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U.S. Nuclear Regulatory Commission
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Washington, D.C. 20555

Subject: McGuire Nuclear Station, Unit 1
Docket Nos. 50-369
Licensee Event Report 369/03-02, Revision 0
Problem Investigation Process No.: M-03-00543

Pursuant to 10 CFR 50.73, Sections (a)(1) and (d), attached is Licensee Event Report (LER) 369/03-02, Revision 0.

On February 4, 2003, with McGuire Unit 1 at 100 percent power, an Auxiliary Feedwater System motor operated valve experienced a valve stem failure during planned maintenance. Repair of this valve stem could not be completed within the Technical Specification Required Action Completion Time of 72 hours. Therefore, a Notice of Enforcement Discretion was requested and granted for an additional 72 hours to complete the repair. See the attached LER for additional details.

This LER is being submitted as per the requirements of 10 CFR 50.73 (a)(2)(i)(B). Probabilistic risk assessment has determined this event to be of no significance to the health and safety of the public. There are no regulatory commitments contained in this LER.

D. M. Jamil

Attachment

IE22

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NRC FORM 366 (7-2001) U.S. NUCLEAR REGULATORY COMMISSION	APPROVED BY OMB NO. 3150-0104 EXPIRES 7-31-2004
LICENSEE EVENT REPORT (LER) (See reverse for required number of digits/characters for each block)	Estimated burden per response to comply with this mandatory information collection request. 50 hours Reported lessons learned are incorporated into the licensing process and fed back to industry Send comments regarding burden estimate to the Records Management Branch (T-6 E6), U S Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to bjs1@nrc gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202 (3150-0104), Office of Management and Budget, Washington, DC 20503 If a means used to impose information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
McGuire Nuclear Station, Unit 1	05000 369	1 OF 7

4. TITLE
Operation Prohibited by Technical Specifications 3.6.3 and 3.7.5 due to an Inoperable Auxiliary Feedwater System Valve for Greater than 72 Hours

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
02	07	03	2003	- 002 -	00	04	04	2003	FACILITY NAME	DOCKET NUMBER

9. OPERATING MODE	1
10. POWER LEVEL	100

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)

	20 2201(b)		20 2203(a)(3)(ii)		50.73(a)(2)(ii)(B)		50 73(a)(2)(ix)(A)
	20 2201(d)		20 2203(a)(4)		50.73(a)(2)(iii)		50.73(a)(2)(x)
	20 2203(a)(1)		50 36(c)(1)(i)(A)		50 73(a)(2)(iv)(A)		73.71(a)(4)
	20 2203(a)(2)(i)		50 36(c)(1)(ii)(A)		50.73(a)(2)(v)(A)		73.71(a)(5)
	20 2203(a)(2)(ii)		50 36(c)(2)		50.73(a)(2)(v)(B)		OTHER Specify in Abstract below or in NRC Form 366A
	20 2203(a)(2)(iii)		50 46(a)(3)(ii)		50 73(a)(2)(v)(C)		
	20 2203(a)(2)(iv)		50 73(a)(2)(i)(A)		50 73(a)(2)(v)(D)		
	20.2203(a)(2)(v)	X	50.73(a)(2)(i)(B)		50 73(a)(2)(vii)		
	20.2203(a)(2)(vi)		50.73(a)(2)(i)(C)		50 73(a)(2)(viii)(A)		
	20.2203(a)(3)(i)		50.73(a)(2)(ii)(A)		50 73(a)(2)(viii)(B)		

12. LICENSEE CONTACT FOR THIS LER

NAME	TELEPHONE NUMBER (Include Area Code)
Lee A Hentz, Regulatory Compliance	704-875-4187

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
B4	BA	ISV	R378	YES					

14. SUPPLEMENTAL REPORT EXPECTED		15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE).	NO				

16. ABSTRACT (Limit to 1400 spaces, i e., approximately 15 single-spaced typewritten lines)

Unit Status: At the time of the event, Unit 1 and Unit 2 were in Mode 1 (Power Operation) at 100 percent power.

Event Description: On February 4, 2003, Auxiliary Feedwater System Valve 1CA-42B was declared Inoperable to perform scheduled maintenance. While functionally testing this valve following maintenance, its valve stem failed. Repair of this valve stem could not be completed within the Technical Specification Required Action Completion Time of 72 hours which expired on February 7, 2003. Therefore, a Notice of Enforcement Discretion was requested and granted for an additional 72 hours. The restoration of valve 1CA-42B was completed within this additional 72 hours.

Event Cause: The valve stem failure was caused by an overload condition resulting from the failure of the limit and torque control functions of the motor actuator switch mechanism. The control function failure was due to previous vendor assembly deficiencies combined with the recent maintenance.

Corrective Action: Restore valve 1CA-42B to original design specification. Revise procedures to detect and prevent improper actuator assembly and prevent improper actuator annealing. Inspect other affected valves for improper actuator assembly.

NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)* (17)

BACKGROUND

The following information is provided to assist readers in understanding the event described in this LER. Applicable Energy Industry Identification (EIIS) system and component codes are enclosed within brackets. McGuire unique system and component identifiers are contained within parentheses.

Auxiliary Feedwater System

The Auxiliary Feedwater System [BA] (CA) automatically supplies feedwater to the steam generators [AB-SG] (S/G) to remove decay heat from the Reactor Coolant System [AB] (NC) upon the loss of normal feedwater supply [SJ] (CF). The CA System consists of two motor driven pumps [BA-P] and one steam turbine driven pump configured into three trains. Each of the motor driven pumps supplies 100 percent of the flow requirements to two steam generators, although each pump has the capability to be realigned to feed other steam generators. The turbine driven pump provides 100 percent of the flow requirements to all four steam generators.

Valve 1CA-42B

Valve 1CA-42B [BA-ISV] is a motor operated isolation valve on the line to the 1D S/G from the 1B Motor Driven CA Pump discharge. The safety functions for this valve are containment isolation, to remain open to align CA to the 1D S/G, and to close to isolate CA from the 1D S/G following a S/G tube rupture or faulted S/G. This valve is a 4 inch parallel slide gate valve manufactured by Atwood & Morrill with an actuator (motor operator) manufactured by Rotork.

The Rotork actuator switch mechanism functions to activate and deactivate switches to control valve position or provide valve position indication. The motor control portion of the switch mechanism can be used to stop the actuator at a specific position or at a specific motor torque. The valve actuator consists of the switch mechanism, add-on-pak, motor, and gear assembly. The major components of the switch mechanism are the overtravel guide bar, striker plate, retainer circlip, cam saddle, screwed shaft, and the torque helix.

Technical Specifications Affected

The Limiting Condition for Operation (LCO) associated with Technical Specification (TS) 3.7.5, Auxiliary Feedwater System, states that three CA trains shall be OPERABLE. This LCO is applicable in Modes 1, 2, and 3. It is also applicable in MODE 4 when steam generators are relied upon for heat removal. TS 3.7.5 Condition B states that, with one CA train INOPERABLE in MODE 1, 2, or 3 for reasons other than Condition A (one steam supply to turbine driven pump inoperable), restore the CA train to OPERABLE status in 72 hours. Condition C states that if the required action and associated completion for Condition B are not met, the unit must be in Mode 3 in 6 hours and in Mode 4 in 12 hours.

The LCO associated with TS 3.6.3, Containment Isolation Valves, states that each containment isolation valve shall be OPERABLE. This LCO is applicable in Modes 1, 2, 3, and 4. TS 3.6.3 Condition C states that, with one or more penetration flow paths with one containment isolation valve INOPERABLE, isolate the affected penetration flow path by use of at least one closed and de-activated automatic valve, closed manual valve, or blind flange in 72 hours. Condition F states that if the required action and associated completion time is not met, the unit must be in Mode 3 in 6 hours and in Mode 5 in 36 hours.

A Notice of Enforcement Discretion (NOED) was requested from the NRC so that the Completion Times of the Required Actions for TS 3.6.3 and TS 3.7.5 could be extended from 72 hours to an additional 72 hours. Although the NOED request was approved, failure to complete the Required Actions within the original 72 hours is reportable pursuant to 10 CFR 50.73 (a)(2)(i)(B) as a condition prohibited by Technical Specifications.

EVENT DESCRIPTION

At the time the Technical Specification Required Action Completion times were exceeded on February 7, 2003, Unit 1 was in Mode 1 at 100 percent power. All emergency core cooling systems and the emergency diesel generators were Operable. The 1B train of the CA system was logged Inoperable due to the failure of the valve stem on 1CA-42B.

On February 4, 2003, at approximately 0830, valve 1CA-42B was logged Inoperable to perform preventative and corrective maintenance in the form of add-on-pak annealing. Add-on-pak annealing (heat treating) is a corrective measure resulting from a 10 CFR Part 21 notification from Rotork. One of the required steps of the annealing process is to unload the add-on-pak and switch mechanism switches by placing the valve in mid-position. Due to a pre-existing condition of improper assembly of

NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)* (17)

the overtravel guide bar assembly and subsequent wear and damage, the overtravel guide bar assembly was binding when the valve was manually operated to mid-position. This binding imparted an un-recognized load on the striker plate of the switch mechanism. Also, by design specification, the striker plate should have been annealed by the manufacturer, Rotork, and therefore should have been unaffected by the in-situ add-on-pak annealing. However, the striker plate was not annealed and the applied load from the overtravel guide bar assembly binding combined with the heat of the add-on-pak annealing process resulted in bending of the striker plate.

On February 4, 2003, at approximately 1500, after completion of the add-on-pak annealing process, valve actuator preventative maintenance (PM) was performed. One of the steps of the actuator PM is to manually stroke the actuator from the full closed to the full open position. This full manual travel combined with the binding and degradations of the overtravel guide bar assembly and a bent striker plate caused the loss of the switch mechanism limit and torque functions.

On February 4, 2003, at approximately 1630, valve 1CA-42B was stroked from mid-position to the close position but prematurely stopped. The valve was then opened believing it was fully closed but the limit function had failed causing intermediate position indication. With the loss of limit and torque function, the actuator output torque and resultant stem thrust increased until an overload condition sheared the valve stem.

On February 4, 2003, at approximately 2100, root cause and repair teams were formed. Realizing that valve repair or replacement would probably exceed the current 72 hour Technical Specification Required Action Completion Times, a NOED request was initiated.

On February 6, 2003, at approximately 1500, the NOED request was reviewed and approved by the NRC.

On February 7, 2003, at 0826, TS 3.6.3 and 3.7.5 Required Action Completion Times were exceeded as approved by the NOED.

On February 9, 2003, at approximately 0500, the valve stem modification and testing was completed. The conventional valve stem was replaced with a custom two piece design. The actuator was also replaced. Valve 1CA-42B was then declared Operable and TS 3.6.3 and TS 3.7.5 were exited.

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CAUSAL FACTORS

The root cause for the valve stem failure of 1CA-42B was due to an overload condition resulting from the failure of the limit and torque control functions of the motor actuator switch mechanism. The control function failure was due to a combination of the pre-existing condition of improper assembly of the overtravel guide bar assembly and the distortion of the striker plate during the annealing process on February 4, 2003.

Based on a review of work history, it was determined that the improper assembly of the overtravel guide bar assembly most likely occurred prior to receipt of the actuator at McGuire Nuclear Station in 1998 since no maintenance activities have been performed which required disassembly of the switch mechanism since receipt and installation. The improper assembly probably occurred during initial limit setup of the actuator switch mechanism by the vendor.

Fifteen other safety related valves with identical valve and actuator combinations were identified as susceptible to the same failure mode. Of these, none of the valve actuators had undergone the add-on-pak annealing process and therefore are not susceptible to this same failure scenario. If any of these valve actuators had undergone this annealing process, successful functional testing would have provided adequate assurance of operability.

CORRECTIVE ACTIONS

Immediate:

1. Root cause, valve repair, and Unit recovery teams were formed.

Subsequent:

1. A notification was made to the nuclear industry regarding a potential generic valve manufacturing issue.

2. A modification was designed and implemented to replace the conventional valve stem with a custom two piece design. The actuator for valve 1CA-42B was also replaced as a conservative measure.

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3. All planned Rotork actuator annealing was suspended until the valve stem failure root cause was determined.

4. Inspections were completed on the switch mechanisms on 13 of the 15 remaining valves with identical valve and actuator combinations for proper overtravel guide bar assembly installation. No problems were found.

5. Inspections were completed on the replacement actuator for valve 1CA-42B to ensure that the overtravel guide bar assembly was properly installed and the add-on-pak was annealed. No problems were found.

Planned:

1. Replace the custom two piece stem on valve 1CA-42B with the original, conventional design at the earliest reasonable opportunity permitted by plant operating conditions (no later than the next refueling outage).

2. Revise applicable routine maintenance procedures to include more comprehensive inspections and verifications to ensure proper Rotork actuator assembly and function.

3. Revise applicable maintenance procedures to prevent improper annealing of Rotork actuator switch mechanisms and add-on-paks.

4. Revise applicable maintenance procedures to detect improper overtravel guide bar assembly prior to and during initial installation and set-up of Rotork actuators.

5. Inspect the remaining 2 valves with identical valve and actuator combinations for proper installation of the overtravel guide bar assembly.

SAFETY ANALYSIS

An evaluation was performed from a probabilistic risk (PRA) standpoint concerning the extended Inoperability of valve 1CA-42B and the 1B train of the CA system.

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Valve 1CA-42B has two functions that are modeled in the PRA: (1) to close to isolate feedwater and prevent overfill in the event of a tube rupture in the 1D S/G, and (2) to remain open to allow the 1B Motor Driven CA pump to feed the 1D S/G in the event of a loss of normal feedwater.

For event sequences requiring isolation of the CA flow path to the 1D S/G, there are redundant means of isolation which are procedurally controlled. The air operated control valve from the 1B Motor Driven CA pump to the 1D S/G, 1CA-40B, provides an alternative means as does manual valve, 1CA-39, upstream of valve 1CA-42B. Given the redundancy and diversity available to terminate flow to the 1D S/G, any contribution to core damage frequency (CDF) or large early release frequency (LERF) that could result from the inability to close valve 1CA-42B is judged to be insignificant.

Because providing secondary side heat removal to the 1D S/G is the more important function of 1CA-42B, the valve was placed in the open position for most of the time the valve was out of service. During the modification and testing of valve 1CA-42B, it was necessary to place the valve in the closed position for a short period of time. Placing the valve in the closed position does result in some small increase in CDF and LERF. However, for the short time period it was necessary to be closed, the change in CDF and LERF was insignificant. Additionally, during the time the valve was closed, compensatory measures were in place that would ensure that the configuration was risk neutral and represented no net increase in radiological risk.

Therefore, this event represents no significance with respect to the health and safety of the public.

ADDITIONAL INFORMATION

A search using the McGuire Problem identification Process (PIP) database was performed to identify any similar events involving Rotork actuators. No other valve stem failures as a result of improper actuator assembly or a maintenance activity were identified over the last ten years. Therefore, this event is not considered recurring.