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 4

TITLE (4)
Unit Shutdown Due to Cold Leg Accumulator Low Boron Concentration

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 0 0
0 4	0 9	8 5	8 5	—	0 1 1	—	0 0	0 5	0 9	8 5		0 5 0 0 0

OPERATING MODE (9)	3	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)					
POWER LEVEL (10)		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)	X	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
	AREA CODE
Jerry Day - Licensing	7 0 4 3 7 3 - 7 0 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	
B	B P	V	W 0 3 0	N		B	B P	V	F 1 3 0	N	
B	B P	V	F 1 3 0	N		B	B P	V	F 1 3 0	N	

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 April 9, 1985, a shutdown of McGuire Unit 1 was completed as required by Technical Specification 3.5.1.1 LCO c., Action a, Cold Leg Injection Accumulator inoperable due to low boron concentration. Unit 1 was in Mode 1 at 33 percent power at the time of discovery. The cause of the event is a component failure, because of the leakage of valves 1NI-82, 1NI-80, 1NI-67, 1NI-56.

Corrective actions consisted of returning the boron concentration to within Specifications, valve realignment, and the leaking valves will be repaired during the current refueling outage.

The health and safety of the public were not affected.

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

INTRODUCTION: On April 9, 1985, McGuire Unit 1 completed a shutdown to comply with Technical Specification requirement 3.5.1.1c. This specification requires that each cold leg accumulator be maintained with a boron concentration of between 1900 and 2100 parts per million (ppm). Samples taken from Cold Leg Accumulator "A" prior to the unit shutdown revealed the boron concentration had fallen below the 1900 ppm requirement.

Operations personnel attempted to correct the low boron situation with a series of accumulator tank draining and refilling using water with a higher boron concentration. They were unable to correct the low boron concentration condition within the time limit specified in the Specification, and the unit was shut down.

The unit was in Mode 1 at 33 percent power at the time the low boron concentration was discovered.

The incident is classified as a Code 7-0, Component Failure/Malfunction, due to leakage of valves 1NI-82, 1NI-80, 1NI-67, and 1NI-56. The leaking valves, identified at an earlier date, had caused station Operation's personnel to initiate complex valve alignments to minimize the leakage.

EVALUATION: Each of the four cold leg accumulator tanks contain 1350 cubic feet of dilute boric acid at approximately 450 pounds per square inch (PSIG) pressure. The accumulator tanks are designed to inject water into the reactor cold legs during large break loss-of-coolant accidents to limit the peak fuel cladding temperatures. The boric acid concentration is required by Technical Specification 3.5.1.1c to be between 1900 and 2100 ppm.

In 1984, Operations personnel identified a problem in maintaining the water levels in cold leg accumulator tanks "A" and "B". The levels were increasing due to a leak from the reactor coolant (NC) system into the accumulator tanks. The leakage path was physically identified by checking piping temperatures upstream from the accumulator discharge check valves. The leakage path was identified as from NC Loop 3 through 1NI-82, 1NI-80, 1NI-67 and 1NI-56 into Cold Leg Accumulators "A" and "B".

At the time this leak path was identified, the main problem for system operation was maintaining the tank levels. The boron concentration from the NC system was high enough (~700-800 ppm) that the tank boron dilution rate was not significant. As the unit neared the end of life for the fuel cycle, the NC system boron concentration was greatly reduced (~ 50 ppm). This caused a much higher dilution rate in the accumulator tanks as the low boron NC water mixed with the water in the accumulator tanks.

A special valve alignment was initiated to stop the accumulator "in leakage" and provided a flow path for the NC system leakage away from the accumulator tanks and piping. This arrangement allowed the accumulator tanks to leak down slowly and kept the piping full of high boron concentration water. The valve alignment and chemistry sampling requirements were documented on Operation's Special Order No. 85-3.

The accumulator leakage, in this special valve arrangement, had resulted in the Accumulator Tank "A" having to be filled approximately every four hours. The high boron concentration water (~ 2050 ppm) from the Refueling Water Storage Tank (RWST) was pumped

into accumulator tank "A". This constant drain and fill method worked well for the majority of the time. The problem encountered using this method occurred as the fill process was ending and the drain process was beginning. The internal valve construction of valve 1NI-95 would, under high reverse flow conditions, allow the valve to act as a check valve. This action would stop the accumulator tanks from draining and allow "in leakage" to return to the accumulator tanks.

Operations personnel believe that 1NI-95 did "check" the drain path flow following the drain and fill operation completed on April 8, 1985, at 1010. The drain and fill was initiated to increase the boron concentration following a low chemistry sample result. The checking action of 1NI-95 allowed low boron concentrated (∿ 50 ppm) NC water to enter and further dilute the accumulator tank. The subsequent chemistry samples indicated that the boron concentration was still dropping and Operations personnel reinitiated the drain and fill operation. One drain path was to the chemistry primary sample sink. The other drain path was to the WEFT and was apparently blocked by the "checking" action of 1NI-95 during one or more of the fill and drain cycles. When Operations personnel did not see the boron concentrations increasing in the accumulator, they started various valve troubleshooting manipulations in an attempt to determine the cause. One manipulation was to close 1NI-96. This valve was not immediately reopened following subsequent valve manipulations.

This allowed more NC water to leak into the accumulator. The associated piping then became full of low boron concentrated water. As the fill process started, the low boron water in the piping was also forced into the accumulator, diluting the accumulator out of Specifications.

The boron concentration of Cold Leg Accumulator "A" was restored to within specifications (1900 ppm - 2100 ppm) On April 9, 1985, at 0900. Unit 1 was returned to service and operated to the end of fuel life, on April 19, 1985, without further incidents.

CORRECTIVE ACTION:

Immediate: Upon receiving chemistry sampling verification that Cold Leg Accumulator "A" was out of specification, unit shutdown was commenced per Technical Specification requirements.

Subsequent: The normal accumulator valve alignment was restored. Filling and draining operations increased the boron concentration to an acceptable level.

Planned: The leaking valves (1NI-82, 1NI-80, 1NI-67, and 1NI-56) will be repaired during the current Unit 1 refueling outage.

Operations personnel have submitted a Station Problem Report identifying the need for a bidirectional flow valve replacement for valve 1NI-95.

Two Nuclear Station Modifications (NSM) are in the design stages to replace the cold leg accumulator check valves with another type valve.

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

SAFETY ANALYSIS: The operability of the four cold leg accumulators ensure that a sufficient volume of borated water will be injected into the reactor core through each of the cold legs in the event that the NC system pressure drops below the pressure of the accumulators. The Final Safety Analysis Report single failure analysis on the Emergency Core Cooling system states that the contents of only three of the four accumulator tanks need to be injected in order to limit the peak cladding temperature at or below the maximum allowable. The other three Cold Leg Accumulators were operable throughout this event.

Cold Leg Accumulator "A" was not isolated from the system when it was declared inoperable. In the event of a large break loss of coolant accident, the contents of all four accumulators would have been injected with a total minimum average boron concentration of 1935 ppm (A = 1881 ppm, B = 1912 ppm, C =1979 ppm, D = 1971 ppm).

During this incident, Operations took required actions to shut down the unit in a safe manner until the "A" accumulator was returned to operable conditions.

The health and safety of the public were not affected by this incident.

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VICE PRESIDENT
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May 9, 1985

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

Subject: McGuire Nuclear Station, Unit 2
Docket No. 50-370
LER 369/85-11

Gentlemen:

Pursuant to 10 CFR 50.73 Sections (a)(1) and (d), attached is Licensee Event Report 369/85-11 concerning the completion of a shutdown as required by Technical Specifications due to low boron concentration in a Cold Leg Accumulator, which is submitted in accordance with §50.73 (a)(2)(i)(A). This event was 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

JBD/mjf

Attachment

cc: Dr. J. Nelson Grace, Regional Administrator
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