. "A Review of the Effects of Human Error on the Risks Involved in Spent Fuel Transportation," Prepared for the Nebraska Energy Office.

Audin, L., n.d. "The SANDIA Movie: The Book was Better," E.A.M. Transport Intelligence Bulletin, No. 2.

Barry, D.O., 1988. Letter to R. di Bartolo, September 13, 1988, Regarding Current Capacity Utilization and Pavement Conditions Along Proposed Shipping Routes.

Battelle Memorial Institute, 1986. Overweight Truck Shipments to Nuclear Waste Repositories: Legal, Political, Administrative, and Operational Considerations, BMI/OSTP-01, Office of Transportation Systems and Planning, Columbus, OH.

Battelle Memorial Institute, 1988. Analysis of Institutional Issues and Lessons Learned From Recent Spent Nuclear Fuel Shipping Campaigns (1983-1987), BMI/OSTP-03, Office of Transportation Systems and Planning, Columbus, OH.

Brodnick, D.A., 1988. "The Utility Industry's Perspective on OCRWM's Plans for Developing the System for Transporting Spent Fuel under the Nuclear Waste Policy Act," Waste Management 88, Proceedings of the Symposium on Waste Management, Tucson, AZ, Vol. 2, 51-56.

Bucholz, J.A. 1986. Scoping Study of Casks Shipped from the MRS Facility to Various Repository Sites, ORNL/CSD/TM-237, Prepared by Oak Ridge National Laboratory for U.S. Department of Energy, Oak Ridge, TN.

Callaghan, E.F., W.H. Lake, 1988. "DOE Procurement Activities for Spent Fuel Shipping Casks," Journal of the Institute of Nuclear Materials Management, Vol. 16, No. 3 (April 1988), 24 - 27.

Cashwell, J.W., K.s. Neuhauser, P.C. Reardon, G.W. McNair, 1986. Transportation Impacts of the Commercial Radioactive Waste Management Program, SAND85-2715, Sandia National Laboratories, Albuquerque, NM.

Chilk, S.J., 1986. Letter to C.A. Sinderbrand, October 10, 1986, Transmitting U.S. Nuclear Regulatory Commission Denial of Petition for Rulemaking by the State of Wisconsin, Docket No. PRM-71-10.

Coakley, L.G., 1987. "Highway Routing of Commercial Spent Fuel Shipments: Local Input to the Process," Waste Management 87, Proceedings of the Symposium on Waste Management, Tucson, AZ, Vol. 1, 223 - 226.

Colglazier, E.W., 1985. Evaluation of the Need, Feasibility, and Siting of the MRS in Tennessee, Draft Final Report, Prepared by the University of Tennessee, Energy, Environment and Resources Center for the State of Tennessee, Knoxville, TN.

Coyle, D., et al., 1988. Deadly Defense: Military Radioactive Landfills, Radioactive Waste Campaign, New York, NY.

Earl, A.S., 1986. Letter to L. Zech, U.S. Nuclear Regulatory Commission, October 30, 1986, Regarding Northern States Power Company Spent Nuclear Fuel Shipments.

Evans, T.J., R.J. Halstead, 1987. "How Many Geologic Repositories Will Be Needed?", Waste Management 87, Proceedings of the Symposium on Waste Management, Tucson, AZ, Vol. 2, 33-40.

Felton, J.M., 1985. Letter to C.A. Sinderbrand, April 24, 1985, Transmitting Copies of Comment Letters Received on State of Wisconsin Petition for Rulemaking, Docket No. PRM-71-10.

Fisher, L.E., C.K. Chou, M.A. Gerhard, C.Y. Kimura, R.W. Martin, R.W. Mensign, M.E. Mount, M.C. Witte, 1987. Shipping Container Response to Severe Highway and Railway Accident Conditions, NUREG/CR-4829, UCID-20733, Vols. 1 and 2, Prepared by Lawrence Livermore National Laboratory for U.S. Nuclear Regulatory Commission, Washington, DC.

Foster, B., 1986. Risk Analysis and Spent Fuel Transportation, National Conference of State Legislatures, Denver, CO.

Foster, B., C. Runyon, 1987. State Issues in Radioactive Waste Transportation and Applicable Conflict Mediation Techniques," Waste Management 87, Proceedings of the Symposium on Waste Management, Tucson, AZ, Vol. 1, 203-205.

Freudenberg, W., 1988. "Perceived Risk, Real Risk: Social Science and the Art of Probabilistic Risk Assessment," Science, Vol.242 (October 7, 1988), 44-49.

Friederich, C.E., 1986. "Earl Asks U.S. to Halt Transit of A-waste," Milwaukee Journal, October 31, 1986.

Fuierer, A.A., 1987. "Reactor Fuel Management Practices and Utility Waste System Issues," Presentation at the American Nuclear Society Topical Meeting/Workshop on the Integrated Spent Fuel and HLW Management System, September 28-30, 1987, Albuquerque, NM.

Furber, C.P., 1988. "Transportation of Spent Fuel by Rail," Presentation to 1988 Annual Meeting, National Conference of State Legislators, Reno, NV.

Gertz, 1988d. Letter to M. Baughman, September, 1988, Regarding Study of Additional Alternative Rail Routes to Yucca Mountain.

Gertz, C.P., 1988a. Letter to R.R. Loux, April 28, 1988, Regarding Radioactive Waste Management Transportation Managers Meeting, February 9, 1988.

Gertz, C.P., 1988b. Letter to R.R. Loux, June 10, 1988, Regarding Request for Rail Access Spur Planning Documents.

Gertz, C.P. 1988c. Letter to R.R. Loux, August 23, 1988, Regarding Environmental Impact Statement Planning for Transportation Issues.

Gertz, C.P., D.H. Schoonen, B.H. Wakeman, 1987. "Transportation of Spent Fuel to the Idaho National Engineering Laboratory," Waste Management 87, Proceedings of the Symposium on Waste Management, Tucson, AZ, Vol. 1, 397 - 403.

Grella, A.W., 1987. "Compliance Inspections by U.S.N.R.C. of Recent Spent Fuel Shipments," Waste Management 87, Proceedings of the Symposium on Waste Management, Tucson, AZ, Vol. 1, 431 - 435.

Grimm, P.D., L.H. Harmon, 1987. "Safe But Controversial: A Study of Recent High-Visibility Spent Fuel Shipping Campaigns," Waste Management 87, Proceedings of the Symposium on Waste Management, Tucson, AZ, Vol. 1, 217 - 221.

Hahn, K., 1985. Letter to B. Rusche, May 17, 1985, Transmitting State of Nebraska Comments on the DOE Draft Environmental Assessments.

Halstead, R.J., C. Sinderbrand, D. Woodbury, 1987. "Regulation of Spent Nuclear Fuel Shipments: A State Perspective," Waste Management 87, Proceedings of the Symposium on Waste Management, Tucson, AZ, Vol. 1, 227 - 234.

Halstead, R.J. 1986. Comments on 1977 Sandia Film of Spent Nuclear Fuel Shipping Cask Crash Tests, Prepared for Wisconsin Radioactive Waste Review Board, Madison, WI.

Halstead, R.J., M. Wise, T.J. Evans, 1988. "Rethinking the Nuclear Waste Program: Lessons from the Crystalline Repository Project," Waste Management 88, Proceedings of the Symposium on Waste Management, Tucson, AZ, Vol. 2, Vol. 2, 901-914.

Halstead, R.J., S.M. Kidwell, D. Woodbury, 1986. "Implications of Monitored Retrievable Storage for Geologic Disposal of Spent Nuclear Fuel and High Level Radioactive Waste," Waste Management 86,

Proceedings of the Symposium on Waste Management, Tucson, AZ, Vol. 2,595 - 601.

Hoskins, R. 1987. Status of Spent Nuclear Fuel Management Technology Related to DOE Monitored Retrievable Storage Proposal, Draft Preliminary Report Prepared by University of Tennessee, Waste Management Research and Education Institute, for the State of Tennessee, Knoxville, TN.

Joy, D.S., P.E. Johnson, I.G. Harrison, "A Comparison of Actual and Predicted Routes Used in the Shipment of Radioactive Materials," Waste Management 85, Proceedings of the Symposium on Waste Management, Tucson, AZ, Vol. 3, 269 - 272.

Joy, D.S., R.L. Jolley, 1986. "The Monitored Retrievable Storage Facility (MRS) and its Impact on Spent Fuel Transportation," Waste Management 86, Proceedings of the Symposium on Waste Management, Tucson, AZ, Vol. 2, 589 - 593.

Kerrey, R., 1986. Letter to J.S. Herrington, September 24, 1986, Regarding DOE s\Shipments of Three Mile Island Core Debris to Idaho National Engineering Laboratory.

Kleinhans, J., 1987. Wisconsin's Involvement in High-Level Radioactive Waste Transportation, Prepared for Wisconsin Radioactive Waste Review Board, Madison, WI.

Kouts, C.A., 1988. Letter to Dear Colleagues, September 23, 1988, Transmitting Minutes of the Transportation Coordination Group (TCG) Meeting held in Atlanta, Georgia, March 29-30, 1988.

Lahs, W.R., 1987. Transporting Spent Fuel: Protection Provided Against Severe Highway and Railroad Accidents, NUREG/BR-0111, U.S. Nuclear Regulatory Commission, Washington, DC.

Lahs, W.R., J.R. Cook, W.H. Lake, 1987. "The Modal Study: The Response of Spent Fuel Packages to Severe Transportation Accidents," Waste Management 87, Proceedings of the Symposium on Waste Management, Tucson, AZ, Vol. 1, 437 - 440.

Lipschutz, R.D., 1980. Radioactive Waste: Politics, Technology, and Risk, A Report of the Union of concerned Scientists, Ballinger Publishing Company, Cambridge, MA.

Liverman, D.M., 1985. Risk Assessment and Radioactive Waste Transportation: A Review of RADTRAN II Model, Prepared for the Utah State Office of Planning and Budget, Madison, WI.

MacDougall, H.R., L.W. Scully, J.R. Tillerson, 1987. Nevada Nuclear Waste Storage Investigations Project Site Characterization Plan Conceptual Design Report, SAND84-2641, Vol. 4, Appendix H, Prepared by Sandia National Laboratories for U.S. Department of Energy, Albuquerque, NM.

Managan, D., W.A. Higinbotham, 1988. "Physical Protection Around the World: Special Issue," Journal of the Institute of Nuclear Materials Management, Vol. 16, No. 2 (January 1988).

McClure, J.D., R.E. Luna, F.P. Falci, 1988. "Public Concerns about RAM Transport: Communicating Engineering Data on Risk," Waste Management 88, Proceedings of the Symposium on Waste Management, Tucson, AZ, Vol. 2, 415 - 420.

McClure, T.A., L.E. Brentlinger, V.J. Drago, D.C. Kerr, 1988. Considerations in Rail Routing of Radioactive Materials, With Emphasis on the Relationship Between Track Class and Train Accidents, BMI/OSTP-02, Battelle Memoria Institute, Office of Transportation Systems and Planning, Columbus, OH.

McDonnell, L.J., 1987. Memorandum, January 13, 1987, Regarding Wisconsin's Spent Fuel Shipment Monitoring Program, Department of Health and Social Services, Madison, WI.

Meyer, R.J., D.M. Osborne, 1988. "New Generation Legal Weight Spent Fuel Shipping Cask," GA-A19168, GA Technologies, Inc., San Diego, CA.

Mortensen, C., J. Cooper, n.d. Illinois Spent Nuclear Fuel Transportation, Pamphlet Prepared for U.S. Department of Transportation, Research and Special Programs Administration.

Nash, L., A.H. Schiling, 1985. Analysis of the Illinois Spent Nuclear Fuel Vehicle Inspection and Escort Program, Prepared for Illinois Department of Nuclear Safety, Battelle Human Affairs Research Centers, Seattle, WA.

National Research Council, 1983. A Study of the Isolation System for Geologic Disposal of Radioactive Wastes, Board on Radioactive Waste Management, Waste Isolation Systems Panel, National Academy Press, Washington, DC.

National Research Council, 1984. Social and Economic Aspects of Radioactive Waste Disposal, Board on Radioactive Waste Management, Panel on Social and Economic Aspects of Radioactive Waste Management, National Academy Press, Washington, DC.

Nevada Department of Transportation, 1987. Nevada Rail Plan: 1987 Update, Carson City, NV.

Nuclear Assurance Corporation, 1986. Spent Fuel Transportation in the United States: Commercial Spent Fuel Shipments Through December 1984, SAND85-7246, Prepared by Sandia National Laboratories for the U.S. Department of Energy, Albuquerque, NM.

Nuclear Waste Policy Act of 1982, 42 USC Secs. 10101-10226.

Oak Ridge National Laboratory, 1987. Integrated Data Base for 1987: Spent Fuel and Radioactive Waste Inventories, Projections and Characteristics, DOE/RW-0006, Rev. 3, Prepared for U.S. Department of Energy, Washington, DC.

Ostmeyer, R.M., 1986. "The Potential Importance of Water Pathways for Spent Fuel Transportation Accident Risk," Waste Management 86, Proceedings of the Symposium on Waste Management, Tucson, AZ, Vol. 1,

Pellettieri, M.W., B.W. Welles, 1985. "State Issues and Recent Experience in Spent Fuel Shipping," Waste Management 85, Proceedings of the Symposium on Waste Management, Tucson, AZ, Vol. 3, 227 - 230.

Phillips, F.J., 1988. The United States Department of Transportation Inconsistency Rulings, Prepared for Nevada Agency for Nuclear Projects, Denver, CO.

Philpott, R.E., 1985a. Letter to Dear Colleague, January 18, 1985, Transmitting Technical information and maps requested by attendees at the November 27-28 transportation meeting in Oak Ridge.

Philpott, R.E., 1985b. Letter to Dear Colleague, February 1, 1985, Transmitting Technical information and maps requested by attendees at the November 27-28 transportation meeting at Oak Ridge.

Resnikoff, M., 1983. The Next Nuclear Gamble: Transportation and Storage of Nuclear Waste, A Council on Economic Priorities Publication, New York, NY.

Resnikoff, M., 1985. Analysis of RADTRAN II Model and Assumptions, Prepared for the Utah State Office of Planning and Budget, Blainstown, NJ.

Resnikoff, M., 1986. Analysis of Model 125-B TMI Shipping Cask, October 22, 1986, Radioactive Waste Campaign, New York, NY.

Resnikoff, M., L. Audin, 1984. Comments by the Sierra Club Radioactive Waste Campaign on Proposed Rule 10 CFR Part 73, Modification of Protection Requirements for Spent Fuel Shipments, Blainstown, NJ.

Roddy, J.W., et al., 1986. Physical and Decay Characteristics of Commercial LWR Spent Fuel, Prepared by Oak Ridge National Laboratory for U.S. Department of Energy, ORNL/TM/9591/V1&R1, Oak Ridge, TN.

Rowe, G. T., 1988. Letter to State of Nevada, Nuclear Waste Project Office, May 9, 1988, Transmitting information on alternative rail corridor routes through Lincoln County to Yucca Mountain.

Rowe, W.D., 1983. Risk Assessment Processes for Hazardous Materials Transportation, National Research Council, Transportation Research Board, Washington, DC.

Salgado, J.F., 1986. Letter to U.S. Senator William Proxmire, July 3, 1986, Transmitting Report Entitled A Study of the Costs and Benefits of Extended Burnup.

Sanders, T.L., R.M. Westfall, R.H. Jones, 1987. "Incentives for the Allowance of 'Burnup Credit' in the Design of Spent Fuel Shipping Casks," Waste Management 87, Proceedings of the Symposium on Waste Management, Tucson, AZ, Vol. 1, 411 - 416

Sandoval, R.P., J.P. Weber, H.S. Levine, A.D. Romig, J.D. Johnston, R.E. Luna, G.J. Newton, B.A. Wong, R.W. Marshall, Jr., J.L. Alvarez, F. Gelbard, 1983. An Assessment of the Safety of Spent Fuel Transportation in Urban Environs, SAND82-2365, Prepared by Sandia National Laboratories for the U.S. Department of Energy, Albuquerque, NM.

Schneider, J.K., R.I. Smith, 1987. "Radiation Doses for a Transportation System and its Interface Operations for Commercial Spent Fuel," Waste Management 87, Proceedings of the Symposium on Waste Management, Tucson, AZ, Vol. 1, 405 - 410.

Strohl, J., 1984. Letter to S. Chilk, U.. Nuclear Regulatory Commission, September 25, 1984, Transmitting comments on Proposed Rule, 10 CFR Part 73, Modification of Protection Requirements for Spent Fuel Shipments.

Su. S.D., 1988. "Criticality Control for Spent Fuel Transportation in High-Capacity Truck Casks," GA-A19167, GA Technologies, Inc., San Diego, CA.

U.S. Congress, Office of Technology Assessment, 1986. Transportation of Hazardous Materials, OTA-SET-304, Washington, DC.

U.S. Congress, Office of Technology Assessment, 1985. Managing the Nation's Commercial High-Level Radioactive Waste, OTA-O-171, Washington, DC.

U.S. Congress, Senate Committee on Energy and Natural Resources, 1987. Nuclear Waste Policy Act Amendments Act of 1987. Report together with Additional Views. To Accompany S. 1668, Report 100-152, 100th Congress, 1st session, Ordered to be printed September 1, 1987.

U.S. Department of Energy, 1979. Technology for Commercial Radioactive Waste Management, DOE/ET-0028 Vol. 4, Office of Nuclear Waste Management, Washington, DC.

U.S. Department of Energy, 1980. Final Environmental Impact Statement: Management of Commercially Generated Radioactive Waste, DOE/EIS-0046F, Vols. 1 and 2, Office of Nuclear Waste Management, Washington, DC.

U.S. Department of Energy, 1985. Mission Plan for the Civilian Radioactive Waste Management Program, DOE/RW-0005, Vol. 1, Office of Civilian Radioactive Waste Management, Washington, DC.

U.S. Department of Energy, 1986a. Environmental Assessment: Davis Canyon Site, Utah, DOE/RW-0071, Vols. 1 - 3, Office of Civilian Radioactive Waste Management, Washington, DC.

U.S. Department of Energy, 1986b. Environmental Assessment: Deaf Smith County Site, Texas, DOE/RW-0069, Vols. 1 - 3, Office of Civilian Radioactive Waste Management, Washington, DC.

U.S. Department of Energy, 1986c. Environmental Assessment: Reference Repository Location, Hanford Site, Washington, DOE/RW-0070, Vols. 1 - 3, Office of Civilian Radioactive Waste Management, Washington, DC.

U.S. Department of Energy, 1986d. Environmental Assessment: Richton Dome Site, Mississippi, DOE/RW-0072, Vols. 1 - 3, Office of Civilian Radioactive Waste Management, Washington, DC.

U.S. Department of Energy, 1986e. Environmental Assessment: Yucca Mountain Site, Nevada Research and Development Area, Nevada, DOE/RW-0073, Vols. 1 - 3, Office of Civilian Radioactive Waste Management, Washington, DC.

U.S. Department of Energy, 1986f. Report of the Task Force on the MRS/Repository Interface, DIE/RW-0044, Office of Civilian Radioactive Waste Management, Washington, DC.

U.S. Department of Energy, 1986g. Transportation Business Plan, DOE/RW-0046, Office of Civilian Radioactive Waste Management, Washington, DC.

U.S. Department of Energy, 1986h. Transportation Institutional Plan, DOE/RW-0094, Office of Civilian Radioactive Waste Management, Washington, DC.

U.S. Department of Energy, 1986i. Transporting Spent Nuclear Fuel: An Overview, DOE/RW-0066, Office of Civilian Radioactive Waste Management, Washington, DC.

U.S. Department of Energy, 1986j. Request for Proposals: Development of From-Reactor Casks, DE-RP07-861D12625, Idaho Operations Office, Idaho Falls, ID.

U.S. Department of Energy, 1987a. Characteristics of Spent Fuel, High-Level Waste, and Other Radioactive Wastes Which May Require Long-Term Isolation, DOE/RW-0184, Vols. 1-6, Office of Civilian Radioactive Waste Management, Washington, DC.

U.S. Department of Energy, 1987b. Commercial Nuclear Power, 1987: Prospects for the United States and the World, DOE/EIA-0438(87), Energy Information Administration, Washington, DC.

U.S. Department of Energy, 1987c. Monitored Retrievable Storage Submission to Congress, DOE/RW-0035/1-Rev. 1, Vols. 1-3, Office of Civilian Radioactive Waste Management, Washington, DC.

U.S. Department of Energy, 1987d. OCRWM Mission Plan Amendment, DOE/RW-0128, Office of Civilian Radioactive Waste Management, Washington, DC.

U.S. Department of Energy, 1987e. World Nuclear Fuel Cycle Requirement, 1987, DOE/EIA-0436(87), Energy Information Administration, Washington, DC.

U.S. Department of Energy, 1988a. Annual Report to Congress, DOE/RW-0189, Office of Civilian Radioactive Waste Management, Washington, DC.

U.S. Department of Energy, 1988b. "Chapter 7: Waste Package," in Consultation Draft Site Characterization Plan, Yucca Mountain Site, Nevada Research and Development Area, Nevada, DOE/RW-0160, Vol. 3. Office of Civilian Radioactive Waste Management, Washington, DC.

U.S. Department of Energy, 1988c. Draft 1988 Mission Plan Amendment, DOE/RW-0187, Office of Civilian Radioactive Waste Management, Washington, DC.

U.S. Department of Energy, 1988d. State and Local Meeting on the Status of NNWSI Transportation Routing Activities, March 7, 1988, Nevada Operations Office, Waste Management Project Office.

U.S. Department of Transportation, 1981. Radioactive Materials: Routing and Driver Training Requirements, Research and Special Programs Administration, 49 CFR Parts 171, 172, 173, 177, Docket No. HM-164 Final Rule, January 19.

U.S. General Accounting Office, 1987. Nuclear Waste: Shipping Damaged Fuel from Three Mile Island to Idaho, GAO/RCED-87-123, Washington, DC.

U.S. General Accounting Office, 1988. Nuclear Health and Safety: DOE Needs to Take Further Action to Ensure Safe Transportation of Radioactive Materials, GAO/RCED-88-195, Washington, D.C.

U.S. Nuclear Regulatory Commission, 1977. Final Environmental Statement on the Transportation of Radioactive Materials by Air and Other Modes, NUREG-0170, Vols. 1 and 2, Washington, DC.

U.S. Nuclear Regulatory Commission, 1981. Advance Notification to Governors Concerning Shipments of Irradiated Reactor Fuel, Office of Nuclear Material Safety and Safeguards, 10 CFR Part 73, Final Rule, December 20.

U.S. Nuclear Regulatory Commission, 1981b. Report to Congress on Abnormal Occurrences, July - September, 1981, NUREG-0090 (Vol. 4, No. 3), Washington, DC.

U.S. Nuclear Regulatory Commission, 1983a. Report to Congress on Abnormal Occurrences, July - September, 1983, NUREG-0090 (Vol. 6, No. 3) Washington, DC.

U.S. Nuclear Regulatory Commission, 1983b. Report to Congress on Abnormal Occurrences, October - December, 1983, NUREG-0090 (Vol. 6, No. 4), Washington, DC.

Virginia Power Company, Pacific Northwest Laboratory, EG&G Idaho, 1986. The Castor-V/21 PWR Spent Fuel Storage Cask: Testing and Analyses, EPRI NP-4887, Interim Report, Electric Power Research Institute, Palo Alto, CA.

Western Interstate Energy Board, 1988a. Memorandum, July 28, 1988, Transmitting Final Minutes from Meeting of the WIEB High-Level Waste Committee, June 13-114, 1988.

Western Interstate Energy Board, 1988b. Spent Nuclear Fuel and High-Level Radioactive Waste Transportation Primer, Prepared for the U.S. Department of Energy, Denver, CO.

Yook, H.R., J.G. Arbital, J.M. Keeton, J.E. Mosier, B.S. Weaver, 1984. Repository Preclosure Accident Scenarios, BMI/ONWI-551, Prepared by Science Applications, Inc., for Battelle Memorial Institute, Office of Nuclear Waste Isolation, Columbus, OH.

Zegel, M., 1988. "Two Railroads Blamed in TMI Transport Mix-Up," Webster-Kirkwood Times (St. Louis, MO), April 8, 1988.

Case References for Section 2.0

The Regulatory Environment for Nuclear Waste Transportation

American Trucking Associations, Inc. v. Larson, 683 F.2d 787 (3d Cir. 1982), cert. denied, 459 U.S. 1036 (1982).

American Trucking Associations, Inc. v. Scheiner, 97 L. Ed. 2d 226 (1987).

California Coastal Commission v. Granite Rock Co., 107 S. Ct. 1419 (1987).

City of New York v. United States Dept. of Transportation, 715 F2d 732 (2d Cir. 1983), cert. denied, 465 U.S. 1055 (1984).

Evansville-Vanderburgh Airport Authority Dis. v. Delta Airlines, Inc., 405 U.S. 820 (1972).

Florida Lime and Avocado Growers, Inc. v. Paul, 373 U.S. 132 (1963).

Huron Portland Cement Co. v. City of Detroit, 362 U.S. 440 (1960).

Jersey Central Power & Light Co. v. Township of Lacey, 772 F2d 1103 (3d Cir. 1985), cert. denied, 475 U.S. 1013 (1986).

Jones v. Rath Packing Co., 430 U.S. 519 (1977).

Kapplemann v. Delta Air Lines, Inc., 539 F. 2d 165 (D.C. Cir. 1976) cert. denied, 429 U.S. 1061 (1977).

Kelly v. Washington, 302 U.S. 1 (1937).

National Association of Regulatory Utility Commissioners v. Coleman, 542 F.2d 11 (3d Cir. 1976).

National Tank Truck Carriers, Inc. v. Burke, 608 F.2d 819 (1st Cir. 1979).

National Tank Truck Carriers, Inc. v. Burke, 535 F. Supp. 509 (D.R.I. 1982), aff'd, 698 F. 2d 559 (1st cir. 1983).

National Tank Truck Carriers, Inc. v. City of New York, 677 F.2d 270 (2d Cir. 1982).

New Hampshire Motor Transport Association v. Flynn, 751 F. 2d 43 (1st Cir. 1984).

Pacific Gas and Electric Co. v. State Energy Resources Conservation and Development Commission, 461 U.S. 190 (1983).

Ray v. Atlantic Richfield Co., 451 U.S. 151 (1978).

United States v. Oilfields Trucking Co., 549 F.2d 646 (9th Cir. 1977).

Law Review Articles

Air Transportation of Radioactive Materials and Passenger Protection Under International Law, 5 Calif. W. Int. L.J. 425-45 (1975).

Banning the Transportation of Nuclear Waste: A Permissible Exercise of the States' Police Power? 52 Fordham L. Rev. 663-90 (1984).

Federal Regulation of Certain Bulk Hazardous Cargo: Focus on the Great Lakes, 28 Buffalo L. Rev. 795-816 (1979).

Federal-State-Local Relationships in Transporting Radioactive Materials: Rules of the Nuclear Road, 68 Ky. L. J. 251-99 (1979-80).

Increasing Complexity in the Regulation of Hazardous Materials Transportation, 54 Transp. Prac. J. 68-77 (1986)

Insurance & Indemnity Coverage for Public Liability Associated with Nuclear Materials in Transportation, 17 Forum 1326-34 (1982).

International Regulation of Transfrontier Hazardous Waste Shipments: A New EEC Environmental Directive, 21 Tex. Int'l L. J. 85-128 (1986).

Issues in Emergency Preparedness for Radiological Transportation Accidents, 212 Nat. Resources J. 693-894 (1981).

Options for Gathering Information about Shipment of Radioactive and other Hazardous Material, 53 Tenn. L. Rev. i, 559-83 (1986).

Policy Issues in the Routing of Radioactive Materials Shipments, 21 Nat. Resources J. 693-894 (1981).

Preemption of Local Laws by the Hazardous Materials Transportation Act, 53 U. Chi. L. Rev. 654-81 (1986).

Preemption Under the Atomic Energy Act of 1954: Permissible State Regulation of Nuclear Facilities' Location, Transportation of Radioactive Waste Disposal, 11 Tulsa L. J. 397-419 (1976).

Radioactive Material - Passenger Notice of Carriage - Injunction to Order an Air Carrier to Give Adequate Warning to Passengers When a Significant Amount of Radioactive Material Was to be Shipped on its Flights was Properly Denied Because the Doctrine of Primary Jurisdiction was Required Prior to Agency Action, 42 J. Air. L. 906-19 (1976).

Radioactive Material Transportation: Federal Regulators Pose Roadblocks to Local and State Initiatives, 35 Syracuse L. Rev. 1235-81 (1984).

Rail Transportation of EPA - Regulated Hazardous Wastes, 17 Forum 857-65 (1982).

Recent Developments in the Transportation of Hazardous Materials, 10 Transp. L.J. 97-120 (1978).

Recent Regulatory Developments Concerning the Transportation of Nuclear Fuel and Other Radioactive Materials, 7 Env'tl. L. 203-22 (1977).

Regulating the Transportation of Dangerous Goods, 21 Alta L. Rev. 488-517 (1983).

Regulating the Transportation of Hazardous Materials Over the Nation's Roadways, 15 Transp. L.J. 149-63 (1986).

Regulating the Transportation of Hazardous Materials: A Critique and a Proposal, 5 Harv. Env'tl. L. Rev. 345-76 (1981).

Routes & Roadblocks: State Controls on Hazardous Waste Imports, 23 Nat. Resources J. 767-93 (1983).

State and Local Nuclear Transportation Permit and Fee Requirements, 15 Transp. L.J. 389-410 (1986).

The Hazardous Materials Transportation Act: Chemicals at Uncertain Crossroads, 15 Transp. L.J. 411-33 (1987).

The Initial Environmental Assessments for the Nuclear Waste Repository Under Section 112 of the Nuclear Waste Policy Act, 4 U.C.L.A. J. Env'tl. L. & Pol'y 187-229 (1985).

The Need for Exacting Legislation Regulating the Shipment of Radioactive Wastes in Vermont, 8 Vt. L. Rev. 407-32 (1983).

The Role of Localities in the Transportation and Disposal of Nuclear Wastes, 18 U. Rich. L. Rev. 655-95 (1984).

The Washington Statute Prohibiting Transportation and Storage Within the State of Radioactive Waste Produced Outside the State Violates Both the Supremacy Clause and the Commerce Clause. 18 Gonz L. Rev. 605-26 (1982-83) (Washington State Building and Construc. Trades v. Spellman, 684 F 2d 627).

Transportation Controls Under the Clear Air Act: A Legal Analysis, 15 B.C. Ind. & Com. L.R. 749-766 (1974).

Transportation of Dangerous Substances, 31 U.N.B. L.J. 135-60 (1982).

Transportation of Nuclear Material: The Public Challenge, 11 Rut. Cam. L.J. 63-99 (1979).

Transportation of Spent Nuclear Fuel: The Need for a Flexible Regulatory System, 12 B.C. Env'tl. Aff. L. Rev. 51-101 (1985).

Urban Radioactive Waste Transportation Gets Another Green Light. 7 J. Energy L. & Pol'y 177-189 (1986) (City of New York v. United States Dep't of Transportation, 715 F.2d 732).

6.0 APPENDICES

Appendix 1

THE STATE OF NEVADA AGENCY FOR NUCLEAR PROJECTS/ NUCLEAR WASTE PROJECT OFFICE (NWPO)

STRUCTURE AND FUNCTIONAL ORGANIZATION

A. Introduction

In response to the passage of the NWPA of 1982, the Nuclear Waste Project Office was established in 1983 as part of the Governor's Office. In 1985, by action of the Nevada Legislature, the NWPO was renamed the Agency for Nuclear Projects and became a free-standing State agency whose director reports to the Governor. Under the NWPA and its amendments, the State of Nevada has the right to monitor and evaluate the policies, plans and actions of the DOE and other federal agencies to assure their adequacy and to identify potential impacts on the health, safety and welfare of Nevada citizens.

In taking these roles, the NWPO works under the administrative guidance of the Nevada Commission on Nuclear Projects and the review and advisement of the State Legislature through its Study Committee on High-Level Radioactive Waste.

The NWPO provides periodic reports of its activities to the DOE, the Governor's Office, the Nevada Commission on Nuclear Projects and the Nevada Legislature. Funding is approved on a yearly basis by the DOE and budget and spending authorization is provided by the State Legislature.

Since its inception, the NWPO has worked closely with affected State agencies and local and tribal governments in its socioeconomic and transportation planning and research activities. This cooperative effort has been undertaken under the aegis of the State/Local Government Planning Group described in the Preface and elsewhere in this report.

The NWPO is organized into divisions or programs under an executive director:

Division of Technical Programs, which is charged with conducting scientific and technical studies and monitoring DOE activities in areas related to environment, radiation, health physics, engineering, geology, hydrology, volcanism and seismicity;

Planning Division, which is charged with addressing socioeconomic and transportation areas relating to the repository and with providing liaison between the State and local governments and Indian tribes;

App. 1 (con't)

Quality Assurance Program, which provides quality assurance for all aspects of the technical program; and,

Public Affairs Program, which coordinates the publication of NWPO materials and public participation in the State program.

A Deputy Attorney General and staff is assigned exclusively to the NWPO.

STATE OF NEVADA AGENCY FOR NUCLEAR PROJECTS
ORGANIZATIONAL CHART

Appendix 2

REGIONAL, STATE AGENCY, LOCAL GOVERNMENT, TRIBAL REPRESENTATION ON NWPO STUDY, PLANNING, REVIEW OR ADVISORY GROUPS

1. State of Nevada Agencies

Representatives of the following State agencies work with NWPO on an ad hoc basis in addressing certain aspects of the high-level nuclear waste transportation.

Emergency Management Division, Department of Military
Fire Marshal Division, Department of Commerce
Highway Patrol Division, Department of Motor Vehicles and
Public Safety
Legislative Counsel Bureau (also serves on State/Local Government
Planning Group)
Nevada Indian Commission
Public Service Commission
Radiological Health Section, Division of Health, Department
of Human Resources
Department of Transportation

2. Local and Tribal Governments

Representatives of the following regional, local government or tribal agencies serve on the State/Local Government Planning Group (Transportation Steering Committee).

Regional Commission

Regional Transportation Commission of Clark County

Counties

Clark County Department of Comprehensive Planning
Lincoln County Joint Impact and Alleviation Committee (with
City of Caliente)
Nye County Planning Department

Cities

Caliente Joint Impact and Alleviation Committee (with Lincoln
County)
Henderson Department of Development Services, Planning
Division
Las Vegas Department of Economic and Urban Development
North Las Vegas Department of Comprehensive Planning and
Development

Indian Tribes

Moapa Band of Paiutes
Western Shoshone National Council

3. Socioeconomic Technical Review Committee

This committee provides technical and scientific review of a NWPO Planning Division socioeconomic and transportation program activities.

Michael S. Bronzini, Ph.D.
 Pennsylvania State University
William Colglazier, Ph.D.
 University of Tennessee
Bruce Dohrenwend, Ph.D.
 Columbia University
Kai Erikson, Ph.D.
 Yale University
Reed Hansen
 Hansen Research Associates
Allen V. Kneese, Ph.D.
 Resources for the Future, Inc.
Richard Moore
 Independent Consultant, Wyoming
Edith B. Page
 Office of Technology Assessment
 United State Congress
Roy A. Rappaport, Ph.D.
 University of Michigan
Gilbert F. White, Ph.D.
 University of Colorado

4. Interstate Groups

Members of the NWPO staff serve on the following committees.

High-Level Radioactive Committee, Western
Interstate Energy Board
Hazardous Material Transportation Committee,
Western Governors Association

Appendix 3

GLOSSARY

This glossary is included to assist the reader in recognizing and understanding acronyms or terms which are used throughout this report. Certain technical or scientific terms are defined in abbreviated form as is necessary for the purposes of this report.

Acronyms

Federal Governmental Acts

NWPA	Nuclear Waste Policy Act of 1982, which directed the U.S. Department of Energy to undertake activities to site, construct, operate and decommission a geological repository for the disposal of commercial spent nuclear fuel.
NWPAA	Nuclear Waste Policy Amendments Act of 1987, which limited site characterization to Yucca Mountain and added certain transportation program requirements.

Federal, Regional, State and Local Governmental Agencies

DOE	U.S. Department of Energy, the federal agency directed by law to site, construct, operate and decommission the repository.
OCRWM	DOE Office of Civilian Radioactive Waste Management, the office which manages and coordinates all aspects of the repository project.
YMPO	Yucca Mountain Project Office, the office of the Nevada Operations Office which coordinates and manages all aspects of the Yucca Mountain repository investigations.

EPA	U.S. Environmental Agency, which regulates and coordinates federal and state environmental programs.
FEMA	Federal Emergency Management Agency, which funds and coordinates state emergency management programs.
NRC	U.S. Nuclear Regulatory Commission, the federal agency which regulates the nuclear industry and some aspects of transportation. The NRC must license the repository.
NWPO	State of Nevada Agency for Nuclear Projects/Nuclear Waste Project Office, the agency which by law monitors federal repository studies and undertakes and coordinates independent State investigations.
SLGPG	State/Local Government Planning Group, composed of NWPO, other State agencies (on an ad hoc basis), representatives from Clark, Lincoln and Nye Counties, the Cities of Las Vegas, North Las Vegas, Henderson, Caliente, the Western Shoshone National Council, the Moapa Band of Paiutes and the Nevada Legislative Counsel Bureau. This group serves as a steering and coordinating committee for all NWPO socioeconomic and transportation activities.
NCSL	National Association of State Legislatures, and organization of state legislators which studies high-level nuclear waste transportation issues and

WGA	Western Governors Association, an organization of western state governors which has established a hazardous materials transportation committee to study and make recommendations regarding the transportation of radioactive waste to the repository or other federal facilities.
WIEB	Western Interstate Energy Board, an organization of western states which has established a High-Level Radioactive Waste Committee to study and make recommendations regarding the repository program in general, and repository-related transportation, specifically.

Technical or Scientific Terms

SNF	Spent nuclear fuel, irradiated reactor fuel which has been removed from a reactor core.
HLW	High-level radioactive waste, waste which results from reprocessing of SNF or from defense production activities. Term used to refer to defense waste which will be stored in a repository.
ALARA	As low as reasonably achievable, the principle that specifies that all radiation doses are to be maintained as far below prescribed standards as can be reasonably expected under present technology.
EIS	Environmental Impact Statement, which must be submitted to Congress by DOE by the year 1994 and include all repository-related impacts.

MRS	Monitored Retrievable Storage Facility, an above-ground facility where spent nuclear fuel can be repackaged and temporarily stored prior to shipment to a repository.
MTU	Metric tons of uranium.
canister <u>or</u> cask	A large, heavily shielded vessel for the transportation or storage of (usually) consolidated SNF or solidified HLW. An <u>overweight</u> truck cask is one which causes the weight of the truck, carriage and cask to exceed 80,000 pounds when loaded.
contamination	The presence of radioactive material on the outside of a transportation vehicle, a shipping cask, repository equipment, or a waste disposal container.
cooling	Storage of SNF elements after discharge from reactors, usually under water, to allow for the decay of short-lived radionuclides and hence the decrease of radioactivity and heat emission to acceptable levels for transportation. Synonymous with aging.
criticality	The condition of supporting a nuclear chain reaction.
dedicated train	A train which may carry only one commodity, in this case, SNF or HLW, may operate between specified points, and is constrained by rules regarding speed and passing of other trains.
fuel assembly	An assembly of nuclear fuel rods.
fuel consolidation	The removal of fuel rods from an assembly and repacking in a denser array to reduce the volume per metric ton of fuel.

fuel rod	A long, slender cylindrical tube of stainless steel or Zircaloy containing nuclear fuel in the form of uranium oxide fuel pellets.
fuel reprocessing	The process whereby spent fuel is dissolved, waste materials removed, and reusable materials segregated for reuse.
half-life	Time required for a radioactive substance to lose 50% of its activity by decay.
nonradiological risk	A risk from sources other than radiation, e.g., from traffic accidents.
quality assurance	All the planned and systematic actions necessary to provide adequate confidence that a structure, system, or component is constructed to plans and specifications and will perform satisfactorily.
quality control	Quality assurance actions that provide a means to control and measure the characteristics of a process or facility to established requirements.
radiological risk	A risk derived from exposure to radioactive materials.
radionuclide	An unstable radioactive isotope that decays toward a stable state at a characteristic rate by the emission of ionizing radiation.
WIPP	Waste Isolation Pilot Plant, New Mexico, a federal facility now being constructed and tested for the disposal of transuranic wastes resulting from national defense activities and programs under the auspices of DOE Defense Programs.

I. INTRODUCTION

This Work Plan identifies the tasks which the Nuclear Waste Transportation Research Center (NWTRC) at the University of Nevada, Las Vegas (UNLV) will undertake from November 1, 1988, through June 30, 1989. The Work Plan is intended to provide a general description of the first year efforts of the NWTRC. For each task in the Work Plan, Task Work Orders will be developed to provide a more detailed description of the work to be conducted. The Task Work Orders, which will be submitted to the State/Local Government Planning Group (Transportation Steering Committee) (SLGPG) for review and comment, will specify the objectives, relationship to other tasks, activities and schedule, deliverables and dates, and budgets.

The task descriptions are limited to the activities to be conducted during the NWTRC's first year. The background discussion of the major areas of emphasis provides a general indication of some of the NWTRC anticipated activities for the second and subsequent years.

Clearly, the resources available to the NWTRC are bounded. Consequently, one cannot expect the NWTRC to strive to duplicate all the technical activities that the United States Department of Energy (DOE) is carrying out in developing the nuclear waste transportation system. However, it is clear that state, Tribal and local governments in Nevada must be cognizant of and have the technical capacity to review and provide input on all nuclear waste transportation issues.

II. BACKGROUND

The DOE's system for transporting nuclear waste to the proposed repository at Yucca Mountain, Nevada, will have profound impacts upon the state, Tribal and local governments. Over the 25-year planned life of the repository, up to 18,000 rail shipments or over 100,000 truck shipments of nuclear waste will be transported through Nevada. During the first year of full repository operation, more nuclear waste (3,400 metric tons of Uranium [MTU]) will be transported through Nevada than has been transported in the entire United States over the last 40 years. The term nuclear waste is used in this document to refer to all of the waste (spent nuclear fuel, commercial and defense high-level radioactive waste) that is planned to be shipped to the repository.

This Work Plan builds upon the Transportation Needs Assessment conducted by Mountain West Research, Inc., for the State of Nevada Agency for Nuclear Projects/Nuclear Waste Project Office (NWPO). The Transportation Needs Assessment produced (or will produce) the following working papers for use in the development of the NWTRC program:

- o Description of the Preferred Transportation System
[Task 15.2; Draft submitted, 5/16/88]
- o Description of the DOE Planned Transportation System
[Task 15.3; Draft submitted, 9/2/88]
- o Evaluation of the DOE Planned Transportation System
[Task 15.4; Draft due, 10/7/88]
- o Review and Evaluation of Existing Studies and Data Sources
[Task 15.5; Draft due, 10/30/88]
- o Design of Transportation Impact Studies and Identification of Transportation Research Needs
[Task 15.6; Draft submitted, 6/15/88; Draft Work Plan submitted, 9/6/88]

III. PROGRAM OBJECTIVES

The primary goal of the NWTRC is to provide the technical resource base to assist state, Tribal and local governments in Nevada in addressing the full range of nuclear waste transportation issues impacting the State of Nevada. This includes: (1) assessing the impacts from the DOE nuclear waste transportation system, (2) analyzing alternatives which minimize impacts and increase safety, and (3) investigating potential mitigation and compensation strategies for those impacts which cannot be avoided. In order to assist the NWPO in achieving these goals, the NWTRC will:

1. develop programs to pursue the Transportation Research Needs recommended in the Transportation Needs Assessment;
2. continue research on the Preferred Transportation System developed in the Transportation Needs Assessment;
3. implement the Comprehensive Transportation Impact Assessment System developed in the Transportation Needs Assessment; and,
4. investigate potential mitigation and compensation strategies for those impacts which cannot be avoided.

During the first year of operation, the NWTRC proposes to initiate work in the major areas which were identified in the Transportation Needs Assessment as most important and most urgent.

Ultimately, the NWTRC seeks to become the center for transportation issues of all types in Nevada and the southwestern United States. These issues include not only the transport of nuclear materials, but the transport of hazardous materials of all types as well as the general transportation requirements of the rapidly growing areas of Nevada and the Southwest. The strategic plan for meeting this long-range objective includes the

development of a recognized transportation research program and the establishment of a curriculum to meet the public education needs of the surrounding region as they pertain to transportation.

IV. MANAGEMENT APPROACH

A. Management Structure

The NWTRC has been constituted within the UNLV Howard R. Hughes College of Engineering. The director of the NWTRC will report to the Dean of Engineering, Dr. William R. Wells. In the period before a permanent director is functioning, a management team will oversee the planning, administration and technical activities of the NWTRC. The management team consists of Dr. William R. Wells, Dr. Russell di Bartolo (NWPO) and Mr. Leonard C. Slosky (consultant to the UNLV/NWTRC).

The following page contains the initial organizational chart for the NWTRC.

After a permanent director and key staff members are hired, it is expected that the organizational structure will be refined. [Organizational chart to be provided.]

B. Management Philosophy

The long-term goal is for the NWTRC to have as much in-house expertise on the broad range of technical nuclear waste transportation issues as resources will permit. When a certain expertise is needed, an attempt will be made to identify qualified personnel in the State of Nevada and particularly at UNLV and the University of Nevada, Reno (UNR). It is recognized, however, that in order to be responsive to the short-term needs of the NWPO, Tribal and local governments, the use of external consultants will be necessary during the first year of NWTRC operations.

FIGURE 1

Initial Organizational Chart for the
Nuclear Waste Transportation Research Center

IV. SCOPE OF WORK

The scope of work is described in terms of eight areas of emphasis, outlined below.

Areas of Emphasis

- o Building the Capacity of the NWTRC and Liaison with State, Local and Tribal Governments and Agencies.
- o Development of the Nuclear Waste Transportation Information and Analysis System.
- o Monitoring and Reviewing Developments in the DOE Transportation System and Maintaining Relationships with National, Regional and Tribal Groups.
- o Assessing Emergency Preparedness Needs in Nevada.
- o Incorporating Needs Assessment Information in the NWTRC.
- o Establishing Cask Design and Testing Review Capacity.
- o Special Projects.
- o Establishing Infrastructure Baseline Information

Task 1 Build the Capacity of the Nuclear Waste Transportation Research Center

Background

The development of a nationally recognized transportation research center will require the sustained commitment of the NWPO and the UNLV. Important steps will be taken in the first year to lay the foundation for the long-term development of the NWTRC.

Task 1.0 Management, Supervision and Coordination

As the NWTRC gets underway, it is important to establish a management structure which will plan, coordinate, supervise and integrate all administrative and technical tasks. Until a director is hired, a three-person management team consisting of representatives from UNLV, NWPO and the contracting firm which conducted the transportation needs assessment, will carry out this task. In view of the vital role and interests of State, local and tribal governments in repository-related transportation, it is essential that NWTRC establish and maintain cooperative relationships with these entities.

Task 1.1 Recruitment

A major milestone for the first year is the hiring of a director and several key staff members of the NWTRC. It is hoped that a director will be hired early in 1989. The criteria for selection of senior personnel in the NWTRC will be submitted to the SLGPG for review and comment.

Task 1.2 Technical Library

A major transportation information center will be developed within the UNLV library system. The acquisition of documents has already begun. During the first year monographs, periodicals and documents will be added to the UNLV library.

Task 1.3 Curriculum Development

Over the long-term, the NWTRC will become a regional center for nuclear waste transportation education and training. In the first year, colloquia will be planned and presented and planning will begin on curriculum development for undergraduate and graduate courses, specialized training and public information.

Task 2 Develop the Nuclear Waste Transportation Information and Analysis System (TMIAS)

Background

In order to meet the challenges of nuclear waste transportation to a repository at Yucca Mountain, it is essential that the State of Nevada develop a systems approach to impact analysis, built around a transportation network model orientation. The advent of a systems approach, using the latest in computer technology, will prepare Nevada for the multitude of transportation issues, such as modal mix, alternative routing, risk analyses and infrastructure impact assessment, which require analytical study. Capitalizing on geographic information systems, Nevada databases, information management capability, state-of-the-art display graphics and user friendly menu operation, Nevada will be forging a pioneering effort in transportation analysis which will meet or exceed the ability of the DOE.

The transportation analysis system will consist of two basic components: (1) the models to perform analyses; and (2) the databases which supply the information necessary for the models. Developing a transportation analysis system customized to Nevada's needs is a time and resource intensive activity. It involves the specification of a desired level of analysis capability, definition of important transportation parameters, identification of risk criteria, integration of system elements into a common analysis framework and development of algorithms which can solve

the problems as defined. It also involves design, collection and management of information to support the analysis system. This will include information on infrastructure geometrics and condition, traffic and rail operations and utilization, facility construction and maintenance schedules, emergency response capability, etc. The analytical system can also be applied to managing everyday transportation concerns within the state, such as road and bridge repair, traffic management, routing of hazardous materials, and emergency response planning.

Beginning in the second year, the Transportation Analysis System will be used to explore issues related to routing, modal mix, volume and timing of shipments, infrastructure improvements, etc. In the second and subsequent years, efforts will be directed towards overcoming the shortcomings of the basic models and tailoring the models to meet the specific needs of state, Tribal and local governments in Nevada. Database improvement and maintenance will also be a long-term effort.

The goal of this effort is the development of a "Nevada Model" (and accompanying) database which accurately assess the impacts of and alternatives to the DOE nuclear waste transportation system. With the draft Yucca Mountain EIS scheduled to be released by DOE in 1993, the Nevada Model should be fully operational prior to that time.

Task 2.1 Specifications for the Transportation Analysis System

The conceptual approach for impact assessment models described in the Transportation Needs Assessment will be translated into a "blueprint" which is far more precise in terms of analysis modules, how each issue is represented, the relationships between modules, the source of needed data and how it will be managed, output formats, and a number of additional model design considerations. The beginning point of this effort is the enumeration of the transportation issues and questions which state, Tribal and local governments in Nevada must address. It is also important to recognize the imperative of coordinating the development of the analytical system with the design and implementation of the databases. This effort will be closely coordinated with the NWPO, tribal and local governments so that the system will provide the capabilities needed by these governments. The result of this effort will be an architectural layout (blueprint) for constructing the transportation impact analysis system for Nevada.

Task 2.2 Assessment of Available Models

Available models such as HIGHWAY, INTERLINE, RADTRAN III, DANTRAN, and those from Lawrence Livermore National Laboratory, NCAR and Vanderbilt University will be reviewed. This will include consideration of model reviews which have been previously

conducted, such as the Mountain West review of RADTRAN. One or more models will be put on-line at the NWTRC in order to provide Nevada with some short-term analytical capability and to understand the strengths and limitations of existing models. This review will result in a determination of which model presents the best framework upon which to base the development of a model tailored to Nevada's needs (or if the development of an original model is necessary). The review will also identify deficiencies in the basic model which will be corrected in development of the Nevada Model.

The urgency here is that the base case must be established before repository issues can be investigated. Given that the DOE will be making policy decisions in the near future that affect how the repository transportation program will be structured, it is essential that the NWTRC move quickly to build the capability to respond to these issues as they arise.

Task 2.3 Design Data Collection and Information Management System and Begin Implementation

The transportation data collection and information management system is central to the transportation analysis system since it provides the information upon which all planning and analysis is based. The development of the databases must be closely linked with the development of the analytical models as neither can usefully function without the other. While the models should generally drive the design of the databases, the data requirements of the chosen models must be reasonably achievable.

The first step in developing the information management system is to assess existing data sources. This will include (but not be limited to) databases maintained by the Nevada Department of Transportation (NDOT), the regional transportation commissions, UNR, DOE and the United States Department of Transportation (DOT). At a minimum, data will be needed on rail and highway infrastructure location and conditions, traffic utilization and safety, emergency response location and capability, land usage topography and weather near existing and planned transport facilities, demographic characteristics and location of environmentally sensitive areas along transport corridors.

Following the assessment of existing data sources and the selection of the basic transportation analysis models, a detailed information management system specification will be developed. This is envisioned as a document describing the overall structure of the data collection and information management system, including: where each pertinent existing database is stored; who has responsibility for database maintenance and updates; the accuracy and completeness of the data; how the data can be accessed; and how the data can be networked to support the transportation analysis system. Where data is not presently

available, it must be collected through survey or inventory review. In these cases, sampling methodology and survey design work will be necessary prior to data collection. implementation of the data collection and information management system will begin in the first year. At an early stage in this effort, the collection of baseline data is important in that it establishes a benchmark (the base case) against which repository impacts can be compared. This effort will be closely coordinated with the NDOT and the regional transportation commissions. Maximum use will be made of existing data collection efforts and database management systems.

Task 3 Monitor and Review Developments in the DOE Nuclear Waste Transportation System and National. Maintain Cooperation with National, Regional and Tribal Groups Involved in HLW Transportation.

Background

During the first year, there are several federal actions anticipated which will have important influence on the development of the nuclear waste transportation system and the State of Nevada's role therein. Therefore, it is essential that the NWTRC immediately develop the capability for monitoring and reviewing federal activities.

In the second and subsequent years, NWTRC will pilot test the TRANSCOM system, assess state, Tribal and local government monitoring and prenotification needs, and investigate alternatives for providing shipment monitoring and prenotification information.

During the second and subsequent years, the NWTRC will conduct an independent assessment of the probabilities and consequences of sabotage and terrorism, and assess the trade-offs between features of the nuclear waste transportation system which have the potential to improve safety but which may have adverse physical protection consequences.

A number of national, regional, state and tribal groups and agencies are involved in monitoring DOE transportation activities or are otherwise interested in the transportation of nuclear materials. The State of Nevada is represented on some of these groups and maintains institutional relationships with those with whom it is not officially affiliated. These groups have concerns about repository-related transportation which are similar to those of Nevada and it is incumbent upon the State to maintain interaction with them in order to develop cooperative policies, plans and actions to help assure the safe and uneventful transportation of nuclear waste to a repository.

Task 3.1 Monitor and Review Developments in the DOE Nuclear Waste Transportation System

In order for the NWTRC to be able to provide technical support to state, Tribal and local governments in Nevada to address transportation issues, the NWTRC must be knowledgeable of the current status of DOE and related transportation activities. Therefore, the NWTRC will monitor the technical and regulatory activities (including the release of technical documents) and decisions of federal agencies concerning nuclear waste transportation including the DOE, DOT, the United States Nuclear Regulatory Commission (NRC), the Congressional Office of Technology Assessment (OTA) and the Congressional Government Accounting Office (GAO). The NWTRC will alert the NWPO, Tribal and local governments of important developments.

During the first year, it is anticipated that the NWTRC will review the technical transportation and emergency preparedness aspects of the following:

- o DOE Nuclear Waste Policy Amendments Act (NWPAA) Section 175 Report,
- o DOE/Yucca Mountain Project Office (YMPO) highway routing study,
- o DOE/YMPO rail access study,
- o DOE/YMPO aircraft overflight study, and,
- o Commercial Vehicle Safety Alliance (CVSA) vehicle inspection standards.

The NWTRC will assemble technical teams composed of UNLV/UNR and external personnel, as necessary, to conduct technical reviews of the transportation and emergency preparedness aspects of these reports for the NWPO. The Preferred Transportation System and the Impact Assessment System described in the Transportation Needs Assessment will serve as the "yard sticks" against which these reports will be measured.

Section 175 Report. Section 175 of the NWPAA requires the DOE to report to Congress in December 1988 on the potential impacts of locating a repository at the Yucca Mountain site, including recommendations for mitigation of such impacts. The statute requires the report to include impacts on:

. . . transportation, including any roads, terminals, airports, bridges, or railways associated with the facility and the repair and maintenance of roads, terminals, airports, bridges, or railways damaged as a result of the construction, operation, and closure of

the facility...[and]...equipment and training for State and local personnel in the management of accidents involving high level radioactive waste . . .

DOE/Yucca Mountain Project Office (YMPO) Highway Routing Study. During the first year, the YMPO is expected to release a preliminary evaluation of the Nevada highway routes identified in the Environmental Assessment: Yucca Mountain Site, May 1986.

DOE/YMPO Rail Access Study. In the first year, the YMPO is expected to release a preliminary study identifying and evaluating potential rail spurs from the Southern Pacific and Union Pacific mainlines to Yucca Mountain.

DOE/YMPO Aircraft Overflight Study. During the first year, the YMPO is expected to release an assessment of the extent of the United States Department of Defense aircraft flights over the Nevada highway and rail routes identified in the Environmental Assessment: Yucca Mountain Site, May 1986.

CVSA Proposed Vehicle Inspection Standards. The Commercial Vehicle Safety Alliance (CVSA) is working in cooperation with the OCRWM to develop uniform and reciprocal vehicle inspection procedures for highway shipments of spent fuel. Review is continuing on the draft inspection procedures prepared in November 1987. Plans for a pilot test of the draft inspection procedures are being developed at this time. The test will be administered by the Pacific States Agreement on Radioactive Materials Transportation Management, which consists of Idaho, Oregon and Washington, and is scheduled to begin in fiscal year 1989. When the draft inspection procedures have been sufficiently refined, they are expected to be proposed for adoption by the CVSA.

As required by the National Environmental Policy Act (NEPA), the DOE is scheduled to conduct hearings during the first quarter of 1989 on the scope of matters to be considered in the preparation of the draft environmental impact statement (EIS) for the repository at Yucca Mountain.

Based upon the Impact Assessment System developed in the Transportation Needs Assessment, the NWTRC will provide technical support to the NWPO in preparing recommendations (related to transportation and emergency preparedness) which will be presented at the EIS scoping hearings. The NWTRC will also review any transportation-related documents prepared by the DOE in advance or subsequent to the hearings.

Two specific areas to be evaluated, shipment monitoring/prenotification and physical protection are covered in Tasks 3.2 and 3.3, respectively.

Task 3.2 Review & Evaluate Developments Concerning Shipment Monitoring and Prenotification

The NWPAA now requires the DOE to comply with the NRC prenotification requirements for all shipments to a repository or an MRS facility. With the frequency of shipments planned for the Yucca Mountain repository, it is in the State of Nevada's interest to have a more efficient prenotification system. Real-time shipment location and condition information is invaluable for physical protection and emergency response. Shipments through Nevada to the Waste Isolation Pilot Plant (WIPP) in New Mexico, which are scheduled to begin in 1990, will present an ideal opportunity to test improved shipment monitoring and prenotification technologies and procedures.

The NWTRC will monitor technical developments by the DOE, the NRC and other public and private entities (e.g., Railstar regarding shipment monitoring and prenotification, including the pilot test of the DOE TRANSCOM system with the Pacific States Agreement on Radioactive Materials Transportation Management, consisting of Idaho, Oregon and Washington).

Task 3.3 Monitor Developments Concerning Physical Protection (Sabotage/Terrorism)

The probability and consequences of sabotage and terrorism against nuclear waste shipments is an area which has received little attention, at least in unclassified contexts. Although the probability may be low, the consequences of a certain sabotage or terrorist incident probably represent the upper boundary of the risk events spectrum.

The NWTRC will monitor the activities of federal agencies (e.g., NRC, FAA) and the technical literature concerning the physical protection of nuclear materials.

Task 3.4 Interact with National and Regional Groups Regarding Repository Transportation. Prepare Special Issues Papers

NWTRC staff will participate in meetings, workshops and conferences of such groups as the Western Governors Association, the Western Interstate Energy Board, the National Conference of State Legislatures, the National Association of Attorneys General, and Indian tribal groups and nations. Concerns common to Nevada and any of these groups may be addressed in a cooperative manner.

Upon request, the NWTRC will prepare status reports and issues papers on developments in nuclear waste transportation at the federal, regional, state and tribal levels.

The NWTRC will also develop the capability to alert the NWPO, tribal and local governments in Nevada of emerging issues and new

developments in nuclear waste transportation.

Task 4 Assess Emergency Preparedness (EP) Needs in Nevada_

Background

The shipment of nuclear waste to a repository at Yucca Mountain will subject state, Tribal and local governments in Nevada to a level of radiological transportation risks never experienced in the United States. The number, frequency and high radioactive content of shipments to Yucca Mountain will require a sophisticated emergency preparedness program in order to minimize the impacts upon public health and safety and the environment.

In the second and subsequent years, the NWTRC will review DOE's emergency preparedness capabilities; describe the preferred emergency preparedness system for nuclear waste shipments to Yucca Mountain; and define state, Tribal and local governments' emergency preparedness needs for the nuclear waste transportation system.

Task 4.1 Inventory of Existing Emergency Preparedness Capabilities

NWTRC staff will become familiar with the state, Tribal and local emergency preparedness structure in Nevada. This will entail understanding the legal roles, responsibilities, authorities and the institutional interrelationships of the state, Tribal and local emergency response agencies in Nevada.

The NWTRC will then inventory the emergency preparedness capabilities of the state, Tribal and local emergency response agencies. The inventory will include: training, equipment, communications, actual response experience, emergency response drills, emergency preparedness planning, mutual aid agreements, funding levels and sources, etc. This will establish a baseline which will be assessed against the preferred emergency preparedness system.

Task 5 Provide Technical Assistance in Incorporating Transportation Needs Assessment (TNA) Information into NWTRC Program

Background

In the first few years of operation of the NWTRC, it is important to accomplish the transfer of information from the Transportation Needs Assessment to the NWTRC. Mr. Slosky will be responsible for this effort and will draw upon other members of the Transportation Needs Assessment study team as necessary.

Task 6 Establish Cask Design and Testing Review Capacity__

Background

Cask performance during routine transportation and conditions of severe accidents, sabotage and terrorism is the most important determinant of radiological risk (including transportation and repository operations) to the citizens of Nevada. The DOE is currently in the process of designing a new generation of casks which will contain a much larger amount of spent fuel per cask than current packages.

Current design efforts are focusing on "from-reactor" casks, which are intended for shipping spent fuel from commercial reactors to a repository or to a monitored retrievable storage (MRS) facility. Three types of from-reactor casks are being designed: legal weight truck, overweight truck and rail and/or barge. It has become unclear if design of the overweight truck cask has been delayed.

Cask performance is judged on the basis of three criteria: containment, limitation of exposure, and criticality prevention. Under the NWPAA all casks used to transport waste to a repository must now comply with the NRC requirements. Serious questions have been raised regarding the adequacy of NRC's cask design standards and testing procedures as well as the development, implementation and oversight of cask design, testing and maintenance quality assurance and quality control (QA/QC) programs.

It is not intended that the State of Nevada conduct basic research or duplicate the cask design and testing being conducted by the DOE, however, Nevada needs the capability to critically review the DOE cask development program.

Ultimately the NWTRC seeks to have the capacity to address the entire spectrum of cask issues. The Transportation Needs Assessment identified a number of technical cask issues with which the NWTRC will become involved over time. They include: cask performance during severe accidents, sabotage and terrorism conditions; cask sensors; fuel cleanliness; human factor issues in design, fabrication and maintenance; burn-up credit; results of cask testing models vs. full-scale physical tests; special considerations for defense high-level waste casks; and QA/QC programs, including human factors. Many of these issues are complex and require a substantial commitment of funding and time to be fully addressed.

Task 6.1 Review DOE Preliminary Cask Design Report

The DOE is scheduled to release a preliminary cask design report in mid-1989, therefore, the NWTRC must begin to establish the capability to review cask issues. During the first year, the NWTRC will establish an initial capacity to review the preliminary DOE cask design report and to begin a critical review of the NRC's cask

design and testing requirements.

Task 7 Special Projects

Background

The NWTRC has begun building the technical capacity to respond to special transportation needs of the state, tribal and local governments in Nevada. During the first year, specific studies will be conducted to determine lead time necessary for major highway and rail infrastructure improvements and new construction, baseline and forecasted traffic demand on highways which may be used for shipments of nuclear waste to Yucca Mountain and, if requested, a study to clarify the impacts on local governments and upon the selection of rail access routes by DOE. The NWTRC will seek to maintain the flexibility to undertake other studies as requested by NWPO, local governments and tribes.

Task 7.1 Determine Lead Time Necessary for Major Highway and Rail Infrastructure Improvements and New Construction

It is important that DOE make important transportation decisions far enough in advance of the initiation of waste shipments to allow sufficient time for needed infrastructure improvements to be completed. A study will be conducted to determine the realistic time needed to implement major new infrastructure additions such as a highway bypass and a rail spur. The study will consider the time needed for planning, design, funding, permitting, right-of-way acquisition and construction.

Task 7.2 Develop Information on Current and Forecasted Utilization of Highway Infrastructure on Potential Repository Routes

In order to assess the impacts of the repository on Nevada's transportation infrastructure, it is necessary to have baseline information on the current utilization of transportation infrastructure in the State. An assessment will be conducted of current highway infrastructure utilization in Nevada. The assessment will consider the major highway routes in Nevada which may be used for waste transportation to Yucca Mountain and will include design capacity, existing traffic volumes, recent accident rates and other risk and safety factors.

Task 7.3 Determine Socioeconomic and Transportation Impacts of Relocation of Union Pacific Rail Yard from Las Vegas to North Las Vegas (Tentative)

The Union Pacific Railroad (UP) is planning to move its Las Vegas rail yard to North Las Vegas in the spring of 1989. This move may have significant socioeconomic implications for the two cities, with regard to economic and industrial development, cost to their governments, traffic patterns and population exposure to hazardous

materials, among others. These potential impacts need to be identified and evaluated by NWTRC so that State monitoring of DOE rail routing, service options and access to Yucca Mountain may be carried out with meaningful and timely baseline information.

[Note: Subtasks 7.1 and 7.2 are to be developed by staff of the College of Engineering, University of Nevada-Reno]

**Task 8 Conduct Baseline Infrastructure and Safety Factors Survey
of Potential Nevada Highway and Rail Routes to a Yucca
Mountain Repository**

Background

In order for NWTRC to conduct any risk, routing or impact studies, it is necessary that baseline information on infrastructure and safety factors be collected and included in the Transportation Information and Analysis System. Such information may be used in current risk and routing models and may also be used to assess and/or predict impacts of repository construction and operation. It is essential that this survey be conducted for all rail and highway routes under consideration for repository shipments and that the information is continually updated and reviewed. As potential highway and rail access routes are identified by DOE, it will also be necessary to survey these routes using the same factors as those in the present project.

[Note: Subtasks under Task 8 are to be developed by staff of the College of Engineering, University of Nevada-Reno]

END

**DATE
FILMED**

9 / 8 / 92