SYSTEM ENERGY RESOURCES, INC.

JOHN G. CESARE, JR.
Director
Nuclear Licensing

June 2, 1989

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

Attention: Document Control Desk

Gentlemen:

SUBJECT: Grand Gulf Nuclear Station
Unit 1
Docket No. 50-416
License No. NPF-29
Reactor Scram on Low Water Level
LER 89-006-00
AECM-89/0105

Attached is Licensee Event Report (LER) 89-006-00 which is a final report.

Yours truly,

JGC:slg
Attachment

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NRC Form 366 (9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/88

LICENSEE EVENT REPORT (LER)

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TITLE (4)
Reactor Scram on Low Water Level

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 5	0 5	8 9	8 9	0 0 6	1 0	0 6	0 2	8 9	N/A	0 5 0 0 0
										0 5 0 0 0

OPERATING MODE (9)	2	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)								
POWER LEVEL (10)	0 0 5		20.402(b)		20.405(c)	X	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)		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
Paul M. Different/Licensing Engineer	AREA CODE 6 0 1 — 4 3 7 - 1 2 1 6

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
YES (If yes, complete EXPECTED SUBMISSION DATE)	X NO				

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

On May 5, 1989 at 0948 hours, the reactor tripped on low reactor water level. A controlled plant shutdown was in progress when operators experienced level control problems. Attempts to control the vessel overfeed condition were unsuccessful and the operating Reactor Feed Pump Turbine (RFPT) tripped on high water level. Subsequent attempts to restart the tripped RFPT and restcre level were unsuccessful.

The cause of the vessel overfeed was determined to be the feedwater heater outlet valves indicating closed when in fact they were slightly open. The RFPT trip reset logic misled the operators when they attempted to restart the tripped RFPT.

Design changes to the feedwater control logic are being evaluated to prevent recurrence. Also training on the event will be conducted to make operators aware of the lessons learned.

All plant safety systems performed as expected. The minimum water level reached was approximately 14 feet above the top of active fuel. All emergency core cooling systems were operable and available to respond if necessary.

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

A. REPORTABLE OCCURRENCE

On May 5, 1989 at 0948 hours, the reactor tripped on low reactor water level. The reactor trip is reported as an Engineered Safety Feature (ESF) actuation pursuant to 10CFR50.73(a)(2)(iv).

B. INITIAL CONDITIONS

The plant was in Operational Condition 2, Startup, at 5 percent thermal power with a controlled shutdown in progress. Reactor Feed Pump Turbine (RFPT) (EIIS System Code: SK) "B" was secured and the reactor feedwater system was aligned for startup level control. Reactor water level was 31 inches as indicated on narrow range instrumentation.

C. DESCRIPTION OF OCCURRENCE

On May 5, 1989 the plant was being taken to cold shutdown for corrective maintenance work on a reactor feedwater motor operated isolation valve (EIIS System Code: SJ). Reactor power was being reduced via control rod insertions. The operators began having difficulty controlling the water level. Level was increasing above the normal band and the startup level control valve (F513) indicated full closed. (See Figure 1 for the feedwater lineup) Because reactor water level continued to increase, the startup level control valve was isolated by closing the F001 valve at approximately 43 inches. The startup level control bypass valve, F040, and the high pressure feedwater heater outlet valves, F009A and B, all indicated closed, but reactor water level continued to increase.

When water level reached approximately 50 inches, operators initiated valve alignments to blowdown water to the main condenser using Reactor Water Cleanup (RWCU) system (EIIS System Code: CE). Before blowdown flow could be established, reactor water level reached the level 8 setpoint (53.5 inches) which tripped the "A" RFPT. Reactor water level began decreasing and the high water level signal cleared.

The "A" RFPT trip logic was manually reset and the "A" RFPT manual speed changer (MSC) was raised to the high speed stop to increase "A" RFPT speed. The turbine control valves did not respond to the demand to open because the MSC had not completed its runback to the low speed stop. As reactor water level continued to decrease, operators attempted to unisolate the "B" RFPT and prepare it for service.

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When reactor water level reached 20 inches, the Reactor Core Isolation Cooling (RCIC) System (EIIS System Code: BN) was manually initiated and Control Rod Drive (CRD) (EIIS System Code: CD) flow was maximized. These combined flows were insufficient to makeup the steam flow out of the reactor. Level decreased to low level 3 (11.4 inches) and a full reactor scram occurred.

Following the automatic scram, immediate operator actions were taken in accordance with the Scram Off-Normal Event Procedure. The inboard Main Steam Isolation Valves (MSIV) were closed to limit the cooldown rate. The minimum reactor water level reached was 3 inches on narrow range. Water level control was reestablished using RWCU blowdown and CRD flow. RCIC was secured and returned to standby. Conditions were restored to normal at 1010 hours on May 5, 1989.

D. APPARENT CAUSE

Previous level control difficulties at low power levels led the operators to focus their attention on the three startup level control valves (F513, F040, and F001) as the cause of the vessel overfeed. The actual root cause of the overfeed was that the feedwater heater outlet valves (F009A and B) were not fully closed but indicated closed. The valve status lights for F009A and B are independent of the closing torque limit. The operating procedure for transferring a RFPT to the startup level controller instructs the operator to slowly jog shut both the F009A and B valves. Hence, it was concluded that both valves were slow jogged closed until the closed indication was obtained. The valves were actually open enough to result in vessel overfeed as power (steam flow) decreased via control rod insertions. This conclusion was demonstrated during the cooldown period following the scram. Water level was being controlled by jogging the "A" RFPT discharge valve F014A open and closed. The F009A and B jog close pushbuttons were depressed and held for several seconds to allow the torque switches to fully close the valves. Afterwards, feedwater could no longer be added to the vessel in this lineup. Level control through the startup level control valve bypass valve F040 was established.

The "A" RFPT would not respond to the demand for feedwater flow since the MSC had not been runback to the low speed stop. On a RFPT trip, the MSC automatically runs back to the low speed stop in slow speed. This takes approximately 1 minute and 17 seconds as demonstrated by testing performed on the RFPT after the scram. However, the operators reset the RFPT trip logic before the MSC had completely runback. This reset stopped the MSC at an intermediate position, without being runback sufficiently to relatch the RFPT control valves. The "A" RFPT indicated it was reset by the illuminated reset light and the clearing of trip alarm. This misled the operators into believing that the RFPT was reset properly and ready to respond to increase turbine speed.

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It was noted during the review of this event that the training simulator is modeled to runback the MSC automatically in fast speed, approximately 9 seconds. This greatly reduces the chances of an operator resetting the trip logic prematurely, and may have contributed to the operator's premature reset of the trip logic during the transient.

The "B" RFPT turbine had been revmoved from service by closing local steam supply valves on a previous shift in accordance with the system operating instruction. The instruction did not contain provisions to place a RFPT in Standby.

E. SUPPLEMENTAL CORRECTIVE ACTIONS

All operation shift personnel were made aware of the concern with jogging of valves such as with F009A/B. Operations personnel were instructed to maintain valves which are jogged in the closed direction for several seconds, after receiving closed indication, to assure that the valves are torqued completely closed. Operators were also informed of the other concerns noted during the event concerning proper reset of a RFPT trip.

The system operating instruction for the feedwater system was revised to add information about the auto runback sequence of the MSC following a RFPT trip. A precaution to completely runback the MSC to the low speed stop before attempting to raise turbine speed was added to the instruction. The instruction was also revised to allow placing a nonoperating RFPT in Standby condition if plant conditions might require feedwater availability.

Several design changes to the feedwater system are being evaluated including a change to make the RFPT MSC auto runback occur in fast speed rather than slow speed. Changes to the RFPT control logic indication are being evaluated to prevent a reset indication when the reset pushbutton is depressed before the MSC has been runback to the low speed stop. Also, a change to prevent the MSC runback inhibit that occurs when the RFPT turbine reset pushbutton is depressed is being evaluated.

Training is being conducted on this event during this requalification training cycle including throttleable valves and RFPT reset logic. The discrepancies between the simulator and the plant concerning MSC runback in fast speed versus slow speed will be changed until the proposed design change for runback of the MSC in fast speed for the plant can be implemented.

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F. SAFETY ASSESSMENT

Plant systems performed as expected during the transient. The reactor scram on high water level 8 is bypassed whenever the reactor mode switch is not in RUN. The reactor tripped as designed on low level 3. The minimum water level attained was 3 inches on narrow range which is approximately 169.7 inches above the top of active fuel. All the emergency core cooling systems were operable and available to inject water to the vessel if level nad continued to decrease.

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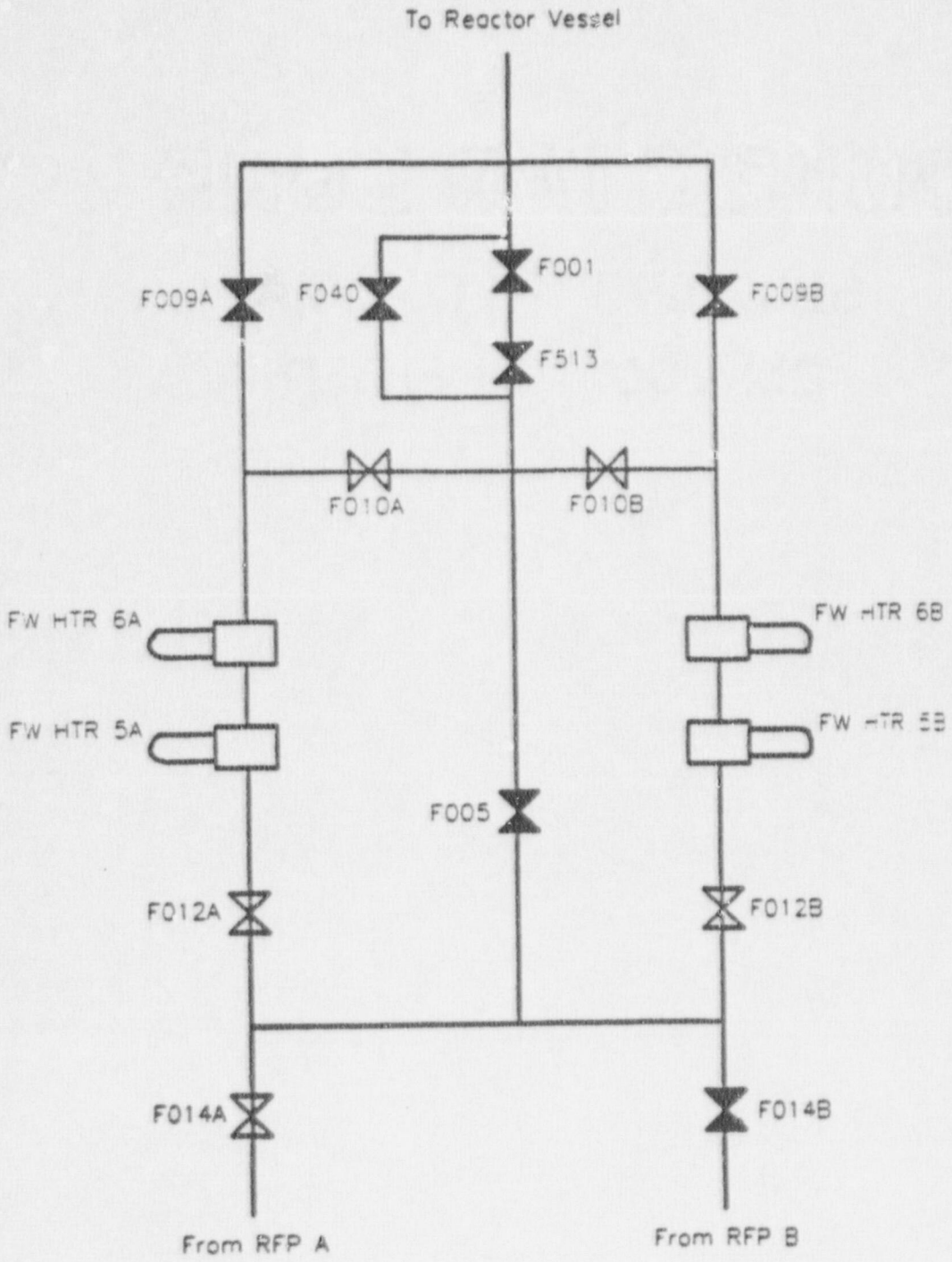

Figure 1
Valve Lineup With S/U Level Controller Isolated