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- CRA should be basis of risk communication throughout life of the project

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- Reevaluate Modal Study findings , and if appropriate, revise NRC cask performance standards
- Evaluate costs and benefits of destructive testing of a randomly-selected production model cask

## **Nevada Recommendations Accident Prevention & Emergency Response**

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- Coordinate with Indian Tribes and local governments
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- Adopt WIEB Sept., 1994 proposal for evaluation and final designation of preferred shipping routes
- Implement Section 180(c) Financial Assistance to State, local, & tribal governments through rulemaking
- Revise DOE Plan for Privatization of Transportation Services to emphasize safety and public acceptance

## Yucca Mountain Transportation Issues

**No Rail Access.** At present, there is no railroad access to Yucca Mountain. Construction of a new rail spur would cost more than \$1 billion. Even the shortest of the five spur options (99 to 344 miles in length) would be the largest new rail construction project in the United States since World War I. Environmental approvals, right-of-way acquisition, and litigation could delay rail construction for 10 years or more. The alternative to rail spur construction, delivery of thousands of large rail casks by 220-foot-long heavy haul trucks (HHTs) over distances of 112 to 330 miles on Nevada public highways, is probably not feasible. Even if DOE is able to develop rail access to Yucca Mountain, one-third of the reactor sites cannot ship directly by rail.

**Mostly Truck Scenario.** The DOE "mostly legal-weight truck scenario" is the only national transportation scenario that is currently feasible. All 72 power plant sites and all 5 DOE sites can ship by legal-weight truck. DOE would need 53,000 shipments over 24 years to move 70,000 metric tons of spent nuclear fuel (SNF) and high-level radioactive waste (HLW) to the repository. If all projected SNF and HLW were shipped to Yucca Mountain, there would be almost 109,000 shipments over 38 years.

**Mostly Rail Scenario.** DOE's "mostly rail" national scenario would result in fewer cross-country shipments. However, the barge and heavy haul truck shipments from 24 reactor sites that lack rail access, and the heavy haul truck shipments required in Nevada if there is no rail spur to Yucca Mountain, must be added to get a true picture of DOE's "preferred option." When the barge and HHT shipments are included, DOE's "mostly rail" total would be 22,500 shipments over 24 years, and 45,000 over 38 years.

**Past & Future Shipments.** DOE shipments to Yucca Mountain would greatly exceed past U.S. shipments of SNF. Between 1964 and 2001, about 2,457 metric tons of commercial SNF was shipped in 2,722 shipments, an average of 65 metric tons and 72 shipments per year. DOE proposes to ship 2,900 metric tons to Yucca Mountain every year for 24 years, requiring 935 to 2,200 shipments per year. Over 38 years, DOE could ship 3,100 metric tons per year, requiring 1,100 to 2,900 shipments per year. Between 1971 and 2001, SNF shipments traveled about 1.6 million miles by truck and 120,000 miles by rail, and there were four accidents involving loaded casks. If future DOE shipments have the same accident rate as past shipments, there would be 160-190 accidents over 38 years, plus 850-2,400 regulatory violations.

**Transportation Routes.** After concealing potential routes in the Draft EIS, DOE published maps of "representative routes" in the Final EIS. The DOE maps generally agree with the routes identified in previous studies by DOE and Nevada contractors. DOE's primary truck route would be I-80 from Cleveland to Salt Lake City. DOE's primary rail route would be the Union Pacific from Chicago to Salt Lake City. With a few exceptions, DOE has identified the most likely highway and rail routes to Nevada. The routes identified by DOE could affect 45 states and the District of Columbia. More than 123 million people currently live in the 703 counties traversed by DOE's highway routes, and 106 million live in counties along DOE's rail routes. DOE predicts that between 10.4 and 16.4 million people will live within one-half mile of a transportation route in 2035.

**Spent Nuclear Fuel SNF** from commercial power reactors would comprise about 90 percent of the wastes shipped to the repository. Fission products, especially Strontium-90 (half-life 28 years) and Cesium-137 (half-life 30 years), account for most of the radioactivity in SNF for the first hundred years after removal from reactors, and are a major source of intense gamma and neutron radiation. After one-year in a water-filled storage pool, unshielded SNF is so radioactive that it

delivers a lethal dose of radiation (600 rem) in about 10 seconds. After 50 years of cooling, the total radioactivity (measured in curies) and the surface dose rate (measured in rem/hour) decline by more than 95 percent, but SNF can still deliver a lethal radiation exposure in less than 5 minutes after 50 years.

**Cask Contents.** The 70,000 metric tons of SNF and HLW shipped to Yucca Mountain during the first 24 years would contain more than 12 billion curies total radioactivity, including 4.8 billion curies of deadly Cesium-137, and 25 million curies of Plutonium-239, which has a half-life of 24,000 years. The average truck cask of commercial SNF would contain more than 350,000 curies, including 20-30 times the amount of radioactive cesium and strontium released by the Hiroshima bomb. Each rail cask of spent fuel from a commercial nuclear power plant would contain more than 2 million curies total radioactivity. Four rail casks would contain more Cesium-137 than the total amount released during the Chernobyl accident (2.4-2.9 million curies).

**Accident Consequences.** Highway and rail accidents severe enough to release radioactive materials from a shipping cask have a very low probability of occurrence, but such accidents are credible. A Nevada-sponsored study of the July 2001 Baltimore rail tunnel fire concluded that it would have resulted in significant release of radioactive materials. It burned for more than three days with temperatures as high as 1500°F. A single rail cask in such an accident could have released enough radioactive cesium to contaminate an area of 32 square miles. Failure to cleanup the contamination, at a cost of \$13.7 billion, would cause 4,000 to 28,000 cancer deaths over the next 50 years.

**Terrorism Consequences.** DOE and NRC testing in the 1980s demonstrated that a military demolition charge could breach the wall of a truck cask. An industry test in 1998 demonstrated that a TOW missile warhead could breach a rail cask. DOE acknowledges that a successful attack on a truck cask in an urban area would result in 48 latent cancer fatalities. A Nevada-sponsored evaluation of the same scenario concluded the attack on a truck cask using a common military demolition device could cause 300 to 1,800 latent cancer fatalities, assuming 90% penetration by a single blast. Full perforation of the cask, likely to occur in an attack involving a state-of-the art anti-tank weapon, such as the TOW missile, could cause 3,000 to 18,000 latent cancer fatalities. Cleanup and recovery costs would exceed \$10 billion.

**Dedicated Trains.** Current USDOT regulations allow shipment of spent fuel casks in mixed freight trains carrying other hazardous materials. Nevada believes spent fuel should never be shipped in mixed freight trains, and that spent fuel should always be shipped in dedicated (sole-use) trains, operating under strict speed limits and special passing rules, as recommended by the Association of American Railroads. Since the 1970s, DOE and the nuclear industry have opposed mandatory use of dedicated trains and special safety rules.

**Full-Scale Testing.** The NRC does not currently require full-scale physical testing of shipping casks. None of the SNF shipping casks currently used in the United States have ever been tested full-scale. This fact was confirmed by NRC Chairman Richard Meserve in letters to Senator Harry Reid dated April 2, 2002 and April 24, 2002. DOE has no plans for full-scale testing of the casks which would be used for shipments to Yucca Mountain. Since the 1970s, DOE and the nuclear industry have opposed mandatory full-scale testing.

Revised by Bob Halstead, Nevada Agency for Nuclear Projects, March 17, 2003. State of Nevada transportation maps and reports can be accessed on the web at [www.state.nv.us/nucwaste](http://www.state.nv.us/nucwaste).

## Yucca Mountain Transportation: Critical Issues

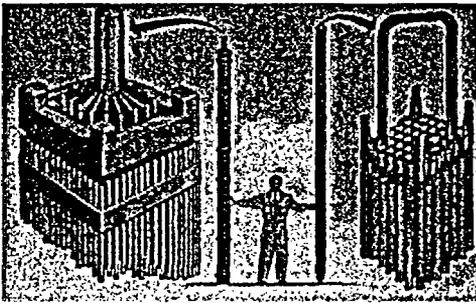
Bob Halstead  
State of Nevada Agency for Nuclear Projects  
Fred Dilger  
Clark County Nevada Nuclear Waste Division  
Presentation to  
National Association of  
Regulatory Utility Commissioners  
Nuclear Issues-Waste Disposal Subcommittee  
Denver, CO  
July 25, 2003

## Yucca Mountain Transportation Critical Issues

- Spent Fuel Transportation Hazards
- Risk Management Recommendations
- Rail Access to Yucca Mountain
- Highway Access to Yucca Mountain
- Potential Shipment Scenarios
- Potential Cross-Country Routes

Additional documentation available at  
[www.state.nv.us/nucwaste/trans.htm](http://www.state.nv.us/nucwaste/trans.htm)

## Fresh Fuel Assemblies



## Spent Fuel Storage Pool



## Spent Fuel Transportation Hazards

- Direct SNF exposure deadly for 50+ years
- Each cask contains enormous amount of dangerous radioactive materials
- Routine radiation from casks hazardous to workers and to some members of public
- Cask breach in worst-case accident: 5-4,000+ latent cancer fatalities (LCFs) and \$300,000-10 billion+ cleanup costs
- Cask breach in successful terrorist attack: 48-1,800+ LCFs and \$10 billion+ cleanup costs
- Shipping casks not tested full-scale

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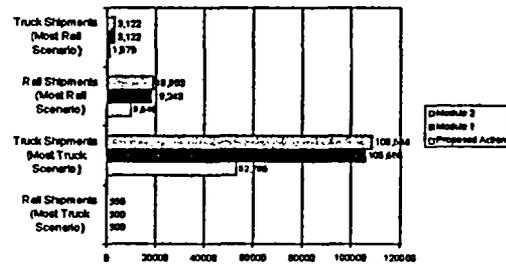
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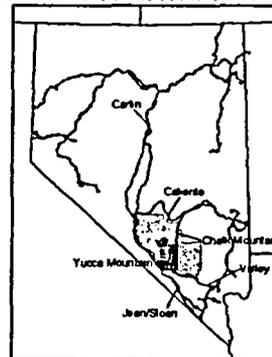
### Rail Access is Desirable

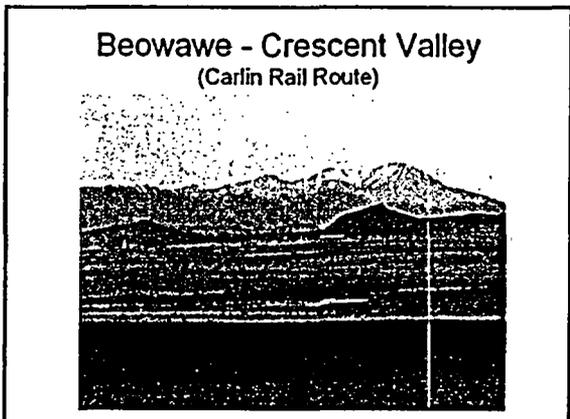
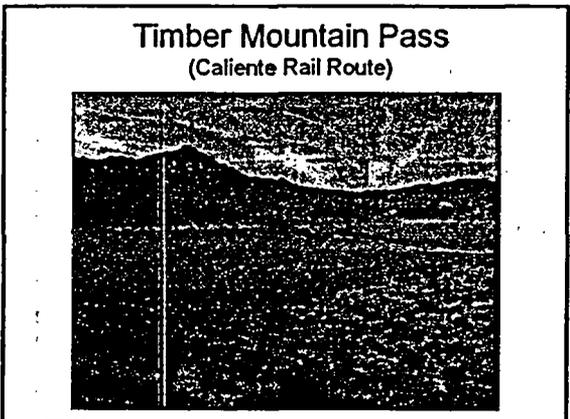
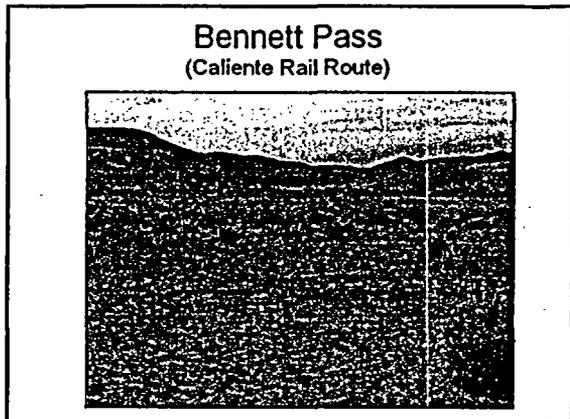
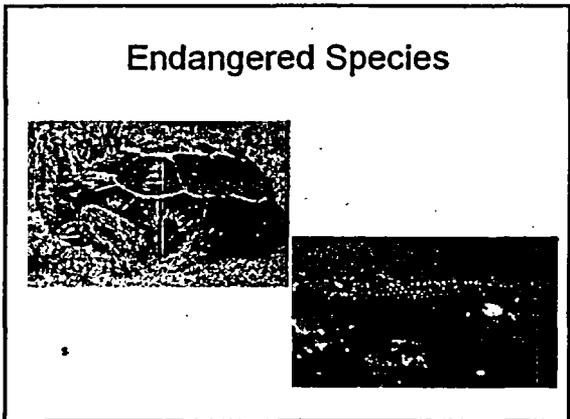
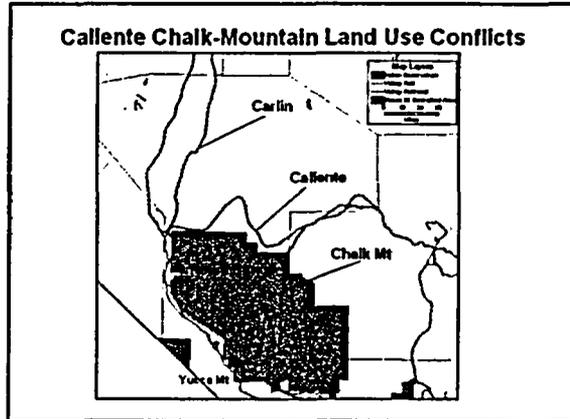
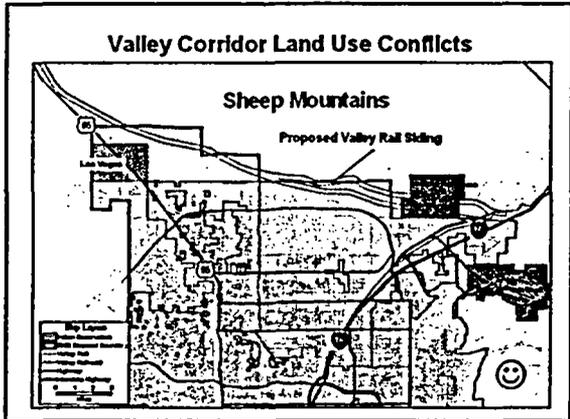


### Yucca Mountain Rail Issues

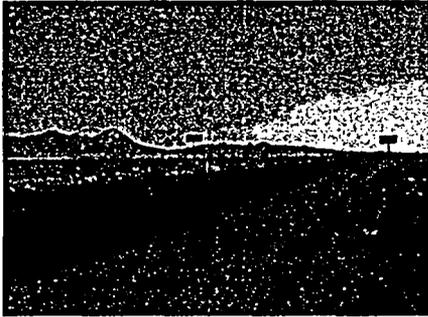
- Currently no rail access to Yucca Mountain
- 3 DOE rail options infeasible (land use conflicts)
- Caliente & Carlin options would be longest new rail construction in US since 1930s
- Construction cost could exceed \$1 billion
- Significant environmental challenges & conflicts with ranching, mining, recreation, and Native American lands & cultural resources
- Caliente option impacts City of Las Vegas
- Heavy Haul Truck (HHT) options infeasible

### Potential Nevada Rail Routes to Yucca Mt





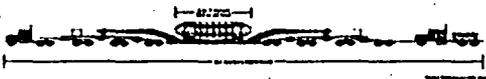
**Southern Crescent Valley  
(Carlin Rail Route)**



**Union Pacific RR – Las Vegas  
(Looking West from Stratosphere)**



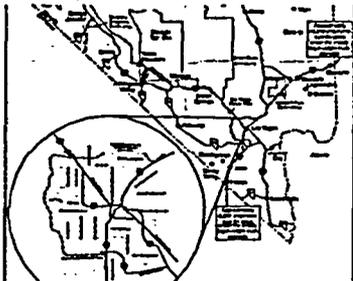
**Heavy Haul Truck Rig for Use With  
Yucca Mountain Shipments**



**Rail Access Summary**

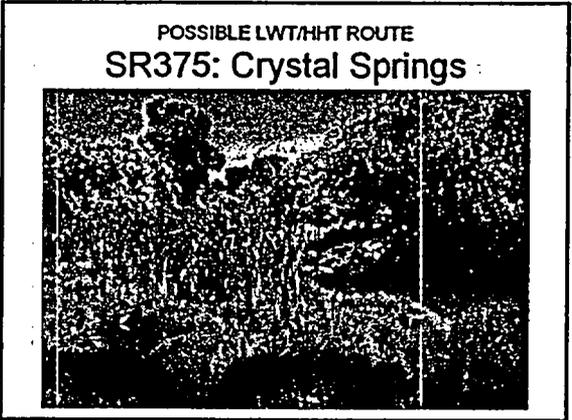
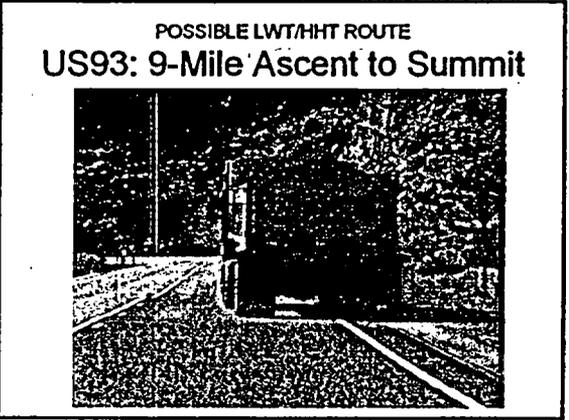
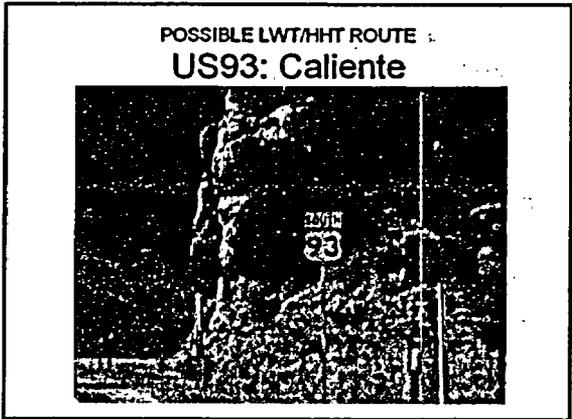
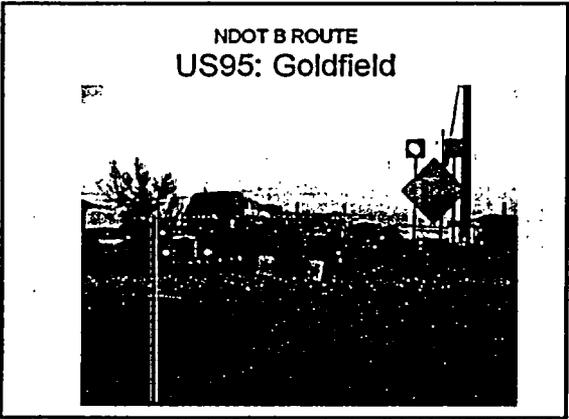
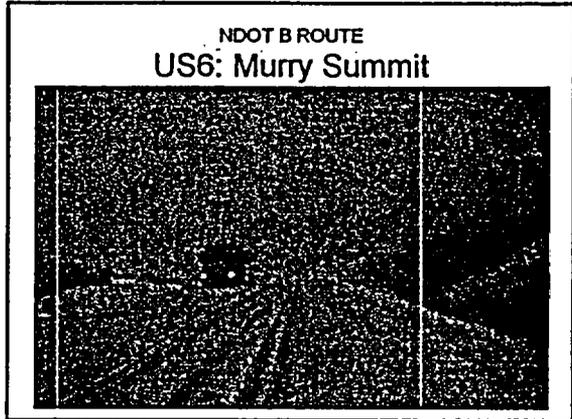
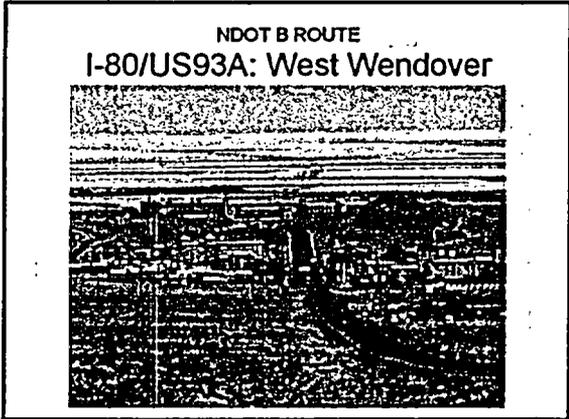
- Direct rail access to national rail network is highly desirable for repository site
- Yucca Mountain site lacks rail access
- DOE has not demonstrated feasibility of any of the 5 rail access options identified in the FEIS
- Alternative to rail spur, HHT delivery from intermodal transfer station, probably not feasible
- Rail shipments through downtown Las Vegas will be a major issue in any future DOE transportation planning activities

**Legal-Weight Truck Access  
DOE FEIS Proposed Truck Routes**

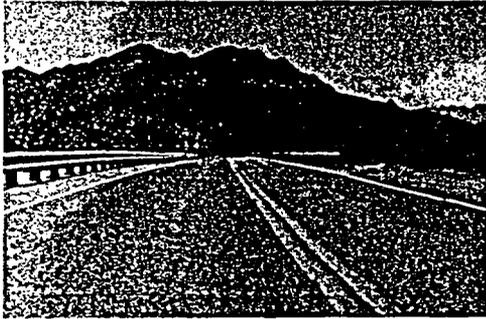


**Legal-Weight Truck Access  
NDOT B Route**





POSSIBLE LWT/HHT ROUTE  
**SR375: Hancock Summit**



POSSIBLE LWT/HHT ROUTE  
**SR375: Rachel**



**Potential Shipment Scenarios  
 Over 38 Years, 2010-2048**

- **Mostly Truck:** 109,000 Cask-Shipments (about 8 trucks per day)
- **Mostly Rail:** 22,000 Cask-Shipments (about 10 rail casks and 2 truck casks per week, plus barge or HHT shipments from 24 reactors)
- **Current Capabilities:** 42,000 Cask-Shipments (about 2 truck casks and 1 rail cask per day, assuming rail spur can be built)

**Most Likely Highway Routes  
 to Yucca Mountain**



**Most Likely Rail Routes  
 to Yucca Mountain**

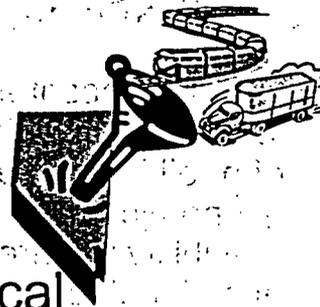


**Affected Jurisdictions & Populations  
 Along Yucca Mountain Routes**

- Truck and rail routes could traverse 45 states, 700 counties, and 50 Indian Reservations
- More than 120 million people live in counties traversed by truck routes
- More than 100 million people live in counties traversed by rail routes
- More than 11 million people live within one-half mile (800 meters) of a potential highway route

Source: Dilger & Halstead, Many Roads to Travel, WM'03, February 2003

DOE's  
Transportation  
Responsibilities:



An Affected Unit of Local  
Government (AULG) Perspective

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NWTRB Transportation Panel

January 21, 2004

Las Vegas, Nevada

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## OVERVIEW

- Views of Nye, Clark, Churchill, Eureka, Lander, Mineral, White Pine counties in Nevada and Inyo County, California
- In the context of the questions posed by the committee we will discuss:
  - Transportation systems
  - Interaction and process
  - Emergency management
  - Transportation decision-making

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## TRANSPORTATION SYSTEMS

- With the recent announcement by DOE identifying corridor preferences for construction of a rail line to serve Yucca Mountain, the economic, environmental and institutional feasibility for direct rail access remain questionable.
- Direct rail access to Yucca Mountain is feasible. However, if the mode decision is delayed, DOE would likely be forced to consider direct truck or rail-to-truck alternatives for its initial shipments to Yucca Mountain.
- In light of the alternatives to direct rail, DOE must be encouraged to expeditiously construct direct rail to Yucca Mountain.

## MOSTLY RAIL STILL MEANS TRUCK SHIPMENTS FROM EAST AND WEST

- As DOE focuses on direct rail, DOE must continue work to define truck transportation planning, impact and mitigation issues as the "mostly rail" scenarios will still involve thousands of legal weight truck shipments through Nevada.
- Construction of a dedicated rail line to Yucca Mountain will not do much to induce California's nuclear utilities to ship by rail. Truck shipments from the 4 California sites would likely be quicker and cheaper; this has implications for future use of California rural routes

## MODE AND ROUTE INTEGRATION

- Any modal and routing Record of Decision (ROD) issued by DOE must include an explanation of how all reactor and defense sites will route shipments to Yucca Mountain. The ROD must indicate all modes and routes that will be used, and the number of shipments expected for each.
- DOE mode and route decisions must be transparent regarding factors considered in reaching decisions.

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## INTERACTION AND PROCESS

- **Situs county and AULGs need a direct and active role in transportation planning that affects our region.**
  - Some suggestions: DOE could initiate a monthly planning meeting to involve all counties in the planning;
  - DOE could submit transportation planning-related questions to the counties to help inform DOE's planning.

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## DOE: ADDRESS AULG COMMENTS ON MODE AND ROUTE

- Pursuant to Section 116c of the NWPA, as amended and NEPA, AULGs have provided extensive comments to DOE regarding mode and routing. DOE mode and routing decisions must reflect how those comments have been considered by DOE.
- Example: the pending Record of Decision on modal preference might include a description of input provided by AULGs over the years and how, if at all, such input contributed to the modal choice. Documentation of comments and response is essential.

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## AULGS AND UMBRELLAS

- As explained in DOE's transportation strategic plan, the use of umbrella groups to "check off" the local government interaction box is inadequate and unacceptable for the AULG
- DOE must recognize the AULG as a distinct group of stakeholders who are more heavily burdened than the rest of the local governments in the country. The AULGs with truck and rail routes will see virtually all of the shipments. This is very different from the effect transportation may have on local governments in reactor and corridor states throughout the country.
- Recognition of AULGs by DOE includes continuing involvement, consultation, oversight funding and mitigation.

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## EXAMPLES OF INTERACTION

- For example, local government should have a long term ongoing ability to influence and be involved in the management and operation of the rail system including emergency response and safety of operations.
- Local government should be able to maximize development opportunities and other options involving the rail system.

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## EMERGENCY MANAGEMENT

- Nevada local governments are on the front line of public health and safety for nuclear waste transportation, and are responsible to be prepared for an accident even if the risk is believed to be minimal.
- Interlocal mutual aid agreements continue to commit counties to regional emergency response obligations, regardless of routing and mode decisions
- Mutual aid agreements, particularly important to rural Nevada, will require emergency first response training and equipment be provided by DOE to local governments not necessarily located along designated transportation routes.

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## DOE'S RECORD IS INCONSISTENT

- Recent WIPP shipments had extensive involvement with local jurisdictions, while foreign fuel shipments by rail through northern Nevada, based on Lander County's experience, did not.
- Working through the state does not guarantee adequate preparation at the local level.

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## ROUTE PREPARATION CRITERIA

- DOE needs to establish acceptable route preparation criteria before shipments could begin. Such criteria might include emergency response training and equipment, required infrastructure improvements, and appropriate monitoring and oversight capabilities.
- Use WIPP as an example. Shipments don't start along a route until it is considered "Open." To be open, DOE has to have provided training, participated with States in public information, etc. In essence, the State has to agree that preparations along the route are adequate, and that emergency responders are prepared to handle an event.

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## AULG CAPACITY

- DOE should plan and budget for regional emergency response training facilities fully funded by DOE, staffed by professionals but operated by local governments, as proposed by Eureka County
- Emergency medical capabilities and training have not been addressed – volunteers, facilities, emergency medical capacity and training in preparation for a nuclear incident

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## DOE TRANSPORTATION DECISION-MAKING

- We are experiencing piecemeal decision-making on transportation because of the lack of a transportation Programmatic EIS which would analyze cradle to grave transportation of ALL materials destined for Yucca Mountain, including PFS shipments and defense waste, in the context of current low level and transuranic shipping programs already affecting Nevada and California.
- In order to avoid 12th hour decisions which prohibit effective risk analysis and management (i.e. emergency first response training and equipment) DOE must move forward expeditiously to make specific mode and routing decisions regarding transportation through Nevada.

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## USING FEIS AS DECISION-MAKING TOOL

- Regarding the upcoming mode decision (mostly rail or mostly truck), FEIS lacked a national route-specific study that should be the basis for informed decision making on mode and route, and that takes into consideration all affected, involved and responsible parties for shipping from many cradles to one grave.
- FEIS is inadequate to support transportation planning and decisions that take into consideration the indirect effects and cumulative effects of nuclear waste transportation.
- What is the basis for DOE's mode decision? Who decides? Why isn't this a public dialogue since the entire country is affected? What is mode preference based on, other than "rail is safer"?

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## SUPPLEMENTAL EIS ON SECURITY ISSUES IS NEEDED

- Because FEIS was completed prior to 9/11, the NEPA document does not give proper weight to security issues. A Supplemental EIS focused on security issues pertaining to the Yucca Mountain project, transportation, and the commercial nuclear fuel cycle should be developed.

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## TRUCK DECISIONS

- The Final EIS for the project does not provide sufficient detail on potential truck routes into Yucca Mountain.
- Although DOE claims that the FEIS is sufficient to support all subsequent decision concerning routing, no analysis was done on several rural routes already in use by DOE for nuclear waste transportation.
- The FEIS for the project did not compare potential truck routes with respect to safety or cost.

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## RAIL DECISIONS

- DOE has announced its rail route preference in Nevada: Caliente with Carlin as a secondary preference
- DOE intends to prepare an EIS only on the Caliente route. From a planning perspective, analyzing the secondary route and rail/truck alternatives in the event that the preferred route is infeasible would be prudent and efficient.

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## FINAL THOUGHTS

- DOE has resisted acknowledging that its current low level waste and transuranic waste shipping programs are legitimate subjects of study for purposes of anticipating how DOE will handle the transportation of high level waste and spent fuel. DOE should encourage AULGs to use oversight funding to develop an understanding of DOE's existing nuclear waste transportation practices and regulatory framework.
- Until a Supplemental EIS is completed on security issues, there is no rational basis for a decision on the preferred mode of transportation or preferred routes. Absent decisions on mode and routes, impacted jurisdictions cannot be identified and costs to prepare these routes cannot be estimated.

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## LONG RANGE PLANNING IS DIFFICULT

- 180(c) funding is not a panacea for the AULGs.
- Funding will not be available until three years prior to first shipments and the amount available to Nevada and California is unknown. Knowing neither the risks nor the resources available to offset these risks, makes long range planning difficult if not impossible. Funding needs to be based on the total impact of under the draining end of the transportation funnel.

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## OUR CHALLENGE

- Understanding the anticipated impacts
- Weighing the burden of risk and responsibility imposed upon the county
- Developing a plan to respond to those burdens
- Getting DOE to compensate the counties for the cost of implementing the plan for the duration of the shipping campaign
- Implementing the plan for the duration.....

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