OMB No.: 3150-0011
NRCB 94-01

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

April 14, 1994

NRC BULLETIN 94-01: POTENTIAL FUEL POOL DRAINDOWN CAUSED BY INADEQUATE MAINTENANCE PRACTICES AT DRESDEN UNIT 1

Addressees

For Action:

All holders of licenses for nuclear power reactors that are permanently shut down with spent fuel in the spent fuel pool (except Shoreham). [Humboldt Bay, Indian Point 1, La Crosse, Rancho Seco, San Onofre 1, Trojan, Yankee Rowe, and Dresden 1]

For Information:

All holders of operating licenses or construction permits for nuclear power reactors and all fuel cycle and materials licensees authorized to possess spent fuel.

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this bulletin: (1) to inform addressees of the results of a special NRC inspection at Dresden Nuclear Power Station Unit 1 (Dresden 1), (2) to request that all action addressees implement the actions described herein, and (3) to require that all action addressees provide to NRC written responses to this bulletin relating to implementation of the requested actions.

Description of Circumstances

Dresden 1, one of three boiling water reactors at the Dresden site near Morris, Illinois, was licensed for operation on September 28, 1959, and was permanently shut down on October 31, 1978. On January 25, 1994, the licensee for Dresden 1 discovered approximately 200 m^3 [55,000 gallons] of water in the basement of the unheated Unit 1 containment. The water originated from a rupture of the service water system piping inside the containment that had been caused by freeze damage to the system. The licensee investigated further and found that, although the fuel transfer system was not damaged, there was a potential for a portion of the system inside the containment to fail and result in a partial draindown of the spent fuel pool (SFP) that contained

660 spent fuel assemblies. The licensee implemented several specific actions to guard against further damage from freezing and appointed a team to investigate the status of Dresden 1.

The NRC dispatched a team of inspectors from the Offices of Nuclear Reactor Regulation (NRR), Nuclear Material Safety and Safeguards, and Region III to conduct a special inspection of the circumstances surrounding the event. The details of that inspection will be in an NRC inspection report to be issued shortly. Based on these reviews the following conditions existed:

- Heating had not been provided to the Dresden 1 containment for the 1989/1990 and subsequent heating seasons. The lack of heating inside the containment under more severe weather conditions could potentially have resulted in the freezing and rupture of the fuel transfer tube. Failure of the fuel transfer tube could have drained the SFP to several feet below the top of the stored fuel assemblies. The loss of water shielding would have created onsite personnel hazards from the high radiation fields.

- The water quality in the SFP was poor. The original cleanup and cooling system was shut down in 1983; by 1987 the water quality had degraded to the point that an influx of microorganisms had developed. Concerned that the microorganisms might cause microbiologically induced corrosion, the licensee installed a temporary system to clean up the pool. The temporary system proved to be incapable of restoring the water quality to an acceptable level. Licensee records show that the conductivity in the pool exceeded the technical specification limit of 10 μmho per centimeter by about a factor of two. Also, the licensee estimated that approximately 90 stored fuel bundles had leaking fuel pins resulting in elevated concentrations of cesium-137 of about 370 Becquerels/ml [1 x 10^{-2} μCi/ml].

- A number of obsolete piping lines from the original pool cleanup and cooling system remained in the SFP and were potential siphon paths that could reduce the pool level.

- Because the SFP gate was not installed it could not have prevented a draindown of the pool if the fuel transfer pool or tunnel had emptied. The NRC inspectors noted that the gaskets and steel mating surfaces for the spent fuel gate had been exposed to adverse biological, chemical, and radiological conditions that may have affected their ability to seal had the gate been installed.

- The licensee had no SFP leak detection or water inventory program. The observed cracks in the unlined concrete pool indicated a potential for pool leakage.

Site personnel had for some time focused their attention on the operating units and assumed that no significant problems would occur at Dresden 1.

Interviews with personnel at the Dresden site (which includes two operating units in addition to Dresden 1) showed that, in part, the weaknesses identified above were based on an incorrect belief that Dresden 1 could not cause a serious safety problem because it was permanently shut down. This belief resulted in audits and safety evaluations that were not rigorously implemented or that did not include the Dresden 1 systems and programs. However, as noted above, significant safety considerations did exist.

Discussion

It is necessary to maintain an adequate inventory of water in the spent fuel pool to safely store spent fuel. A proper depth of SFP water provides protection for plant personnel from excessive exposure to radiation from spent fuel and other materials stored in the spent fuel pool. Control of the exposure of plant personnel is required by Part 20 of Title 10 of the Code of Federal Regulations (10 CFR Part 20). Rapid loss of SFP water inventory may result from a failure of piping connected to the SFP or from a siphoning action of piping as a result of an improper valve alignment. A loss of SFP water inventory may also result from a failure of seals or gaskets used as part of the SFP boundary. If seals and gaskets are allowed to become degraded, a leak may increase rapidly once it initiates. Failure to have a leak detection system or a water inventory program may allow leakage of SFP water to go undetected.

Proper maintenance and operation of SFP systems is necessary to maintain water quality and radionuclides at acceptable levels. Maintenance of water quality is necessary to prevent degradation of the spent fuel and other stored materials stored in the SFP (i.e., control rod blades or incore instrument strings). Proper SFP water treatment programs prevent the buildup of excessive concentrations of radionuclides. Proper maintenance of the SFP and the support systems would also mitigate the consequences of any potential release from the SFP.

Requested Actions

Immediately upon receipt of this bulletin, all action addressees are requested to take the following actions to ensure that the quality of the SFP coolant, and the cooling and shielding for fuel or equipment stored in the SFP is not compromised and that all necessary structures and support systems are maintained and are not degraded.

1. Verify that the structures and systems required for containing, cooling, cleaning, level monitoring and makeup of water in the SFP are operable and adequate, consistent with the licensing basis, to preclude high levels of radionuclides in the pool water and adverse effects on stored fuel, the SFP, fuel transfer components, and related equipment.

2. Ensure that systems for essential area heating and ventilation are adequate and appropriately maintained so that potential freezing failures that could cause loss of SFP water inventory are precluded.

3. Ensure that piping or hoses in or attached to the SFP cannot serve as siphon or drainage paths in the event of piping or hose degradation or failure or the mispositioning of system valves.

4. Ensure that operating procedures address conditions and observations that could indicate changes in SFP level and address appropriate maintenance, calibration and surveillance of available monitoring equipment. This should include any leak detection systems.

Required Response

All action addressees are required to submit the following written response to this bulletin:

1. Within 30 days of the date of this bulletin, a written response indicating whether or not the addressee will implement the actions requested above. If the addressee intends to implement the requested actions, provide a schedule for completing implementation. If an addressee chooses not to take the requested actions, provide a description of any proposed alternative course of action, the schedule for completing the alternative course of action (if applicable), and the safety basis for determining the acceptability of the planned alternative course of action.

2. Within 30 days of completion of the requested actions, a report confirming completion.

Address the required written reports to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, D.C. 20555, under oath or affirmation under the provisions of Section 182a, Atomic Energy Act of 1954, as amended, and 10 CFR 50.54(f). In addition, submit a copy to the appropriate regional administrator.

Backfit Discussion

Actions 2, 3 and 4 requested in this bulletin may represent new staff positions and these requests are considered backfits in accordance with NRC procedures. Because established regulatory requirements exist but were not satisfied, these backfits are to bring facilities into compliance with existing requirements. Therefore, a full backfit analysis was not performed. A documented evaluation was performed in accordance with NRC procedures including a statement of the objectives of and reasons for the modifications and the basis for invoking the compliance exception. It will be made available in the Public Document Room with the minutes of the 256th meeting of the Committee to Review Generic Requirements.

A notice of opportunity for public comment was not published in the Federal Register because of the urgent nature of the actions requested by the bulletin.

Paperwork Reduction Act Statement

The information collections contained in this request are covered by the Office of Management and Budget clearance number 3150-0011, which expires June 30, 1994. The public reporting burden for this collection of information is estimated to average 300 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Information and Records Management Branch (MNBB-7714), U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-3019, (3150-0011), Office of Management and Budget, Washington, D.C. 20503.

Compliance with the following request for information is purely voluntary. The information would assist NRC in evaluating the cost of complying with this bulletin:

(1) the licensee staff time and costs to perform requested inspections, corrective actions, and associated testing;

(2) the licensee staff time and costs to prepare the requested reports and documentation;

(3) the additional short-term costs incurred as a result of the inspection findings such as the costs of the corrective actions or the costs of down time;

(4) an estimate of the additional long-term costs which will be incurred in the future as a result of implementing commitments such as the estimated costs of conducting future inspections or increased maintenance.

NRC is issuing this bulletin to the information addressees to alert them to the potential for spent fuel pool draindown under the described conditions. It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. However, the requested actions and required responses applicable to the action addressees are not applicable to the information addressees; therefore, no specific action or written response is required from them. The NRC staff is reviewing the need to request actions related to siphon or drainage paths at older operating power plants and certain fuel cycle facilities.

If you have any questions about this matter, please contact one of the persons listed below or the appropriate NRC project manager.

John T. Greeves for
Malcolm R. Knapp, Director
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

Luis A. Reyes
Acting Associate Director for Projects
Office of Nuclear Reactor Regulation

Technical contacts: Steve Jones, NRR
(301) 504-2833

Lee Thonus, NRR
(717) 948-1161

Larry Bell, NMSS
(301) 504-2171

Attachment:
List of Recently Issued NRC Bulletins

LIST OF RECENTLY ISSUED NRC BULLETINS

Bulletin No.	Subject	Date of Issuance	Issued to
93-02, Supp. 1	Debris Plugging of Emergency Core Cooling Suction Strainers	02/18/94	All holders of OLs or CPs for boiling-water reactors All holders of OLs or CPs for pressurized-water reactors
91-01, Supp. 1	Reporting Loss of Criticality Safety Controls	07/27/93	For Action - All fuel fabrication facilities. For Information - All facilities whose activities include, Hot Cell Operations, Uranium Enrichment Operations, Uranium Fuel R&D, and Critical Mass Operations
93-03	Resolution of Issues Related to Reactor Vessel Water Level Instrumentation in BWRs	05/28/93	All holders of OLs or CPs for boiling water reactors (BWRs) with the exception of Millstone, Unit 1, and Big Rock Point.
93-02	Debris Plugging of Emergency Core Cooling Suction Strainers	05/11/93	All holders of OLs for nuclear power reactors.
93-01	Release of Patients After Brachytherapy Treatment with Remote Afterloading Devices	04/20/93	Brachytherapy Licensees Authorized to Use Afterloading Brachytherapy Unit(s) Capable of Delivering Dose Rates Greater than 500 RADS (centigray) per Hour at 1 Centimeter
90-01, Supp. 1	Loss of Fill-Oil in Transmitters Manufactured by Rosemount	12/22/92	All holders of OLs or CPs for nuclear power reactors.

OL = Operating License
CP = Construction Permit

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orig /s/'d by JT Greeves/for

Malcolm R. Knapp, Director
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*See previous concurrence

OFFICE	LLWM:NMSS*	D/LLWM:NMSS*		
NAME	LBell	MKnapp		
DATE	04/11/94	04/11/94 4/14/94		

OFFICE	OGCB:DORS:NRR*	C/OGCB:DORS:NRR*	D/DORS:NRR*	ADPR:NRR
NAME	JBirmingham	AJKugler	BKGrimes	LReyes
DATE	04/11/94	04/11/94	04/11/94	04/14/94

SPLB:DSSA:NRR*			D/DSSA:NRR	ADT:NRR*
SJones			MVirgilio*	AThadani 4/12
04/11/94	04/ /94	04/ /94	04/12/94	04/13/94

RPB:ADM*	ONDD:DORS:NRR*		C/ONDD:DORS:NRR*	OGC
MMejac	LThonus		SWeiss	SHLewis
04/11/94	04/11/94	04/ /94	04/11/94	04/14/94

OFFICIAL DOCUMENT NAME: 94-01.BL

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