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)
McGuire Nuclear Station, Unit 1	0 5 0 0 0 3 6 9	1 OF 0 7

TITLE (4) Unit Entered TS 3.0.3 When Train A Of ECCS And Train B Of The Component Cooling System Were Inoperable Due To External Causes

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 9	1 2	8 8	8 8	0 2 4	0 0	1 0	1 2	8 8	N/A	0 5 0 0 0
										0 5 0 0 0

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
POWER LEVEL (10)	1 0 0	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)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
		20.405(a)(1)(iii)	XX 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
Steven E. LeRoy, Licensing	AREA CODE 7 0 4 3 7 3 - 6 2 3 3

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)	XX NO				

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

On the morning of 09/12/88, Performance (PRF) was monitoring the flow and differential pressure (D/P) parameters for the Component Cooling (KC) heat exchangers and discovered that the D/P across one of the Unit 1 and both of the Unit 2 KC heat exchangers was in the action range (D/P $\geq$ 8.8 psid). PRF notified Operations (OPS) of the potential inoperability of the KC system for both units. After PRF discussed the potential inoperability of the KC system with OPS, PRF began performance testing 1B KC Heat Exchanger. The heat exchanger failed the performance test and PRF informed OPS. At approximately 0950, OPS entered Unit 1 into Technical Specification 3.0.3 because Train A of the Emergency Core Cooling System was already declared inoperable for maintenance work and because 1B KC Heat Exchanger failed its performance test which rendered Train B of the Emergency Core Cooling System inoperable. OPS performed a high velocity water flush which lowered the D/P across the 1B KC Heat Exchanger to an acceptable level. Unit 1 exited the action statement of Technical Specification 3.0.3 at 1045. A Cause of External Cause is assigned to this event because 1B KC Heat Exchanger failed its performance test because of seasonal environmental factors.

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

INTRODUCTION:

On the morning of September 12, 1988, Performance (PRF) personnel were monitoring the flow and differential pressure (D/P) parameters for the Component Cooling (KC) heat exchangers and discovered that the D/P across one of the Unit 1 and both of the Unit 2 KC heat exchangers was in the action range (D/P $\geq$ 8.8 psid). PRF personnel notified Operations (OPS) Control Room personnel of the potential inoperability of the KC system for both units.

After PRF personnel discussed the potential inoperability of the KC system with OPS Control Room personnel, PRF personnel began performance testing 1B KC Heat Exchanger. The heat exchanger failed the performance test and PRF personnel informed OPS Control Room personnel.

At approximately 0950, OPS Control Room personnel entered Unit 1 into the action statement of Technical Specification 3.0.3 because Train A of the Emergency Core Cooling System was already declared inoperable for maintenance work and because 1B KC Heat Exchanger failed its performance test which rendered Train B of the Emergency Core Cooling System inoperable. OPS personnel performed a high velocity water flush which lowered the D/P across the 1B KC Heat Exchanger to an acceptable level. Unit 1 exited the action statement of Technical Specification 3.0.3 at approximately 1045.

There was not a problem with the Unit 2 KC system because Train A and Train B KC Heat Exchangers were flushed with high velocity water and they passed the performance tests.

Unit 1 was in Mode 1, Power Operations at 100% power, when Unit 1 entered in the action statement of Technical Specification 3.0.3.

A Cause of External Cause has been assigned to this event because 1B KC Heat Exchanger failed its performance test because of seasonal environmental factors.

EVALUATION:

Background

Technical Specification (TS) 3.5.2 specifies that two independent Emergency Core Cooling System (ECCS) subsystems be operable in Mode 1 (Power Operations), Mode 2 (Startup), and Mode 3 (Hot Standby). During unit operation in Modes 1, 2, and 3, when one train of ECCS becomes inoperable, the inoperable train must be returned to operable status within 72 hours, or the unit must be shut down to Mode 4 (Hot Shutdown). If both trains of ECCS are inoperable, TS 3.0.3 applies, and the unit must be shut down to Mode 5 (Cold Shutdown) unless at least one train is made operable within an hour.

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TS 3.0.3 states that when a Limiting Condition for Operation and its associated action statements are not met within one hour, action must be initiated to place the affected unit in a mode in which the specification does not apply.

The KC system [EIIS:CC] serves as an intermediate cooling system and a secondary boundary between systems contaminated with radioactivity (including the ECCS) and the Nuclear Service Water (RN) system [EIIS:BI]. This arrangement ensures that any leakage of radioactive fluid into the KC system from components being cooled is contained within the station. There are two KC heat exchangers [EIIS:HX] for the Unit 1 KC system, one for each train. One heat exchanger is adequate to supply minimum engineered safeguards heat transfer requirements. One heat exchanger is required during normal plant operation and is also adequate for minimum unit cooldown requirements. RN system water flows through the tube side of the KC heat exchangers. The KC heat exchangers are shell and tube type heat exchangers which are manufactured by Delta Southern.

Testing surveillance programs for verifying system and equipment operability have surveillance intervals which may be variable or fixed. Acceptance criteria are established at a point at which corrective action should be initiated. The acceptance criteria for the KC heat exchangers include an acceptable range (D/P < 7.92 psid), an alert range (D/P of > 7.92 psid but < 8.8 psid), and an action range (D/P > 8.8 psid) for the $D/\overline{P}$ parameters. In the alert range the heat exchanger is operable but marginal and in the action range the heat exchanger is inoperable. The surveillance interval is selected to be frequent enough, and the action criteria is selected to be far enough from safety limits to identify developing problems before they threaten safety.

The Unit 1 KC heat exchangers are tested by PRF personnel using procedures PT/1/A/4401/05A,05B, Component Cooling Train 1A, 1B Heat Exchanger Performance Test. The established testing frequency is quarterly and is increased to monthly in the fall when the lake experiences inversion and environmental fouling. Also, in response to similar fouling problems experienced by the KC heat exchangers in the Fall of 1987, the Process Control and Data Acquisition system was installed to allow daily or more frequent D/P monitoring.

If a KC heat exchanger fails the performance test, it is often corrected by high velocity water flushing. The normal cooling flow through the KC heat exchanger is considerably lower than flow during accident conditions and the low flow contributes to silt accumulation. To flush the heat exchanger, flow is increased as much as practical. If the flush is not successful, the heat exchanger must be mechanically cleaned.

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Description of Event

On the morning of September 12, 1988, PRF personnel were monitoring the flow and D/P parameters for the KC heat exchangers using their Process Control and Data Acquisition system and discovered that the D/P across one of the Unit 1 and both Unit 2 KC heat exchangers was in the action range. PRF personnel called the Control Room Senior Reactor Operator and discussed the potential of one of the Unit 1 and both Unit 2 KC heat exchangers being inoperable. The Control Room Senior Reactor Operator instructed PRF personnel to come to the Control Room and discuss the problem. In the meantime, PRF personnel gathered their test equipment to begin testing 1B KC Heat Exchanger. PRF personnel discussed testing 1B KC Heat Exchanger with Control Room personnel and at aproximately 0840, PRF personnel entered the test procedure into the Pericdic Test Logbook.

PRF personnel proceeded to set up their test equipment. At approximately 0920, PRF Staff personnel informed PRF personnel at the Unit 1 KC heat exchangers that OPS personnel had adjusted RN flow and that they could proceed with testing 1B KC Heat Exchanger. PRF personnel obtained the test data from 1B KC Heat Exchanger and telephoned the results of the test data to PRF Staff personnel. PRF Staff personnel performed the necessary calculations and determined that 1B KC Heat Exchanger did not meet the acceptance criteria. PRF Staff personnel notified the PRF personnel at the KC heat exchangers that 1B KC Heat Exchanger did not meet the acceptance criteria and that they should inform OPS Control Room personnel of the results of the testing. PRF Staff personnel also instructed PRF personnel at the KC heat exchangers to request OPS Control Room personnel to perform a high velocity water flush of 1B KC Heat Exchanger.

PRF personnel informed OPS Control Room personnel that 1B KC Heat Exchanger had failed its performance test and at approximatly 0950, OPS Control Room personnel entered Unit 1 into the action statement of TS 3.0.3 because Train A of the ECCS was already declared inoperable for maintenance work. KC supplies cooling water to some Train B components of the ECCS, thus both trains of the ECCS were inoperable.

OPS Control Room personnel performed a high velocity water flush to lower the D/P across the heat exchanger to an acceptable level. PRF personnel verified that the D/P across 1B KC Heat Exchanger did meet the acceptance criteria.

At approximately 1045, Unit 1 exited the action statement of TS 3.0.3.

There was not a problem with the Unit 2 KC system because Train A and Train B KC Heat Exchangers were flushed with high velocity water and they passed the performance tests.

Conclusion

The established testing frequency for the KC heat exchangers is quarterly and is increased to monthly in the fall when Lake Norman experiences inversion and environmental fouling increases. At the time of this event, Lake Norman had not experienced inversion. PRF personnel also monitor flow and D/P parameters using the Process Control and Data Acquisition system 5 days a week. During the week if these parameters are in the alert range (D/P of $\geq$ 7.92 psid but $<$ 8.8 psid) PRF personnel request OPS personnel to flush the heat exchangers which usually lowers the D/P. This event is assigned a Cause of External Cause because of the KC heat exchangers fouling, and the subsequent failing of the performance test being a seasonal environmental problem. It has been demonstrated that periods of increased flow (flushing) through the KC HXs tends to lower the D/P. This is apparently because higher water velocities will carry away silt left behind by normal operating water velocities. It has not yet been determined by station or Design Engineering personnel exactly what environmental factor is causing the problem. PRF personnel have initiated Station Problem Reports requesting that design studies be initiated for enhancements to the RN system to reduce heat exchanger fouling problems. Nuclear Station Modifications MG-12129 and MG-22129 will be implemented to replace the RN system inlet valves to the KC heat exchangers. This replacement should reduce heat exchanger fouling problems.

Design Engineering personnel have completed one design study which evaluated the RN system for control of environmental debris. The study determined that the only two feasible solutions to the problem are: 1) A closed loop RN system; or, 2) A large filter. It was determined by Design Engineering personnel that neither option is cost effective at the present time.

This event is reportable to the Nuclear Plant Reliability Data System (NPRDS). A search of the NPRDS revealed numerous instances of heat exchanger fouling. It should be noted that not all plants report heat exchanger fouling to the NPRDS unless TS limits were exceeded.

A review of McGuire Licensee Event Reports (LER) revealed no previously documented events that involved TS 3.0.3 being entered into, and attributed to a cause of External Causes. However, a reportable event currently being investigated (LER due to NRC October 19, 1988) will document an event of entering the Action Statement of TS 3.0.3 because of External Causes involving the Unit 2 KC heat exchangers. LER 369/87-31 reported entering the Action Statement of TS 3.0.3 when one train of KC did not pass a performance test while the other train was already inoperable due to maintenance. LER 370/87-22 reported an inadequate KC heat exchanger operability determination program. After that report was submitted, the Process Control and Acquisition system was installed allowing PRF personnel the capability of continuously monitoring the KC heat exchangers. There have also been non-reportable incidents involving KC heat exchanger performance.

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CORRECTIVE ACTIONS:

Immediate: OPS personnel performed a high pressure water flush of 1B KC Heat Exchanger and Unit 1 exited the action statement of TS 3.0.3.

Subsequent: Integrated Scheduling Shift Engineers are monitoring the KC flow and D/P parameters on night shifts and on weekends and will initiate measures to prevent the D/P parameter from approaching the action range. These surveillances will be done until the environmental conditions of the lake improves or returns to normal.

Planned: None

SAFETY ANALYSIS:

Unit 1 entered TS 3.0.3 for approximately 55 minutes because both trains of the ECCS were inoperable because of a lack of a dedicated cooling water source from Train B of the KC system and because Train A of the ECCS was inoperable. Train A KC Heat Exchanger was operable during this time and one KC heat exchanger is adequate to supply minimum engineered safeguards heat transfer requirements. Train A KC Heat Exchanger flow could have been manually re-aligned to supply Train B of the ECCS with cooling water.

The largest postulated thermal load on the KC system would be the Decay Heat Removal (ND) heat exchangers during a large break Loss of Coolant Accident. Following a Safety Injection, KC loads would be isolated except the ND heat exchangers, Reactor Coolant pump motor bearings and thermal barrier cooling. These loads would probably have been within the degraded capability of 1B KC Heat Exchanger.

Even though Train B KC Heat Exchanger did not pass its performance test, the acceptance criteria (D/P < 8.8 psid) is conservative. Based on a model assuming uniform depositing of silt on the heat exchanger tubes, the limiting D/P for design basis heat transfer is above 10.0 psid. The D/P for 1B KC Heat Exchanger was found to be 10.6 psid; therefore, the heat exchanger should have been capable of transferring heat.

In addition, two other factors were more favorable than those assumed in normal accident analysis: 1) RN water temperature in the fall, when this problem is likely to occur, is 65 degrees-F or less, rather than 78 degrees-F used in accident analysis; and, 2) Increased resistance in the KC heat exchangers would increase the flow through other heat exchangers, including Containment Spray, which would partially compensate for loss of KC heat removal.

No incidents occurred to challenge heat transfer capability of the KC heat exchangers or the ECCS during the period covered by this report.

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There were no personnel injuries, radiation overexposures, or releases of radioactive material as a result of this event.

This event is considered to be of no significance with respect to the health and safety of the public.

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DUKE POWER

October 12, 1988

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

Subject: McGuire Nuclear Station, Unit 1
Docket No. 50-369
Licensee Event Report 369/88-24

Gentlemen:

Pursuant to 10CFR 50.73 Sections (a)(1) and (d), attached is Licensee Event Report 369/88-24 concerning Unit 1 entering Technical Specification 3.0.3. This report is being submitted in accordance with 10CFR 50.73(a)(2)(i)(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

SEL/346/mmf

Attachment

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