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Date: 8/23/02 3:29PM
Subject: Nevada's Estimates for Potential Nuclear Waste Shipments to Yucca Mountain Through Calif.

Attached FYI is information developed by Nevada's transportation consultant, Bob Halstead, regarding the potential nuclear waste shipments to Yucca Mountain through California. He is presenting this information next Tuesday, Aug. 28, at the California Integrated Waste Management Board training conference in Squaw Valley.

The information provided in the attached includes:

- (1) the estimated number of truck and rail shipments under different assumptions,
- (2) the radioactive inventories, and source terms, and (3) Nevada's transportation concerns

**California, Here They Come -
Potential Nuclear Waste Shipments to
Yucca Mountain through California**

**Bob Halstead, Consultant
State of Nevada Agency for Nuclear Projects
California Integrated Waste
Management Board Conference
Squaw Valley, CA
August 28, 2002**

Potential Shipments Through California Scenarios Based on DOE Final EIS

- DOE Base Case Routes, DOE Mostly Truck Scenario – 4 CA reactor sites plus 8 reactor sites in other states
- DOE Base Case Routes, DOE Mostly Rail Scenario – 4 CA reactor sites plus 13 reactor sites in other states
- Consolidated Southern Routes, DOE Mostly Truck Scenario – 4 CA reactor sites plus 68 sites in other states
- Consolidated Southern Routes, DOE Mostly Rail Scenario – 4 CA reactor sites plus 68 reactor sites in other states

Potential Truck Shipments Through California Base Case and Consolidated Southern Routes

- 24 Years, Base Case Routes – 6,867 Shipments (286 per year), 12.9% of Total Shipments
- 38 Years, Base Case Routes – 14,479 Shipments (381 per year), 13.3% of Total Shipments
- 24 Years, Consolidated Routes – 47,762 Shipments (1,990 per year), 89.9% of Total Shipments
- 38 Years, Consolidated Routes – 88,854 Shipments (2,338 per year), 81.6% of Total Shipments

Potential Rail Shipments Through California Base Case and Consolidated Southern Routes

- 24 Years, Base Case Routes – 1,464 Cask-Shipments
(61 per year), 13.7% of Total Shipments
- 38 Years, Base Case Routes – 2,779 Shipments (73
per year), 12.6% of Total Shipments
- 24 Years, Consolidated Routes – 8,528 Shipments (355
per year), 79.5% of Total Shipments
- 38 Years, Consolidated Routes – 14,883 Shipments (392
per year), 67.5% of Total Shipments

Yucca Mountain Transportation Access Factors Unfavorable for Rail Transportation

- No existing rail access
- DOE identified 5 potential rail access routes (100 – 360 miles of new construction)
- DOE failed to designate preferred route in DEIS
- Each route involves serious land use conflicts, adverse environmental impacts, and potential for lengthy litigation
- Construction cost could exceed \$1 Billion
- DOE has not specified operating assumptions

Yucca Mountain Transportation Access Factors Favorable for LWT Transportation

- All existing reactors and DOE sites can ship by legal-weight truck (LWT); 30+ sites will have difficulty shipping by rail
- DOE repository thermal loading strategy may require LWT shipment of 5 year-cooled SNF
- Utilities may exercise contract options to ship 5 year-cooled SNF by LWT rather than older SNF by rail
- Current DOE privatization plan does not require transportation service providers to maximize use of rail
- LWT is cost-competitive with rail

High-Level Nuclear Waste Characteristics Shipping Cask Inventories & Source Terms

- Pressurized water reactor (PWR) SNF comprises about 63% of commercial SNF, and will be the predominant waste type shipped to a repository
- The representative truck cask (GA-4) loaded with 10-year cooled PWR SNF contains a radionuclide inventory of 846,000 curies total activity, including 177,000 curies of Cesium-137
- The representative large (26 PWR) rail transport-only cask loaded with 26-year cooled PWR SNF contains a radionuclide inventory of 2,000,000 curies, including 810,000 curies of Cesium-137
- Defense HLW, DOE SNF, and Naval SNF also contain large radionuclide inventories dominated by Cesium-137

Nevada Transportation Concerns Potential Routine Radiation Exposures

- Exposure rate 10 mrem/hour at 2 meters from cask
- Exposure to truck safety inspectors: 2,000-8,000 mrem/year
- Exposure to occupants of vehicle next to SNF truck cask in traffic gridlock (1 - 4 hours): 10 - 40 mrem/person/incident
- Exposure to service station attendant (maximally exposed member of public): 100-500 mrem/year
- Exposures at commercial and residential locations along potential routes in Nevada: 30 - 200 mrem/year

[Source: Collins, Gathers, and Halstead, WM'02, February, 2002]

Nevada Transportation Concerns Consequences of Credible Severe Accident

- Nevada-sponsored study estimated impacts of rail accident similar to July 2001 Baltimore Tunnel Fire
- Contaminated Area: 32 square miles
- Latent cancer fatalities: 4,000-28,000 over 50 years (200-1,400 during first year)
- Cleanup cost (2001\$): \$13.7 Billion

[Source: RWMA, 9/15/01]

Nevada Transportation Concerns Consequences of Successful Terrorist Attack

- DOE successful act of sabotage against truck cask in urban area (high-energy explosive device)
- DOE estimated impacts [FEIS, Pp. 6-50 to 6-52]
 - Population dose (person-rem): 96,000
 - Latent cancer fatalities: 48
(RISKIND, 15 year-old PWR, 90% penetration, average atmospheric conditions)
- Nevada estimated impacts [RWMA, 4/15/02]
 - Latent cancer fatalities: 300 – 1,800
 - Economic cost (2000\$): More than \$10 Billion
(RISKIND/RADTRAN5, 15 year-old PWR, 90% penetration, range of cesium gap estimates, weighted average atmospheric conditions)

State of Nevada Approach To HLW Transportation Risk Management

- State of Nevada Opposes Repository at Yucca Mountain
- State of Nevada Opposes Interim Storage Facility at Nevada Test Site
- State of Nevada Has Proposed Comprehensive Approach to HLW Transportation Risk Management
 - Recommendations to U.S. Department of Energy (DOE)
 - Recommendations to U.S. Nuclear Regulatory Commission (NRC)
 - Recommendations to U.S. Department of Transportation (DOT)

Nevada Recommendations Comprehensive Risk Management

- Comprehensive risk assessment (CRA) should cover all transportation system phases, events, and consequences (Golding and White, 1990)
- CRA calculates probabilities only where existing data, theories, and models are sufficient to support use of rigorous quantitative methods, and uses sensitivity analysis to illustrate impact of differing assumptions and variations in quality of data
- CRA should be used as working risk management tool throughout life of project, with ongoing public participation
- CRA should be basis of risk communication throughout life of the project

Nevada Recommendations Preferred Transportation System

- Dual purpose casks for at-reactor storage and transport
- Ship oldest fuel first (at least 20 years at-reactor cooling)
- Maximum use of rail (mode of choice)
- Mandatory use of dedicated trains, special safety protocols, and special car designs as recommended by AAR
- Early DOE and carrier identification of preferred cross-country mainline routes in consultation with stakeholders
- Early involvement of corridor states and Indian Tribes, including financial assistance under Section 180(c)

Nevada Recommendations Full-Scale Physical Testing of Casks

- Meaningful stakeholder role in development of testing protocols & selection of test facilities and personnel
- Full-scale physical testing (sequential drop, fire, puncture, and immersion) prior to NRC certification
- Additional computer simulations to determine performance in extra-regulatory accidents and to determine failure thresholds
- 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

- Maximize use of regional organizations such as Western Governors Association (WGA) and Western Interstate Energy Board (WIEB) for planning, implementation, and program evaluation
- Coordinate with Indian Tribes and local governments
- Develop comprehensive safety program modeled after WGA-State-DOE WIPP Transportation Program
- 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

Nevada Transportation Concerns U.S. SNF Shipment Experience, 1979 -1997

- Amount Shipped: 1,453 MTU (77 MTU per year)
 - Truck Shipments: 1,181 (62 per year)
 - Rail Shipments: 153 (8 per year)
 - Truck Share of Shipments: 89%
 - Rail Share of MTU: 76%
 - Average Truck Distance: 684 miles (82% < 900 miles)
 - Average Rail Distance: 327 miles (80% < 600 miles)
 - Origin & Destination East of Mississippi River: 70% (935/1334)
 - Reactor Sites Shipping SNF: 27 (9 sites >2 shipments)
- Source: NUREG-0725, Rev. 13 (Oct., 1998)

Nevada Transportation Concerns Future Shipments Will Differ Dramatically

- 35 Times More SNF Shipped Per Year
- 8 to 36 Times More Shipments Per Year
- 680% Increase In Average Rail Shipment Distance
- 290% Increase In Average Truck Shipment Distance
- Western Route Characteristics (Mountainous Terrain, Severe Weather Conditions)
- Western Operating Conditions (Higher Speeds, Longer Emergency Response Times)
- Potential Unprecedented Reliance on Long-Distance Heavy Haul Truck Shipments

Nevada Transportation Concerns Projected SNF/HLW Accidents & Incidents

- DOE Mostly Truck National Scenario, 38 Years
 - 159 Truck Accidents
 - 2,391 Truck Regulatory Incidents
- DOE Mostly Rail National Scenario, 38 Years
 - 384 Rail/ 6 Truck Accidents
 - 767 Rail/ 91 Truck Regulatory Incidents
- Nevada Current Capabilities National Scenario, 38 Years
 - 291 Rail/ 46 Truck Accidents
 - 581 Rail/ 691 Truck Regulatory Incidents

Source: Halstead Testimony, 5/22/02