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FACIL:50-269 Oconee Nuclear Station, Unit 1, Duke Power Co. 05000269

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SUBJECT: LER 88-008-00:on 880301,SSF HVAC svc water flow capacity below design value for worst-case SSF event mitigation.
W/8 ltr.

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NRC Form 366 (9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/85

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Oconee Nuclear Station, Unit 1	0 5 0 0 0 2 6 9	1 OF 0 6

TITLE (4) SSF HVAC Service Water Flow Capacity Below the Design Value for Worst-case SSF Event Mitigation

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 3	0 1	8 8	8 8	— 0 0 8 —	0 0	1 2	0 1	8 8	Oconee Unit 2	0 5 0 0 0 2 7 0
									Oconee Unit 3	0 5 0 0 0 2 8 7

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: *(Check one or more of the following)* (11)

OPERATING MODE (9): N	[ ] 20.402(b)	[ ] 20.405(c)	[ ] 50.73(a)(2)(iv)	[ ] 73.71(b)
POWER LEVEL (10): 1 0 0	[ ] 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)	[X] 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 (AREA CODE)
Philip J. North, Regulatory Compliance	7 0 4 3 7 3 - 7 4 5 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)

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

EXPECTED SUBMISSION DATE (15): MONTH ___ DAY ___ YEAR ___

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

On March 1, 1988, testing of the SSF HVAC Service Water System revealed maximum system flow capacity below the design value for worst-case SSF Event mitigation. This decrease in capacity was identified during review of the test data on March 3, 1988.No immediate corrective action was taken since lake water temperature was well below the maximum assumed in the worst-case analysis. Design Engineering confirmed operability of the system. Station status was not affected. There are several postulated root causes of the incident, though positive confirmation has not been completed. Contributing to the incident were: seemingly incorrect pressure drop data from the heat exchanger vendor, insufficient capacity margin for fouling in raw water piping, possible air entrainment in condenser discharge piping, and possibly the effects of oversized pump discharge check valves.

IE22

INTRODUCTION

On March 1, 1988, testing of the Standby Shutdown Facility (SSF) HVAC Service Water System revealed maximum system flow capacity below the design value for worst-case SSF Event mitigation. This decrease in capacity was identified during review of the test data on March 3, 1988, at approximately 1400 hours. The SSF, and therefore this incident, applies to all three Oconee units.

No immediate corrective action was taken since lake water temperature was well below the maximum assumed in the worst-case analysis. Cooling capacity of the system was expected to be adequate; Design Engineering was requested to confirm the adequacy of the system with an operability evaluation. The evaluation confirmed operability of the system. Station status was not affected.

There are several postulated root causes of the incident, though positive confirmation has not been completed. Contributing to the incident were: seemingly incorrect pressure drop data from the heat exchanger vendor, insufficient capacity margin for fouling in raw water piping, possible air entrainment in condenser discharge piping, and possibly the effects of oversized pump discharge check valves.

BACKGROUND

The Oconee SSF is designed to provide an alternate and independent means to achieve and maintain hot shutdown for one or more units. It would be operated only in the event installed normal and emergency systems are unavailable.

The SSF HVAC Service Water (SW) system provides condenser cooling water flow for a chiller which cools the SSF Control Room, battery (EIIS:BY) rooms, and electrical equipment rooms, as well as the security computer (EIIS:CPU) and other non-safety loads. This SW system has two pumps which take suction from the Condenser Circulating Water (CCW) system (EIIS:BS) piping. The system was originally designed so one pump would serve as a backup to the other. Service water flow is directed from the 2 inch pump discharge, through 3 inch check valves, a flow orifice, strainers, both chiller condensers, and is returned to the CCW piping. A bypass is provided around each condenser for low-load situations.

During the summer of 1987, Oconee was analyzed for operation at lake temperatures higher than 75 degrees F. The higher water temperature impacted the capacity of the SSF HVAC system. The flow requirement for SSF HVAC SW increased to 41 gpm and procedures were revised to run both pumps simultaneously to achieve this capacity. Procedures were also revised to manually trip the security computer (an HVAC load) if room temperature became excessive.

It should be noted that the maximum SSF HVAC SW temperature during an SSF event is about 18 degrees F higher than the initial lake (CCW) temperature. The water is circulated thru the SSF, returned to the CCW piping, and then is once again recirculated through the SSF. The SSF Auxiliary SW pump minimum flow and the cooling water for the SSF Diesel (EIIS:DG) are also recirculated in this manner. The diesel cooling water is the primary source of heat for the returning water. This re-use of cooling water allows enough time for installation of a submersible pump into the CCW intake canal to replenish the SSF water source. The diesel cooling water, after one recirculation, is diverted to the yard to avoid further heating of the remaining available water supply.

DESCRIPTION OF INCIDENT

On March 3, 1988, Oconee Performance personnel concluded the SSF HVAC SW system was incapable of meeting the flow rate specified by Design Engineering for a worst-case SSF Event. The maximum flow rate to the HVAC condensers measured during testing on March 1, 1988, was 34.5 gpm, with both SSF HVAC SW pumps running. Design had specified a minimum of 41 gpm to the condensers for an SSF event, and under test conditions the flow rate should have been higher than 41 gpm.

The HVAC SW flow provides cooling water to condense refrigerant entering the HVAC compressor. Inadequate flow thru the condenser would result in poor cooling, at a minimum, and could cause the compressor (EIIS:CMP) to trip due to high head pressure. Loss of the compressor would result in loss of all cooling capacity. This would mean that during an SSF event, temperatures in the SSF control room, electrical equipment rooms, and battery rooms would potentially reach levels unacceptable to support SSF event mitigation. High temperatures would threaten control room habitability and electrical component operability.

Due to the very low lake temperatures measured at the time of the incident, it was expected that analysis would show the SSF HVAC SW system was indeed operable in spite of the lower flow rate. Further testing by Oconee Performance and Design Engineering was performed March 10-15, 1988, to establish the actual capacity of the system.

Preliminary analysis completed on March 21 verified system operability and a formal operability statement was issued on April 13, 1988, and revised on May 27, 1988. Worst case analysis showed 25.9 gpm would be available but with lake temperature at 67 degrees F or below only 24 gpm would be required for SSF event mitigation. (The revised operability statement changed the maximum lake temperature from 74 degrees F to 67 degrees F; an error in calculations was found and corrected).

Design Engineering also identified a change in operating procedures which would assure SSF HVAC operability for lake temperature up to 85 degrees F. The procedures at that time, due to adequate margin in the system, did not necessarily divert SSF diesel cooling water immediately after one recirculation through the SSF. Some additional heating of the remaining water available for the SSF after one recirculation was therefore possible. Procedures were revised to divert the diesel cooling water immediately following one recirculation, as indicated by temperature monitors, to assure the maximum allowable HVAC SW temperatures would not be exceeded. Implementation of this procedure change assured the SSF would remain operable for lake temperatures as high as 85 degrees F.

Investigation into the cause of the reduced flow proceeded in parallel with the operability evaluations. Additional diagnostic testing was performed on May 4, 1988. Testing and subsequent analysis produced several findings:

- The flow-measuring orifice/transmitter was indicating 2 to 3 gpm lower than actual flow. A correlation between indicated and actual flow rates was developed over a range of flows.

- Pressure drop through the condensers was considerably higher than the values provided by the manufacturer.

- Pressure drop between the pump discharge and the flow orifice was higher than anticipated. Since this is a raw water system, it is expected the higher DP is due to service-induced fouling, though the over-sized check valves (3" in a 2" line) could be contributors.

- Pressure drop in the condenser discharge lines was higher than anticipated. This higher DP could be due to fouling, or due to air blockage (coming out of solution under vacuum).

- The 3-way valves which serve to isolate condenser bypass flow in high cooling load situations failed to fully shut off bypass flow. Although this further reduced the flow margin available for operability, total flow minus leakage flow was still adequate.

The valve stroke was re-adjusted and subsequent testing showed the bypass leaking was eliminated.

Along with the testing and analysis, a review of previous test data for the HVAC SW pumps was undertaken by Oconee Performance to determine if past operability (ie. during the Summer of 1987) was affected by lower flow capacity. Due to the system alignment for previous tests, maximum capacity of the system was not obtained and thus the data is inconclusive with regard to previous operability.

An Urgent Modification was initiated on July 8, 1988, to provide a third, higher capacity, HVAC SW pump in series with the two existing pumps. Although the root cause(s) of the reduced flow had not been finally established, the modification was begun to assure operability in case the lake temperature exceeded 85 degrees F. It was also recognized that once the higher capacity pump was installed, more conclusive diagnostic testing over a higher flow range could be performed. Higher flow was especially important for determining if air blockage in the condenser discharge lines was a problem. The modification was partially installed before lake temperature leveled off at which time the modification was put on hold. The installation of stainless steel piping upstream of the HVAC SW flow orifice was completed; the removed carbon steel pipe had a considerable amount of rust which served to decrease its internal diameter as much as an eighth of an inch in places.

On November 7, 1988, HVAC SW pump check valve CCW-271 was inspected for deposits or excessive rust which could block flow. Although the valve internals were rusty, the valve disc swung freely and no flow restriction was observed. Since this valve was considered acceptable the valve in the parallel line (CCW-274) was not inspected.

CAUSE OF OCCURRENCE

On March 1, 1988, due to a combination of factors, the SSF HVAC SW system was incapable of providing design flow rates through the HVAC condensers during an SSF event. Factors involved in the reduced flow capacity included potentially erroneous vendor design data information, service-induced fouling, and possible system design errors. The incident is classified as OTHER in that the potential causes of the incident are several and no firm conclusions have been drawn.

Due to low lake water temperature the system was found to be operable at the time of discovery of reduced flow capacity. Operating procedures

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

were revised before the lake temperature rose to unacceptable levels such that the HVAC SW system was never determined to be inoperable. No releases of radioactive materials, radiation exposures, or personnel injuries were involved.

CORRECTIVE ACTIONS

Based on initial engineering assessment, the immediate corrective action was to judge the system operable due to the low lake water temperature measured at the time of the incident. Design Engineering began verification of system operability.

Subsequent corrective action was to complete a preliminary analysis verifying operability on March 21, 1988. A formal operability statement was provided by Design Engineering on April 13, 1988. Design identified procedure changes necessary to assure operability for a lake temperature as high as 85 degrees F, which were subsequently implemented by the station.

Planned corrective actions are to modify both the SW system and the HVAC system to restore appropriate margin to the HVAC design. The two existing HVAC SW pumps will be provided new motors and impellers to increase their capacity. The HVAC system modification will remove the non-safety HVAC loads from the present system and add a new non-safety system to carry these loads. The security computer will be placed on this new system.

ANALYSIS OF OCCURRENCE

The SSF HVAC SW system, when discovered to be degraded beyond its design basis was still capable of performing its safety function. No loss of a safety system resulted from this incident since the low lake temperature more than compensated for the reduction in system capacity.

The SSF is designed to provide an alternate and independent means to achieve and maintain hot shutdown for one or more units. It would be operated only in the event installed normal and emergency systems are unavailable. Additionally, maximum SSF HVAC system performance is required only when the SSF Diesel is required to operate. Some events requiring the use of SSF components do not require diesel operation and therefore do not require full HVAC capacity. In that no plant situation has required the actuation of any SSF components, no reduction in HVAC SW flow during high lake temperatures has been identified, and HVAC SW system operability at the time reduced flow was measured has been verified, it is concluded the incident caused no adverse safety consequences and had no impact on the health and safety of the public.

Duke Power Company
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Hal B. Tucker
Vice President
Nuclear Production

DUKE POWER

December 1, 1988

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

Subject: Oconee Nuclear Station
Docket No. 50-269, -270, -287
LER 269/88-08

Gentlemen:

Pursuant to 10CFR 50.73 Sections (a)(1) and (d), attached is Licensee Event Report (LER) 269/88-08 concerning decreased standby shutdown facility (SSF) HVAC service water flow capacity. By letter dated July 15, 1988 the NRC was informed of the delay in submitting this report.

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

Very truly yours,

Hal B. Tucker

Hal B. Tucker

PJN/438/mmf

Attachment

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