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December 5, 1994

Re: Indian Point Unit No. 2
Docket No. 50-247
LER 94-04-00

Document Control Desk
US Nuclear Regulatory Commission
Mail Station P1-137
Washington, DC 20555

The attached Licensee Event Report LER 94-04-00 is hereby submitted in accordance with the requirements of 10 CFR 50.73.

Very truly yours,

Thomas Schmeisser

Attachment

cc: Mr. Thomas T. Martin
Regional Administrator - Region I
US Nuclear Regulatory Commission
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King of Prussia, PA 19406

Mr. Francis J. Williams, Jr., Project Manager
Project Directorate I-1
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US Nuclear Regulatory Commission
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NRC FORM 366 (6-89)

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-0104
EXPIRES: 4/30/92

ESTIMATED BURDEN PER RESPONSE TO COMPLY WTH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Indian Point Unit No. 2	0 5 0 0 0 2 4 7	1 OF 0 5

TITLE (4)

Inadequate Mounting of Control Rod Drive Fan (CRDF)

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)
1 1	0 5	9 4	9 4	— 0 0 4	— 0 0	1 2	0 5	9 4		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)	8 9	20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
		20.405(a)(1)(i)	50.36(c)(1)	50.73(a)(2)(v)	73.71(c)
		20.405(a)(1)(ii)	50.36(c)(2)	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)	50.73(a)(2)(viii)(A)	
		20.405(a)(1)(iv)	X 50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	
		20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
Ed Goetchius, Engineer	AREA CODE 9 1 4 7 3 4 - 5 4 0 4

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS	

SUPPLEMENTAL REPORT EXPECTED (14)		EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE)	X NO				

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

On November 5, 1994, with the unit operating at 89% power, house maintenance crews completed the replacement of 22 Control Rod Drive Mechanism Cooling Fan (CRDF). The fan motor had failed on November 3, and was replaced over the course of several shifts. When the fan was remounted on the reactor missile shield blocks, the lower fan support bolts which mount the fan to the support bracket and to the fan intake duct were out of alignment and could not be reinstalled. The work crew then connected the duct to the fan and support bracket with high strength cable ties to close the gap between the duct and fan, thereby minimizing air inleakage to the duct. This physical arrangement was then reported to and subsequently evaluated by engineering staff and found to be inadequate to support the fan. The fan was removed and later reinstalled in accordance with engineering guidance.

PLANT AND SYSTEM IDENTIFICATION:

Westinghouse 4-Loop Pressurized Water Reactor

IDENTIFICATION OF OCCURRENCE:

Inadequate Mounting of Control Rod Drive Fan (CRDF)

EVENT DATE:

November 5, 1994

REPORT DUE DATE:

December 5, 1994

REFERENCES:

Significant Occurrence Report (SOR) 94-576

PAST SIMILAR OCCURRENCE:

None

DESCRIPTION OF OCCURRENCE:

On November 5, 1994, with the unit operating at 89% power, house maintenance crews completed the replacement of 22 Control Rod Drive Mechanism Cooling Fan. The fan motor had failed on November 3, 1994 and was replaced over the course of several shifts. The work is performed inside the Vapor Containment (VC) which is a radiologically contaminated area and, as such, requires a complete set of protective clothing as well as a faceshield to be worn. The work area temperature varies from 105 to an estimated 120 degrees F.

The Control Rod Drive Mechanism Cooling System is designed to provide ventilation for the control rod drive mechanisms and consists of four CRDF's connected by four ducts to a shroud around the drive mechanisms. Cooler containment air is drawn into the top of the shroud by the action of the fans. Each fan discharges directly up into the containment free volume above the operating floor. Each fan assembly consists of a 15,000 cfm axial flow fan with a butterfly type back draft damper on the fan outlet, and a mounting bracket, or sled, which attaches to the fan upper and lower mounting flanges with bolts and nuts. The sled is then securely mounted to the reactor head missile shield with mechanical fasteners. The fan is attached to the 36" ventilation duct via an expansion joint from the duct top to the fan bottom (inlet) at the lower fan mounting flange with bolts and nuts.

DESCRIPTION OF OCCURRENCE: (continued)

Fan replacement requires moving the fan assembly from the missile shield to a lower radiation level area of containment, changing out the fan and then reinstalling the assembly. The major steps of the task are as follows:

- Electrically disconnect the fan motor
- Unbolt the expansion joint from the fan inlet (this requires the use of a manbasket suspended near the fan).
- Rig the fan assembly to the polar crane
- Unfasten the sled from the missile blocks
- Move the fan assembly to the work area.
- Remove the failed fan from the sled and replace or repair

The reinstallation is performed in the reverse of the removal.

During the reinstallation phase of the work on 22 CRDF, six of the lower fan flange bolts would not align with the expansion joint bolt holes. Believing that the fan was supported by the bolting of the upper bracket, and that the function of the lower bracket was only to support the expansion joint, the crew completed the installation by using cable ties to draw the expansion joint up to the fan flange to minimize air inleakage at the joint. The crew exited containment and turned the work permit in to Operations for testing of the CRDF. The maintenance foreman discussed the as left condition with Operations and based on the information provided, Operations started the fan for testing. The test run was satisfactory, however the fan was not declared operable until the alternate method of fastening the duct was evaluated. House maintenance requested an engineering analysis to validate the alternate mounting arrangement.

ANALYSIS OF OCCURRENCE:

Engineering evaluated that six of the bottom flange flexible duct connection bolts could not be reinstalled. Four wire tie raps were installed in their place and two locations were left blank. The CRDF is restrained and supported via two U-braces connected to a sled which is attached to the missile block. All six bolts were properly installed in the upper U-brace. Each U-brace is attached to the sled via three bolts. None of the six bolts in the lower U-brace were installed (four bolt holes were secured with tie raps.) An evaluation was conducted of the potential failure modes which concluded that the three bolts which attached the upper U-brace to the sled were overstressed in the tension direction. The overstress condition in the tension direction was above yield but below ultimate. The stress in the shear direction both laterally and vertically was below yield and therefore not a concern. A zone-of-influence review was conducted for a postulated drop of the CRDF in the tension direction to ensure that the "missile" generated as a result of a seismic event would not impact safety related items. The empty reactor cavity was the only location for the CRDF to impact. No mechanism was available to divert the CRDF into the Control Rod Drive Shafts. Therefore, there was no potential operability impact as a result of a postulated CRDF drop in the tension direction.

ANALYSIS OF OCCURRENCE: (continued)

This condition was outside the design basis of the plant and therefore was reported under 10 CFR 50.72 (b)(1)(ii)(B). The CRDF is designed to be seismically supported to prevent it from becoming a missile during a seismic event.

The analysis of the fan mounting was initiated because of the use of an alternate fastening method in the field. Further review of the normal maintenance procedure and the refueling procedure (all fans must be removed/reinstalled during a refueling outage) revealed that since the fan bottom bolts are the first bolts removed and the last bolts installed in every removal/replacement cycle, the normal procedure for fan installation/removal causes an overstress condition during maintenance. The fan is not attached to the crane to provide support while the bolting in question is removed since the crane is needed to support a manbasket for the personnel unbolting the duct expansion joint.

CAUSE OF OCCURRENCE:

The Engineering report of unsatisfactory mounting resulted in the completion of significant Operating Report (SOR) No. 94-576 which documented the condition as outside the plant design basis. The SOR also required an in depth investigation of root causes as well as commitments for corrective action. The following contributing factors caused the event:

- Design. The fan support design consists of the sled with the two mounting brackets which bolt to the fan housing upper and lower flanges. The duct riser expansion joint also bolts to the lower fan housing flange. Because attachment of the expansion joint to the bottom fan housing flange and lower U-brace requires that all of the lower bolts be removed at least long enough to install the expansion joint, the lower support is not fastened during this portion of the evolution. As stated in the task description, the lower flange bolts are the first bolts removed and the last bolts installed. The unbolted condition exists during all CRDF repairs for a limited time period.

- Field Fit. The method of removing/replacing CRDFs has not been changed for several cycles. Based on interviews conducted with personnel who have previously done this work, this is the first occurrence of field fit-up problems of this magnitude. The cause for this fit-up problem will be investigated during the next fan changeout.

- The Procedure. The procedure directs the removal of the expansion joint from the fan housing by removing the lower bolts. The stress conditions that have now been determined to exist while the fan assembly is in this interim condition are not acceptable.

CORRECTIVE ACTION:

The CRDF No. 22 was immediately removed from the reactor missile blocks upon completion of the engineering analysis which concluded that the mounting inadequate. This fan was later realigned in the support bracket and replaced with a mounting arrangement approved by engineering. All other CRDF mountings were inspected and were found to be acceptable. CRDF No. 21 had two of the six lower bolts missing. These two bolts were replaced, although engineering analysis of the mounting showed acceptable stress levels.

A procedure/design change will be implemented to assure that an overstress condition is precluded during future CRDF maintenance activities. The procedure will be revised prior to reuse with the objective of more properly addressing the mounting requirements.

All CRDF U-bracket support bolts will be upgraded with higher strength bolts during the 1995 Refueling Outage.

The bolting alignment problems will be investigated during the next repair effort or during the 1995 Refueling Outage. The cause of the alignment problem will be determined and corrected or the fan will be removed by an alternate method which leaves the lower bolting intact.

This event will be reviewed with appropriate supervisory personnel in order to emphasize the importance of rapid resolution of conditions which modify or do not conform to the plant design condition.