From: "Joe Strolin" <jstrolin@nuc.state.nv.us>
To: <mtl@nrc.gov>
Date: 5/30/03 1:57PM
Subject: Comments on NUREG-1768: Package Performance Performance Study Test Protocols

Attached are the State of Nevada's comments on the Nuclear Regulatory Commission's Package Performance Study Test Protocols, NUREG-1768: Draft Report for Comment.

Joseph C. Strolin, Administrator
Planning Division
Office of the Governor
Nevada Agency for Nuclear Projects
1802 N. Carson Street, Suite 252
Carson City, Nevada 89701
(775) 687-3744 - Phone
(775) 687-5277 - Fax

6/2/03
68FR 8530
(89)

CC: "Bob Halstead - AOL" <bearhalstead@aol.com>

E-RIDS=ADM-03
Add = A. Snyder (AMS3)
A.S. Murphy (ASM1)

Template = ADM-013

KENNY C. GUINN
Governor

STATE OF NEVADA

ROBERT R. LOUX
Executive Director

OFFICE OF THE GOVERNOR
AGENCY FOR NUCLEAR PROJECTS
1802 N. Carson Street, Suite 252
Carson City, Nevada 89701
Telephone: (775) 687-3744 • Fax: (775) 687-5277
E-mail: nwpo@nuc.state.nv.us

May 30, 2003

Chief, Rules Review and Directives Branch
U.S. Nuclear Regulatory Commission
Mail Stop T-6-D-59
Washington, DC 20555-0001

RE: Comments on United States Nuclear Regulatory Commission Package Performance Study Test Protocols, NUREG-1768: Draft Report for Comment

Dear Sir:

Thank you for the opportunity to submit written comments on the Package Performance Study (PPS) Draft Test Protocols, NUREG-1768. This letter and attachment supplement our comments made during the PPS public meetings in Rockville, MD, Las Vegas, NV, Pahrump, NV, and Chicago, IL. We appreciate the public participation process used during these public meetings and the timely manner in which transcripts of those meetings were prepared and posted on the PPS website. We expect our verbal comments made during those meetings to receive the same consideration as these written comments.

Based on a careful review of NUREG-1768 and consideration of the additional information provided by NRC staff and contractors during the PPS public meetings, we conclude that the testing protocols are wholly unacceptable to the State of Nevada. We call upon the NRC to completely reexamine the reasons for full-scale cask testing, and to reissue new draft test protocols for public comment.

NUREG-1768 proposes a testing program for two casks that will cost more than $20 million, but will not determine if the two casks meet the accident performance standards set forth in the NRC regulations. This is not acceptable to the State of Nevada.

NUREG-1768 proposes a testing program that will cost more than $20 million, but will not determine the failure thresholds of the two casks tested. This also is not acceptable to the State of Nevada. Based on comments made during the public meetings, it appears that many other affected stakeholders advocate testing to failure.

NUREG-1768 states that the primary technical objective of the PPS is to "further validate the computer models used to evaluate the safety of cask transportation...." [p.1] Yet the proposed PPS impact tests will result in cask deformations so small that they may not be accurately measurable, and the proposed fire tests are so vague that there is no way of knowing what, if any, useful cask temperature data will result.

The State of Nevada believes that full-scale testing should be conducted to evaluate the performance of the casks themselves, not the performance of the computer models. NRC must go back to the drawing board and develop test protocols that confirm cask compliance with current regulations, and that determine cask failure thresholds. If properly designed, such tests will also provide physical data that can be used to benchmark the computer models used for transportation risk assessments. On the other hand, if the NRC proceeds with an expensive testing program narrowly focused on confirmation of finite element analyses, i.e., the computer models, public confidence in spent fuel transportation safety will likely be further diminished.

Sincerely,

Robert R. Loux
Executive Director

RRL/cs
Attachment

ATTACHMENT

State of Nevada
Agency for Nuclear Projects
Comments on United States Nuclear Regulatory Commission Package Performance Study Test Protocols, NUREG-1768: Draft Report for Comment

General Comments

1. Alternative approach to full-scale testing

The State of Nevada has proposed an alternative, five-part approach to full-scale testing: (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; and (5) evaluation of costs and benefits of destructive testing of a randomly selected production model cask.

Nevada believes that comprehensive full-scale testing would not only demonstrate compliance with NRC performance standards, it would also improve the overall safety of the cask and vehicle system and generally enhance confidence in both qualitative and probabilistic risk analysis techniques. It could potentially increase acceptance of shipments by state and local officials and the general public, and potentially reduce adverse social and economic impacts caused by public perception of transportation risks.

The comprehensive regulatory testing program proposed by Nevada (drop, puncture, fire, and immersion) for the first truck cask would likely cost $7.8-8.4 million. Comprehensive regulatory testing of the first large rail cask would cost $9.1-12.0 million. In addition, a one-time cost of about $10 million would be incurred to upgrade the testing facility to lift and drop rail casks weighing up to 150 tons. Subsequent tests would likely cost considerably less per cask. Nevada estimates that it would cost $40-75 million to conduct a comprehensive testing program for the five to eight truck and rail cask designs expected to be used for repository shipments.

Nevada is currently preparing a report, scheduled for release by December 2003, which will offer more specific details regarding extra-regulatory fire and impact testing.

2. Stakeholder participation in PPS

NUREG-1768 says the following regarding stakeholder participation: "After receiving and considering all stakeholder comments on the test protocols, the NRC staff will develop detailed test plans and procedures for each of the PPS testing programs, again making use of SNL's expertise. The NRC will make these detailed plans, procedures and tests available to the public before finalizing and conducting the planned tests. Thus, the finalized detailed plans will reflect public comments on these test protocols, constraints imposed by NRC's programmatic priorities, and the available funding to support these tests." [Pp. xiii]

The NRC plans for future stakeholder involvement are not acceptable to Nevada, and are almost certainly insufficient to inspire public confidence in spent fuel transportation safety. The NRC must provide a meaningful and substantive role for stakeholders in finalizing the testing protocols, selecting the testing contractors, and overseeing the implementation of the test program. The first step is for NRC to agree to publish revised draft test protocols for public review and comment.

Regarding implementation of the test program, Nevada believes that the approach used for testing of the TRUPACT shipping container is a model for effective stakeholder involvement. The TRUPACT-II shipping container is used for transporting transuranic waste to the Waste Isolation Pilot Plant (WIPP) in New Mexico. In that case, representatives from affected states, as well as outside consultants identified by the states, were fully involved in the design of the test program and in overseeing its implementation. Such involvement resulted in greater public confidence in container safety and acceptance of the entire WIPP shipping program. It also resulted in the identification of engineering and safety flaws and corresponding package design changes that likely would not have been found absent the involvement of these "outside" participants.

3. Selection of cask testing facilities

The NRC, with stakeholder input, must fully consider all options before final selection of cask testing facilities. Press reports prior to release of NUREG-1768 stated that NRC had already selected Sandia National Laboratories (SNL) "because it was the only facility capable of challenging the containers." ["NRC Plans Tests on Nuclear Waste Shipping Containers," Las Vegas Sun, November 15, 2002.] Numerous statements throughout NUREG-1768 seem to indicate SNL has been selected, although NRC staff stated during the PPS meetings that no final decisions have yet been made.

While SNL has extensive testing experience, other competent facilities are available. Indeed, a 1993 SNL report identified 12 facilities in United States with various capabilities for testing 40-ton and 100-ton containers, and a contractor report prepared for Nevada identified 5 potential testing facilities in the United States, 2 in the United Kingdom, and 1 in Canada.

Before a final selection of test facilities, NRC should discuss all relevant issues and options with stakeholders. The accessibility of the test facilities to stakeholders, and the willingness of facility personnel to facilitate stakeholder participation in testing, may be as important as technical testing capabilities and previous experience. Even the best-equipped and most experienced facilities have known limitations regarding capabilities to perform drop tests on large rail casks, and to perform long-duration fire tests. These factors, plus the potential multi-million dollar value of the testing program, create the potential for real or perceived conflicts of interest if the testing facility is selected without a formal competitive evaluation.

4. Commitment to testing

NUREG-1768 states: "Publication of these test protocols does not imply any commitment on the part of the NRC to conduct any of the tests, or to conduct any test as described in this report." Contrary to this statement in NUREG-1768, NRC representatives, including former NRC Chairman Richard Meserve, have stated publicly that NRC is committed to full-scale testing. [Doug Abrahms, "NRC promises full testing for shipments to Yucca Mountain, Reno Gazette-Journal, May 24, 2002; Steve Tetreault, "Yucca Mountain: Transport safety tests promised," Las Vegas Sun, May 24, 2002; Associated Press, "NRC plans tests on nuclear waste shipping containers," Reno Gazette-Journal, November 15, 2002]

Comments in Response to NRC Questions

5. How many casks and what types of casks should be used in the tests?

One truck cask and four rail casks should be used in the tests.

Over the next 40 years, the overwhelming majority of spent nuclear fuel and high-level radioactive waste shipments in the United States would be shipments to the proposed Yucca Mountain repository. Each of the truck and rail cask designs used for these shipments should be tested full-scale, to demonstrate compliance with existing regulations. NRC has identified five currently licensed cask designs as "most likely to be used for large shipping campaigns to a disposal facility" – the General Atomics GA-4 truck cask, and four rail casks: the NAC International NAC-STC, the Transnuclear West NUHOMS MP187, the Holtec International HI-STAR 100, and the Transnuclear TN-68. [Table of Commercial Spent Fuel Transport Casks, Enclosure 1, R.A. Meserve to H. Reid, April 2, 2002]

Additionally, at least one of these truck cask designs, and at least one of these rail cask designs, should be subjected to extra-regulatory test conditions to determine cask failure thresholds, and to determine if finite element analyses can accurately predict the release (or lack of release) of radioactive material from a cask. Based on the information presented in DOE's Final Environmental Impact Statement for Yucca Mountain, the General Atomics GA-4 cask, designed to transport 4 PWR assemblies, is the most appropriate choice for extra-regulatory testing. The GA-4 could be used for about two-thirds of all shipments under the DOE "mostly legal-weight truck" national shipping scenario.

Selection of the rail cask for extra-regulatory testing should be deferred until detailed, comparative, finite element analyses are provided in a revised draft test protocol. Selection of the most appropriate rail cask, or casks, for extra-regulatory testing is crucial to the credibility of the PPS. Although similar in overall dimensions, gross weight (125-141 tons) and payload capacity, the four rail casks exhibit differences in design (such as use of a welded internal canister) that should be fully evaluated before selection of one or more test subjects. This decision is particularly important because of the DOE stated intention to maximize use of rail for shipments to Yucca Mountain, even though DOE has not yet demonstrated the feasibility of the "mostly rail" shipping scenario.

6. At what scale should the cask impact tests be conducted (e.g., full-scale or a partial-scale)?

Full-scale casks, without impact limiters, should be used for both regulatory and extra-regulatory impact tests.

The drop test proposed in NUREG-1768 is a free drop on the impact limiter. Because the impact limiter will absorb most of the impact, little deformation of the cask itself is predicted. The drop test as proposed will fail to achieve the objective of demonstrating that finite element analysis can accurately predict the performance of the cask in an accident situation. NRC states, "But the main concern for the impact test is how well the pretest analysis does in predicting the response of the cask body, not the impact limiter. Because deformations to the cask body will likely be small, accurate measurements (± 0.0254 mm [± 0.001 in.]) are needed to compare with the results of the pretest finite analysis. Measurements to this accuracy on a full-scale cask are difficult because the thermal expansion of cask structures caused by a change of a few degrees in temperature will produce changes in structures of this magnitude, leading to larger inaccuracy in the measured result." [p.10]

NRC concludes, regarding the proposed GA-4 impact test, that "finite element analysis results may depend significantly on the response of cask features that are too small to model." [p. 73] The same observation would appear to apply to the rail impact test as well, particularly if the test were performed on a rail cask that did not rely upon a welded Multipurpose Canister for containment. [see p.12] If the objective of the test is to verify the finite analysis, a drop without the impact limiter would result in much more deformation of the cask, reducing the effects of temperature on measurement, and the difficulty of modeling small but important features (such as bolt threads).

It should also be noted that in a severe accident, it would not be unexpected to have a cask subject to more than one impact. Accidents involving multiple rail cars within a train, or multiple rail cars from another train, could result in multiple impacts to a cask. A rail cask involved in an accident could also suffer damaging multiple impacts with man-made structures and/or natural objects. The first impact, if oriented correctly, could either cause significant deformation to the impact limiter, or rip the impact limiter from the cask. Therefore, it is not unrealistic to assume that once the impact limiter's effectiveness is destroyed, a subsequent severe impact could occur.

The performance of impact limiters has been extensively evaluated in scale-model tests for currently licensed casks. Scale-model drop tests have also been performed for several cask designs. The revised draft test protocols should include an evaluation of all previous scale-model package drop tests, and scale-model impact-limiter drop tests, conducted on the TN-8, DOE 125-B, TN-BRP, TN-REG, GA-4, NAC-STC, FN-FSV, NUHOMS MP 187, HI-STAR 100, and TN-68 casks.

7. Should the impact tests be conducted as drops from a tower, as proposed in this report, or along a horizontal track using a rocket sled?

The impact tests should be conducted as drops from a tower.

Nevada generally agrees with the NUREG-1768 discussion of the advantages and disadvantages of drop tests versus rocket sled tests [Pp. 9-10]. However, the discussion of the "newly constructed target" to be used for drop tests should have included cost data. Further, NUREG-1768 should have identified other potential drop testing facilities in the Untied States and abroad (such as those at Oak Ridge National Laboratories, and at Cheddar Gorge in the United Kingdom), their lift and drop capabilities, and the cost of using and/or upgrading existing facilities other than those at Sandia National Laboratories.

8. What should the impact speed and orientation be for the rail cask impact test?

For the four rail cask regulatory impact tests (drop from 9 meters), the orientation should be drop onto the lid end, with center of gravity-over-corner impact, without impact limiters.

For the rail cask extra-regulatory impact test or tests, final specification of impact speed and orientation should be deferred until detailed, comparative, finite element analyses are provided in a revised draft test protocol. Nevada believes that NRC should evaluate both end-impact and back breaker drop test orientations for rail casks, at impact speeds of 75 mph or greater, without impact limiters.

9. Is 26.8 to 40.2 m/s (60 to 90 mph) a reasonable speed range for the rail cask impact test given that the frequency for a rail cask impacting a hard rock surface within this speed range is 10^{-6} to 10^{-8} per year?

The 60 to 90 mph speed range is reasonable. However, train accidents are known to have occurred at speeds in excess of 90 mph. The stated frequency of a rail cask impacting a hard rock surface within this speed range, 10^{-6} to 10^{-8} per year, is based on a flawed probabilistic risk analysis. [Pp. A-2 to A-3] The actual historical accident rate for U.S. spent fuel shipments by rail is about 4.6 accidents per million cask-miles, or ten times greater than the projected accident rate used by NRC. The sequential accident event fractional probabilities used in the NRC analysis [p. A-3] are unsubstantiated.

10. Is the 33.5 m/s (75 mph) rail cask impact speed proposed by the NRC staff appropriate?

For the rail cask extra-regulatory impact test or tests, final specification of impact speed and orientation should be deferred until detailed, comparative, finite element analyses are provided in a revised draft test protocol. Based on preliminary analyses, Nevada believes that a rail cask impact speed of 75 mph or greater, without impact limiters, would likely result in significant cask deformation.

11.What should be the impact speed for the back breaker truck cask impact test?

For the truck cask extra-regulatory impact test or tests, final specification of impact speed and orientation should be deferred until detailed, comparative, finite element analyses are provided in a revised draft test protocol. Nevada believes that NRC should evaluate both end-impact and back breaker drop test orientations for truck casks, at impact speeds of 75 mph or greater, without impact limiters.

The truck cask back breaker drop test as proposed in NUREG-1768 would not challenge the lid closure to the same extent as an end-first impact. Moreover, the use of impact limiters in the back breaker test, as proposed in NUREG-1768, would limit the extent of wrap-around cask deformation more than would be the case in a real world accident, where the bridge support column would not be backed up by a flat unyielding surface.

12.What should be the duration and size of the cask fire tests?

For the five cask regulatory fire tests, the fire duration should be 30 minutes at 1475°F (800°C).

For the truck and rail cask extra-regulatory fire tests, final specification of fire duration and temperature should be deferred until further analyses are provided in a revised draft test protocol. The fire tests should be designed considering both predicted temperature failure thresholds and historical accident fire conditions.

Extra-regulatory fire test design should assess potential temperature failure thresholds for critical cask components (such as lid seals) and fuel cladding, assuming both intact and damaged neutron shields and impact limiters. Since rail cask designs with and without internal welded canisters could perform differently in severe fire environments, both types of rail casks must be tested.

Based on preliminary analyses of the July 2001 Howard Street Rail Tunnel fire in Baltimore, the minimum extra-regulatory test fire conditions should be 3 hours at 1800°F (1000°C), or 6 hours at 1475°F (800°C). Nevada and NRC are separately sponsoring additional studies of the Baltimore fire.

13.What should be the cask position relative to the fire?

For the five cask regulatory fire tests, the cask position should be one meter above a fuel pool, one to three meters beyond the side of the cask.

For the extra-regulatory fire tests, final specification of cask position should be deferred until further analyses are provided in a revised draft test protocol. NRC should consider cask placement at the edge of the fuel pool under various wind conditions. NRC should also consider furnace testing as an alternative to fuel pool fire testing.

14.How many and what types [(real or surrogate, pressurized-water reactor (PWR) or boiling-water reactor (BWR)] of fuel assemblies should be in the casks during the tests?

Since PWR fuel will be the predominate form shipped to the repository, PWR fuel should be in the truck cask and in at least one of the rail casks during the tests.

Each cask should contain one real, fresh fuel assembly. The remaining fuel basket cells can be loaded with the correct weight of dummy and/or surrogate fuel and heaters.

15.Will the proposed tests be able to yield risk insights consistent with NRC's risk-informed regulatory initiatives?

NUREG-1768 does not provide a sufficient discussion of NRC's risk-informed regulatory initiatives to answer this question. Nevada rejects the assessment of risk insights based on the use of NUREG/CR-6672, Reexamination of Spent Fuel Shipment Risk Estimates.