

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) Pilgrim Nuclear Power Station	DOCKET NUMBER (2) 0   5   0   0   0   2   9   3	PAGE (3) 1 OF 0   5
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TITLE (4)  
Automatic Start of a Reactor Building Closed Cooling Water System Pump

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)					
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES			DOCKET NUMBER(S)		
04	25	88	88	01	2	00	05	25	N/A			0   5   0   0   0		
												0   5   0   0   0		

OPERATING MODE (9) N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR § (Check one or more of the following) (11)									
POWER LEVEL (10) 0   0   0	20.402(b)	20.405(c)	<input checked="" type="checkbox"/>	50.73(a)(2)(iv)	73.71(b)					
	20.405(a)(1)(ii)	50.38(c)(1)	<input type="checkbox"/>	50.73(a)(2)(v)	73.71(c)					
	20.405(a)(1)(iii)	50.38(c)(2)	<input type="checkbox"/>	50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)					
	20.405(a)(1)(iii)	50.73(a)(2)(i)	<input type="checkbox"/>	50.73(a)(2)(viii)(A)						
	20.405(a)(1)(iv)	50.73(a)(2)(ii)	<input type="checkbox"/>	50.73(a)(2)(viii)(B)						
20.405(a)(1)(v)	50.73(a)(2)(iii)	<input type="checkbox"/>	50.73(a)(2)(ix)							

LICENSEE CONTACT FOR THIS LER (12)

NAME Douglas W. Ellis - Compliance Division Engineer	TELEPHONE NUMBER 6   1   7   7   4   7   -   8   1   6   1   0
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COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRRDS
X	C   C	C   P   L   G   K   2   0   0		Y					

SUPPLEMENTAL REPORT EXPECTED (14)	YES (If yes, complete EXPECTED SUBMISSION DATE)	NO <input checked="" type="checkbox"/>	EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
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ABSTRACT (Limit to 1400 spaces, i.e. approximately fifteen single-space typewritten lines) (16)

On April 25, 1988 at 0322 hours, an automatic start of the Loop 'A' Reactor Building Closed Cooling Water (RBCCW) System pump 'A' occurred. The pump start was coincident with an appropriate Control Room annunciation.

The cause for the pump start and annunciation was accelerated wear induced failure of the coupling in the RBCCW System pump 'B'. The coupling mechanically connects the principle components (pump and motor) of the pump. The coupling is a Model 'B', size 2 1/2, self aligning (Fast's) type coupling manufactured by the Koppers Company. The wear was due to a combination of misalignment and separation of the grease (Mobilux EP-2) used in the coupling.

The replacement of the coupling had not been completed when this report was prepared but is being tracked and is scheduled prior to restart. Additional measures are being planned and scheduled. The measures include disassembly, inspection, and lubrication (with Mobilux EP-1 grease) of the other RBCCW System pump(s) couplings.

This event occurred during an extended outage while in cold shutdown conditions. The reactor mode switch was in the SHUTDOWN position. The control rods were in the inserted position. The Reactor Vessel water temperature was 95 degrees Fahrenheit with negligible core decay heat. The Reactor Vessel pressure was zero psig. The reactor power level was zero megawatts-thermal. One pump was in operation in each of the two RBCCW System loops. The 'B' pump in Loop 'A' was in operation at the time of the coupling failure. The other two Loop 'A' pumps were operable and in normal standby status. This event posed no threat to the health and safety of the public.

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LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

EVENT DESCRIPTION

On April 25, 1988 at 0322 hours, an automatic start of a Reactor Building Closed Cooling Water (RBCCW) System Loop 'A' pump occurred. The start of the pump (P-202A) was coincident with the Control Room annunciation, "RBCCW Loop A Pump Low Disch(arge) Press(ure)".

The RBCCW System loops ('A' and 'B') were in service with one pump operating in each loop. The 'B' pump is one of three pumps in Loop 'A' of the RBCCW System. The pump (P-202B) was the only Loop 'A' pump in operation at the time of the coupling failure.

Initial investigation by shift operating personnel revealed a failure of the coupling of the RBCCW System pump 'B' (P-202B). The coupling mechanically connects the principle components (motor and pump) of the pump. The control switch for pump 'B' was placed in the pull-to-lock (i.e., off) position. A Maintenance Request (MR 88-30-29) was written for repair.

Failure and Malfunction Report 88-87 was written to document the event. Notification of the event was made to the NRC Operations Center on April 26, 1988 at 1141 hours.

This event occurred during an extended outage while in cold shutdown with the following plant conditions. The reactor mode selector switch was in the SHUTDOWN position. The Reactor Vessel water temperature was 95 degrees Fahrenheit with negligible core decay heat. The Reactor Vessel pressure was zero psig. The reactor power level was zero megawatts-thermal.

CAUSE

The cause for the automatic start of the pump (P-202A) was accelerated wear induced failure of the coupling portion of the RBCCW System pump 'B' (P-202B).

When the coupling failed, the pump portion of the assembly ceased to rotate. The resulting decrease of pressure in the discharge header for the RBCCW System Loop 'A' pumps (P-202A, -202B, and -202C) was sensed by the header's pressure switch (PS-4058). The automatic start of the (standby) 'A' pump (P-202A) and annunciation in the Control Room was the result of the low discharge header pressure (in Loop 'A') sensed by the pressure switch PS-4058.

The RBCCW System pump(s) is a cradle mounted, (horizontal) centrifugal type pump rated for 1700 gpm flow at 100 feet. The pump is manufactured by the Ingersol-Rand (I-R) Company. The pump coupling is a Model 'B', size 2 1/2 (two and one-half), self aligning (Fast's) type coupling manufactured by the Koppers Company Incorporated.

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

The coupling consists of two hubs and two sleeves. The hubs are externally toothed and interference (i.e., shrink) fitted to the shaft(s) of the pump and pump motor. The sleeves are internally toothed and encompass the hubs. The teeth of the hubs mate with the teeth of the sleeves when the sleeves are bolted together in a flange type connection.

Following the removal of the coupling, inspection revealed deformed (sleeve and hub) teeth on the pump end of the coupling. Inspection of the (sleeve and hub) teeth on the motor end of the coupling revealed minor damage that may have occurred at the time of the coupling failure or during removal. Measurements taken of the (pump and motor) shafts revealed no significant run out (i.e., bearing wear). The grease on the teeth and inner wall of the coupling sleeve was thick and paste-like.

Other measurements taken revealed that the (axis of the) motor shaft was 0.023 inches above the (axis of the) pump shaft. The pump manufacturer (I-R) manual indicates that the motor shaft should be 0.007 to 0.010 inches below the pump shaft. Therefore, a misalignment of approximately 0.030 inches to 0.033 inches was indicated relative to the value(s) identified in the pump manual and the as-found values.

The coupling manufacturer was contacted regarding the failure and the as-found condition of the coupling. A maximum value of 0.036 inches for offset (i.e., misalignment of the pump and motor shafts) was identified by the manufacturer. Accelerated wear of the coupling teeth can be expected as the amount of offset approaches the maximum value.

The coupling manufacturer also indicated that separation occurs for the components (oil and thickening agent) of some greases available. The separation occurs because of the centrifugal force exerted on the grease during pump operation (i.e., coupling rotation). The thickening agent, having a higher specific gravity than the oil component, tends to separate from the oil component. The separation results in the formation of a coating (of the thickening agent) on the coupling teeth. The coating reduces the effectiveness for lubrication of the teeth provided by the oil component of the grease.

The most recent verbal recommendation by the manufacturer is to use Mobilux EP-1 grease in the coupling. The recommendation is based on their recent tests that demonstrated the resistance of the grease (EP-1) to separation. The grease used for the RBCCW System pump(s) coupling, Mobilux EP-2, was identified by the coupling manufacturer to be susceptible to separation. The grease used (EP-2) is neither specified nor contrary to the guidance provided in the coupling manufacturer's published instructions.

Therefore, based on the noted as-found conditions of the coupling and the information provided by the coupling manufacturer, the failure of the coupling is attributed to accelerated wear.

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

CORRECTIVE ACTION

The replacement of the failed coupling had not been completed when this report was prepared but is being tracked and is scheduled prior to restart.

Additional measures are being taken. The measures include disassembly of the other RBCCW System pump(s) couplings, inspection for the offset of the motor and pump shafts and realignment if necessary, cleaning of the couplings, and (re)lubrication of the couplings with the grease (Mobilux EP-1) recommended by the manufacturer. These measures are being planned and scheduled.

If these measures result in new information that significantly affects this report, an update to this report will be submitted.

SAFETY CONSEQUENCES

This event posed no threat to the health and safety of the public.

The failure of the coupling in a RBCCW System pump during operation would not affect the ability of the system to perform its designed functions.

The largest heat load removed by the RBCCW System occurs during shutdown after full power operation. During those conditions, two (of three) pumps in each of the two RBCCW System loops are used. The pumps provide sufficient flow for cooling of components including the two Residual Heat Removal System (RHRS) heat exchangers.

In the event of a failure of an operating RBCCW System pump during (hot) shutdown, the third (standby) pump in the affected loop(s) is available to compensate for the reduced cooling flow. Moreover, additional operational flexibility of the RBCCW System is provided through pipelines that connect the suction and discharge lines of the RBCCW System Loops 'A' and 'B'.

Control Room operator actions for response to RBCCW System alarms are addressed in written procedures. The procedures include: "Alarm Response Procedure", ARP-C1R (Right): 2.4.42, "Loss of RBCCW": and 2.2.30, "Reactor Building Closed Cooling Water System".

This event was determined to be reportable pursuant to 10 CFR 50.73(a)(2)(iv) because the automatic pump start feature of the RBCCW System was actuated. The automatic start of a RBCCW System pump is a feature that assures adequate cooling water flow during normal operation and following accident and transient conditions (i.e., loss of offsite power).

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0   5   OF   0   5							

TEXT (If more space is required, use additional NRC Form 366A's) (17)

SIMILARITY TO PREVIOUS EVENTS

A review was conducted of Pilgrim Station Licensee Event Reports (LERs) submitted since January 1984. The review focused on LERs submitted pursuant to 10 CFR 50.73(a)(2)(iv) involving the RBCCW System.

The review revealed no previous automatic start(s) of an RBCCW System pump or coupling failure(s).

ENERGY INDUSTRY IDENTIFICATION SYSTEM (EIIS) CODES

The EIIS codes for this event are as follows:

COMPONENTS

Alarm, pressure  
Coupling (P-202B)  
Motor (P-202B)  
Pump (P-202B)  
Switch, pressure (PS-4058)

CODES

PA  
CPLG  
MO  
P  
PS

SYSTEMS

Closed/Component Cooling Water System (RBCCW)

CC



**BOSTON EDISON**  
Executive Offices  
800 Boylston Street  
Boston, Massachusetts 02199

Ralph G. Bird  
Senior Vice President — Nuclear

May 25, 1988  
BECo Ltr. #88- 084

U.S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, D.C. 20555

Docket No. 50-293  
License No. DPR-35

Dear Sir:

The attached Licensee Event Report (LER) 88-012-00 "Automatic Start of a Reactor Building Closed Cooling Water System Pump" is submitted in accordance with 10CFR Part 50.73.

Please do not hesitate to contact me if you have any questions regarding this report.

  
R.G. Bird

DWE/b1

Enclosure: LER 88-012-00

cc: Mr. William Russell  
Regional Administrator, Region I  
U.S. Nuclear Regulatory Commission  
475 Allendale Rd.  
King of Prussia, PA 19406

Sr. Resident Inspector - Pilgrim Station

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