Nye County

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U.S. Nuclear Regulatory Commission
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Nye County Comments on NUREG-1768, Package Performance Study Test Protocols, Draft Report for Comment

Dear Sir:

Enclosed please find the comments submitted by Nye County, Nevada on the above reference NUREG.

We appreciate the opportunity to comment, and to provide input to this important document. We look forward to continuing to work with the Commission and its staff and contractor during the course of the study.

Respectfully,
NYE COUNTY, NEVADA

Les W. Bradshaw
Department Manager

LB/mrm

Enclosure: As stated

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Board of County Commissioners
Bob Loux, Nevada NWPO
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NYE COUNTY COMMENTS ON PACKAGE PERFORMANCE STUDY TEST PROTOCOLS

NUREG-1768
DRAFT REPORT FOR COMMENT

A. INTRODUCTION

As a preface to our substantive comments Nye County again expresses appreciation[1] for conducting Package Performance Study meetings in Nye County and Las Vegas. It is particularly helpful to have such meetings in Nye County, where those who will be most inevitably and directly affected can more easily learn about the programs and initiatives proposed by the NRC, and express their own views on the subjects under discussion.

This is especially true because of the deep seated and widespread lack of knowledge and understanding by many members of the public of the real risks associated with the transportation of nuclear waste, or any other hazardous materials for that matter. And the industry must, in our opinion, bear much of the responsibility for this, for it, along with the federal regulating agencies, have fallen short in their responsibilities to inform the public, in ways that the non-technical lay person can easily understand. That is one of the reasons why Nye County also welcomes the NRC's Package Performance Study (PPS). If performed well and openly, it can contribute to a greater understanding of the risks inherent in the transportation of nuclear waste, as well as the protections provided by the NRC's cask certification and testing program, and the limitations on those protections. It must be done with complete openness, however, and in a way that the actual tests and the evaluation of test results are not only transparent, but also accessible to the public most inevitably affected. That is why Nye County has strongly urged not only that full-scale cask tests be conducted in advance of any actual transportation to Yucca Mountain, but also that such tests be conducted in Nye County, where <u>all</u> shipments, from every point of origin, and by whatever mode or route, will terminate[2]. Conducting those tests in a remote location in New Mexico will

[1] First communicated in the letter of March 18 from Les Bradshaw to E. William Brach, Director, Spent Fuel Project Office.

fall far short of satisfying the most directly affected members of the public, the residents of the Nye County communities through which all of the spent fuel and high-level waste will travel, that they were conducted with the high level of robustness and scientific conservatism necessary to even come close to reducing the public's unease. More will be said on this below.

The following sections comment on the objectives and tasks of the PPS. We believe these comments set the context for responses to specific issues raised in NUREG-1768.

B. PPS Objectives

The objectives of the PPS should be more clearly and consistently stated, and the linkages of stated objectives should be more carefully considered and explained. The "Abstract" states the PPS objectives as follows: (pg iii)

a) To enhance public confidence in the inherent safety of spent nuclear fuel cask design;
b) To validate the capability of the cask models and analysis codes to accurately capture cask and fuel response to extreme mechanical and thermal environments; and
c) To provide data to refine dose risk estimates.

Elsewhere, however, NUREG-1768 states the objectives somewhat differently. For example, on page ix, it is stated that the PPS "is examining the adequacy of the analytical models and data," not just validating the models as they currently exist. On page 2 it is stated that NUREG/CR-6672 "raised a number of technical issues about the performance of spent fuel packages during extreme accidents," suggesting that to "demonstrate that finite element models can accurately predict" (pg 7) involves more than validation of existing models and codes. The variations leave it unclear whether the NRC's purpose is simply to confirm the existing models and data used in cask certification, or to truly examine the adequacy of the models' representation of cask performance under specified extreme conditions.

Another example: Page 1 states that "the PPS is wholly consistent with the NRC's commitment to continually assess the regulations governing and safety of transport of spent nuclear fuel." However, this is preceded by statement that the PPS is not intended to involve the development of new standards for transportation casks. We believe that the NRC should be open to change in its analytical models and data, based on rigorous full-

[2] These recommendations were first made to the ACNW in a letter to ACNW Chairman Hornberger on March 14, 2002, and were repeated on December 17, 2002 in the letter from Mr. Bradshaw to Chairman Meserve

scale testing of cask performance under extreme conditions.

Still another example: At various points, NUREG-1768 suggests that the PPS is a response to stakeholder concerns, not to a NRC conviction that "the near-term possibility of a significant increase in the number of spent fuel shipments" (pg ix) requires testing of the adequacy of the representation of cask performance under specified extreme conditions. We believe NUREG-1768 should include a clear statement of NRC conviction in the efficacy of its PPS program.

While most of the statements of PPS objectives include "enhancing public confidence," or "responding to public concern," NUREG-1768 includes no statement regarding how NRC believes that testing and model revision leads to greater public confidence—that is, the linkage between the program's scientific and public confidence objectives. We believe that the link is in how (and where) the PPS tests are designed, conducted, evaluated, and applied in cask certification procedures. We recommend that the testing and evaluation be conducted in the YMP Site County, so that citizens and public officials of the Site County and the Site State can more easily observe, not just the tests, but the evaluation of test results and their incorporation in cask certification models and procedures.

NUREG-1768 should include a better description of how the PPS intends to accomplish its third (and critical) objective: estimating dose risk under extreme conditions. Page 11 discusses this in terms of pressure differentials, but notes, "the finite element calculations do not directly give leak rate." We suggest a fuller explanation of how tests that will not use actual SNF yield reliable data regarding dose risk—in the types of tests proposed for the current PPS, and in further "tests to failure."

As mentioned, the PPS objectives should be more clearly and consistently stated, and the linkages of stated objectives should be considered and explained. Here is a suggestion: The PPS objectives are:

a) To improve the capability of existing models and analysis codes to accurately represent cask and fuel response to specified extreme mechanical and thermal environments;
b) To provide data to more accurately estimate dose risk under specified extreme conditions; and
c) To conduct the PPS in a manner that enhances the confidence of public officials and citizens in the capability of the NRC's models and analysis codes to represent cask performance under specified extreme conditions, and in the NRC cask certification process.

C. PPS Tasks

Page x states that the PPS includes four tasks, of which NUREG-1768 addresses only the second and third, not the first (reanalysis of rail and truck accident statistics) or the fourth (tests of spent fuel pellets and rods). We suggest that a more carefully considered conceptual linkage of the four tasks could improve the PPS, and clarify the test design.

For example, while NUREG-1768 states that NRC studies suggest that its current certification standards encompass "over 99% of all possible transportation accidents" (pg. ix), it does not provide the most convincing basis for its selection of tests of cask and fuel response to extreme conditions. Reference to recent accidents (PPS task one) could provide a useful basis for selection of a sequence of impact, puncture, and fire tests based on extreme events that have or clearly could occur: e.g.

- An impact test based on current traffic speeds (75 mph) and an unyielding surface;
- A puncture test based on attack from a shoulder-fired weapon of a type now widely available;
- A fire test based on the Baltimore tunnel fire, which burned for 3 days at up to 1800 degrees.

The point is that tests clearly keyed to key features of recent extreme events or events that are clearly credible could provide a basis for public confidence in the capability of the NRC's models and analysis codes to represent cask performance under specified extreme conditions, and in the NRC cask certification process.

Similarly, conceptual integration of the fourth PPS task (tests of spent fuel pellets and rods) with those addressed in NUREG-1768 could clarify how the PPS can accomplish its third major objective (estimating dose risk under extreme conditions).

D. Specific NUREG-1768 Questions

Based on the above discussion of PPS objectives and tasks, we now proceed to our responses to the specific issues the staff has asked for comments on in NUREG-1768. We address them in the order in which they appear in the document.

1. *How many casks and what types of cask design should be used in the tests?*

We understand that the facilities for full-scale cask testing will cost about $8 million, and that the PPS test program will cost about $10 million per full-scale cask tested. In these comments, we will suggest modifications in the sequence of tests, but not (in the current PPS program) in the numbers of casks tested or in the selection of casks:

- Regarding the number of casks, our understanding is that cost-effectiveness argues for more extensive testing of each cask, rather than more limited testing of additional casks. (We would appreciate NRC's confirmation or revision of our understanding.)
- Regarding the types of casks, our understanding is that the focus of the PPS is on the performance of finite cask elements (cask body, lid, bolts, canister, etc.) under extreme conditions, rather than the performance of any particular cask design. Therefore, the proposed use of a Holtec HI-STAR 100 rail cask and a GA-4 truck cask seem appropriate in view of the purposes of the PPS program.

While we make the above suggestions regarding the current PPS, we also recommend that the PPS include a preliminary evaluation of the use of full-scale testing in three foreseeable contexts beyond the PPS:

- *Testing casks to failure, to define the limits at which casks lose* shielding and/or containment.
- Full-scale testing of cask designs proposed for use in a YMP shipment campaign.
- Full-scale testing of randomly selected casks during a YMP shipment campaign.

2. *At what scale should the cask impact tests be conducted (e.g. full scale or partial-scale?*

Full-scale tests are essential. During the preliminary phases of the PPS carried out in 1999 and 2000, repeated references were made by the Commission and staff to the importance of attaining stakeholder and public confidence in the process, as well as the findings, of the PPS. Anything less than full-scale tests will have no chance of reaching that goal.

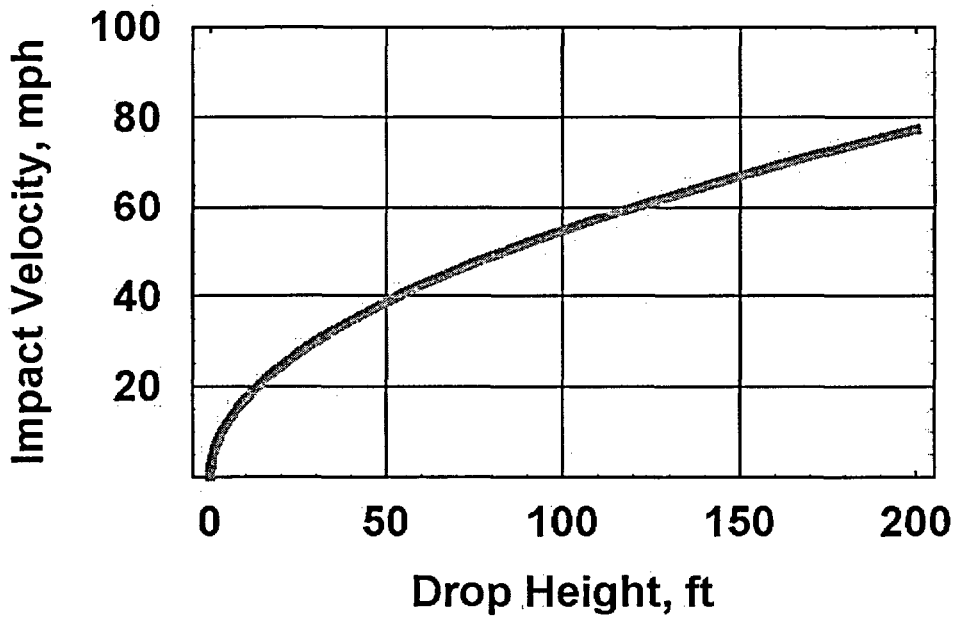
3. *Should the impact tests be conducted as drops from a tower, as proposed in the report, or along a horizontal track using a rocket sled?*

The tests should be conducted horizontally. If conducted as drops from a tower, however, the Test Protocols should be revised to clearly indicate that the test will be conducted from a height greater than 9 m (30 ft), and should indeed disclose the actual height of the drops proposed.

NUREG -1768, at p. 1, cites the current cask certification requirement for a 9 meter (approximately 30 ft) drop onto an unyielding surface, but does not at the same time make clear that such a drop is not proposed (or is

considered inadequate) for the PPS. Later, at p. 9, the document says that a "new drop tower might be high enough to allow an 82.3 m (270 ft.) free drop of a 136,000 kg (300,000 test unit---." This is heartening, but it should be made very clear in the NUREG itself that the test will be conducted at a height greater than 30 feet. If a 270 foot tower is to be constructed than why not say at the outset that the drop will be from 270 feet? Clearly, a 30 foot drop test will not produce adequate results, because it does not simulate a worst case scenario at highway or rail speeds. Such a test would yield an impact velocity of approximately 30 mph, well below highway speeds.

We provide a simple example. A truck is traveling down the highway and hits an icy spot in the road. The driver loses control because of a driving error by the driver of the vehicle that is passing him/her at the time. The truck jackknifes and flips. The cask impacts directly on a bridge abutment or rock outcrop along the highway. The load on the cask may not be evenly distributed (point load), the mass of the truck trailer behind the cask may increase the impact forces, and the impact velocity may exceed the impact velocity from the 30 foot drop test. The relationship between height in the drop test and impact velocity (ignoring air resistance) is illustrated in the figure below.



The NUREG itself should provide no opportunity for any confusion on this. It should very explicitly state that the current cask certification requirement of a 9 m or 30 ft drop will not be employed, and should set out specifically the height to be used.

We would also postulate a similar rail accident scenario, with the rail car derailing for some reason and the cask impacting an abutment or rock outcropping adjacent to the track.

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

NUREG-1768 proposes an impact speed of 120 kph, or 75 mph (pg. xii). The proposed impact orientation is CG-over-corner for the rail cask (with impact limiter), and side-on back-breaker for the truck cask. We suggest CG-over-the-corner (without impact limiter) impact tests at 75 mph for both truck and rail casks, for the following reasons.

- The CG-over-the-corner impact orientation tests the most vulnerable part of the cask; the lid, bolts and seal.
- An impact speed of 75 mph is probably consistent with expected highway speeds, but as noted below, we believe a CG-over-the corner test at 75 mph without impact limiter provides a more instructive extreme impact test than one at 90 mph with a limiter.
- While the likelihood of an impact on a hard rock surface may be low, it should be considered since the purpose of the PPS is to improve the capability of existing models and analysis codes to accurately represent cask and fuel responses under extreme accident conditions.
- Excluding impact limiters enables the PPS to provide data regarding extreme impact to the most vulnerable part of the cask itself, and avoids confusing the performance of the cask with that of the limiter.
- The performance of the impact limiter to absorb energy may already be relatively well understood, and. If so, can be incorporated into the PPS test results.

5. *Is 96 to 144 kph (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?*

Yes, with the emphasis on the upper end of the range to achieve scientific

conservatism and enhance public confidence.

6. *Is the 120 kph (75 mph) rail cask impact speed proposed by the NRC staff appropriate?*

No, if the test is conducted with an impact limiter.
Yes, if the test is conducted without a limiter.

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

As noted above we believe a CG over-the-corner impact at 75 mph without an impact limiter should be conducted for both the truck and rail casks. Furthermore, a puncture test, based on a credible terrorist attack with a modern shoulder-fired anti-tank weapon, should be included in the PPS test sequence. Without such a test, the PPS will be unable to effectively address a key post-September 11 concern. Regarding the design of such a test, our suggestions are:

- It should represent the penetrating force of a shoulder-fired anti-tank weapon. (The test protocol could be similar to the puncture test in the cask certification sequence.)
- It should be included after the impact test and before the fire test.
- It should provide information (perhaps in combination with PPS task 4: see above) regarding expected radiological releases.

After the events of September 11, 2001, and the continuing threat of terrorist attack on nuclear facilities in general and transportation in particular, any package performance study that does not address that threat is doomed to fail the test of public confidence.

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

We believe the fire test protocol should be designed to reflect the key characteristics of the Baltimore tunnel fire, which burned for 3 days at temperatures as high as 1800 degrees.

- Temperatures comparable to those reached in Baltimore will enable the PPS to address extreme conditions of a well-known accident.
- Fire duration of well over an hour will enable cask temperatures to plateau at the cask's lid region as well as at the middle of the cask. (pg 59)

The above recommendations are based, in part, on emergency response conditions in rural communities such as the Yucca Mountain Site County.

All spent fuel and high-level waste transportation casks will travel, whether by truck or rail, through unpopulated or very sparsely populated areas of Nye County. First responders can be hours away from the scene of an accident. Communication is problematic in many areas, with many, many miles between landline phone service, and periodic cell phone dead areas. In some areas of the county a bystander, or operator of a truck or train, might have to drive as many as 60 miles before reaching an area with cell phone coverage. In rural Nye County it generally takes an hour or longer for dispatch to receive a call notifying it of a fire. A person unfamiliar with the area might give erroneous directions, or may not even know where they are.

Volunteers who are at work take time to respond. Those at home may have to drive miles to the fire station to be ready to respond. Most of the fire stations in Nye County cover a 100 mile radius for mutual aid and for routine fire calls. Rail fires may require the use of a four wheel drive vehicle, which adds response time. Once on the scene the time is needed to suppress or extinguish a fire. There are no hydrants in the middle of the desert. If the unit(s) responding runs out of water (a not infrequent occurrence even for routine highway fires, with associated wild land fires started by the burning vehicle) they may have to travel many miles to fill the tanker truck again and return to the scene of the fire.

Obviously then, a fire of 30 minutes duration would fall woefully short of replicating conditions that could be encountered in rural Nye County, as well as in many other sparsely populated areas in the west through which this material will inevitably travel.

The proposed test protocols call for both a truck and rail cask to be subjected to a "fully engulfing, optically dense fire for a duration of more than a half-hour". That is far too vague, and for too short. Both the rail and truck cask should be subjected to such a fire for a minimum of 12 hours, in order to in some way simulate actual conditions which might be encountered after an accident (or terrorist incident) in many areas in Nye County. And it must again be kept in mind that <u>every</u> cask will travel through these areas of Nye on the way to its final resting place at Yucca Mountain. There is no guess work involved here. Rural Nye County will see every single transportation cask, whether by truck or rail. Any fire test that does not take into account the special circumstances of travel through the unpopulated desert of portions Nye County will fail even a minimum test of credibility.

Current regulations call for a fire of 1,475 degrees F for a duration of 30 minutes. That temperature (but not duration) may suffice for the open country in Nye County, where highway and rail tunnels will not be encountered. That may not be the case where a prolonged fire could occur in a tunnel, however, and for that reason we recommend, as noted above, that the conditions existing during the Baltimore Tunnel Fire be replicated as nearly as practical.

One other area should be covered more adequately in the Test Protocols. There is no mention in the document of the type of fuel to be employed. Comments at the NRC staff workshop in Las Vegas on March 12, 2003 indicated that jet fuel (specifically JP 5) would be utilized. Many people will question that, since most trucks and/or locomotives use either gasoline or diesel fuel. While admittedly the temperature and duration of the fire are the critical factors, and not the type of fuel which produces the fire, the choice of fuel, and the reasons for that choice, should be disclosed and fully discussed in the Test Protocols themselves.

The Draft Report for Comments proposes to use a full-scale rail cask and a full-scale truck cask for collision tests, and to conduct "separate fire tests", also on full-scale rail and truck casks. While NUREG 1768 does make this clear, we assume that separate casks will be used for each test, so that 4 casks in all will be involved, 2 in the collision tests and a different suite of 2 for the fire tests. In order to take into account and simulate an actual worst case the protocols should be modified to provide so that the fire tests are conducted on casks already subjected to the collision tests. The response of an already damaged cask to a fully engulfing fire, and the resulting release of radioactivity, may, indeed probably will, be significantly different from an intact, undamaged cask experiencing the same fire conditions. In order to endure credibility and enhance any chance for increased public acceptance of the study's findings, the more conservative "test to failure" approach should be followed.

9. *What should be the cask position relative to the fire?*

Two fire tests of the rail cask and one of the truck cask are set out in the PPS Test Protocols. The rail cask would be positioned first above the vapor dome and then on or near the ground. The truck cask would be positioned one meter above the surface of the fire pool. Both seem appropriate to Nye.

10. *How many and what types of (real or surrogate), PWR or BWR) of*

fuel assemblies should be in the casks during the tests?

The draft protocols propose, for the impact test at least, that the casks contain one real fuel assembly packed with surrogate fuel and three dummy assemblies. Our views are:

- Surrogate PWR fuel will be required in testing the GA-4 cask, and, therefore, for comparison purposes should be used in testing the rail cask as well.
- Surrogate fuel should be included throughout the test sequence.
- The full-scale test sequence should be integrated with PPS task 4 (fuel pellets and rods) to address PPS objective 3 (provide data to refine dose risk estimates).

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

The simple answer is yes, if the tests are conducted in the manner recommended in these comments. However, the question does not go far enough. The real issue is not just informing the NRC's regulatory initiatives, but enhancing public trust and confidence as well, as NUREG-1768 itself (pg. 1) recognizes.

We would answer this modified question in the affirmative as well, again assuming that the tests are conducted with the openness, accessibility, stakeholder involvement, robustness, level of conservatism, and driven to failure as discussed in these comments. Openness and accessibility are the keys. Tests conducted in some location removed from the Yucca Mountain project, so that the people most directly involved cannot observe them, will not enhance public confidence. The tests should be moved to a location near Yucca Mountain, off the Nevada Test Site so that public access is not an issue, and conducted in the full light of day, will full stakeholder involvement. Anything short of this, while perhaps yielding valuable scientific and engineering insights, will not increase the public's faith in the process, or lead to a greater acceptance of the risks inherent in transportation of radioactive materials.

E. Test to Failure

The NRC staff has stated that the current PPS Test Protocols do not incorporate the concept of test to failure, and that, while such testing could provide additional relevant data, the design of a test sequence leading to cask failure (in one or more cask elements) could be quite complicated. (See May 2, 2003 letter from Andrew J. Murphy to Les W. Bradshaw.) Complication alone is not, in our view, sufficient justification for

rejecting a test to failure approach for the PPS.

The value of testing to failure (melting of seals, deformation of cask lid, puncture of cask or canister wall, etc) is to define the limits at which a cask loses shielding and/or containment. Our understanding is that the PPS is intended to improve the capability of existing models and analysis codes to accurately represent cask and fuel response to specified extreme conditions, not to systematically identify the cask's limits.

If test to failure is not incorporated into the final PPS Test Protocols, we suggest that NRC examine in general terms the type of full-scale testing regime that could provide reliable information regarding the limits of a cask to shield or contain SNF; i.e. a test to failure regime.