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March 2, 1995

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Subject: Oconee Nuclear Station
Docket Nos. 50-269, -270, -287
LER 269/95-03

Gentlemen:

Pursuant to 10 CFR 50.73 Sections (a)(1) and (d), attached is Licensee Event Report (LER) 269/95-03, concerning the Low Pressure Injection System being technically inoperable.

This report is being submitted in accordance with 10 CFR 50.73 (a)(2)(v)(D). This event is considered to be of no significance with respect to the health and safety of the public.

Very truly yours,

J. W. Hampton
Vice President

/ftr

Attachment

xc: Mr. S. D. Ebneter
Regional Administrator, Region II
U.S. Nuclear Regulatory Commission
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Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
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700 Galleria Parkway
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Mr. P. E. Harmon
NRC Resident Inspector
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NRC FORM 366 (5-92) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
EXPIRES 5/31/95

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.

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Oconee Nuclear Station, Unit One	05000 269	1 OF 7

TITLE (4) The Low Pressure Injection System Technically Inoperable Due To A Design Analyis

EVENT DATE (5)			LER NUMBER (6)			REPORT NUMBER (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
									Oconee, Unit 2	05000 270
01	31	95	95	-- 03 --	00	03	02	95	FACILITY NAME: Oconee, Unit 3	DOCKET NUMBER: 05000 287

OPERATING MODE (9)	N	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)	X 50.73(a)(2)(v) (D)	73.71(c)
		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	TELEPHONE NUMBER (Include Area Code)
L. V. Wilkie, Safety Review Manager	(803) 885-3518

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 15 single-spaced typewritten lines) (16)

On December 27, 1994, during a routine review of an Abnormal Procedure (AP) (Loss of Low Pressure Injection) a System Engineer noted that the AP directs the operators to align Low Pressure Injection (LPI) flow through two headers at approximately 1500 gpm per header, following a Engineered Safeguards (ES) System actuation with a failure of one of the two ES LPI pumps. He was concerned that adequate flow may not be assured due to instrument inaccuracies in this flow range and initiated an operability evaluation. On January 31, 1995, with all three units operating at 100 % full power, Engineering completed a past operability evaluation. The evaluation revealed that all three units had been operating outside of design basis. If LPI flow instrument inaccuracies, Reactor Building Cooler and LPI Cooler fouling are considered, coincident with a postulated single failure of a LPI pump during Emergency Core Cooling System operation, then the Reactor Building pressure/temperature profile required in the Equipment Qualifications (EQ) analysis could have been exceeded. Therefore, it was concluded that the LPI system had been technically inoperable in the past. The root cause of this event was determined to be Design Analysis, Unanticipated interaction of systems or components. The AP was revised.

BACKGROUND

The Low Pressure Injection (LPI) [EIIS:BP] system is an Engineered Safeguard System (ES) [EIIS:JE] designed to maintain core cooling for large break Loss of Coolant Accidents. Low pressure injection is accomplished through two separate flow paths. Each header includes one pump, one heat exchanger, associated piping, valves, and instrumentation and terminates directly in the reactor vessel through nozzles located on opposite sides of the vessel. A third pump (Non ES) which can be shared by both headers is also available and is normally used to remove decay heat during normal shutdowns.

The Reactor Building Spray (RBS) [EIIS:BE] is an ES System designed to remove heat from the Reactor Building (RB)[EIIS:NH] following an accident. The Reactor Building Cooling (RBC) [EIIS:BK] System is an additional system that removes heat from the RB atmosphere. The RBS in conjunction with the RBC and LPI is capable of removing sufficient heat from the containment atmosphere to maintain the RB post-accident conditions (i.e., pressure, temperature, etc.) within the Equipment Qualification requirements.

EVENT DESCRIPTION

On December 27, 1994, a System Engineer (SE) was reviewing the Abnormal Procedure (AP)(Loss of Low Pressure Injection) when he recognized that, for some single failure scenarios, the AP required the Operators to isolate the Reactor Building Spray (RBS) pumps after realignment of the LPI system suction to the Reactor Building sump. He recalled that the Safety Evaluation Report took credit for RBS operation to meet 10CFR100 limits. As a result, he generated a Problem Investigation Process (PIP) (0-094-1821) to address the potential for violating 10CFR100 dose limits.

Also during this procedure review, the SE noted that the Loss of LPI AP states that if a failure of one LPI pump occurs following Engineered Safeguards System actuation, the operator is to align flow through both headers at approximately 1500 gpm per header. The SE recalled a calculation (LPI Flow Loop Instrument Accuracy calculation completed May 5, 1989) which revealed that LPI flow transmitters are increasingly inaccurate as flow is decreased from the design value (3000 gpm per header). As a result, he assumed that the increased inaccuracy could lead to inadequate emergency core cooling flow or inadequate Net Positive Suction Head to LPI and/or RBS pumps depending upon the direction of the error. He generated another PIP (0-094-1822) for further evaluation of this problem.

On December 27, 1994, at 1400 hours, a meeting was held by Station Management to discuss the problems discovered by the System Engineer. At 1645 hours, management concurred that, using the design basis Maximum Hypothetical Accident (MHA) assumptions, the AP would not assure that 10CFR100 limits would be met. At this time, Technical Specification 3.0 (12 hour Limiting Condition For Operation) was conservatively entered. Management directed that the AP (Loss of LPI) should be revised to prevent isolation of the RBS pumps, if only one LPI pump is available. Management concluded that additional evaluation was necessary to determine if the second problem affected operability. Management also conservatively directed that the AP be revised to eliminate low flow through both headers. These changes eliminated both issues for current operability. System Engineering continued their past operability evaluation for both problems.

Following the meeting, at 1730 hours, a red phone call was made to the NRC reporting the event associated with the isolation of RBS pumps.

At 2225 hours, the AP (Loss of LPI) was revised to inject LPI flow through one header and the 12 hour Limiting Condition For Operation was exited. This is the design configuration for a single train and results in accurate flow instrumentation.

On January 11, 1995, Engineering completed the past operability evaluation on the RBS issue. Using actual past performance data including Integrated Leak Rate Test results, rather than Final Safety Analysis Report design basis assumptions, it was concluded that 10CFR100 limits would not have been exceeded during a MHA. Therefore, all three units were determined to be past operable for this issue. As a result of the operability evaluation, a retraction of the red phone call was made to the NRC on January 17, 1995.

On January 31, 1995, Engineering completed the past operability evaluation on PIP 0-O94-1822 concerning LPI split flow. The evaluation revealed that all three units had been operating outside of design basis due to a step in the AP (Loss of LPI) to split LPI flow. This step, when evaluated considering:

1. Instrument inaccuracies,
2. Fouling of Reactor Building Coolers and LPI Coolers (reported in LERs 269/87-04, 287/88-03 and 287/89-01), and
3. Certain postulated single failures of the LPI pumps

could have resulted in Equipment Qualifications (EQ) requirements (Adopted in 1982) being exceeded. Therefore, it was concluded that the LPI System had been technically inoperable in the past. At 1835 hours, a red phone call was made to the NRC to report this inoperability.

CONCLUSIONS

The root cause of this event is determined to be Design Analysis, Unanticipated interaction of systems or components. The splitting of Low Pressure Injection (LPI) flow, upon a failure of an LPI pump has been in place since the initial startup of Oconee as a mitigation action to provide additional flow to the core in the event of a Core Flood line break. In 1982, the Equipment Qualification (EQ) requirements were adopted for Oconee. At that time, Engineering evaluated the EQ requirements for design basis accidents. However, Engineering did not analyze the affect of splitting of LPI flow, instrument inaccuracies at low flows, and cooler fouling during all configurations allowed by the Emergency Operating Procedures and Abnormal Procedures. If these items had been analyzed at that time, the technical inoperability could have been prevented.

A review of LERs written within the last two years revealed that five events (269/93-01, 269/93-03, 269/93-04, 269-94-01 and 269/94-04) involved Design Analysis, Unanticipated interaction of systems or components. LER 269/93-01 involved a condition that may have prevented Keowee Hydro Station [EIIS:EK] from supplying Oconee's emergency power paths. LER 269/93-03 involved a suction stabilizer bladder that could have prevented the stabilizer from functioning properly during Standby Shutdown Facility [EIIS:NB] scenarios. LER 269/93-04 involved a potential single failure that could close all Condenser Circulating Water [EIIS:BS] Pump Discharge Valves on single unit following a Loss of Coolant Accident/Loss of Offsite Power. LER 269/94-01 involved a potential seismic interaction that could have resulted in the loss Emergency Condenser Circulating Water. LER 269/94-04 involved a postulated event that may have rendered the Post Accident Core Cooling system inoperable. All five of the events identified above involved design deficiencies; therefore, the event is ccnsidered to be recurring. The corrective actions for the events identified above included modifications, completion of single failure analysis and Design Basis Documents. Because the period of inoperability reported in this report occurred prior to the discovery of the problems reported by those LERs, the associated corrective actions could not have prevented this event.

Revisions of the Emergency Operating Procedures and Abnormal Procedures are currently reviewed by System Engineering, prior to the implementation. These reviews should prevent similar events in the future. The Design Basis Document process and testing should identify similar events, if they exist.

This event did not involve an equipment failure and therefore was not NPRDS reportable. There were no radiological overexposures, radioactive releases or personnel injuries associated with this event.

CORRECTIVE ACTIONS

Immediate

1. The Abnormal Procedure (Loss of Low Pressure Injection) was revised to inject Low Pressure Injection (LPI) flow through one header.

Subsequent

None

Planned

None

SAFETY ANALYSIS

The Low Pressure Injection (LPI) system provides emergency coolant injection which is necessary following a Loss of Coolant Accident (LOCA). It also provides suction to the High Pressure Injection (HPI) [EIIS:BQ] system after the Borated Water Storage Tank (BWST) is depleted and the Reactor Building (RB) emergency sump becomes the long-term suction supply for cooling the core. The LPI also rejects heat from the RB in order to stay within the Equipment Qualification (EQ) envelope. Following certain single failures there will only be one LPI pump in operation. For this situation the Abnormal Procedure (AP) (Loss of LPI) directs the operator to split the LPI flow to both headers, while maintaining a total flow < 3000 gpm in order to prevent pump runout. A minimum total flow is also necessary to ensure core cooling. Due to LPI flow instrument inaccuracy when LPI flow is split between two flowpaths, it is possible that either the runout flow limit or the minimum flow limit may be exceeded. An evaluation of the safety significance of this situation follows.

The Emergency Operating Procedure (EOP) requires the operator to maintain ≥ 1000 gpm to each header, but ≤ 3000 gpm total flow. Due to instrument inaccuracies, if the indicated header flow was 1000 gpm, the actual flow might vary from 0 to 1755. This leads to two possible scenarios involving indicated high and low flow conditions.

If instrument error caused the indicated flow to be lower than the actual flow, the operator would try to increase flow to get within the procedural limits. If actual flow began to approach pump runout conditions, a pump Dp alarm should occur to warn the operators. In accordance with the Alarm Response Manual, the operator would reduce flow sufficiently to clear the alarm and begin diagnosing the problem. Since actual flow would be more than adequate to cool the core, core conditions would be stable with slowly decreasing temperatures. The operator would be satisfied, but would probably notify the Emergency Response Organization (ERO) of the discrepancy. This scenario is expected to maintain RB conditions within the EQ requirements, since sufficient LPI flow will exist.

If instrument error caused the indicated flow to be higher than actual flow, the operator would try to throttle total flow below the 3000 gpm procedural limit. There is a degree of error where this could result in cooling the core adequately to prevent fuel damage, but not provide enough LPI flow to maintain EQ requirements. If the instrument error was severe, the actual LPI flow would not be adequate to maintain the core covered, and the operator would be directed into sections of the EOP which requires an increase in Emergency Core Cooling System flow (LPI and HPI) and greater use of the Steam Generators as a heat sink. As the BWST becomes depleted, the systems would be realigned to take suction from the emergency sump. HPI would be supplied from LPI pump discharge and HPI flow would be monitored on instruments with less expected error. This would further reduce the flow seen by the LPI flow instruments, and would be expected to increase the magnitude of the LPI measurement error. This mode would also provide adequate core cooling, but would not assure that EQ requirements could be met. As in the first scenario, it is expected that the operators would inform the ERO that an LPI flow problem existed and efforts would be made to diagnose and correct the problem.

The ERO would be monitoring the long-term response of the RB, but does not have procedural guidance to verify adequate EQ conditions exist. The ERO would be dependent on System Engineering personnel to monitor RB conditions, to recognize if EQ requirements were not being met, and to assist in maximizing total RB cooling. However, due to LPI flow instrument

error, it is possible that some equipment may be exposed to an environment more severe than the EQ limit.

During the period of time that the LPI system was technically inoperable, no event occurred which required long term core cooling. Therefore, the health and safety of the public was not affected by this event.