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April 11, 1994

C. R. Hutchinson
Vice President
Operations
Grand Gulf Nuclear Station

U.S. Nuclear Regulatory Commission
Mail Station P1-137
Washington, D.C. 20555

Attention: Document Control Desk

SUBJECT: Grand Gulf Nuclear Station
Unit 1
Docket No. 50-416
License No. NPF-29
Degradation of Fasteners on the
Standby Service Water Pump
LER 94-003-00

GNRO-94/00055

Gentlemen:

Attached is Licensee Event Report (LER) 94-003 which is a final report.

Yours truly,

CRH/CDH
attachment
cc:

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Mr. H. W. Keiser (w/a)
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NRC FORM 366 (5-92)		U.S. NUCLEAR REGULATORY COMMISSION				APPROVED BY OMB NO. 3150-0104 EXPIRES 5/31/95				
LICENSEE EVENT REPORT (LER)						ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST 500 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503				
FACILITY NAME (1) Grand Gulf Nuclear Station, Unit 1						DOCKET NUMBER (2) 05000-416		PAGE (3) 01 of 04		
TITLE (4) Degradation of Fasteners on the Standby Service Water (SSW) Pump Coupling										
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 NAME	DOCKET NUMBER
03	10	94	94	003	00	04	11	94	N/A	05000
									FACILITY NAME	DOCKET NUMBER
									N/A	05000
OPERATING MODE (9)		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR § (Check one or more) (11)								
1		20.402(b)		20.405(c)		50.73(a)(2)(iv)		73.71(b)		
POWER LEVEL (10)		20.405(a)(1)(i)		50.73(c)(1)		50.73(a)(2)(v)		73.71(c)		
100		20.405(a)(1)(ii)		50.36(c)(2)		50.73(a)(2)(vii)		OTHER		
		20.405(a)(1)(iii)		50.73(a)(2)(i)		50.73(a)(2)(viii)(A)		(Specify in abstract below and in text, NRC Form 366A)		
		20.405(a)(1)(iv)		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 Charles Holifield / Licensing Engineer						TELEPHONE NUMBER (Include Area Code) 601-437-6439				
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)										
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS
B	BI	P	G200	Y						
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 15 single-spaced typewritten lines) (16)										
<p>On March 3, 1994, unacceptable vibration readings were obtained while conducting a routine run of the 'B' Standby Service Water (SSW) pump and the subsystem was declared inoperable. Discretionary enforcement was granted on March 4, 1994, to extend the 72 hour Technical Specification LCO to 7 days. Inspection of the pump revealed deterioration of the coupling bolts and washers which caused the impeller to rub into the wear rings resulting in premature and excessive wear of the pump bowl and impeller. Repairs were completed and the pump declared operable on March 7, 1994.</p> <p>Testing indicated the 'A' pump met all vibration and performance criteria. However, since the 'A' and the 'B' pumps are the same type, the 'A' pump was also taken out of service on March 10, 1994, for inspection. This inspection revealed similar deterioration but not to the extent found in the 'B' pump. The damage was repaired and the pump declared operable on March 11, 1994.</p> <p>Long term corrective actions are:</p> <ul style="list-style-type: none"> -Incorporate a preventive maintenance program which includes total lift readings, vibration trending analysis and a periodic inspection. -Evaluate changing present coupling assembly to stainless steel bolt/washer material. <p>The plant remained in a stable condition at 100% power throughout the event. This event could have eventually resulted in a condition that alone might have prevented the fulfillment of the SSW system safety function. This incident did not degrade the ability of other plant systems or equipment to perform their intended function. The safety and health of the general public were not compromised by this event. This condition is reportable per 10 CFR 50.73(a)(2)(v).</p>										

NRC FORM 368A (5-92)	U.S. NUCLEAR REGULATORY COMMISSION	APPROVED BY OMB NO. 3150-0104 EXPIRES 5/31/95		
LICENSEE EVENT REPORT (LER) TEXT CONTINUATION		ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503		
FACILITY NAME (1)	Grand Gulf Nuclear Station, Unit 1	DOCKET NUMBER (2)	LER NUMBER (6)	PAGE (3)
		05000-416	94-003-00	2 of 04

A. Reportable Occurrence

On March 3, 1994, Standby Service Water (SSW) 'B' system was declared inoperable due to excessive vibration. Upon inspection of pump internals, it was determined that certain component degradation had caused the vibration. On March 10, 1994, the 'A' SSW pump was also disassembled for inspection. The results of the inspection revealed that the 'A' pump had similar degradation to the same components but not to the extent found in the 'B' pump.

This event could have eventually resulted in a condition that alone might have prevented the fulfillment of the SSW system safety function. This condition is reportable per 10 CFR 50.73(a)(2)(v).

B. Initial Condition

The reactor was in OPERATIONAL CONDITION 1 with reactor water level, temperature and power at 36 inches, 531 degrees F and 100 percent respectively. A routine run was being performed on the 'B' SSW pump.

C. Description of Occurrence

On March 3, 1994, while conducting a routine run on the 'B' SSW pump (P41C001B), unacceptable high vibration readings of approximately four times baseline were obtained. The pump was declared inoperable. Technical Specification 3.7.1.1 requires that with one Standby Service Water (SSW) [B] subsystem inoperable, the inoperable subsystem is to be restored to operable status within 72 hours or be in at least Hot Shutdown within the next 12 hours and in Cold Shutdown within the following 24 hours. Discretionary enforcement was granted on March 4, 1994, to extend the LCO time to 7 days to allow for completion of pump repair. Inspection of the 'B' pump revealed deterioration of the coupling bolts and washers which caused the impeller to rub into the wear rings. This resulted in premature and excessive wear of the pump bowl and impeller. Repairs were completed and the pump declared operable on March 7, 1994.

Testing indicated the 'A' pump (P41C001A) met all vibration and performance criteria. However, since the 'A' and the 'B' SSW pumps are the same type, the 'A' pump was also taken out of service for inspection on March 10, 1994. This inspection revealed deterioration of the coupling bolts and washers but not to the extent found in the 'B' pump. The minor damage to the impeller and bowl was repaired and the pump declared operable on March 11, 1994.

NRC FORM 366A (5-82)	U.S. NUCLEAR REGULATORY COMMISSION	APPROVED BY OMB NO. 3150-0104 EXPIRES 5/31/95		
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FACILITY NAME (1)	Grand Gulf Nuclear Station, Unit 1	DOCKET NUMBER (2)	LER NUMBER (8)	PAGE (3)
		05000-416	94-003-00	3 of 04

D. Apparent Cause

The apparent cause of the pump failure was accelerated degradation of the carbon steel bolts and washers in the shaft coupling assembly. This deterioration was due to corrosion associated with use of dissimilar metals and to under deposit corrosion. The stainless steel pump shaft and carbon steel washer/bolt assembly configuration resulted in conditions conducive to galvanic corrosion in conjunction with possible under deposit corrosion. Deterioration of the washers created the potential for the pump to drop the thickness of a washer for each coupling joint and subsequent failure of the 'A' and 'B' SSW pumps.

A detailed investigation by the site Root Cause Group revealed the predictive and preventive maintenance testing programs to ensure long term operability of all deep draft pumps had been based on a Safety Evaluation supported by data taken from testing and inspection results of the 'A' RHR pump. In this case the Safety Evaluation on these programs appears to have failed to identify all operating parameters. Although the RHR, LPCS and HPCS pumps are deep draft pumps, they are of a different manufacturer, water chemistry environment and coupling bolt material than the SSW pumps.

E. Corrective Actions

Immediate remedial actions included:

- The 'A' and 'B' SSW pumps were disassembled and inspected. Repairs were made using stainless washers and carbon steel bolts and the pumps were re-tested.
- GGNS reviewed other ECCS deep draft pump designs to identify additional uses of dissimilar metals that could result in a galvanic corrosion environment. This review indicated that there are eight safety related deep draft pumps on site: five Byron Jackson pumps with stainless screw-on type couplings and three Gould pumps - two with carbon steel bolts and washers and one with a screw on type coupling. The two Gould pumps with carbon steel bolts and washers are the 'A' and 'B' SSW addressed in this LER.

Long term corrective actions are:

- Incorporate a preventive maintenance program that includes total lift readings, vibration trending analysis and a periodic inspection.
- Evaluate replacing the carbon steel bolts and washers with stainless steel material.

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FACILITY NAME (1) Grand Gulf Nuclear Station, Unit 1	DOCKET NUMBER (2) 05000-416	LER NUMBER (6) 94-003-00	PAGE (3) 4 of 04	

F. Safety Assessment

The plant remained in a stable condition at 100% power throughout the event. This incident did not degrade the ability of other plant systems or equipment to perform their intended function. The safety and health of the general public were not compromised by this event.

G. Additional Information

Energy Industry Identification System (EIIIS) codes are identified in the text within brackets [].