

May , 1994

MEMORANDUM FOR: Edward L. Jordan, Chairman
 Committee to Review Generic Requirements

FROM: Frank J. Miraglia, Deputy Director
 Office of Nuclear Reactor Regulation

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

The Office of Nuclear Reactor Regulation (NRR) met with the Committee to Review Generic Requirements (CRGR) on April 11, 1994, to review the subject proposed bulletin. In response to comments on the draft bulletin from CRGR at that meeting and discussions with the CRGR and Office of the General Counsel (OGC) subsequent to that meeting, NRR revised the bulletin and issued it on April 14, 1994. By this memorandum, NRR is providing CRGR a copy of the issued bulletin and revised responses to the questions contained in Section IV.B of the CRGR charter.

Enclosure 1 is Bulletin 94-01 as issued with comments from CRGR and OGC incorporated. The purpose of the bulletin remains the same as previously reviewed.

Enclosure 2 contains the revised responses to the questions contained in Section IV.B of the CRGR Charter. Because requested actions 2, 3 and 4 are considered backfits in accordance with NRC procedures and because these backfits are to bring facilities into compliance with existing requirements, the staff included in the responses an evaluation of the type discussed in 10 CFR 50.109(a)(6).

The Office of General Counsel reviewed the bulletin and had no legal objection. Brian K. Grimes, Director, Division of Operating Reactor Support is the bulletin sponsor.

Original signed by
 Frank J. Miraglia
 Frank J. Miraglia, Deputy Director
 Office of Nuclear Reactor Regulation

- Enclosures:
- Bulletin 94-01
 - Revised Responses to CRGR Charter Questions

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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 m³ [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 μ mho per centimeter by about a factor of 10. Also, the licensee estimated that approximately 90 stored fuel assemblies had leaking fuel pins resulting in elevated concentrations of cesium of about 370 Becquerels/ml [1×10^{-2} μ Ci/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. Greaves for *Luis A. Reyes*
Malcolm R. Knapp, Director Luis A. Reyes
Division of Waste Management Acting Associate Director for Projects
Office of Nuclear Material Safety Office of Nuclear Reactor Regulation
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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 Criti- cality Safety Controls	07/27/93	<u>For Action</u> - All fuel fabrication facilities. <u>For Information</u> - All facilities whose activities include, Hot Cell Opera- tions, 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 After- loading 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 Manu- factured by Rosemount	12/22/92	All holders of OLs or CPs for nuclear power reactors.

OL = Operating License
 CP = Construction Permit

RESPONSES TO QUESTIONS IN SECTION IV.B OF THE CRGR CHARTER

- (i) The proposed generic requirement or staff position as it is proposed to be sent out to licensees.

The proposed bulletin requests action addressees to take the following actions:

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.

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.

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 is not required. However, in accordance with NRC procedures, a documented evaluation was performed including a statement of the objectives of and reasons for the modifications to the existing staff positions and the basis for invoking the compliance exception. The documented evaluation is

contained in the response to question (ix) of this enclosure. By means of this memorandum, the evaluation will be made available in the Public Document Room and will be referenced by 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.

- (ii) Draft staff papers or other underlying staff documents supporting the requirements or staff positions. (A copy of all materials referenced in the document shall be made available upon request to the CRGR staff. Any Committee member may request CRGR staff to obtain a copy of any reference material for his or her use.)

As applicable, the staff position is supported by existing requirements in individual plant licensing documents and Section VI, "Fuel and Radioactivity Control," of Appendix A to Part 50 of Title 10 of the Code of Federal Regulations (10 CFR Part 50). Further, the staff position is supported by the requirements found in Part 20 of Title 10 of the Code of Federal Regulations (10 CFR Part 20). Part 20 of the Code contains requirements for licensees to ensure that exposure to plant personnel or to the public do not exceed the limits described in 10 CFR Part 20.

- (iii) Each proposed requirement or staff position shall contain the sponsoring office's position as to whether the proposal would increase requirements or staff positions, implement existing requirements or staff positions, or would relax or reduce existing requirements or staff positions.

Requested action 1 implements existing requirements and staff positions. Requested actions 2, 3 and 4 may represent new staff positions but are considered necessary to ensure that licensees are in compliance with existing NRC rules and regulations.

- (iv) The proposed method of implementation with the concurrence (and any comments) of OGC on the method proposed. The concurrence of affected program offices or an explanation of any nonconcurrences.

The proposed method of implementation is to request action licensees to verify the status of their spent fuel pools and all necessary support systems and to report to the NRC the status of these items. Further, the bulletin requests that licensees take certain actions to ensure that SFP systems and structures are adequate and operable. The Offices of NMSS and NRR have concurred in the proposed implementation and OGC has no legal objection.

- (v) Regulatory analyses conforming to the directives and guidance of NUREG/BR-0058 and NUREG/CR-3568. [This does not apply for backfits that ensure compliance or ensure, define, or redefine adequate protection. In these cases a documented evaluation is required as discussed in IV.B.(ix).]

This is a compliance issue; therefore no value/impact analysis was made.

- (vi) Identification of the category of reactor plants to which the generic requirement or staff position is to apply.

The proposed bulletin would apply to all permanently shut down reactors with spent fuel in the spent fuel pool. Action addressees are identified in the bulletin. Further, the proposed bulletin would be provided for information purposes to all holders of operating licenses or construction permits for nuclear power reactors and all fuel cycle and materials licensees authorized to possess spent fuel.

- (vii) For backfits other than compliance or adequate protection backfits, a backfit analysis as defined in 10 CFR 50.109. The backfit analysis shall include, for each category of reactor plants, an evaluation which demonstrates how the action should be prioritized and scheduled in light of other ongoing regulatory activities. The backfit analysis shall document for consideration information available concerning any of the following factors as may be appropriate and any other information relevant and material to the proposed action:

The bulletin seeks to ensure that licensees are in compliance with existing requirements. Therefore, a full backfit analysis is not required.

- (viii) For each backfit analyzed pursuant to 10 CFR 50.109(a)(2) (i.e., not adequate protection backfits and not compliance backfits), the proposing Office Director's determination, together with the rationale for the determination based on the consideration of paragraph (i) and (vii) above, that:
 - (a) There is a substantial increase in the overall protection of public health and safety or the common defense and security to be derived from the proposal; and
 - (b) The direct and indirect costs of implementation, for the facilities affected, are justified in view of this increased protection.

The bulletin seeks to ensure that licensees are in compliance with existing requirements. Therefore, this section is not applicable to the bulletin.

- (ix) For adequate protection or compliance backfits evaluated pursuant to 10 CFR 50.109(a)(4)
 - (a) a documented evaluation consisting of:
 - (1) the objectives of the modification
 - (2) the reasons for the modification
 - (3) the basis for invoking the compliance or adequate protection exemption.
 - (b) in addition, for actions that were immediately effective (and therefore issued without prior CRGR review as discussed in III.C) the evaluation shall document the safety significance and appropriateness

of the action taken and (if applicable) consideration of how costs contributed to selecting the solution among various acceptable alternatives.

Action 1 requested in the bulletin does not represent a new staff position or requirement. Actions 2, 3 and 4 requested in this bulletin may represent new staff positions and therefore are considered backfits in accordance with NRC procedures. An evaluation for requested actions 2, 3 and 4 follows:

1. The objective and reason for requested action 2 is to ensure that area heating and ventilation is such that those systems and structures, including piping, that are attached to or that are a part of the SFP are protected so as to preclude failures from freezing that could cause a loss of SFP water inventory. The basis for this action is to ensure adequate shielding for plant personnel, preclude excessive buildup of radionuclides in the SFP and vicinity, and preclude or mitigate the spread of contamination from the SFP to other plant areas.
2. The objective and reason for requested action 3 is to 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 mispositioning of system valves and result in the loss of SFP water inventory. The basis for this action is to ensure adequate shielding for plant personnel and to preclude or mitigate the spread of contamination from the SFP to other plant areas.
3. The objective and reason for requested action 4 is to ensure that operating procedures address conditions that could indicate changes in the SFP level and that any available monitoring equipment is maintained, calibrated and surveilled so that leakage from the SFP or loss of water inventory is detected. The basis for this action is to ensure adequate shielding for plant personnel and to preclude or mitigate the spread of contamination from the SFP to other plant areas.

The requested actions were reviewed by the CRGR; therefore item (ix)b above is not applicable.

- (x) For each evaluation conducted for proposed relaxations or decreases in current requirements or staff positions, the proposing Office Director's determination, together with the rationale for the determination based on the considerations or paragraphs (i) through (vii) above, that:
- (a) The public health and safety and the common defense and security would be adequately protected if the proposed reduction in requirements or positions were implemented, and
 - (b) The cost savings attributed to the action would be substantial enough to justify taking the action.

This item is not applicable to the proposed bulletin because no relaxation or decrease in current requirements is being proposed.

- (xi) For each request for information under 10 CFR 50.54(f) (which is not subject to exception as discussed in III.A) an evaluation that includes at least the following elements:
- (a) A problem statement that describes the need for the information in terms of potential safety benefit.
 - (b) The licensee actions required and the cost to develop a response to the information request.
 - (c) An anticipated schedule for NRC use of the information.
 - (d) A statement affirming that the request does not impose new requirements on the licensee, other than for the requested information.

This item is not applicable to requests for information under 10 CFR 50.54(f) that are contained in the proposed bulletin because the information is requested to verify compliance with existing requirements.

- (xii) An assessment of how the proposed action relates to the Commission's Safety Goal Policy Statement.

Because this is a compliance backfit, there is no impact on the Commission's Safety Goal Policy Statement.