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 5

TITLE (4)
Both Trains of Hydrogen Mitigation System Inoperable

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 1	8 6	8 6	— 0 1 7	— 0 0	1 0	1 3	8 6		0 5 0 0 0
										0 5 0 0 0

OPERATING MODE (9): 2

POWER LEVEL (10): 0 0 0

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

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 (AREA CODE)
Jerry B. 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
X	B B	H R T B	E 1 4 7	YES					

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 September 11, 1986, at 0220, it was determined that both trains of the Unit 1 Hydrogen Mitigation (EHM) system were inoperable. The system was determined to be inoperable during quarterly surveillance testing. The cause for the inoperable system was multiple failures of the hydrogen ignitors used in the system. The failures were apparently due to the ignitors' service life being exceeded. All but two ignitors were replaced and tested by September 14, 1986.

Unit 1 was in Mode 2, Start-up, at the time of the incident.

The ignitor failures were randomly dispersed throughout containment as would be expected due to the generic cause of failure. Also, there were only two ignitor locations where both train ignitors failed. Therefore, a general coverage of containment with operable ignitors was maintained.

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☆U.S.GPO:1984-0-454-481/18759

On September 11, 1986, at 0220, it was determined that both trains of the Unit 1 Hydrogen Mitigation [EIIS:BB] (EHM) system were inoperable. The system was determined to be inoperable during quarterly surveillance testing. The cause for the inoperable system was multiple failures of the hydrogen ignitors used in the system. The failures were apparently due to the ignitors' service life being exceeded. All but two ignitors were replaced and tested by September 14, 1986.

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BACKGROUND

The Hydrogen Mitigation system is provided to remove hydrogen from containment atmosphere during an accident condition. This system contains 72 ignitors located throughout containment in dead-ended compartments and other areas where hydrogen gas pockets are most likely to form. The system is provided to ensure burning in a controlled manner as hydrogen is released instead of allowing it to be ignited at high concentrations by a random ignition source.

The ignitors are segregated into Trains A and B with each location containing an ignitor from each train. Each train of the system must be demonstrated operable at least once per 92 days be energizing the power supply breakers and verifying that at least 32 ignitors are energized and at least once per 18 months by verifying the temperature of each ignitor is a minimum of 1700 degrees-F.

The 18 month surveillance test requires a visual inspection and temperature measurement of each ignitor while energized. The circuit current of each group of ignitors is measured to establish baseline circuit current data for the ignitors when normally operated.

The 92 day surveillance test requires the ignitors to be energized and the circuit current measured. If an ignitor becomes inoperable, a significant reduction of circuit current (approximately 1 ampere per ignitor) will be measured.

Previous experience with the EHM system has shown that with age (presumably due to corrosion) the ignitor circuits draw less circuit current which may require revision of the baseline data circuit current used to detect inoperable ignitors.

DESCRIPTION OF INCIDENT

On September 6, 1986, periodic testing of the EHM system began to satisfy quarterly surveillance requirements of T.S. 4.6.4.3.a. Problems were encountered with the test. The "as-found" test data obtained was consistently lower than the acceptance criteria stated in the procedure. Based on previous experience, it was suspected the acceptance criteria needed revising to reflect the data obtained by the 18 month surveillance test performed a month earlier. The technicians contacted engineering personnel regarding the problem and it was jointly decided to review the previous test data to determine if a procedure change was necessary, but they

were unable to locate the data. The periodic test surveillance work request was rescheduled until the personnel responsible for the system were on duty.

On September 8, 1986, the test acceptance criteria was reviewed and it was discovered that different methodologies were being used by different personnel. The testing and investigation of possible reasons for discrepancies in the data and acceptance criteria continued. On September 10, 1986, personnel and supervision met to discuss the method of determining the operability of the EHM system. The decision was made to perform visual inspections and temperature measurements in conjunction with taking circuit current readings as soon as possible.

Personnel visually discovered several ignitors of Train A not burning and declared Train A of the EHM system inoperable. Upon further investigation, it was discovered that several Train B ignitors were not burning and Train B of the EHM system was declared inoperable. With both trains of the EHM system inoperable and Unit 1 in Mode 2, shutdown of Unit 1 began within one hour and reached Mode 3 shortly thereafter as required by T.S. 3.0.3. The ignitors which were not burning were replaced with spare ignitors. Due to limited available spares, a meeting was held by McGuire management personnel to determine a plan of correction. The plan consisted of: 1) replacing the known inoperable ignitors and performing temperature measurements to verify operability, 2) entering Mode 2 to perform Zero Power Physics Testing of the Unit 1 reactor, and 3) shutting down to Mode 3 and replacing all ignitors with the exception of the two ignitors located in the incore instrument room prior to starting up for long term operation. McGuire management personnel contacted the NRC to inform them of the inoperable hydrogen ignitors and the plans for returning these ignitors to operable status prior to the start-up of Unit 1. The NRC concurred with the plan.

Replacement and testing of the ignitors which were found inoperable began as did the "burn-in" period of newly procured replacement ignitors. The "burn-in" procedure is a method used to reduce the early failure rate of newly installed ignitors. The ignitors are energized with a lower than normal operating voltage which is increased in steps to full operating voltage over a 10 hour period of time.

Due to the time required by the burn-in procedure of the newly procured ignitors and the time required to replace all existing ignitors, the plan to replace only the known inoperable ignitors initially was implemented. On September 12, 1986, at 1700, Unit 1 entered Mode 2. Zero Power Physics Testing and checkout of the turbine were completed and Unit 1 entered Mode 3 on September 13, 1986, at 0635. Replacement of all ignitors which had not been replaced began. On September 14, 1986, all EHM system ignitors for Unit 1 had been replaced and tested, except for the two ignitors in the incore instrumentation room. These two ignitors were not replaced due to access limitations at the time; however, one of the two ignitors had been replaced just four weeks earlier. Unit 1 entered Mode 2 at 0230.

CONCLUSION

This incident is attributed to the failure of the ignitors. A total of 19 of the 72 ignitors installed were found failed. This number of failures is more than ever found before. During the life of the plant, a maximum of only one or two ignitors have been found failed during each 18 month surveillance test. It is postulated that the ignitor failures of this incident were due to the ignitor's expected life being reached. The life expectancy of the ignitors used is unknown at this time. Based on the experience gained from this incident, the expected life may be approximately five years if the ignitors are only energized for quarterly and yearly surveillance testing. (The ignitors for Unit 1 were installed approximately five years ago and a large number failed during the quarterly surveillance test of this incident.)

An analysis of the failed ignitors is being performed to determine the expected life of the ignitors. I&E personnel plan to replace all ignitors on a regular basis until analyses to provide life expectancy are completed.

A review of past incidents revealed no previous incidents of this type. Therefore, this incident is not considered recurring.

CORRECTIVE ACTIONS

Subsequent:

1) All Unit 1 ignitors were replaced except the two in inaccessible locations.

2) A test box was built to ensure similar test methodologies are used consistently.

3) The stocking levels of ignitors and installation materials were revised to ensure spares are available to make a full system replacement of ignitors.

4) Additional test equipment was requested to perform the temperature measurement test.

Planned:

1) The EHM system test procedures will be revised to clarify the actions necessary if ignitors are found inoperable per the acceptance criteria.

2) The EHM system test procedure will be revised to ensure a consistent test methodology is performed.

3) Duke will determine a specific life expectancy of the ignitors to use in maintaining the EHM system operable.

SAFETY ANALYSIS

The Hydrogen Mitigation system provides no function required to safely shut down the reactor. The system provides an additional means of preventing the accumulation of high concentrations of hydrogen which may be generated after a Loss of Coolant Accident (LOCA). The system's function is not required in the mitigation of any design basis event. Further study of hydrogen generation and accumulation, as supported by the Probabilistic Risk Assessment for McGuire, revealed that the system is overdesigned. The change of stagnant hydrogen accumulation in numerous areas appears less likely than originally postulated.

The ignitor failures were randomly dispersed throughout containment as would be expected due to the generic cause of failure. Also, there were only two ignitor locations where both train ignitors failed. Therefore, a general coverage of containment with operable ignitors was maintained. The Containment Air Return fans and the Hydrogen Skimmer system fans would provide air circulation which would further minimize the possibility of stagnant hydrogen accumulating in areas where ignitors were unavailable. Hydrogen elimination is also handled by the hydrogen recombiners of the Hydrogen Skimmer system. The hydrogen recombiners were available during this incident.

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

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October 13, 1986

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

Subject: McGuire Nuclear Station, Unit 1
Docket Nos. 50-369
LER 369/86-17

Gentlemen:

Pursuant to 10CFR50.73, attached is Licensee Event Report 369/86-17 concerning both trains of the Unit 1 Hydrogen mitigation system being inoperable due to equipment failure. This event was considered to be of no significance with respect to the health and safety of the public.

Very truly yours,

H.B. Tucker /JBD

Hal B. Tucker

JBD/108/jgm

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