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22 June 1994

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
Voluntary Report Due to Slow Scram Times for Multiple Control Rods
LER 94-006-00

GNRO-94/00088

Gentlemen:

Attached is Licensee Event Report (LER) 94-006 which is an interim report.

Yours truly,

CRH/RR/
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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)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
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TITLE (4)
Voluntary Report Due To Slow Scram Times Of Multiple Control Rods

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
									N/A	05000
05	28	94	94	006	00	06	17	94	FACILITY NAME: N/A	DOCKET NUMBER: 05000

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR § (Check one or more) (11)							
POWER LEVEL (10)	100		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)	X	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)	10 CFR 21	
			20.405(a)(1)(v)		50.73(a)(2)(iii)		50.73(a)(2)(x)	VOLUNTARY	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Riley Ruffin / Licensing Specialist	601-437-2167

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

SUPPLEMENTAL REPORT EXPECTED (14)				EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
X	YES (If yes, complete EXPECTED SUBMISSION DATE)		NO		12	30	94

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single spaced typewritten lines) (16)

On May 28, 1994 during scram time testing of control rods, plant personnel identified that the scram times (to notch 43) for two control rods were not acceptable as defined by GGNS Technical Specifications. The two failures only constituted 10 percent of the random sample of rods which is an acceptable number of failures as specified by GGNS TS. Therefore, further testing was not required by GGNS TS. However, testing continued due to recently identified concerns with delayed operation of the scram pilot valves. The previous condition that was identified on March 26, 1994 was reported in LER 94-004, dated April 26, 1994. Subsequently, all control rods were tested. Out of all rods tested, 38 had unacceptable scram times. As a part of the continued testing, rods that were unacceptable during the test were reworked, retested and returned to service. All TS requirements were met during testing. Based on current fuel exposure, an engineering evaluation indicated that the Minimum Critical Power Ratio safety limit would not have been exceeded as a result of the observed scram times. Therefore, the health and safety of the public were not compromised as a result of this condition.

Preliminary results from root cause investigation activities indicate that the Viton elastomer disc material may be different from the disc material that was installed prior to Refueling Outage 6. The malfunction appears to be retarded release of the Viton disc material from the seating surface in the upper valve body.

Even though this condition did not meet reporting criteria as specified in 10 CFR 50.73, it is being submitted as a voluntary report. This condition is considered a potential Part 21.

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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

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TEXT *(If more space is required, use additional copies of NRC Form 366A) (17)*

A. Reportable Occurrence

During scram time testing, several control rods were observed to have unacceptable scram times to notch 43 (10 percent insertion). Even though during testing no condition was identified that would compromise plant safety, or meet the reporting requirements, the observed condition is being voluntarily submitted. Additionally, this condition is considered potentially reportable in accordance with 10 CFR 21.

B. Initial Condition

On March 27, 1994, the plant was voluntarily shutdown to investigate control rods with slow scram times. At that time, the cause of this condition was attributed to the use of a thread sealant that contained a standard methacrylate ester on the air supply connections for the scram pilot valves. Based on the available information, it was surmised that the compound caused the Viton elastomer seats to slightly adhere to the adjacent seating surface which resulted in a slight delay in the initial opening of the pilot valve's exhaust port. This condition was reported in LER 94-004, dated April 26, 1994. Following complete change-out of all top head assemblies and subsequent testing, the plant was restarted and returned to full power operations. Efforts to conclusively confirm the root cause were continued through additional testing by onsite personnel as well as independent test labs.

On May 28, the scram time surveillance was being performed at an increased frequency to confirm the adequacy of previous corrective actions. The reactor was in OPERATIONAL CONDITION 1 with reactor power at approximately 75 percent power.

C. Description of Occurrence

On May 28, 1994, plant personnel were performing scram time testing of control rods [AA]. A random sample of 20 rods was chosen for testing. Two of the 20 rods had scram times to notch 43 which exceeded GGNS TS surveillance time requirements. These rods were declared inoperable, reworked and satisfactorily returned to service. Even though the number of failures that occurred during this test met the TS limit of less than 20 percent failures, the Plant Safety Review Committee instructed subsequent testing for the remaining rods.

The plant operated at approximately 70 percent power while testing was performed using existing plant procedures. Upon identification of unacceptable scram times, personnel declared the applicable rod inoperable. All TS requirements were met during testing.

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Of the 193 tested rods, 153 were fast (reached notch 43 within ~300 ms), 5 were normal (notch 43 between ~300 and 310 ms), 25 were slow (reached notch 43 between ~310 and 380 ms), 8 failed (reached notch 43 greater than ~380 ms) and due to test switch failures, as-found data for two rods was not taken. All rods (40) which were not considered fast were reworked and retested satisfactorily.

D. Apparent Cause

The investigation of this condition has not been completed at this time. The review of existing test data is inconclusive. However, data indicates a possible defect (as defined by 10 CFR 21.3(d)(4)) with the seating material located in the disc holder sub-assembly ("milk stool") of the scram pilot valves. The seating material is a Viton elastomer which seats against an internal air port. The seating force is supplied by the disc spring along with energized solenoids. Upon deenergization of the solenoids, the milk stool is unseated by the force of the core spring which allows air to vent from the pilot valve cylinder. The venting of the air results in a scram of the associated rod. The malfunction appears to be retarded release of the Viton disc material from the seating surface in the upper valve body which results in a slow (only milliseconds) start of the control rod. This slow start causes the rod to be slow to notch 43 (greater than ~310 ms).

Preliminary results from root cause investigation activities indicate that the Viton elastomer may be different from the seating material that was installed prior to Refueling Outage 6.

E. Corrective Actions

As aforementioned, affected rods were reworked, retested and returned to service. Approximately half of the 40 rods were reworked using the pre-RF06 style seating material and half with the newer material. Based on plant experience, initial retest following installation of the newer seating material yields satisfactory results. However, after some period of time, the operation of some pilot valves appears to degrade.

An aggressive effort is being made to determine the root cause of this condition. Upon completion of the root cause determination, appropriate corrective actions will be taken in order to prevent recurrence. In the interim, an increased testing frequency will continue and repairs will be made as necessary.

A supplemental report will be submitted indicating the results of our investigation and detailing our plans for corrective actions.

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F. Safety Assessment

The affected control rods experienced slow starts. The individual scram times observed for some rods were slower than those used in the Cycle 7 safety analyses. In the analyses, this condition is of primary concern during rapid pressurization transients (e.g., Generator Load Reject Without Bypass). The extremely conservative analyses indicate that in the event of slow rods, the Minimum Critical Power Ratio (MCPR) limits could be exceeded near the end-of-core life (when the axial power shape is peaked towards the top of the core). Therefore, the control rod insertion time to the point where power is turned becomes the limiting action.

At the time of discovery, GGNS was approximately 35 percent into cycle 7; thus the axial power peak shape was closer to the bottom of the core. This allows rods being inserted from the full-out position to promptly turn power which would prevent MCPR safety limit violations in the event of a transient that depends upon control rod insertion for mitigation. Even though some rod times are slower than those assumed by the Cycle 7 analyses, the average time was well within the assumed time to notch 43. Further localized over-power conditions in the area of slow rods are not expected to occur due to the closely coupled design of the GGNS core in which core-wide negative reactivity effects dominate. Therefore, the analyses bound the identified condition due to the current fuel exposure, core design and operating strategy.

As the cycle progresses, the axial power shape will shift upward in the core, fewer control rods are inserted and the void coefficient becomes more negative. Subsequently, core conditions will be reached where a limiting transient coupled with the scram times observed during testing could violate the MCPR safety limit. This condition was conservatively determined to be 132 EFPD from May 28, 1994.

G. Additional Information

Manufacturer: **Automatic Switch Co.**
Valve Model: **HV-176-816**
Supplier: **General Electric (Part # 922D138)**

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