



U.S. Department of Energy  
Office of Civilian Radioactive Waste Management



# Transportation of Spent Nuclear Fuel

Presented to:

**Wisconsin Legislative Council  
Special Committee on Nuclear Power**

Presented by:

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Madison, WI**



# Introduction

- **Spent nuclear fuel (SNF) shipments in the U.S. have an impressive safety record**
  - Over 3,000 shipments in the U.S. during the past 30 years
  - 754 Navy container shipments, traveling over 1 million miles since 1957
  - No release of radioactive material harmful to the public or the environment
- **Waste Isolation Pilot Plant (WIPP) has completed more than 5,050 shipments of transuranic waste as of October 2006**
- **More than 70,000 metric tons of SNF have *already* been shipped safely in densely populated Europe**
  - France and Britain average 650 shipments per year



# The National Academies' (NAS) Committee on Transportation of Radioactive Waste

- Released report, “*Going the Distance? The Safe Transport of Spent Nuclear Fuel and High-Level Radioactive Waste in the United States,*” in February 2006
  - Multi-year study by panel of 16 physical and social scientists
- Principal findings
  - The Committee found no fundamental technical barriers to the safe transport of SNF and high-level radioactive waste (HLW) in the U.S.
  - Transport by highway and rail is a low-radiological risk activity when conducted in strict adherence with existing regulations
  - U.S. regulations are adequate to ensure package containment effectiveness over a wide range of transport conditions



# The NAS Study (continued)

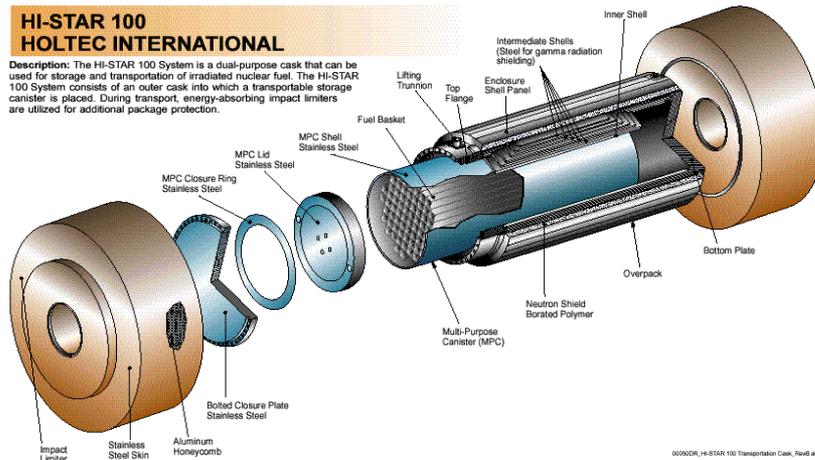
- **The NAS Committee report:**
  - **Endorsed the Department of Energy (DOE) choice of a mostly rail transportation mode and the use of dedicated trains**
  - **Stated that DOE should make public its suite of preferred highway and rail routes as soon as practicable to support state, tribal, and local planning**



# Transportation Rail Cask

## HI-STAR 100 HOLTEC INTERNATIONAL

Description: The HI-STAR 100 System is a dual-purpose cask that can be used for storage and transportation of irradiated nuclear fuel. The HI-STAR 100 System consists of an outer cask into which a transportable storage canister is placed. During transport, energy-absorbing impact limiters are utilized for additional package protection.



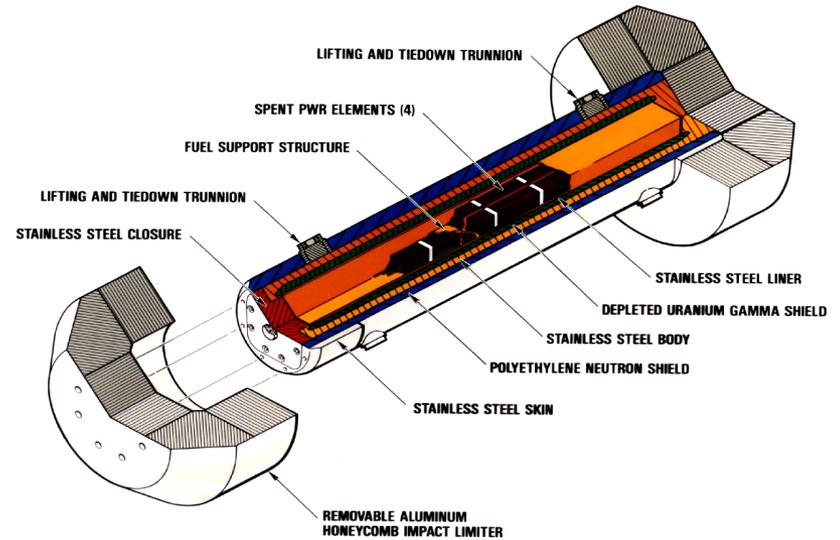
Trans Nuclear  
West Valley Shipment

- A typical rail cask weighs 70 to 125 tons and would handle pressurized water reactor (PWR) or boiling water reactor (BWR) SNF elements
- Figure depicts existing design of dual purpose cask
- This design may change in the future



# Legal Weight Truck Cask

- A typical truck cask weighs 24 to 26 tons and contains up to 4 PWR or 9 BWR SNF elements

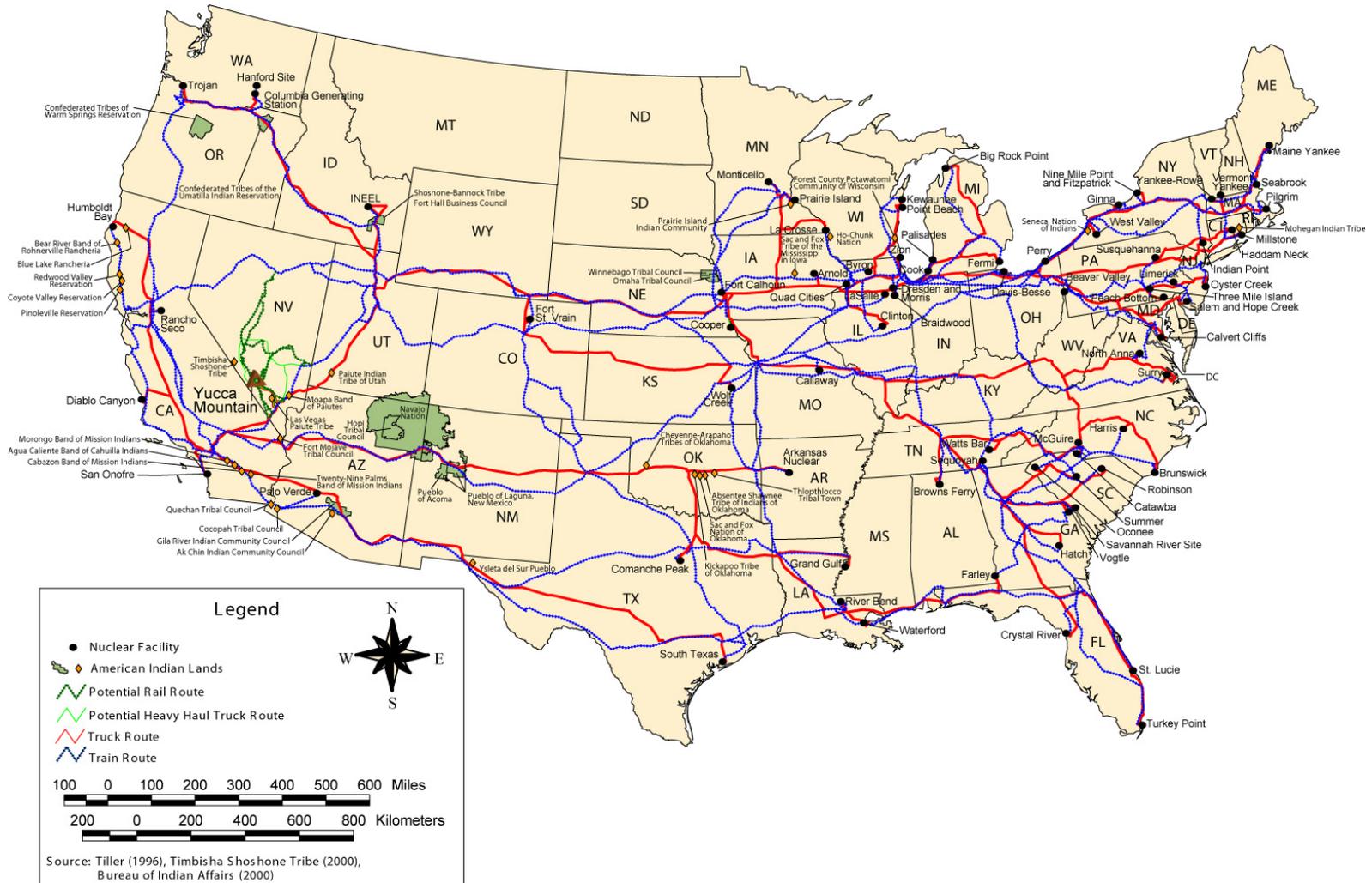


# Transportation Under the Nuclear Waste Policy Act

- **Transportation casks must be certified by the Nuclear Regulatory Commission (NRC)**
- **Responsibility for transport and disposal given to Office of Civilian Radioactive Waste Management (OCRWM)**
- **OCRWM must provide advance notification of shipments to states per NRC regulations**
- **OCRWM must use private industry to the fullest extent possible in each aspect of transportation**
- **Under Section 180(c), OCRWM must provide technical assistance and funds to states and tribes for training in safe, routine transportation and emergency response procedures**



# Representative Transportation Routes to Yucca Mountain



These routes represent the routes analyzed in Chapter 6 of the Final Repository Environmental Impact Statement and may not be the routes actually used for shipments to a potential repository at Yucca Mountain. Truck routes comply with U.S. Department of Transportation routing regulations. Rail routes are based on maximizing the distance on mainline track and minimizing the overall distance and number of interchanges between railroads. Direction arrow is approximate.



# Estimated Number of Shipments to Yucca Mountain

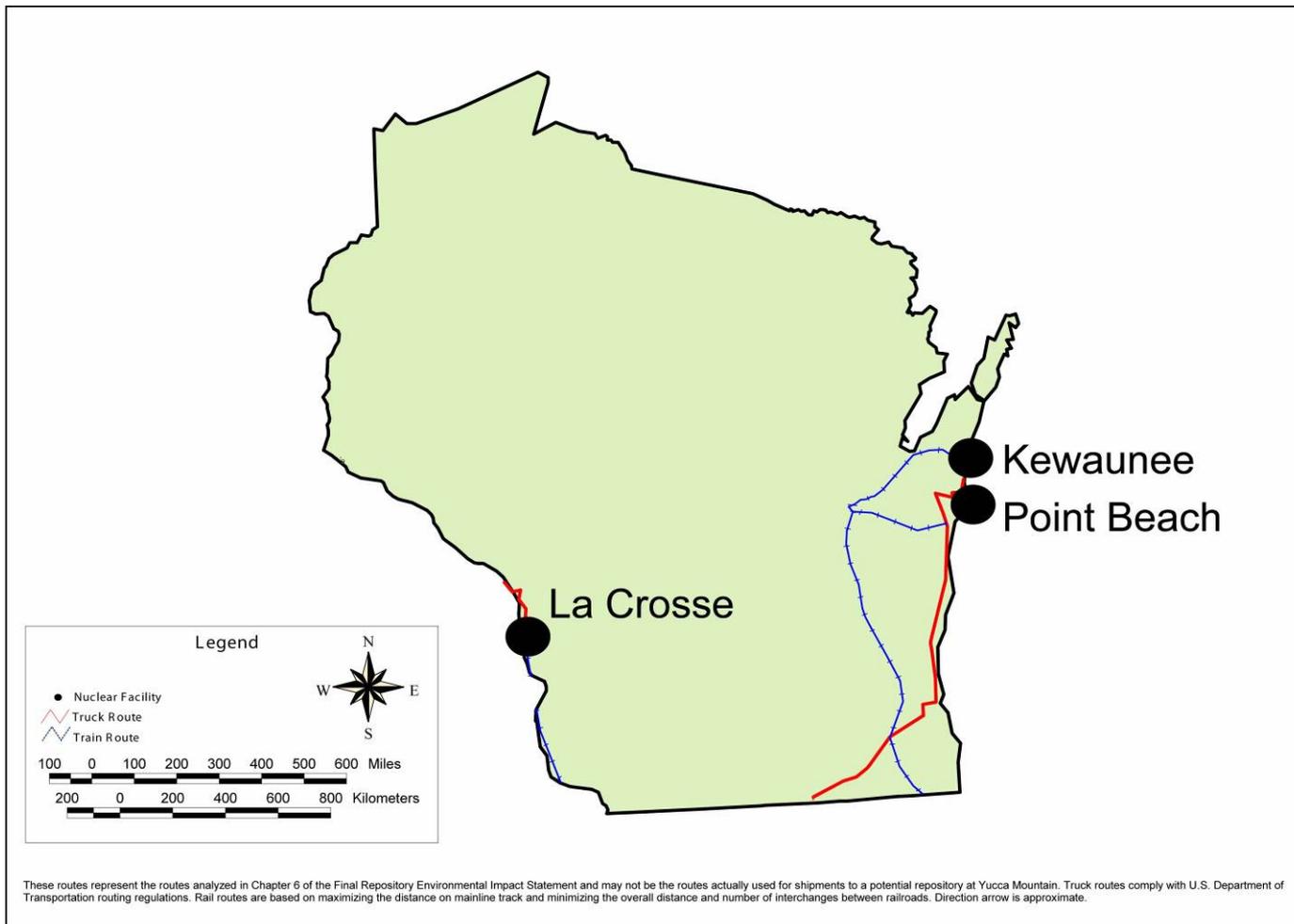
Scenario	Expected Case – Mostly Rail	
	Truck*	Rail*
<b>Proposed Action (70,000 MTHM over 24 years)</b>	<b>1,100</b>	<b>10,000 casks 3,500 trains</b>
<b>Annual</b>	<b>45/year</b>	<b>400 casks/year 130 trains/year</b>

\* Estimated numbers from Yucca Mountain Final Environmental Impact Statement (EIS)

- **Under the proposed action (70,000 MTHM, mostly rail scenario) there would be approximately 450 casks shipments per year**
- **It is anticipated that 90% of all cask shipments will be by rail**
- **A rail shipment may include three rail casks, reducing the total number of rail shipments to approximately 130 trains per year**



# Wisconsin Routes Analyzed in EIS



# Waste Acceptance by DOE

- **The Standard Contract established the contractual mechanism for OCRWM acceptance and disposal of SNF**
  - Required by the Nuclear Waste Policy Act
- **Contract assigns acceptance priority based on the principle of “Oldest Fuel First”**
  - Contract holder with oldest fuel gets first priority
  - Wisconsin nuclear plants have projected annual allocations in first five years of repository operations
- **OCRWM may grant priority to permanently shutdown reactors**
- **Priority for emergencies also allowed**



# Best-Achievable\*

## Yucca Mountain Repository Schedule

<b>Activity</b>	<b>Date</b>
<b>Begin Nevada Rail construction</b>	<b>Oct. 2009</b>
<b>NRC authorizes construction</b>	<b>Sep. 2011</b>
<b>Submit receive and possess application to NRC</b>	<b>Mar. 2013</b>
<b>Complete initial rail access</b>	<b>Jun. 2014</b>
<b>Complete construction for initial repository operations</b>	<b>Mar. 2016</b>
<b>Begin waste receipt</b>	<b>Mar. 2017</b>

\* Schedule dependent on factors outside DOE's control: i.e., funding, NRC and congressional actions, issuance of authorizations and permits, and potential litigation



# OCRWM Office of Logistics Management

- **Established in 2003, the Office of Logistics Management (OLM) is responsible for designing and developing the transportation system**
  - **OLM will serve as the link between SNF and HLW generators and the repository**
- **OLM's work scope focuses on these activities:**
  - **National transportation**
    - ◆ **Casks and rolling stock**
  - **Nevada rail line**
  - **Operations development**
  - **Institutional activities**



# *Strategic Plan for the Safe Transportation of Spent Nuclear Fuel and High-Level Radioactive Waste to Yucca Mountain*

- **Issued November 2003 – fulfilled a commitment by the Department**
- **The transportation mission – to develop a safe, secure, and efficient transportation system – will be guided by these principles:**
  - **Conduct an open and collaborative planning process with interested parties**
  - **Develop a safe and secure transportation system and related infrastructure that is based on that planning**

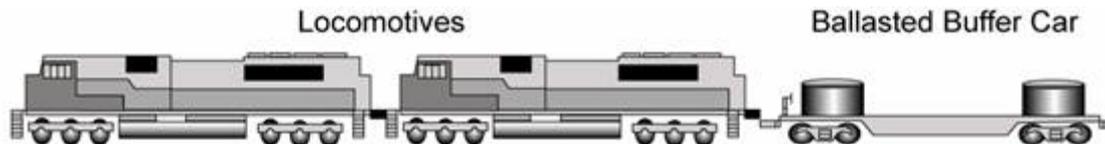


# Use of Dedicated Train Service

- **Benefits of dedicated trains include system efficiency and operational control**
  - **Enable OCRWM to better manage resources**
    - ◆ **Avoiding lengthy “dwell times” in rail yards means shorter transit time**
    - ◆ **Increased command and control capabilities**
    - ◆ **Increased routing flexibility**
    - ◆ **Shorter transit time provides more efficient use of assets**
  - **Responsive to concerns expressed by numerous parties**
    - ◆ **OCRWM has received recommendations from states, Federal Railroad Administration, Association of American Railroads, and industry to use dedicated trains**



# Train “Consist”



Estimated Weight and Length of Rolling Stock

Unit	Weight	No. in Consist	Length
4000 HP Locomotive	136 tons	2 per consist	61 ft. length
Cask Car	72 tons	3-5 per consist	80 - 90 ft. length
Cask & Cradle	150 tons	3-5 per consist	25 ft. length
Buffer Car	32 tons	2 per consist	60 ft. length
Escort Car	80 tons	1 per consist	85 ft. length



# Interactions on Transportation Planning

- **Maintain national and regional planning activities**
  - **Exchange information to assist in development of transportation system plans**
  - **Work directly with stakeholders including**
    - ◆ **Transportation External Coordination (TEC) Working Group**
    - ◆ **State Regional Groups (SRG)**
    - ◆ **Native American Tribal governments**
    - ◆ **National Conference of State Legislatures**
    - ◆ **Commercial Vehicle Safety Alliance**
    - ◆ **Federal agencies**
    - ◆ **Other groups as appropriate**



# Project Regulators, Oversight, and Interested Parties

## Regulation

- Nuclear Regulatory Commission
- Environmental Protection Agency
- Department of Transportation

## Oversight

- Federal government
  - Government Accountability Office
- State/Local Government
  - Host state and affected counties
- Tribes

## Review

- National Academy of Sciences
- Nuclear Waste Technical Review Board
- Advisory Committee on Nuclear Waste

The White House

Congress



## Federal Agencies

- Federal Emergency Mgmt. Agency
- Dept. of the Interior
- Dept of Labor
- U.S. Geological Survey

## Other Interest Groups

- States/regional organizations
- Professional organizations
- Environmental groups
- Public interest groups
- Educational organizations

## Transportation Industry

- Cask designers and manufacturers
- Carriers & transportation service contractors

## Public

- Media
- Academic institutions
- Citizens
- Civic groups

## Electric Utilities

- Utility transportation groups
- Utility technical & information groups

## Nation's Ratepayers

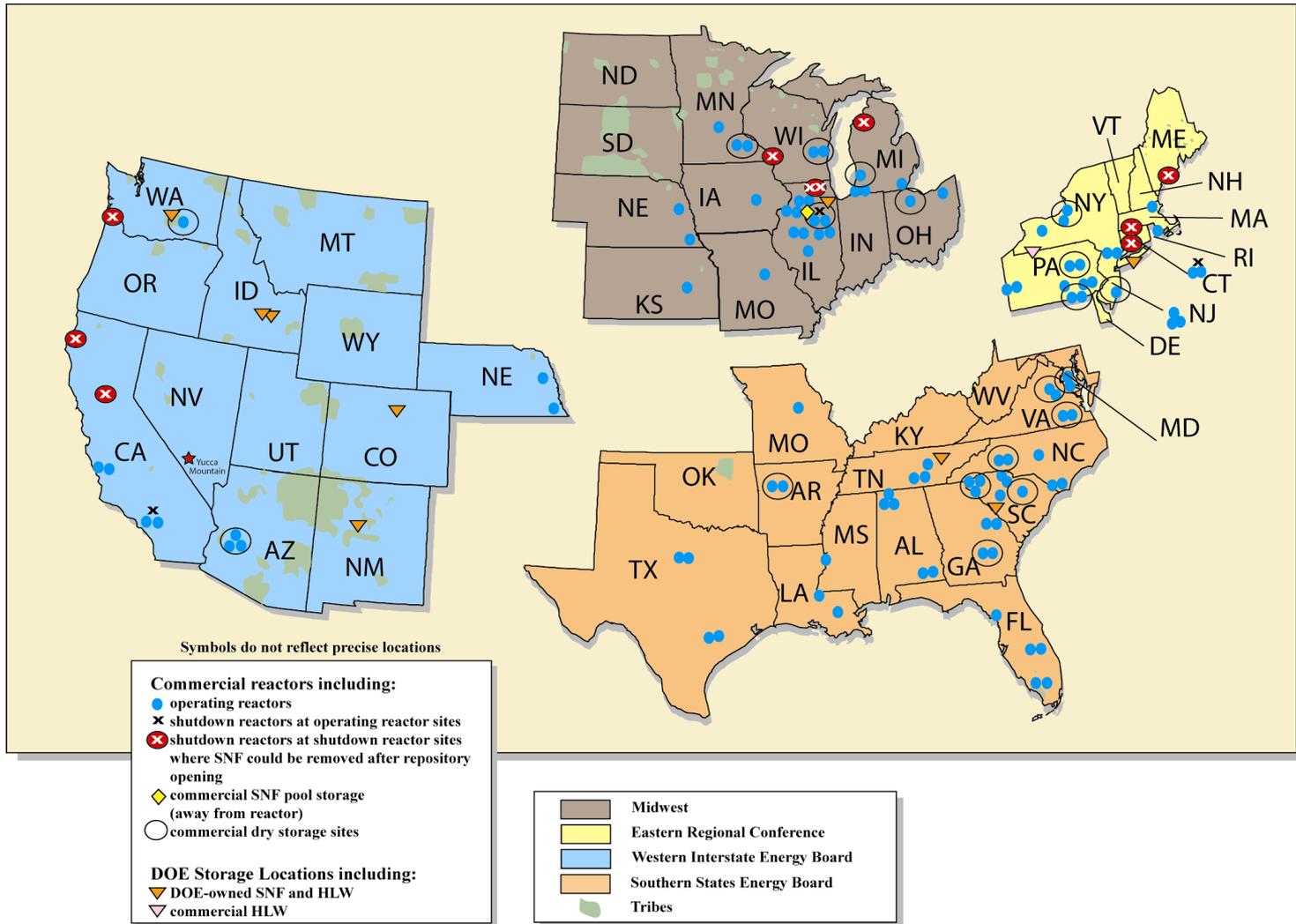
- National Association of Regulatory Utility Commissioners
- Nuclear Waste Strategy Coalition

## International

- International governments
- International agencies
- International organizations



# SRGs, Reservations, and Reactor/DOE Site Locations





# Section 180(c) Implementation

- **Draft 180(c) policy and grant application developed with stakeholder input**
  - **State, tribal, and local officials, emergency response associations and nuclear and transportation industry represented**
- **Pilot program is intended to test 180(c) approach before national grants are distributed**
- **Planning grants will be available to states and tribes four years prior to the start of shipments**
- **Formula-based training grants available three years in advance of shipments**



# Approach to Selecting Transportation Routes

- **Route selection process will**
  - Provide information for 180(c) pilot program and determination of funding allocation for states and tribes
  - Provide basis for planning operations and security activities
- **The approach to developing these routes includes**
  - Issuing a route development plan
  - Establishing a TEC Routing Topic Group
    - ◆ Facilitates participation from states, tribes and other interested parties



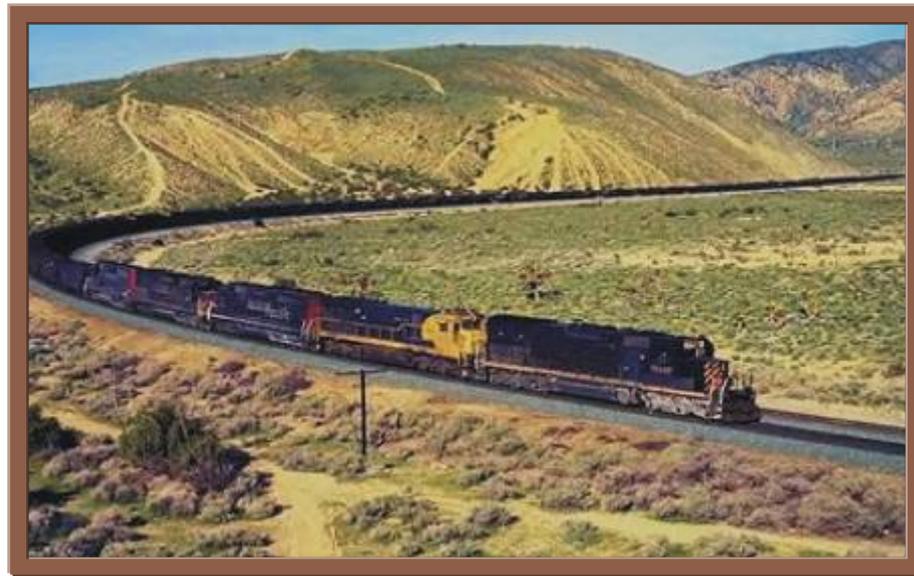
# Route Selection Steps

- **Steps in route selection process include**
  - **Establish draft routing criteria**
  - **Review and revise criteria based on stakeholder input**
  - **Finalize routing criteria**
  - **Review and analyze candidate routes**
  - **Identify preliminary national suite of routes by December 2007**



# Conclusions

- **Developing a comprehensive national spent fuel transportation plan is an OCRWM program priority**
- **A collaborative process with stakeholders will be integral to implementing a transportation system that is safe and secure and merits public confidence**

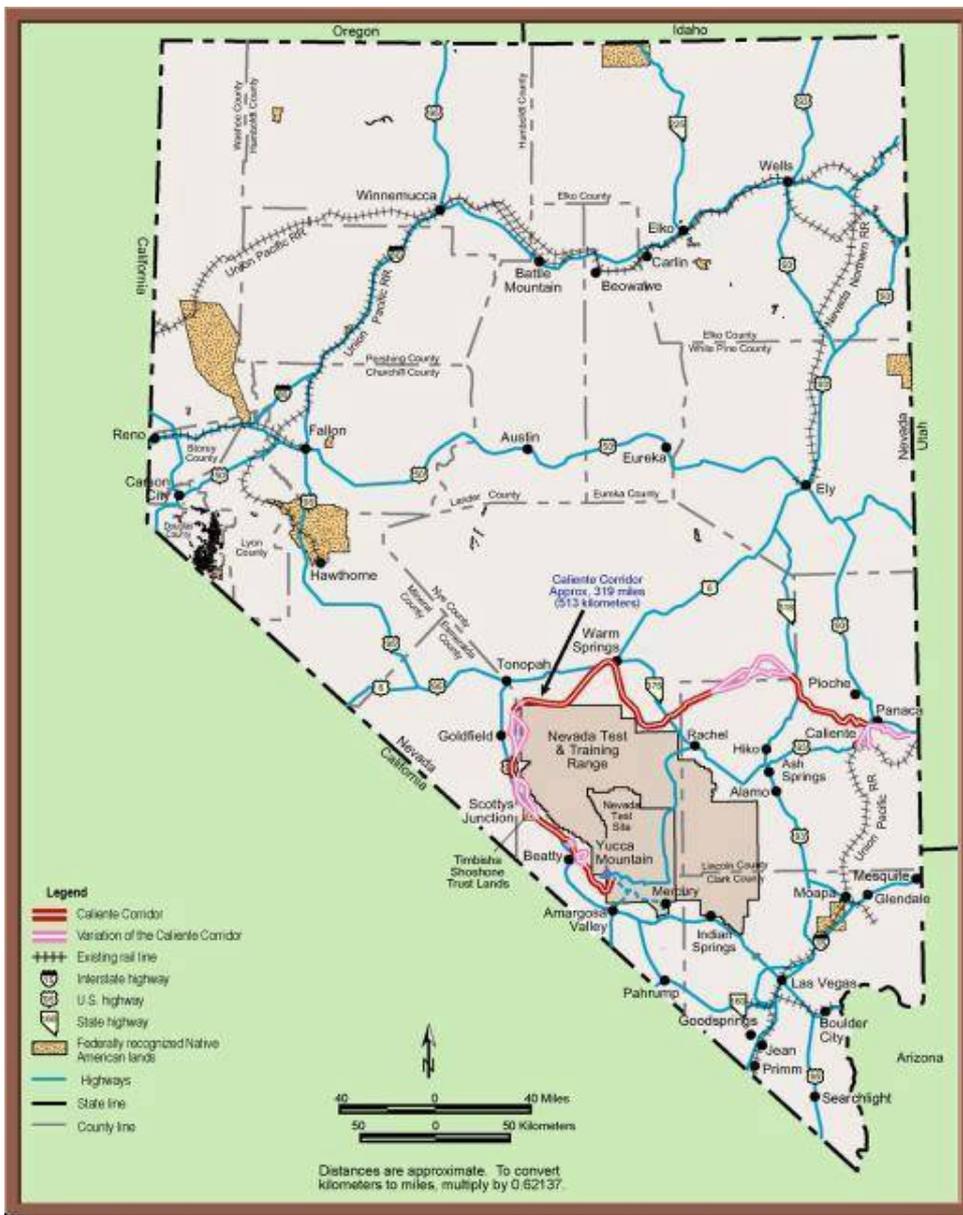


# Back Up Slides



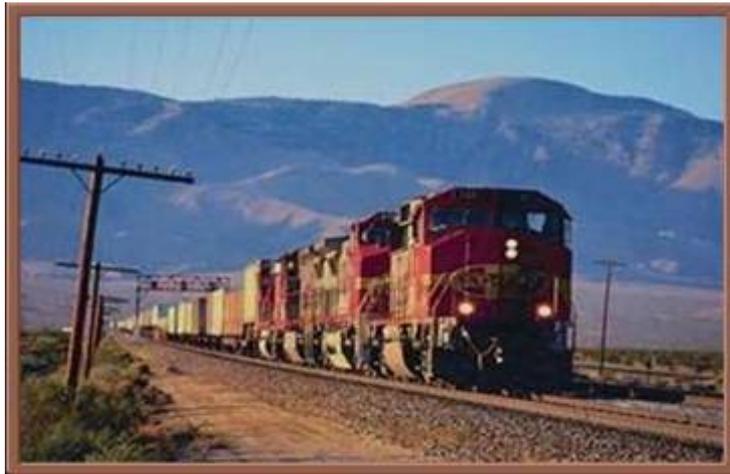
# Nevada Rail

- In April 2004, DOE published its selection of mostly rail as the mode of transport, both nationally and in the State of Nevada
- DOE also selected Caliente as the rail corridor in which to determine a rail alignment for the construction and operation of a rail line in Nevada
- At the same time, DOE issued a Notice of Intent to prepare a rail alignment environmental impact statement (RA-EIS)



# Nevada Rail Development Status

- Caliente corridor selected from five corridor options in the repository EIS based on fewer potential land-use conflicts
- Conceptual design for Caliente was complete; Draft RA-EIS ready to be issued on schedule and within budget
- Mina corridor not considered in the repository EIS due to objections from the Walker River Paiute Tribe

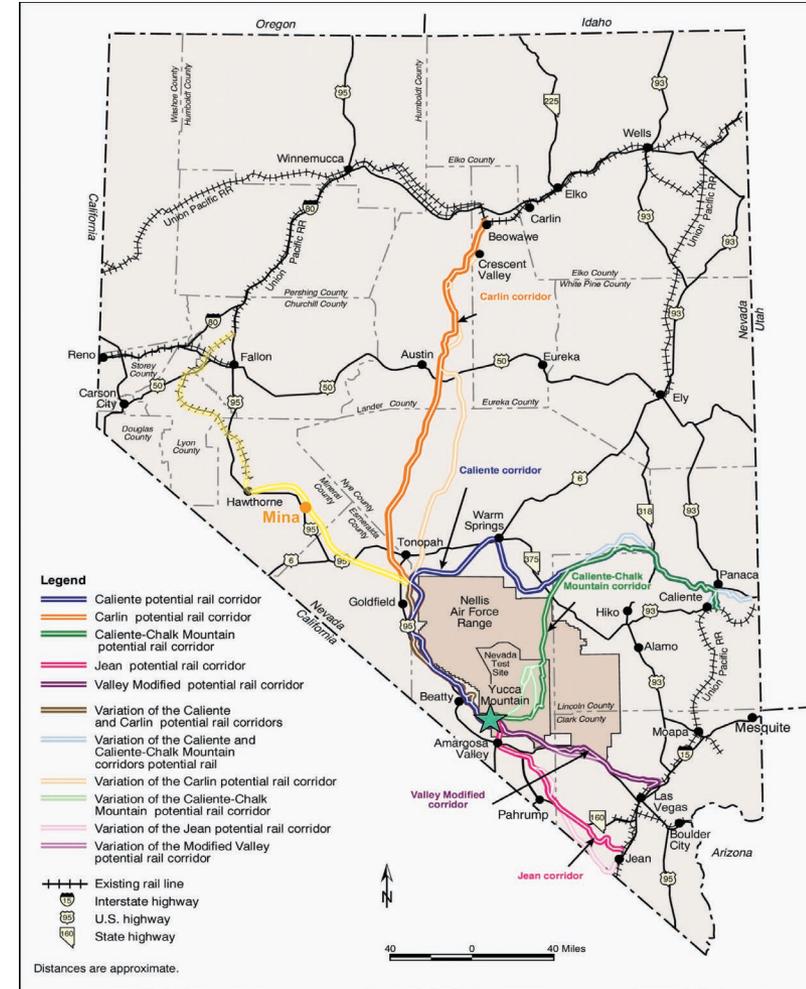


- In May 2006, Tribe removed objection to studying the impacts of nuclear waste shipments across their lands
- Inclusion of the Mina route in an EIS would allow the Tribe to make a more informed, final decision



# Potential Advantages to the Mina Corridor

- Based on preliminary analysis, the Mina corridor appears to offer potential advantages –
  - Crosses fewer mountain ranges
  - Utilizes existing rail bed
  - Shorter distance than the Caliente corridor
  - Fewer land use conflicts
  - Less land disturbance, resulting in fewer adverse environmental impacts
  - Simpler design
  - Less costly construction of rail line



# Supplement to Final Repository EIS

- **OCRWM will prepare a supplement to the Yucca Mountain final EIS**
- **Since the 2002 EIS was issued, OCRWM has continued to develop repository design and associated plans**
  - **Repository will be operated using a primarily canistered approach**
  - **Most commercial spent nuclear fuel would be packaged in multipurpose transport, aging and disposal canisters—TADs**
- **Scoping meetings were recently held to get public input on the scope of the EIS**



# Supplement to Final Repository EIS

## (continued)

- **To develop the scope of the EIS, OCRWM has asked for input on a list of issues including the potential impacts of:**
  - **Radiological releases**
  - **Worker safety and health**
  - **Transportation**
  - **Accidents**
  - **Sabotage**
  - **Water and air resources**
  - **Cultural resources**

