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Grand Gulf Nuclear Station

March 26, 1993

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

Attention: Document Control Desk

SUBJECT: Grand Gulf Nuclear Station
Unit 1
Docket No. 50-416
License No. NPF-29
Automatic Isolation of RWC System
LER 92-014-01

GNRO-93/00039

Gentlemen:

Attached is Licensee Event Report 92-014-01 which is a final report.

Yours truly,

WTC/BAB/cg
attachment

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S PDR

FACILITY NAME (1)
Grand Gulf Nuclear StationOTHER
FACILITY NAMES

0 5 0 0 0

TITLE (4)
Automatic Isolation of RWCU SystemREPORT DATE (7)
MONTH DAY YEAR

03 2 6 9 3

LER NUMBER (6)
SEQUENTIAL NUMBER

REVISION NUMBER

(Check one or more of the following) (11)
☒ 50.73(a)(2)(iv)
☐ 50.73(a)(2)(vi)
☐ 50.73(a)(2)(vii)
☐ 50.73(a)(2)(viii)(A)
☐ 50.73(a)(2)(viii)(B)
☐ 50.73(a)(2)(ix)73.71(b)
73.71(c)
OTHER (Specify in Abstract
Below and in Text, NRC Form
365A)EVENT DATE (5)
MONTH DAY YEAR

0 6 2 5 9 2 9 2 - 0 1 4 - 0 1

OPERATING
MODE (8)POWER
LEVEL
(10)

0 9 9

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5:

20.402(c)

20.405(a)(1)(i)

20.405(a)(1)(ii)

20.405(a)(1)(iii)

20.405(a)(1)(iv)

20.405(a)(1)(v)

20.405(c)

50.36(c)(1)

50.36(c)(2)

50.73(a)(2)(i)

50.73(a)(2)(ii)

50.73(a)(2)(iii)

LICENSEE CONTACT FOR THIS LER (12)

AREA CODE

6 0 1 4 3 7 - 6 3 3 3

TELEPHONE NUMBER

NAME

Bruce A. Burke / Licensing

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

CAUSE SYSTEM COMPONENT

MANUFACTURER

REPORTABLE
TO NRCEXPECTED
SUBMISSION
DATE (15)

MONTH DAY YEAR

SUPPLEMENTAL REPORT EXPECTED (14)
☒ YES ☐ NOYES (If yes, complete EXPECTED SUBMISSION DATE)
ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single space typewritten lines) (16)

Automatic actuation of the reactor water cleanup (RWCU) system outboard containment isolation valves occurred on June 25, 1992 at approximately 1337 hours. The leak detection system (LDS) main steam line tunnel high temperature annunciator alarmed simultaneous to the isolation. No leakage of RWCU or other systems was observed.

LDS features sensitive Panalarm (formerly Riley) temperature switches. It is believed that this spurious isolation was actuated by an LDS trip signal generated by a temperature switch. The leak detection logic actuates RWCU containment isolation valves on a single channel trip signal.

Efforts in 1984 eliminated most spurious operation events prior to the issuance of SIL 443. Age-related degradation of aluminum electrolytic capacitors and fluctuation of supply line voltage are suspected to have caused this and other recent spurious operations and failures. The manufacturer has implemented additional improvements to the switches. Replacement of obsolete model temperature switches with improved units will be performed on an as-needed basis.

The actuation of the RWCU isolation system did not compromise the safe operation of GGNS. All safety related equipment operated as designed. The safety and health of the general public was not affected by this event.

NRC Form 366
(5-83)

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-0104

EXPIRES: 8/31/86

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) Grand Gulf Nuclear Station										DOCKET NUMBER (2) 0 5 0 0 0 4 1 6					PAGE (3) 1 OF 0 4										
TITLE (4) Automatic Isolation of RWCU System																									
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)											
0	6	2	5	9	2	9	2	0	1	4	0	1	0	3	2	6	9	3						0 5 0 0 0	
OPERATING MODE (9)			THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR § (Check one or more of the following) (11)																						
1			20.402(b)				20.405(c)				<input checked="" type="checkbox"/> 50.73(a)(2)(iv)				73.71(b)										
POWER LEVEL (10)			20.405(a)(1)(i)				50.36(c)(1)				50.73(a)(2)(v)				73.71(c)										
0 9 9			20.405(a)(1)(ii)				50.36(c)(2)				50.73(a)(2)(vi)				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)(vii)(A)														
			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)(ix)														
LICENSEE CONTACT FOR THIS LER (12)																									
NAME										TELEPHONE NUMBER															
Bruce A. Burke / Licensing										6 0 1 4 3 7 - 6 3 3 3															
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																
SUPPLEMENTAL REPORT EXPECTED (14)										EXPECTED SUBMISSION DATE (15)		MONTH DAY YEAR													
<input type="checkbox"/> YES (If yes, complete EXPECTED SUBMISSION DATE)										<input checked="" type="checkbox"/> NO															

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

Automatic actuation of the reactor water cleanup (RWCU) system outboard containment isolation valves occurred on June 25, 1992 at approximately 1337 hours. The leak detection system (LDS) main steam line tunnel high temperature annunciator alarmed simultaneous to the isolation. No leakage of RWCU or other systems was observed.

LDS features sensitive Panalarm (formerly Riley) temperature switches. It is believed that this spurious isolation was actuated by an LDS trip signal generated by a temperature switch. The leak detection logic actuates RWCU containment isolation valves on a single channel trip signal.

Efforts in 1984 eliminated most spurious operation events prior to the issuance of SIL 443. Age-related degradation of aluminum electrolytic capacitors and fluctuation of supply line voltage are suspected to have caused this and other recent spurious operations and failures. The manufacturer has implemented additional improvements to the switches. Replacement of obsolete model temperature switches with improved units will be performed on an as-needed basis.

The actuation of the RWCU isolation system did not compromise the safe operation of GGNS. All safety related equipment operated as designed. The safety and health of the general public was not affected by this event.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

APPROVED OMB NO. 3150-0104

EXPIRES: 8/31/88

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
Grand Gulf Nuclear Station	0 5 0 0 0 4 1 6	9 2	— 0 1 4	— 0 1	0 2	OF 0 4

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

A. REPORTABLE OCCURRENCE

Automatic actuation of reactor water cleanup (RWC) system [CE] Division 2 containment isolation valves [NH] occurred at Grand Gulf Nuclear Station (GGNS) on June 25, 1992. Automatic actuation of these RWC system valves by a leak detection system (LDS) [JM] signal is an engineered safety feature (ESF) [JE] actuation. This event is reportable per 10 CFR 50.73(a)(2)(iv). This final report is an update to LER 92-014-00. This report is also intended to provide additional information for reports submitted previously which described spurious operation of identical temperature switches.

B. INITIAL CONDITIONS

The plant was in Operational Condition 1 at approximately 99 percent power with reactor water at approximately 529 degrees F and 1030 psig. The RWC system was in steady state operation with both cleanup pumps in service upon isolation. Surveillance of LDS for reactor core isolation cooling (RCIC) [BN] main steam tunnel isolation delay timer was in progress at the time of the RWC isolation.

C. DESCRIPTION OF OCCURRENCE

The RWC outboard isolation valves closed automatically. This occurred simultaneous to a main steam line tunnel high temperature alarm in the control room.

LDS temperature switch E31-TS-N604B or differential temperature switch E31-TDS-N605B would have initiated the alarm. Neither trip unit switch nor any other switch in either division of LDS was found to be in the trip condition upon inspection following the isolation. No leakage of RWC or other systems was observed during inspection following the isolation. Temperatures were normal in the main steam line tunnels. RWC was restored to operation at 1407 hours on June 25, 1992.

D. APPARENT CAUSE

Investigation has not determined the exact cause(s) of the isolation signal. It is believed that this actuation of the RWC outboard isolation valves was triggered by an LDS trip signal. Trip logic for actuation of RWC containment isolation valves requires only a single channel (i.e., non-coincident) trip signal from LDS.

The monthly surveillance of the RCIC delay timer was in progress coincident to the isolation. This circumstance was investigated to determine its potential effect on the actuation. The power source is common for the temperature switches and the RCIC timer. Performance of the surveillance was evaluated as not having caused the occurrence. No other system transient which preceded or coincided with the isolation is known to have initiated the event.

The cause of the signal is unknown, although spurious operation of temperature switches E31-TS-N604B or E31-TDS-N605B is suspected. LDS features Panalarm (formerly Riley) temperature switches. These sensitive switches have caused numerous RWC isolations due to spurious operation. Age-related degradation of aluminum electrolytic capacitors is suspected to have caused this and other recent spurious operations and failures. This is supported by the fact that spare temperature switches have failed upon installation. Decreases in supply line

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		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
Grand Gulf Nuclear Station	05000416	92	014	010	3	OF 04

TEXT (If more space is required, use additional NRC Form 306A's) (17)

voltage are also suspected as being cause for spurious operations at GGNS as evidenced by recordings of supply line voltage. Panalarm temperature switch models 86 and 86A were the subject of General Electric Service Information Letter (SIL) 443 and its supplement.

Efforts to resolve operational anomalies of these units prior to the issuance of SIL 443 included reworking installed and spare units to eliminate the generic overheating power supply problem. Installations were also inspected for proper wire size and thermocouple type. Both of these items were later described in SIL 443 when it was published in 1986. Deficiencies were corrected as necessary. Some installations also required correction by the installation of wire shielding.

Previous maintenance and engineering reviews as a result of spurious operations of these model temperature switches revealed an assortment of causes including incorrect field wiring installations, broken wiring at a terminal strip, loose wiring connections, drifting or faulty units (i.e., temperature switches), and manipulation of the unit's selector switch to read temperatures during daily readings.

Spurious operation during daily readings was corrected in 1984 after bench testing revealed that spurious operation events increased as the difference between the setpoint and actual temperature reading approached zero. This was attributed to voltage fluctuations which occurred during manipulation of the unit's toggle style selector switch. Bypassing the respective isolation logic prior to taking the unit's selector switch from the SET position to the READ position rectified this condition. This eliminated most spurious operation events at GGNS.

Another item described in SIL 443 dealt with aluminum electrolytic capacitors. The capacitor upgrade apparently was not addressed as part of the pre-SIL disposition at GGNS. The units did not have much service at that time due to plant age. This recommendation was not implemented in response to the SIL. Most spurious operations of the units had already been eliminated. The SIL recommendation was retained for future operational reviews.

Several additional shortcomings of the then improved model (86A) temperature switches were described in SIL 443 Supplement 1. One problem was spurious operation due to voltage drop of its power supply. Another problem was contact chattering due to its burnout protection circuit. Model 86B units incorporated the modifications necessary to eliminate these problems as described by the 1989 SIL supplement.

Recent RWCU isolation events of the same division were reported in LER 91-006 and LER 91-015. Another ESF actuation of RWCU Division 1 containment isolation valves occurred on July 9, 1992 and was reported in LER 92-015.

E. Corrective Action

Temperature switches E31-TS-N604B and E31-TDS-N605B were verified to be within their calibration schedule. The operability test was performed successfully on both units to verify proper function; however, both units were replaced.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

APPROVED OMB NO. 3150-0104
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TEXT (If more space is required, use additional NRC Form 366A's) (17)

Recommendations contained in SIL 443 and its supplement have been reconsidered. Specifications have been changed to assure procurement of improved model temperature switches. Replacement of obsolete models with approved units will be performed on an as-needed basis based on the safety assessment below. It is anticipated that the redesigned models will not have the spurious operation and failure modes that previous models exhibited.

F. SAFETY ASSESSEMENT

The actuation of the RWCU isolation system did not compromise the safe operation of GGNS. Isolation of the RWCU system poses no adverse safety consequence since the RWCU system does not provide a safety function.

The RWCU system isolation valves provide isolation from the reactor coolant pressure boundary. The fail safe position of these isolation valves is closed. Design of LDS isolation logic which interfaces with the RWCU system is based on a non-coincident logic, whereas other LDS logic employs a coincident logic. Operation of a temperature switch causes RWCU isolation valves to go to the fail safe position.

The RWCU inboard isolation valves were operable and not affected by this transient. Safety systems functioned as designed upon receipt of the isolation signal. Other ESF systems were available to perform their intended function and responded as designed. The safety and health of the general public was not compromised by this event.

G. ADDITIONAL INFORMATION

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

Some previous similar events were described in LER 83-109, LER 84-027, LER 85-006, LER 85-012, LER 85-022, and LER 85-023. LER 83-109 described an isolation due to a loose connection on the temperature switch. LER 84-027 and LER 91-006 discussed spurious RWCU isolations which occurred during electrical storms. LER 85-022 discussed spurious operation of a Riley Panalarm temperature switch upon resetting its READ/SET toggle switch to the SET position. LER 85-023 discussed an isolation apparently caused by a failed relay in the temperature switch and possibly faulty wiring installations. LER 85-006, LER 85-012, LER 91-015, and LER 92-015 discussed ESF actuations due to suspected spurious operation of the temperature switches. LER 92-020 described spurious actuation of reactor core isolation cooling [BN] system isolation valves suspected to have been caused by a Panalarm temperature switch.

Sixteen temperature switches were removed previously from LDS trip systems as approved by amendment to the GGNS operating license.