

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Reports No. 50-282/87008(DRS); 50-306/87008(DRS)

Docket Nos. 50-282; 50-306

Licenses No. DPR-42; DPR-60

Licensee: Northern States Power Company
International Centre Building
920 Second Avenue South
Minneapolis, MN 55401

Facility Name: Prairie Island Nuclear Generating Plant, Units 1 and 2

Inspection At: Red Wing, Minnesota and Region III Office

Inspection Conducted: May 20, 1987

Inspector: *F. Maura*
F. Maura

6/16/87
Date

Approved By: *G. Wright*
G. Wright, Chief
Test Programs Section

6/17/87
Date

Inspection Summary

Inspection on May 20, 1987 (Reports No. 50-282/87008(DRS); 50-306/87008(DRS))

Areas Inspected: Special, announced inspection by Region based inspector of the licensee's action to determine the cause of the D2 emergency generator lower crankshaft thrust bearing failure and plans to closely monitor both diesel generators for bearing condition. NRC Module 62700 was utilized during this inspection.

Results: No violations or deviations were identified. The cause of the thrust bearing failure has not been identified. Additional checks are yet to be made.

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DETAILS

1. Persons Contacted

Prairie Island Nuclear Plant

- *M. Jablonske, Production Engineer
- *G. Miller, Superintendent Operations Engineering
- *E. Watzl, Plant Manager

USNRC

- *J. Hard, Senior Resident Inspector
- N. Moser, Resident Inspector

*Denotes persons attending the May 20, 1987, exit interview.

2. D2 Bearing Failure

a. Introduction

During the March 1987 annual preventative maintenance (PM) inspection of the D2 diesel generator, the thrust bearing (main bearing No. 13) on the lower crankshaft failed a 0.002" gap check. Upon disassembly, the bearing was found to be severely distressed and some aluminum had transferred to the main journal. A year ago the same bearing was found severely distressed and was replaced (see Detroit Edison's Fermi 2 Inspection Report No. 50-341/85046). Because of the bearing's "short life" an inspection was conducted to review the licensee's investigation into the cause of the failure.

b. Bearing History

The operating history of the two Prairie Island emergency diesel generators was reviewed in 1986 as a result of the Fermi 2 bearing failures experienced in 1985 and 1986. In addition, the inspector had the opportunity to inspect several of diesel D2's bearings and compare the findings with the known history of engine starts and running hours. The operating history of the bearings replaced last March was obtained during this inspection and together with a summary of the previous bearings' history is shown on Table No. 1. From the Table, it can be seen that the present failure occurred in 1/5 the number of starts and running hours, and in 1/11 the number of dry, fast starts experienced prior to the previous failures.

TABLE NO. 1 - PRAIRIE ISLAND DIESEL GENERATORS OPERATING HISTORY

Engine No./Bearing No.	Engine Starts				RUNNING TIME (HRS)
	TOTAL	DRY FAST	PRELUBED FAST	PRELUBED SLOW	
D1 Thrust bearings (upper and lower crankshafts) 5/2/85 to 5/5/87	99	2	83	14	154
D2 Upper and lower crank- shaft thrust bearings replaced April 1986 (1/28/80 to 4/21/86	278	11	254	13	494
Upper and lower crank- shaft thrust bearings replaced March 1987 (4/23/86 to 3/5/87)	53	1	48	4	92
Newly installed thrust bearing (3/5/87 to 5/5/87)	16	1	11	4	34

The replaced, lower crankshaft, thrust bearing was no longer available for inspection, however, based on discussions with the licensee the journal faces of the bearing were as distressed as those of the bearing replaced in 1986, but the thrust faces were in excellent condition. Aluminum was reported to have transferred to the journal. The inspector was able to inspect the upper crankshaft thrust bearing which was also replaced. The loaded half had significant pitting and galling in an area of about 1" on each side of the oil groove from the center hole to the parting line on the non-governor side of the engine. This was expected based on the analysis done by Failure Analysis Associates for Detroit Edison Company.

The inspector reviewed the quarterly lube oil sample results. No abnormal values or trends were noted. Through discussions with the licensee and review of the PM procedures used during this outage, it was determined that:

- (1) All work was done under the guidance of the vendor site representative.
- (2) Licensee maintenance personnel familiar with Fairbanks Morse engines worked on the engine.
- (3) The journal was cleaned, prior to reassembly, with green label Timesaver 111.

- (4) As in the past, no bearing conditioner was used during reassemble. This is in agreement with recommendations made by consultant's for the NRC and the Detroit Edison Company after the failures experienced at Fermi 2.
- (5) The thrust bearing cap did not require any repair, all alignment readings were within vendor specs.
- (6) The vendor has not recommended to the licensee an increase in the number of operating hours under load to "break-in" or "season" a new bearing.
- (7) The vendor took lower crankshaft strain readings at the bearing No. 13 position. According to the licensee, the vendor site representative stated the results indicated no problem with the generator bearing.
- (8) The lube oil filter and strainer were inspected. No metal particles were found on the elements' surface.

c. Corrective Action Taken or Planned

The thrust bearing on each crankshaft was replaced in accordance with licensee and vendor procedures. While the cause of the severe distress found on the thrust bearing has not been determined the licensee is pursuing an adequate investigation program. Among the actions it has committed to take are:

- (1) Gap check D1 diesel generator thrust bearings during June 1987.
- (2) Gap check the D2 diesel generator lower thrust bearing in June 1987 if the D1 bearing gap check is satisfactory, otherwise the check will be done in July 1987 due to the out of service time constraints in the Prairie Island Technical Specifications.
- (3) Visually inspect the D2 generator bearing in July 1987 during the outage planned for blower work.
- (4) Voluntarily report the failure of the thrust bearing and the results of the investigations into its failure to the NRC (after the completion of the checks to be performed during July).
- (5) Strive to complete the lube oil modification, which provides continuous lube oil to the lower crankshaft, on both engines during 1987.
- (6) Continue the engineering work in progress to upgrade Prairie Island electrical system (including the installation of additional diesel generator(s)) with a goal to complete installation in the early 1990's.

- (7) Join in a cooperative effort with other nuclear utilities, owners of Fairbanks Morse engines, and the manufacturer to expedite the development, testing, and production of an improved thrust bearing.

3. Exit Interview

The inspector met with licensee representatives (denoted in Paragraph 1) at the conclusion of the inspection on May 20, 1987. The inspector summarized the results of the inspection and discussed the likely informational content of the inspection report with regards to documents reviewed by the inspector. The licensee did not identify any such documents as proprietary.