From: Steven P. Kraft <spk@nei.org>
To: <nrcrep@nrc.gov>
Date: Fri, May 30, 2003 5:09 PM
Subject: Response from "Comment on NRC Documents"

Below is the result of your feedback form. It was submitted by

Steven P. Kraft (spk@nei.org) on Friday, May 30, 2003 at 17:09:11

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United States Nuclear Regulatory Commission
Package Performance Study Test Protocols
Draft Report for Comment

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Comments:

NUCLEAR ENERGY INSTITUTE

Steven P. Kraft
DIRECTOR, WASTE MANAGEMENT

May 30, 2003

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

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

Dear Sir:

The Nuclear Energy Institute (NEI) is pleased to submit comments regarding the "United States Nuclear Regulatory Commission Package Performance Study Test Protocols," NUREG-1768 (PPS Test Protocol). The draft report presents the U.S. Nuclear Regulatory Commission (NRC) staff's preliminary plans for an experimental phase of the Package Performance Study (PPS) to examine the response of used nuclear fuel transportation casks to extreme transportation accident conditions. The NRC staff is proposing conducting impact and fire tests and analyses of full-scale rail and truck casks. NEI and the Electric Power Research Institute (EPRI) have thoroughly reviewed the PPS Test Protocol. Detailed comments on the PPS Test Protocol are contained in the attachment to this letter.

The PPS Test Protocol document identifies the NRC's objectives in carrying out the testing program: enhancing public confidence in the safety of used nuclear fuel casks, validating the cask models and analysis codes for extreme mechanical and thermal environments, and providing data to refine dose risk estimates.

The goal of enhancing public confidence is laudable, but if NRC carries out its role as a regulator of nuclear safety, including regulation of used fuel transport, in a transparent manner, one would expect the public to have confidence in NRC regulations.

E-RIDS = ADM-03
Add = A. Snyder (AHS8)
A.J. Murphy (AJM2)

Template = ADM-013

Any tests performed as part of the PPS or otherwise, should be representative of real-world, credible accidents. The tests proposed in the PPS Test Protocol involve testing to "extra-regulatory" conditions (beyond the physical test parameters required for cask certification). Since current regulations encompass greater than 99.6% of all possible transportation accidents, NRC's proposed tests are not consistent with NRC's philosophy of risk-informed regulation.

NRC should not depart from the existing regulatory basis. Any full-scale cask tests performed as part of the PPS should not be a reason to eliminate scale-model tests, component tests, materials tests and engineering analysis that are used as the current bases for package certification. If NRC believes that full-scale tests would increase public understanding of the performance of casks that are designed in accordance with NRC's cask safety standards as outlined in Title 10, Part 71, NEI proposes that NRC consider the following approach in lieu of the tests proposed in the PPS Test Protocol.

First, NEI recommends that NRC subject a representative full-scale rail cask and a representative full-scale truck cask, both certified, designed, fabricated in accordance with NRC regulations, to the regulatory tests outlined in 10 CFR Part 71.73, Hypothetical Accident Conditions. These tests will demonstrate that full-scale casks that are designed and fabricated in accordance with NRC's regulations can withstand the regulatory test conditions. These tests should be fully instrumented and monitored to provide any desired scientific information.

Second, NEI recommends that NRC consider subjecting a full-scale rail or truck cask to credible impact and thermal conditions. These tests will demonstrate that a cask that meets NRC's regulatory test conditions can withstand real-world, credible accident conditions. These tests can be instrumented if NRC desires.

Third, NRC should consider what desired scientific information can also be learned from component testing and proceed in that manner.

All testing should be open to the public.

NRC should justify any tests performed as part of the PPS program using a risk-informed, cost/benefit approach. The tests must be consistent with the real-world conditions that used fuel transportation casks might encounter during transport.

Given the historical record of safety used nuclear fuel transportation has achieved, there is no technical justification for conducting extra-regulatory tests of used fuel packages either as part of the PPS or for package certification.

In summary, the safety of used fuel transportation has been demonstrated by the more than 30 years experience under the current regulatory framework for cask design and certification. This experience provides assurance that the current regulations are adequate to protect public health and safety. Further, existing NRC assessments demonstrate that used fuel transportation risks are small. Accordingly, NRC should adopt a risk-informed and cost/benefit approach when considering the types of physical testing to be conducted under the PPS Test Protocol. This approach will support NRC's goal of validating the capability of the cask models and analysis codes at real-world, credible conditions. Developing a test program that is technically justified will enhance public confidence in the inherent safety of NRC's regulations that govern used nuclear fuel cask certification.

NEI fully supports NRC's efforts to seek input from interested parties on its plans for the PPS. We would be pleased to discuss these comments and to respond to any questions the NRC may have.

Sincerely,

Steven P. Kraft

Enclosure

c: The Honorable Nils J. Diaz, Chairman, NRC
The Honorable Greta Joy Dicus, Commissioner, NRC
The Honorable Edward McGaffigan Jr., Commissioner, NRC
The Honorable Jeffrey S. Merrifield, Commissioner, NRC
William Travers, Ph.D., Executive Director for Operations, NRC
Carl J. Paperiello, Ph.D., Deputy Executive Director for Operations for Materials, Research and State Programs, NRC
Mr. Martin J. Virgilio, Director, Nuclear Materials Safety and Safeguards, NRC
Ashok C. Thadani, Ph.D., Director, Nuclear Regulatory Research,NRC
Mr. E. William Brach, Director, Nuclear Regulatory Research, NRC

Enclosure

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

Risk-informing the Package Performance Study

NRC should justify any tests performed as part of the PPS program using a risk-informed, cost/benefit approach. The tests must be consistent with the real-world conditions that used fuel transportation casks might encounter during transport.

NRC should evaluate the potential benefits of any proposed testing. Recent NRC assessments conclude that used fuel transportation risks are small. Consistent with a risk-informed approach, NRC needs to address the question of whether or not the risks being addressed by the PPS Test Protocol justify tests being proposed and the related costs of the program. The answer to this question should be provided as a fundamental part of the basis for any testing program adopted that is outside the current regulatory baseline. This includes not just the PPS Test Protocols, but also the additional research to be conducted related to fuel response to severe accident conditions.

PPS Schedule and Integration of Additional Tasks

In the PPS Test Protocol, the NRC staff states that the following four tasks would address the primary concerns raised by stakeholders:

- Use recent accident data to reanalyze the truck and rail accident speed and fire duration statistics developed by the Modal Study
- Perform high-speed collision tests on full-scale rail and truck casks and compare the test results to pretest damage predictions developed by computer models.
- Expose full-scale rail and truck casks to fully engulfing, long-duration fires and compare the measured temperatures to pretest temperature predictions developed by computer models.
- Conduct laboratory tests to examine rod failure, pellet fracturing, and the release of particles from the failed rods, and use the test results to determine the response to extreme impacts of fuel pellets, fuel rods, and fuel rods containing fuel pellets.

The PPS Test Protocol addresses the second and third bullets listed above. It does not address reanalyzing accident statistics or plans for laboratory tests regarding fuel pellet response. NRC plans to conduct those tests on a different schedule from the used fuel cask tests. NEI recommends that NRC define its research plans in the area of fuel response to severe accident conditions and identify how that research will be integrated with the PPS testing. NRC should also explain its schedule for reanalyzing

accident statistics as well as NRC plans to integrate the four tasks identified above. As stated above, all plans should be risk-informed.

Comments on Proposed Test Program

The PPS Test Protocol proposes two impact tests. The first would subject a full-scale rail cask to an extreme 75-mph impact in a corner over center-of-gravity orientation onto a flat, unyielding surface. The second test would subject a full-scale truck cask to an extreme "back-breaker" 75-mph impact onto one of the flat sides of the cask, midway between the impact limiters onto a rigid semi-cylinder. According to the PPS Test Protocol, these greater than required regulatory impacts are necessary to achieve plastic deformation of the package so that the analysis models can be verified for these extreme conditions.

NRC has also proposed fully engulfing fire tests with a duration extending beyond the 30-minute regulatory requirement. NRC is proposing to conduct fully engulfing fire tests of a calorimeter (the size of a rail cask), a rail cask and a truck cask, but does not specify the duration of the thermal tests. The goal of these tests is to evaluate the predicted thermal response of the package to the thermal conditions.

Any tests performed, as part of the PPS or otherwise, should be representative of real-world, credible accidents. The tests proposed in the PPS Test Protocol involve testing to "extra-regulatory" conditions (beyond the physical test parameters required for cask certification). Since current regulations encompass greater than 99.6% of all possible transportation accidents, NRC's proposed tests are not consistent with NRC's philosophy of risk-informed regulation. In fact, NRC provides information in the PPS Test Protocol that shows that the probability of a rail cask impacting an unyielding surface at 60 to 90 mph is 10-6 to 10-8 per year, not including the probability of striking the most vulnerable spot on the cask, which would further reduce the probability of occurrence. Clearly, the proposed test impact onto an unyielding surface at the proposed test speed is not "realistic."

Thus, it seems that NRC's main purpose in selecting 75 mph into an unyielding surface is the desire to provide enough energy transfer to plastically deform the cask itself. It is not appropriate, in a risk-informed regulatory environment, to conduct such an "incredible" test merely to provide benchmarking data for models that are not needed. There is already high confidence that the existing models adequately model elastic deformation. The very fact that such extreme, non-credible accident conditions are required to cause plastic deformation of the cask, as evidenced by the Sandia National Laboratory (SNL) calculations provided in the PPS Test Protocols report, along with the experience and testing to date, simply confirm that the existing models and data are adequate.

Similarly, a fully engulfing, 30-minute fire at 1475°F (800°C) already encompasses the vast majority of potential accidents. Furthermore, in the case of rail transport there are DOT requirements for shipment by rail that require at least one car length between the spent fuel cask car and other cars that may contain other hazardous materials. Thus, while some accidents involve fires that last longer than 30 minutes, it is extremely unlikely that the confluence of events required to fully engulf a cask for longer than 30 minutes at peak temperatures of 1475°F will occur. In fact, In an April 8, 2003, report prepared for the U.S. Department of Energy's National Transportation Program, SNL scientists conclude that "it would be difficult to justify any fire that could be more severe than a fully engulfing fire." NRC's own recent analysis of the Baltimore Tunnel fire supports the idea that it takes many hours to days for cask temperatures to approach high enough levels to cause!
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cask breach – even with a continuous, strong fire very near the cask itself. A strong, steady fire of long duration that would fully engulf a cask also appears "incredible". Lastly, while DOT regulations permit used fuel casks on multi-use trains, the industry policy on transport of used fuel to a federal facility supports the use of dedicated trains.

Regarding whether NRC should consider "testing to failure," NEI reiterates that there is no technical justification for conducting extra-regulatory tests of used fuel packages either as part of the PPS or for package certification. SNL analyses summarized in the PPS Test Protocol report suggests that, even under low probability conditions proposed in the report, there will only be a small amount of plastic

deformation of the cask. Thus, one could conclude that to "test to failure," however that condition is ultimately defined, the test conditions would have to be even more severe and incredible (less probable) than those proposed in the PPS Test Protocol.

NRC Justification for 75-mph Impact

NRC discusses its selection of 75 mph impact speeds in Appendix A of the PPS Test Protocol report. The justification states that annual probabilities of 10-6 to 10-8 per year "compare favorably to the probabilities considered in Part 63 safety or performance assessments". Appendix A notes that design basis events with a probability lower than 10-4 for the life of the facility are negligible. Hence, an annual probability on the order of 10-8 for Yucca Mountain is acceptable for the period of performance of 104 years. This performance period is ~100 times longer than for the pre-closure facility (and transportation). This is the rationale used in Part 63 to establish the different probability cut-offs for the pre-closure (10-6 per year) and post-closure (10-8 per year) periods. It is clearly inconsistent to use the 10-8 number for a "facility" (or activity such as transportation) that lasts no more than about 100 years.

Appendix A suggests that since transportation activities could occur closer to the public than the Yucca Mountain facility, lower probability events for transportation should be considered. However, NRC regulates a variety of other facilities, e.g. research and power reactors that have event probabilities on the order of 10-5 per year. Thus, considering potential transportation accident scenarios with an annual probability of 10-8 is inconsistent with other activities that NRC regulates.

In conclusion, the industry strongly recommends that if NRC believes that new testing of used fuel transportation casks is required, that NRC develop a plan that is fully justified through risk-informed evaluation. The cover letter to these comments provides such a concept for NRC consideration.

organization: Nuclear Energy Institute

address1: 1776 I Street, N.W.

address2:

city: Washington

state: ---

zip:

country:

phone:
