Yucca Mountain
Rail Transportation
Environmental Issues

Bob Halstead
Transportation Advisor
Nevada Agency for Nuclear Projects

Association of Transportation
Law Professionals – Forum V
Washington, DC
November 10, 2008

Additional documentation available on-line at:
http://www.state.nv.us/nucwaste/trans.htm
Impact analysis reflects contributions of J.D. Ballard, PhD;
H. Collins, MD, PE, CHP; F.C. Dilger, PhD; R. Moore, PE;
M. Resnikoff, PhD; & J. Travers
Fresh fuel assemblies are not dangerously radioactive
Spent (irradiated) fuel assemblies are lethally radioactive for decades

<table>
<thead>
<tr>
<th>SNF Age (Years)</th>
<th>Activity (Curies)</th>
<th>Surface Dose Rate (Rem/Hr)</th>
<th>Lethal Exposure (Time)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2,500,0000</td>
<td>234,000</td>
<td>10 sec.</td>
</tr>
<tr>
<td>5</td>
<td>600,000</td>
<td>46,800</td>
<td>1 min.</td>
</tr>
<tr>
<td>10</td>
<td>400,000</td>
<td>23,400</td>
<td>2 min.</td>
</tr>
<tr>
<td>50</td>
<td>100,000</td>
<td>8,640</td>
<td>4 min.</td>
</tr>
</tbody>
</table>

DOE/NE-007, 1980
Figure J-3. Artist’s conception of a truck cask on a legal-weight tractor-trailer truck.

Figure J-4. Artist’s conception of a large rail cask on a railcar.
Cask vulnerability in transportation accidents is unclear: Baltimore 2001
Rail casks are vulnerable to attack: IFC test, Aberdeen, 1998
Routine shipments result in radiation exposures, especially during stops.
Example: Clark County Government Center, Union Pacific Mainline, Las Vegas.
State of Nevada Transport Safety & Security Recommendations to DOE

- Oldest Fuel First
- Mostly Rail (65-75%)
- Dual-Purpose Casks
- Dedicated Trains
- Full-scale Cask Testing (Regulatory & Extra-regulatory)
- NEPA Process for Selection of Rail Spur
- WIEB “Straw Man” Routing Process
- Sec 180(c) Program Rulemaking
- State Regulatory Enhancements (Safety & Perception)
- Terrorism and Sabotage Concerns

*Human Factors Management*
DOE Proposed Yucca Mountain Transportation System

• Ship 9,495 rail casks (2,800 trains) & 2,650 truck casks over 50 years
• If No 2\textsuperscript{nd} Repository: 24,112 rail casks (7,000 trains) & 5,025 truck casks
• Average 1-3 trains (3-5 casks per train) & 1-2 trucks (1 cask per truck) per week
• Every day, for 50 years, one or more casks on rail or road to Yucca Mountain
The potential SEIS routes traverse 836 counties with a 2005 Census Bureau estimated population of 161 million persons.
Yucca Mountain Rail Access

- Currently no rail access to Yucca Mountain
- DOE preliminary routing studies began 1985
- Caliente route conceptual design, 1991
- DOE YM FEIS evaluated 5 rail options, 2002
- DOE RA FEIS selected Caliente, 2008
- Caliente longest (330 mi) new rail construction in US since 1930s, cost >$2-3 billion
- Significant environmental challenges & conflicts with ranching, mining, recreation, aesthetic and cultural resources, & Native American interests
Final Caliente Corridor Alignment

Legend
- **Yucca Mt**
- Caliente Alignment
- Railroad
- Timbusha Shoshone
- Nevada Tribal Land
- US Census Populated Places (areas)
State of Nevada 1995 Comments to DOE NEPA Process for Rail Access

• Specify rail operating assumptions (ownership, shared use, train service, procurement, & hiring)
• Evaluate at least 3 feasible spur routes using technically credible methodology
• Compare feasibility, costs, ROW acquisition, Native American resources, US Air Force activities, and economic development costs & benefits, in addition to standard review of impacts on human & natural environment
• Specifically evaluate each spur option regarding potential shipments through Las Vegas on existing UP mainline
Caliente Corridor Fails Nevada Criteria

- White River, Timber Mountain Pass
- Mountains = Cuts, Fills, Grades, Curves
- Cow Canyon, Reveille Valley
- Bridges & Flood Hazards
- Garden Valley, Golden Gate
- Land Use Conflicts
- City of Caliente, Lincoln County
- Limited Economic Benefits
UP Mainline to Caliente

1907

2005

1998

Train Derailment
CALIENTE CANYON

NEWS13
LAKE LAS VEGAS
Caliente Rail Profile
Twin Springs Ranch
Impacts on Grazing Allotments– Reveille Valley

Legend
- Grazing Allotments
- Yucca Mountain
- Quarries
- Wells
- Alignments Final
- Access Roads
- Railroad
- Private Land
- Landmarks
An Artist at the End of the World

...ment to finish what may be the biggest sculpture on earth.

By Michael Kimmelman
Impacts on Aesthetic Resources – Garden Valley
Proximity of The Strip to UPRR Mainline to Caliente
In Addition to Trains 1-2 Trucks per Week through Metro Las Vegas to Yucca Mountain

Rail Casks through Las Vegas to Yucca Mountain via Caliente
Minimum – 8% Maximum – 79%

Located in Las Vegas within 0.5 mile (800 m) of Truck Routes to Yucca Mountain:
-113,000 Residents

Located in Las Vegas within 0.5 mile (800 m) of UPRR Route to Caliente:
-95,000 Residents
-34 Hotels, 49,000 Hotel Rooms
-40,000 Visitors & Workers
Proximity of Rail Route to Las Vegas Mayor’s Office

Radiation Exposure Zone