

STATE OF NEVADA
AGENCY FOR NUCLEAR PROJECTS/
NUCLEAR WASTE PROJECT OFFICE

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THE EFFECTS OF HUMAN
RELIABILITY IN THE
TRANSPORTATION OF SPENT
NUCLEAR FUEL

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The Nevada Agency for Nuclear Projects/Nuclear Waste Project Office was created by the Nevada Legislature to oversee federal high-level nuclear waste activities in the state. Since 1985, it has dealt largely with the U.S. Department of Energy's siting of a high-level nuclear waste repository at Yucca Mountain in southern Nevada. As part of its oversight role, NWPO has contracted for studies designed to assess the socioeconomic implications of a repository and of repository-related activities.

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(the paint had worn off). To avoid this problem in the future, the reactor operator (not the cask owner) inscribed valve numbers onto the cask surface and keyed them to the written procedure for hooking up the lines. Since no verification testing is required, however, the problem could still recur. The particular cask involved was designed to always be shipped dry and the presence of water with a "young" fuel assembly could have resulted (during a fire) in pressurization of the cask, opening the relief valve and venting of the contaminated water as steam.

The case concerning an empty cask involved the same container previously seen in the re-oxidation incident. Having been extensively decontaminated after that problem, the empty cask was shipped to another reactor. Upon opening a valve, a cask handler was contaminated by the excess water left in the container. Later analysis found that a small sample of the cask water gave off very high radiation readings (over 100 r/hr). Note that the cask was empty, so it was under no travel or reporting regulations. Recall that this cask had recently had a defective valve replaced, so again there was potential for a release without a vehicular accident (had the valve not been changed prior to this incident). The cask water proved to be a further problem due to the inexperience of the handler (an employee of the cask owner) who, in violation of normal procedures, drained the fluid into a plastic bag. Unable to fit the bag into a shielded waste holder, he punctured the bag with a screwdriver, allowing release of contamination into the air (he wore no breathing apparatus) and spilling the fluid (ref. 44). One wonders how this action would have been perceived if the cask fluid were found to be leaking in transit. In this case, fines were levied, not against the cask owner, but against the utility since it did not properly supervise the situation. But the problem can still recur.

Another problem related to handling is the potential for damaging fuel in loading and/or in transit. At least seven such incidents (two in the U.S.) (ref. 45) have occurred and the damage was only discerned

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upon arrival of the fuel. None of the fuel was damaged prior to loading, so there was no need for it to be canned. As previously mentioned, the release of loose or powdered fuel to the cask interior can create the potential for a release to the environment if accompanied by a failed valve or seal, or a very serious accident that could open a valve or damage a seal. While all present commercial casks require non-air atmospheres, this rule has not been codified (it exists only in the individual licenses of six casks, two of which are no longer available for spent fuel shipments). Unless required by NRC in all new licenses, the potential exists for re-oxidation of fuel that overheats in a future air-filled cask.

Other possible loading scenarios exist that have not occurred (at least to the knowledge of this author). For example, one could imagine a mislabeled gas canister, containing pure oxygen instead of helium. Filling a cask with such a gas could greatly accelerate re-oxidation (and possibly other problems) instead of eliminating that hazard. There is a need - prior to cask licensing - for a full examination of a cask's loading procedures to ascertain all possible errors and design fail-safe procedures or equipment to avoid, or at least detect, the problems before they create a serious potential for risk.

The same need pertains to addressing problems during incidents in transit. Situations have occurred (some not involving spent fuel) that resulted in the mistaken belief that a leak had occurred. In one case, a fire was allowed to contact a container of radioactive gas for over two hours because firefighters had been unnecessarily evacuated from the area (ref. 46). This action calls into question the assumption of a 30-minute fire (one of the cask standards), which is based on an active effort to extinguish (not avoid) a blaze.

Vehicles have also been subject to poor inspection and/or maintenance. Despite design efforts to make a cask trailer strong enough to handle its heavy load, a trailer bed buckled in transit only several days

28. "A Review of the Effects of Human Error on the Risks Involved in Spent Fuel Transportation," Nebraska Energy Office, December, 1986
29. NRC letter to DOE, Docket No. 71-4960, March 13, 1980
30. DOE letter to NRC, May 31, 1983
31. DOT letter to DOE, March 23, 1985
32. NRC meeting memo, "Summary of Meeting Concerning MH-1A Cask Design", November 29, 1985
33. DOE/RW-0073, Yucca Mountain Environmental Assessment, May, 1986, Appendix p. A-13
34. Complaint in U.S. Claims Court, No. 229-83C, filed April 7, 1983
35. NRC Order to Show Cause, Docket No. 71-6698, April 4, 1979
36. NRC Inspection Report 99900331/79-01, August 31, 1979
37. NRC memo, Docket no. 71-9200, July 18, 1986
38. GE letter to NRC, Docket no. 9001, June 2, 1981
39. "Contamination Studies on Pond-Loaded Casks," PATRAM '83, p. 929
40. letter to NRC from Nuclear Assurance Corp., Docket no. 71-6698, April, 1979
41. "Airborne Contamination Released During Unloading of a Failed PWR Spent Fuel Assembly," PATRAM '80, p. 646
42. NRC Decision DD-84-9, April 13, 1984
43. letter to NRC from Duke Power Co., Docket no. 71-9010, December 1, 1981
44. NRC Inspection Reports 50-213/80-20 and 50-219/80-38. April 1981
45. Proceedings of PATRAM '83, p. 806, May, 1983
I'm sending this by mail
46. National Transportation Safety Board Study NTSB-HZM-79-3, p. 8, November 13, 1979
47. NUREG/CR-0744, "Identification and Assessment of Social Implications of Transportation of Radioactive Materials in Urban Environs," 1979
48. letter to NRC from Nuclear Assurance Corp., Docket no. 71-9010, March 14, 1988

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