



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

FEB 17 1988

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TO ALL LICENSEES, APPLICANTS FOR OPERATING LICENSES, AND HOLDERS OF
CONSTRUCTION PERMITS FOR PRESSURIZED WATER REACTORS

Gentlemen:

SUBJECT: RESOLUTION OF GENERIC SAFETY ISSUE 93, "STEAM BINDING OF
AUXILIARY FEEDWATER PUMPS" (GENERIC LETTER 88-03)

This generic letter is being issued:

- (1) to inform you of the staff's resolution of the subject generic safety issue, and
- (2) to request that you continue to implement, as a minimum, the monitoring and corrective procedures previously identified for interim resolution of this issue in IE Bulletin 85-01, "Steam Binding of Auxiliary Feedwater Pumps," dated October 29, 1985. (A copy of this bulletin is attached.)

The issue concerns the potential disabling of auxiliary feedwater (AFW) pumps by steam binding that is caused by backleakage of main feedwater (MFW) past the isolation check valves between the AFW and MFW systems. The issue is significant because most AFW systems are potentially vulnerable to common mode failure of the redundant AFW pumps as a result of steam binding. This vulnerability is inherent to the piping configurations used, which allow redundant trains of AFW to be cross-connected via common headers on the suction and discharge sides of the pumps.

To reduce the probability of AFW pump failure as a consequence of steam binding if backleakage does occur, IE Bulletin 85-01 requested that certain licensees and construction permit holders implement procedures both for monitoring the AFW piping temperatures for indication of possible backleakage and for restoring the pumps to operable status if steam binding were to occur. The bulletin was not issued to all holders of operating licenses and construction permits for pressurized water reactors because the staff had determined that a number of them had already taken actions that would minimize the occurrence of the AFW pump steam binding problem at their plants. The bulletin recommended a monitoring frequency of once a shift, compared with the previously recommended frequency of once a month. This increased frequency reduced the likelihood of pump unavailability because of steam binding by a factor of 90 (3 shifts/day x 30 days/month).

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Multiple Addressees

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As part of its efforts toward a final generic resolution of this issue, the staff surveyed the backleakage experience in operating plants following the implementation of monitoring procedures. Although the number of backleakage events varied from an average of less than one per reactor year at a large majority of plants to more than 100 per reactor year at others, none of the backleakage events that occurred during the review period appeared to have resulted in the steam binding of an AFW pump. This indicates that the various monitoring methods employed can be highly effective in preventing steam binding if backleakage occurs. For the plants with a high backleakage event rate, the installation of continuous monitoring systems with control room alarms was instrumental in providing for early warning to the operator and timely corrective action.

The results of the staff's regulatory analysis indicated that following the recommendations in Bulletin 85-01 would ensure that the contribution of AFW pump steam binding to core melt frequency and public risk was sufficiently low and that there is no need for new recommendations beyond those in IE Bulletin 85-01.

The staff has concluded that the recommended monitoring actions of IE Bulletin 85-01 should be continued. However, although the staff has concluded that the currently assessed risk associated with this issue is reasonably low, it is still concerned about the generally unsatisfactory reliability of check valves in operating plants. Plant operators should continue to be alert to the possible development of malfunctioning check valves, especially as the plant ages. They should be prepared to increase the monitoring frequency as needed and to implement appropriate recovery procedures to ensure that steam binding failure of the AFW pumps does not occur.

IE Bulletin 85-01 recommended that procedural controls remain in effect (1) until the completion of hardware modifications to substantially reduce the likelihood of steam binding, or (2) until it was superseded by action implemented as a result of resolution of Generic Issue 93. This generic letter resolves Generic Issue 93 by perpetuating the recommendations of IE Bulletin 85-01. In particular, all addressees should:

1. Maintain procedures to monitor fluid conditions within the AFW system each shift during times when the system is required to be operable. This monitoring should ensure that fluid temperature at the AFW pump discharge is maintained at about ambient levels.
2. Maintain procedures for recognizing steam binding and for restoring the AFW system to operable status, should steam binding occur.

All addressees are requested to provide a letter of confirmation to the NRC within 90 days of receipt of this generic letter indicating that the procedures discussed in this generic letter are in place and will be maintained. Confirmation by addressees who did not previously receive IE Bulletin 85-01 is being requested because the staff believes that they would rely on these procedures as part of the actions to minimize the occurrence of the AFW pump steam binding problem.

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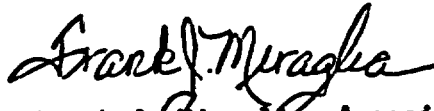
Pursuant to 10 CFR 50.54(f), you are requested to submit under oath or affirmation the letter of confirmation to the U.S. Nuclear Regulatory Commission, Document Control Desk, Washington, D.C. 20555, for reproduction and distribution. This request for information is covered by the Office of Management and Budget under blanket clearance number 3150-0011, which expires December 31, 1989. Comment on burden and duplication should be directed to the Office of Management and Budget, Reports Management, Room 3208, New Executive Office Building, Washington, D.C. 20503.

Although no specific request or requirement is intended, the following information would be helpful to the NRC in evaluating the cost of this generic letter:

1. Staff time to perform the requested confirmation and any needed followup actions.
2. Staff time to prepare requested documentation.

If there are any questions regarding this matter, please contact the Regional Administrator of the appropriate NRC regional office or your project manager in this office.

Sincerely,



Frank J. Miraglia, Associate Director
for Projects
Office of Nuclear Reactor Regulation

Enclosure: IEB 85-01

Attachment

OMB No.: 3150-0011
Expiration Date: 9/30/86
IEB 85-01

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
WASHINGTON, D.C. 20555

October 29, 1985

IE BULLETIN 85-01: STEAM BINDING OF AUXILIARY FEEDWATER PUMPS

Addressees:

For Action - Those nuclear power reactor facility licensees and construction permit (CP) holders listed in Attachment 1.

For Information - All other nuclear power reactor facilities.

Purpose:

The purpose of this bulletin is to inform licensees and CP holders of a potentially serious safety problem that has occurred at certain operating facilities involving the inoperability of auxiliary feedwater (AFW) pumps as a result of steam binding. Certain PWR licensees and all PWR CP holders are requested to take further action to prevent similar events from occurring at their facilities and to document those actions taken or planned.

Description of Circumstances:

Numerous events have been reported where hot water has leaked into AFW systems and flashed to steam, disabling the AFW pumps. Events at Robinson 2 in 1981 through 1983, Crystal River 3 in 1982 and 1983, and D. C. Cook 2 in 1981 were summarized in IE Information Notice (IN) 84-06, issued in January 1984. Also in January 1984, the Institute of Nuclear Power Operations (INPO) issued Significant Event Report (SER) 5-84 detailing events at Robinson 2 and Farley. In April 1984, INPO issued Significant Operating Experience Report (SOER) 84-3 that discussed another event at Surry 2 in 1983.

The NRC's Office for Analysis and Evaluation of Operational Data (AEOD) issued a case study report entitled "Steam Binding of Auxiliary Feedwater Pumps" in July 1984. This study identified 22 events since 1981; 13 of these occurring in 1983. Based on operating experience, it appears that backleakage into AFW could occur in any PWR. In a number of plants, the two motor-driven pumps feed into a single pipe which feeds into the steam generator; therefore, a leaking valve in that pipe increases the probability of steam binding in both trains of AFW. Also, multiple AFW pumps often take suction from a common manifold; therefore, if one pump becomes steam bound because of leaking check valves, the steam can heat the common suction and cause other pumps to become steam bound.

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AFW capability is needed for normal shutdown and transient conditions as well as for accident mitigation. The AEOD case study examined the effects of steam binding on a sequence in which there was a loss of the power conversion (steam generation) system after a transient other than loss-of-offsite power. A probabilistic risk analysis had previously shown this sequence to be a dominant contributor to the core-melt risk for a sample plant (Sequoyah). The case study indicated that unavailability of the AFW system as a result of steam binding contributes significantly to the risk of core melt in PWRs. Monitoring AFW to detect backleakage and to promptly correct the situation if backleakage occurs would reduce the probability of steam binding.

Since the AEOD study was issued, a series of events involving backflow of hot water into the AFW system occurred at McGuire 2 over a period of 7 days in August 1984, before effective corrective action was taken. One of these events involved overpressurization of the suction line and damage to instruments. In November 1984, Catawba 1 experienced backflow of hot water into AFW resulting in fumes from insulation and blistering of paint. In December 1984, the NRC's Office of Nuclear Reactor Regulation (NRR) determined that steam binding of AFW was a generic issue and assigned it a high priority (Generic Issue 93, "Steam Binding of Auxiliary Feedwater Pumps").

To determine the extent of the safety issue and the need for short-term corrective actions, the NRC's regional offices conducted a survey in April and May of 1985. Of the 58 operating reactors surveyed, 39 had temperature monitoring of AFW piping at least once per shift. Of the remaining 19, 17 had normally closed gate or globe valves in the pump discharge path in addition to check valves, or some unique feature such as complete separation of trains that made serious safety problems unlikely. The remaining 2 licensees have subsequently decided to monitor AFW piping temperature.

Although some degree of action has been taken at all units, many have not incorporated these actions into procedures to detect or correct steam binding. Without these provisions, there is little assurance that effective actions will continue. For this reason, the addressees are requested to take the following actions:

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Action for Addressees Listed in Attachment 1

1. Develop procedures for monitoring fluid conditions within the AFW system on a regular basis during times when the system is required to be operable. This monitoring should ensure that fluid temperature at the AFW pump discharge is maintained at about ambient temperature. Monitoring of fluid conditions, if used as the primary basis for precluding steam binding, is recommended each shift.

This item is not intended to require elaborate instrumentation. A simple means of monitoring temperature, such as touching the pipe, is a satisfactory approach.

2. Develop procedures for recognizing steam binding and for restoring the AFW system to operable status, should steam binding occur.

3. Procedural controls should remain in effect until completion of hardware modification to substantially reduce the likelihood of steam binding or until superseded by action implemented as a result of resolution of Generic Issue 93.

Schedule: For operating plants, develop and implement procedures within 90 days of the date of this bulletin. For plants under construction, develop and implement procedures within 90 days after receiving an operating license or provide an appropriate response and commitment within 1 year of the date of this bulletin, whichever comes first.

Reporting Requirements: Prepare and submit a report describing the methods used to accomplish these actions. Include the date(s) that procedures and training were implemented or scheduled to be implemented. State the frequency of monitoring of the temperature. For operating plants, submit this report within 120 days of the date of this bulletin. For plants under construction, submit the report within 120 days after receiving an operating license or within 1 year of the date of this bulletin, whichever comes first. It is not necessary to submit the procedures for review.

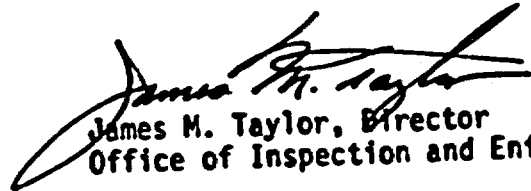
The written report, requested above, shall be submitted to the appropriate Regional Administrator under oath or affirmation under provisions of Section 182a, Atomic Energy Act of 1954, as amended. In addition, the original copy of the cover letter and a copy of the attached report should be transmitted to the U. S. Nuclear Regulatory Commission, Document Control Desk, Washington, DC 20555 for reproduction and distribution.

This request for information was approved by the Office of Management and Budget under blanket clearance number 3150-0011. Comment on burden and duplication should be directed to the Office of Management and Budget, Reports Management, Room 3208, New Executive Office Building, Washington, DC 20503.

Although no specific request or requirement is intended, the following information would be helpful to the NRC in evaluating the cost of this bulletin:

1. staff time to perform requested review and testing
2. staff time to prepare requested documentation

If there are any questions regarding this matter, please contact the Regional Administrator of the appropriate NRC regional office or this office.


James M. Taylor, Director
Office of Inspection and Enforcement

Technical Contacts: Mary S. Wegner, IE
(301) 492-4511

C. Vernon Hodge, IE
(301) 492-7275

Attachments:

1. Addressees for Action
2. List of Recently Issued IE Bulletins

ADDRESSEES FOR ACTION:

The following PWRs having an OL:

BYRON 1
CRYSTAL RIVER 3
DAVIS-BESSE
DIABLO CANYON 1
GINNA
INDIAN POINT 3
KEWAUNEE
MAINE YANKEE
MILLSTONE 2
NORTH ANNA 1
NORTH ANNA 2
PALISADES
POINT BEACH 1
POINT BEACH 2
PRAIRIE ISLAND 1
PRAIRIE ISLAND 2
RANCHO SECO
SAN ONOFRE 1
ST. LUCIE 1
ST. LUCIE 2
SUMMER
TMI 1
TROJAN
TURKEY POINT 3
TURKEY POINT 4
WATERFORD 3
WOLF CREEK 1
YANKEE-ROWE

All PWRs holding a CP

LIST OF RECENTLY ISSUED IE BULLETINS

Bulletin No.	Subject	Date of Issue	Issued to
84-03	Refueling Cavity Water Seal	8/24/84	All power reactor facilities holding an OL or CP except Fort St. Vrain
84-02	Failures Of General Electric Type HFA Relays In Use In Class 1E Safety System	3/12/84	All power reactor facilities holding an OL or CP
84-01	Cracks In Boiling Water Reactor Mark I Containment Vent Headers	2/3/84	All BWR facilities with Mark I containment and currently in cold shutdown with an OL for Action and All other BWRs with an OL or CP for information
83-08	Electrical Circuit Breakers With An Undervoltage Trip Feature In Use In Safety-Related Applications Other Than The Reactor Trip System	12/28/83	All power reactor facilities holding an OL or CP
83-07 Sup. 2	Apparently Fraudulent Products Sold By Ray Miller, Inc.	12/09/83	Same as IEB 83-07
83-07 Sup. 1	Apparently Fraudulent Products Sold By Ray Miller, Inc.	10/26/83	Same as IEB 83-07
83-07	Apparently Fraudulent Products Sold by Ray Miller, Inc.	7/22/83	All power reactor facilities holding an OL or CP; Other fuel cycle facilities and Category B, Priority I (processors and distributors) material licensees

OL = Operating License
CP = Construction Permit

LIST OF RECENTLY ISSUED GENERIC LETTERS

Generic Letter No.	Subject	Date of Issuance	Issued To
GL 88-02	"INTEGRATED SAFETY ASSESSMENT PROGRAM II (ISAP II)"	01/20/88	ALL POWER REACTOR LICENSEES
GL 88-01	"NRC POSITION ON IGSCC IN BWR AUSTENITIC STAINLESS STEEL PIPING"	01/25/88	ALL LICENSEES OF OPERATING BOILING WATER REACTORS AND HOLDERS OF CONSTRUCTION PERMITS FOR BWRs
GL 87-16	NUREG-1262, "ANSWERS TO QUESTIONS AT PUBLIC MEETINGS RE IMPLEMENTATION OF 10 CFR 55 ON OPERATORS LICENSES"	11/12/87	ALL POWER AND NONPOWER REACTOR LICENSEES AND APPLICANTS FOR LICENSES
GL 87-15	POLICY STATEMENT ON DEFERRED PLANTS	11/04/87	ALL HOLDERS OF CONSTRUCTION PERMITS FOR A NUCLEAR POWER PLANT
GL 87-14	REQUEST FOR OPERATOR LICENSE SCHEDULES	08/04/87	ALL POWER REACTOR LICENSEES
GL 87-13	INTEGRITY OF REQUALIFICATION EXAMINATIONS AT NON-POWER REACTORS	07/10/87	ALL NON-POWER REACTOR LICENSEES
GL 87-12	50.54(f) LETTER RE. LOSS OF RESIDUAL HEAT REMOVAL (RHR) DURING MID-LOOP OPERATION	07/09/87	ALL LICENSEES OF OPERATING PWRs AND HOLDERS OF CONSTRUCTION PERMITS FOR PWRs
GL 87-11	RELAXATION IN ARBITRARY INTERMEDIATE PIPE RUPTURE REQUIREMENTS	06/23/87	ALL OPERATING LICENSEES, CONSTRUCTION PERMIT HOLDERS, AND APPLICANTS FOR CONSTRUCTION PERMITS
GL 87-10	IMPLEMENTATION OF 10 CFR 73.57, REQUIREMENTS FOR FBI CRIMINAL HISTORY CHECKS	06/12/87	ALL POWER REACTOR LICENSEES