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**FULL-SCALE CASK TESTING AND PUBLIC ACCEPTANCE
OF SPENT NUCLEAR FUEL SHIPMENTS Abstract # 12254**

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Session # 100

- Current status of cask testing
- Significance of public concern
- Past testing programs
- Nevada concerns about full-scale cask testing
- Nevada recommendations

Cask Testing





1975 to 1977 Sandia tests

NRC proposed package performance study
in 2005

The project is on hold because of funding

Current Status of Cask Testing



Public opinion surveys related to nuclear materials (back to 1992)

A survey along a nuclear route found:

“problems of credibility regarding the U.S. Department of Energy as a message source and public distrust of the agency's performance are grounded in the risk communication of waste transport.” (*Binney, Mason, and Martsolf*)

The survey research finds four publicly expressed concerns:

- terrorism,
- loss of property values,
- unwillingness to live near transportation routes
- perception of the risks for SNF

		High/Moderate Risk	Low/No Risk
1	Rail and truck shipments of radioactive waste	75.8%	23.4%
2	Radioactive contamination of the environment	69.8%	27.4%
3	Losses to property values for homes and businesses near shipping routes	69.4%	29.6%
4	Adverse health effects	64.2%	43%
5	Damage to Nevada's reputation as a place to live or visit	56.8%	34.6%
6	Loss of public revenues due to reduced numbers of visitors/tourists	54.0%	45.4%
7	Economic damage to Nevada's major industries	51.8%	45.6%

2010 Nevada Public Opinion Survey



Sandia: 1975-1977

Smash Hit: 1984

Trupact II: 1990



Cask Testing Programs



In 1975-1977, three obsolete spent fuel shipping casks were subjected to crash and fire tests at Sandia National Laboratories (SNL)

An obsolete spent fuel shipping cask was subjected to a sabotage test at SNL in 1981

The DOE used these films in a public relations campaign to assure the public that current spent nuclear fuel shipments were “safe.”

Aspects of the tests limited their usefulness:

- the test program was forced to use obsolete casks due to budget constraints.
- The casks used were different from currently licensed casks
- The casks were not subjected to regulatory tests

Sandia Cask Tests





Operation Smash Hit tests were performed by the Central Electricity Generating Board (CEGB) in 1984.

These tests consisted of rigorous full-scale regulatory tests which included impact and fire tests

A cask design currently in use, similar to the tests proposed by NANP.

The tests culminated in a public demonstration of a crash when a locomotive was driven into a cask on a derailed train car at 100 miles per hour.

Smash Hit Tests

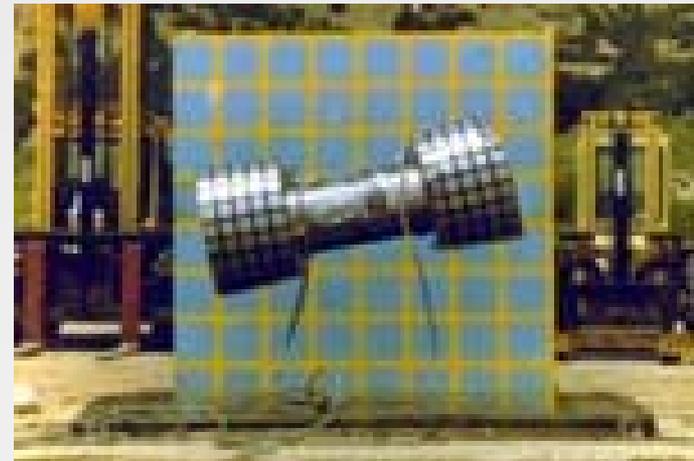
The Trupact II tests evaluated the casks to be used at WIPP

The shipping containers tested were the same containers used for contact handled tru waste shipments to WIPP

The tests conducted were the regulatory tests specified in the NRC regulations. *The tests identified a design deficiency – O-ring performance – which was corrected.*

The test results were accurately portrayed

The testing program and the test results were endorsed by key affected stakeholders, and the tests were featured in public information videos



Tru Pact II Tests

- Full-scale testing should be a supplement to regulatory analysis, not a substitute for regulatory analysis
- Full-scale tests should be performed on casks used for current and future shipments
- Full-scale tests should be designed to challenge cask integrity
 - Demonstration testing is acceptable only in conjunction with regulatory testing
- Stakeholders should be involved in the testing program
- Safety claims should not be exaggerated in test reports, films, and videos



- The Baltimore Tunnel fire is an important event in policy discussion about full-scale cask testing
- The fire may have created conditions more severe than the hypothetical severe fire assumed in 10CFR 71.73

- In 2005, the NRC commissioned a contractor report that evaluated three different cask designs subjected to a hypothetical accident based on the Baltimore tunnel fire conditions
- Nevada's evaluation of NUREG/CR-6886 argues that it significantly underestimates the potential radiological consequences of the fire by assuming that the most vulnerable portion of the cask would be located at least 20 meters from the hottest region of the fire

BALTIMORE TUNNEL FIRE STUDIES



- In 1999, NRC began the process of developing a demonstration study as part of the Package Performance Study (PPS)
- NRC engaged the public and stakeholders with an innovative public participation program.

- In April, 2003, the NRC issued its proposed cask testing plan, NUREG-1768, for public comment. Between February 2004 and March 2005, NRC staff presented the Commission with three additional testing options (SECY-04-0029, SECY-04-0135, and SECY-05-0051).
- The most recent NRC testing proposal (SECY-05-001), approved by the Commission in June 2005, calls for a demonstration test in which a cask mounted on a railcar is impacted by a speeding locomotive, and then subjected to a 30-minute fire engulfing fire.

The National Academies' (NAS) Committee on Transportation of Radioactive Waste released a report In February 2006 entitled Going The Distance? The Safe Transport of Spent Nuclear Fuel and High-Level Radioactive Waste in the United States (PP 14-15)

RECOMMENDATION: Full-scale package testing should continue to be used as part of integrated analytical, computer simulation, scale model, and testing programs to validate the performance of package performance.

*Deliberate full-scale testing of packages to destruction should not be required as part of this integrated analysis
Or for compliance demonstrations.*



- 1) meaningful stakeholder participation in development of testing protocols and selection of test facilities and personnel
- 2) full-scale physical testing (sequential drop, puncture, fire, and immersion) of each cask design prior to NRC certification or DOE procurement
- 3) additional testing (casks, components, models) and computer simulations to determine performance in extra-regulatory accidents and to determine failure thresholds;
- 4) reevaluation of previous risk study findings, and if appropriate, revision of NRC cask performance standards
- 5) evaluation of costs and benefits of destructive testing of a randomly-selected production model cask *(in this context destructive testing means subjecting the cask to threshold failure conditions based on predictive modeling)*

REVISED NEVADA PROPOSAL FOR FULL-SCALE CASK TESTING



Cost Component	Legal-Weight Truck Cask	Large Rail Cask (Up to 150 tons)
Cask	\$2,750,000-3,250,000	\$3,000,000-5,250,000
Physical Testing	530,000	1,190,000
Computer Analysis	800,000	800,000
Test Documentation	100,000	100,000
Technical Peer Review	600,000	600,000
Stakeholder Participation	775,000	775,000
Administration	425,000	525,000
Contingency (30%)	1,794,000-1,944,000	2,097,000-2,772,000
Subtotal for Testing	7,774,000-8,424,000	9,087,000-12,012,000
Facility Upgrade for Large Rail Cask Drop Tests (One-time)	0	10,000,000
Total for Testing First Cask	7,774,000-8,424,000	19,087,000-22,012,000

Estimated Cost of Full-Scale Cask Regulatory Testing



Comprehensive testing program for spent fuel shipping casks would cost \$60-80 million

- Regulatory tests for 4 or 5 rail casks and 1 or 2 truck casks,
- Extra-regulatory fire test of a full-scale truck cask
- Cask and fuel failure analyses

Standardized transportation hardware for rail transportation and a single truck cask design might cost less than \$50 million.

Testing costs are small when compared to the projected costs of the waste transportation system.

Independent analyses concluded that the projected life-cycle cost of a repository transportation system would be in the range of \$7.5 billion to \$9.5 billion.

The last DOE TSLCC Analysis (July 2008) estimated the lifecycle, including TAD canisters cost of the transportation program at more than \$20 billion in 2007 dollars

From this perspective, cask testing-done properly- is a bargain, and should be done before large-scale shipments commence

Conclusions

