

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D.C. 20555-0001

July 11, 1997

NRC INFORMATION NOTICE 97-51: PROBLEMS EXPERIENCED WITH LOADING AND UNLOADING SPENT NUCLEAR FUEL STORAGE AND TRANSPORTATION CASKS

Addressees

All holders of operating licenses or construction permits for nuclear power reactors.

Designers and fabricators of independent spent fuel storage installations (ISFSIs).

All holders of or applicants for licenses to operate ISFSIs.

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to inform addressees of operating experiences and problems encountered with the loading and unloading of storage and transportation casks for spent nuclear fuel. It is expected that recipients will review this information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. However, suggestions contained in this information notice are not NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances

Limitations in storage capacity of spent fuel pools at nuclear power plants and delays in the acceptance of spent nuclear fuel by the Federal Government have led to an increasing use of dry storage systems located in ISFSIs at reactor sites. As licensees have implemented their ISFSI plans, problems with the interface between the cask designers and reactor licensees using the casks have resulted in both safety concerns and delays in the movement of spent fuel from the spent fuel pools to ISFSIs. Information learned from the NRC inspections indicates that many of the problems encountered have involved the activities for loading and unloading of the dry storage casks. This information notice describes some of the problems encountered by licensees in preparing for or actually performing the loading or unloading of storage or transportation casks.

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Discussion

Cask Movement

Dry storage casks, weighing in excess of 100 tons, are among the heaviest loads that are moved within reactor facilities during power operations. NRC Bulletin 96-02, "Movement of Heavy Loads Over Spent Fuel, Over Fuel in the Reactor Core, or Over Safety-Related Equipment," issued April 11, 1996, requested that licensees review their plans and capabilities for handling heavy loads, such as dry storage casks, and determine whether such activities were adequately addressed by the analyses in the existing licensing basis for the affected facilities. The staff subsequently requested some licensees to provide information related to the movement of spent fuel storage or transportation casks without the lids on those casks being secured in place. As a result of these inquiries, one licensee determined that an unreviewed safety question (USQ) was introduced by the existing practice of moving transportation casks with the lids only partially secured and with vent and drain lines exposed as a result of the removal of protective covers. The licensee stated that the practice involved a USQ because the actual cask configuration differed from the configuration assumed in the cask drop analysis that is documented in the affected facility's updated final safety analysis report.

Licensees have also experienced problems during the movement of casks as a result of crane interlocks, errors in the accounting for the weights of cask components, and human error. In moving cask components at the Davis-Besse Nuclear Power Station, both during the dry run exercises and the actual loading of a cask, actuation of electrical thermal overloads interrupted crane operations during slow speed operation. The licensee subsequently learned that a creeper motor installed on the crane was intended to be used during sustained slow speed movements instead of the main hoist motor. At Prairie Island on May 13, 1995, a cask remained in the hoisted position above the spent fuel pool for approximately 16 hours while the licensee developed and implemented corrective actions to address an overload-sensing system that was inaccurately calibrated for lifting of a loaded dry storage cask. Changes in the lifting procedure were required at Prairie Island when it was discovered that a dry storage cask weighed more than expected. The weight difference was found to be the result of acceptable variations in manufacturing tolerances that had not been accounted for in previous weight calculations. At Point Beach, procedure changes were required during the recovery from the hydrogen ignition event described in NRC Bulletin 96-04, "Chemical, Galvanic, or Other Reactions in Spent Fuel Storage and Transportation Casks." The procedure changes were necessary after the licensee discovered that the lifting procedure failed to account for a design change that had revised the shield lid arrangement from a two-component system to a single shield lid.

In September 1993, an empty dry storage cask was placed in Unit 3 spent fuel pool at the Oconee Nuclear Station and was mispositioned on the cask pit stand. This mispositioning resulted in the cask's leaning, which caused the lifting hook to partially slip off the cask trunnion when trying to lift the cask. The licensee secured the cask in a position in which it was partially resting on the stand. Fuel assemblies located in the storage racks nearest the cask were moved in case the cask tipped over within the spent fuel pool. The licensee was able to retrieve the cask after ensuring that the lifting hooks were properly positioned using temporary supports and additional rigging. At Prairie Island, the licensee identified that the wear plate in the cask laydown area was mispositioned during the dry run exercises for cask loadings. This mispositioning was identified after the cask had been filled with water and was about to be lowered into the spent fuel pool. The spent fuel pool liner might have been damaged if a cask had actually been placed on top of the mispositioned wear plate.

Vacuum Drying

During the loading of the third dry storage cask at Calvert Cliffs, the licensee discovered that the low-range vacuum gauge range switch had been improperly wired, causing the low-pressure readings taken during vacuum drying of the first two casks to be off by a factor of 10. This mistake resulted in the failure of those casks to satisfy the technical specification requirements for the vacuum drying pressure to be maintained at less than 3 torr for at least 30 minutes. The licensee was able to evaluate the effects of this error and show that the vacuum drying had adequately removed oxidizing gases from the two loaded casks. A license amendment was requested and approved that allowed the casks to remain in service.

During the loading of the first dry storage cask at Arkansas Nuclear One, the initial vacuum drying of the cask was performed over a period of 86 hours, which was much longer than had been anticipated. During the evolution, the licensee directed considerable attention toward eliminating leaks in the vacuum system and lines. Additional purging with helium to remove moisture from the cask and removal of water that had accumulated in a low spot in the line between the cask and the vacuum pump ultimately allowed the licensee to achieve and maintain the pressure required by the cask's certificate of compliance.

Unloading Procedures

Although experience in the unloading of spent fuel casks is limited to transportation casks and several storage casks that were only partially through the loading process, NRC inspections and licensee assessments have identified some issues pertaining to the procedures for the unloading of dry storage casks. Following the discovery of radiographic

indications of possible defects in a weld in a loaded storage cask, the licensee for Palisades reviewed its unloading procedure in preparation for its potential use. The questions raised by the licensee's review concerned the pressurization of the cask upon initiation of refilling the cask with water, the required venting capacity for steam generated during the refilling of the cask with water, the possible challenge to fuel rod integrity following heatup in the transport cask and cooling during the refilling of the cask with water, and possible problems in the drawing of a gas sample from the cask to determine if fuel oxidation occurred during storage. On the basis of its review, the NRC staff concluded that had the licensee attempted to unload a cask using the original unloading procedure, the licensee would have had to suspend operations and revise its procedure because a continuous cooling cycle could not have been established. An administrative limit in the original unloading procedure maintained cask pressure to less than 10 psig. This pressure would not have been sufficient to force steam to the outlet of the discharge piping at the bottom of the spent fuel pool. The licensee has revised its unloading procedure to address the identified deficiencies and has added additional monitoring and precautions for the control of hydrogen gas in response to NRC Bulletin 96-04 as well.

Unloading of Transportation Casks

The unloading of boiling-water reactor (BWR) fuel from the Brunswick Steam Electric Plant after transport to the Shearon Harris Nuclear Power Plant, a pressurized-water reactor (PWR) with borated water in its spent fuel pools, has resulted in problems with the release of large amounts of "crud." The material released to the spent fuel pool at Shearon Harris is thought to be a result of exposing the BWR assemblies to the borated water in the spent fuel pool, as well as deposited material that comes off the BWR fuel rods during transport. The release of crud from BWR fuel has resulted in radiological concerns because the material has contaminated the Shearon Harris spent fuel pool and increased the concentration of airborne particles during cask unloading operations. Although the NRC staff has confirmed that the licensee has implemented adequate controls to limit the radiological impact associated with the crud for the present, the licensee has stated that additional measures may be necessary as it continues with the transfer of fuel assemblies to the Shearon Harris spent fuel pools.

Related Generic Communications

NRC Information Notice (IN) IN 95-29, "Oversight of Design and Fabrication Activities for Metal Components Used in Spent Fuel Dry Storage Systems," issued June 7, 1995 (Accession Number 9506050138).

NRC IN 96-26, "Recent Problems With Overhead Cranes," issued April 30, 1996 (Accession Number 9604260095).

NRC Bulletin 96-02, "Movement of Heavy Loads Over Spent Fuel, Over Fuel in the Reactor Core, or Over Safety-Related Equipment," issued April 11, 1996 (Accession Number 9604080259).

NRC Bulletin 96-04, "Chemical, Galvanic, or Other Reactions in Spent Fuel Storage and Transportation Casks," issued July 5, 1996 (Accession Number 9607020241).

NRC IN 97-39, "Inadequate 10 CFR 72.48 Safety Evaluations of Independent Spent Fuel Storage Installations," issued June 26, 1997 (Accession Number 9706260174).

This information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact one of the technical contacts listed below or the appropriate Office of Nuclear Reactor Regulation (NRR) project manager.



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Office of Nuclear Reactor Regulation



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Attachments:

1. List of Recently Issued NMSS Information Notices
2. List of Recently Issued NRC Information Notices

**LIST OF RECENTLY ISSUED
 NMSS INFORMATION NOTICES**

Information Notice No.	Subject	Date of Issuance	Issued to
97-50	Contaminated Lead Products	07/10/97	All U.S. Nuclear Regulatory Commission licensees
97-47	Inadequate Puncture Tests for Type B Packages Under 10 CFR 71.73(c)(3)	06/27/97	All "users and fabricators" of type B transportation packages [as defined in 10 CFR 171.16(10(B))]
97-42	Management Weaknesses Resulting in Failure to Comply with Shipping Requirements for Special Nuclear Material	06/27/97	All fuel cycle conversion, enrichment, and fabrication facilities
97-39	Inadequate 10 CFR 72.48 Safety Evaluations of Independent Spent Fuel Storage Installations	06/26/97	All holders of OLs or CPs for nuclear power reactors. All holders of licenses for independent spent fuel storage installations
96-53, Supp. 1	Retrofit to Amersham 660 Posilock Radiography Camera to Correct Inconsistency in 10 CFR Part 34 Compatibility	06/23/97	All industrial radiography licensees
97-35	Retrofit to Industrial Nuclear Company (INC) IR100 Radiography Camera to Correct Inconsistency in 10 CFR Part 34 Compatibility	06/18/97	All industrial radiography licensees
97-30	Control of Licensed Material During Reorganizations, Employee-Management Disagreements, and Financial Crises	06/03/97	All material and fuel cycle licensees

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97-50	Contaminated Lead Products	07/10/97	All U.S. Nuclear Regulatory Commission licensees
97-49	B&W Once-Through Steam Generator Tube Inspection Findings	07/10/97	All holders of OLs or CPs for nuclear power reactors
97-48	Inadequate or Inappropriate Interim Fire Protection Compensatory Measures	07/09/97	All holders of OLs or CPs for nuclear power reactors
97-47	Inadequate Puncture Tests for Type B Packages Under 10 CFR 71.73(c)(3)	06/27/97	All "users and fabricators" of type B transportation packages [as defined in 10 CFR 171.16(10)(B)]
97-46	Unisolable Crack in High-Pressure Injection Piping	07/09/97	All holders of OLs or CPs for nuclear power reactors
96-44, Supp. 1	Failure of Reactor Trip Breaker from Cracking of Phenolic Material in Secondary Contact Assembly	07/02/97	All holders of OL permits for nuclear power reactors
97-45	Environmental Qualification Deficiency for Cables and Containment Penetration Pigtails	07/02/97	All holders of OLs or CPs for nuclear power reactors

OL = Operating License
CP = Construction Permit

NRC Bulletin 96-02, "Movement of Heavy Loads Over Spent Fuel, Over Fuel in the Reactor Core, or Over Safety-Related Equipment," issued April 11, 1996 (Accession Number 9604080259).

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 S.H. Weiss for

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Tech Editor reviewed and concurred on 6/4/97

DOCUMENT NAME: 97-51.IN *SEE PREVIOUS CONCURRENCE

OFC	Contacts	PD/PDIII-3	BC/PECB:DRPM	D/SFPO:NMSS	D/DRPM
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DOCUMENT NAME: G:\EJB1\CASKNEW.IN *SEE PREVIOUS CONCURRENCE

OFC	Contacts	PD/PDIII-3	BC/PECB:DRPM	D/SFPO:NMSS	D/DRPM
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NRC Bulletin 96-04, "Chemical, Galvanic, or Other Reactions in Spent Fuel Storage and Transportation Casks," issued July 5, 1996 (accession number 9607020241).

NRC IN 97-xx, "Inadequate 10 CFR 72.48 Safety Evaluations of Independent Spent Fuel Storage Installations," issued June xx, 1997 (accession number XXXXXXXXXXXXXXXXXXXX).

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