



DUKE POWER

November 6, 1989

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

Subject: McGuire Nuclear Station Units 1 and 2
Docket No. 50-369
Licensee Event Report 369/89-24

Gentlemen:

Pursuant to 10 CFR 30.73 Sections (a)(1) and (d), attached is Licensee Event Report 369/89-24 concerning the Main Steam Isolation Valves tested in a nonconservative manner. This report is being submitted as a Voluntary Report. This event is considered to be of no significance with respect to the health and safety of the public.

Very truly yours,

Tony L. McConnell

T.L. McConnell

DVE/ADJ/cbl

Attachment

xc: Mr. S.D. Ebnetter
Administrator, Region II
U.S. Nuclear Regulatory Commission
101 Marietta St., NW, Suite 2900
Atlanta, GA 30323

INPO Records Center
Suite 1500
1100 Circle 75 Parkway
Atlanta, GA 30339

M&M Nuclear Consultants
1221 Avenue of the Americas
New York, NY 10020

American Nuclear Insurers
c/o Dottie Sherman, ANI Library
The Exchange, Suit 245
270 Farmington Avenue
Farmington, CT 06032

Mr. Darl Hood
U.S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Washington, D.C. 20555

Mr. P.K. Van Doorn
NRC Resident Inspector
McGuire Nuclear Station

bxc: B.W. Bline
A.S. Daughtridge
J.S. Warren
R.L. Gill
R.M. Glover (CNS)
T.D. Curtis (ONS)
P.R. Herran
S.S. Kilborn (W)
R.E. Lopez-Ibanez
J.J. Maher
R.O. Sharpe (MNS)
G.B. Swindlehurst
K.D. Thomas
L.E. Weaver
R.L. Weber
J.D. Wylie (PSD)
J.W. Willis
QA Tech. Services NRC Coordinator (EC 12/55)
MC-815-04
(20)

LICENSEE EVENT REPORT (LER)

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

TITLE (4) **The Main Steam Isolation Valves Were Tested In A Non Conservative Manner Because Of An Installation Deficiency**

EVENT DATE (6)			LER NUMBER (8)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES	DOCKET NUMBER(S)
09	08	89	89	024	00	11	10	89	McGuire, Unit 2	0 5 0 0 0 3 7 1 0
										0 5 0 0 0 0 0 0 0

OPERATING MODE (9) 5	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR § (Check one or more of the following) (11)										
	20.402(b)	20.406(a)(1)(i)	20.406(a)(1)(ii)	20.406(a)(1)(iii)	20.406(a)(1)(iv)	20.406(a)(1)(v)	20.406(a)(1)(vi)	20.406(a)(1)(vii)	20.406(a)(1)(viii)	20.406(a)(1)(ix)	20.406(a)(1)(x)
POWER LEVEL (10) 0 0 0											
											X OTHER (Specify in Abstract below and in Text, NRC Form 366A) Voluntary LER

LICENSEE CONTACT FOR THIS LER (12)
NAME: **Alan Sipe, Chairman, McGuire Safety Review Group** TELEPHONE NUMBER: **7 1 0 4 8 1 7 1 5 1 - 4 1 1 8 1 3**

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)														
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC

SUPPLEMENTAL REPORT EXPECTED (14)
YES (if yes, complete EXPECTED SUBMISSION DATE) NO
EXPECTED SUBMISSION DATE (15) MONTH: **11** DAY: **10** YEAR: **89**

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

On May 16, 1989, General Office (GO) Performance personnel wrote Problem Investigation Report (PIR) 0-M89-0122 as a result of a review of Information Notice (IEN) 88-51. IEN 88-51 described a failure of Main Steam Isolation Valves (MSIVs) to close without air assistance. It was discovered that McGuire timed the MSIVs to close with air assistance. Safety analysis calculations take no credit for air assistance to close. On May 26, 1989, an Operability Evaluation was issued stating that the MSIVs would close as required without air assistance and the MSIVs should be stroke timed without air assistance to close during the next refueling outages. On September 8, 1989, the MSIV Stroke Timing Periodic Test was performed without the air assistance and 3 MSIVs failed to close within 5 seconds as required. PIR 0-M89-0239 was written on the same day. As a result of this PIR, an Operability Evaluation was issued on September 11, 1989, stating that the MSIVs were operable with the air assist to close feature. The MSIVs were tested with air assist to close and they all successfully passed the MSIV Valve Stroke Timing test. This event is assigned a cause of Installation Deficiency because brass guide screws in the actuators were tightened excessively causing the MSIV actuators to bind when closing. Unit 1 was in Mode 1, Power Operation at 100 percent power, and Unit 2 was in Mode 5 (Cold Shutdown) at the time this event was discovered. Maintenance Engineering Services (MES) personnel wrote a Station Problem Report to request Design Engineering (DE) personnel to perform a design study to determine the best resolution to the problem. This report is being submitted as a Voluntary LER.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1) McGuire Nuclear Station, Unit 1	DOCKET NUMBER (2) 0 5 0 0 0 3 6 9	LER NUMBER (6)			PAGE (3)		
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
		8 9	— 0 2 4	— 0 0	0 2	OF	0 6

TEXT (if more space is required, use additional NRC Form 306A's) (17)

EVALUATION:

Background

Main Steam [EII:SB] (SM) Isolation valves [EII:ISV] (MSIVs) 2SM-3, 5, 7, 9 are provided in each Steam Generator [EII:SG] steam line immediately downstream of the safety valves to isolate each individual Steam Generator and prevent reverse flow in the event of a steam line rupture. The MSIVs close on a high-high Containment pressure signal and/or on high steam line pressure rate of change or low steam line pressure as a result of an SM line rupture between the Steam Generator and the Turbine [EII:TB] Steam Stop valves.

The McGuire MSIVs are 34 inch Y-pattern globe valves manufactured by Atwood and Morrill and are equipped with fail close air/spring actuators. The valve actuators utilize air pressure under a piston to hold the valves open for steam flow. When called upon to close and perform their safety function, the air under the piston is vented to atmosphere and the energy stored in the springs drives the valves closed. An additional air supply is directed to the top of the piston to assist closure.

Technical Specification (TS) 3.7.1.4 requires that each MSIV shall be operable in Mode 1, Mode 2 (Startup), and Mode 3 (Hot Standby). Each MSIV shall be demonstrated operable by verifying full closure within 5 seconds.

On July 21, 1988, the NRC issued Information Notice (IEN) 88-51, Failures of MSIVs at Dresden Unit 2. IEN 88-51 detailed an event in which an MSIV failed to close as required when the air supply line pulled out of the manifold on the valve operator. TS at Dresden required quarterly functional testing to evaluate MSIV closure with combined actuator air and spring forces even though the air sources were from non-safety grade sources. Testing demonstrated that the MSIVs would not close with spring forces alone which was contrary to the safety design basis of the plant.

Description of Event

On May 16, 1989, GO Performance personnel completed a review of IEN 88-51 and determined that the same circumstances detailed in IEN 88-51 existed at McGuire Nuclear Station. The Valve Stroke Timing periodic test for the MSIVs tested the MSIVs with the air and spring force combined. Based upon this discovery, PIR 0-M89-0122 was initiated to document the discovery.

On May 26, 1989, DE personnel issued an Operability Evaluation concerning the MSIVs. The Operability evaluation stated in part that the MSIVs under the worst case operating conditions (full pressure, reverse flow) have an operator closing margin of 2264 ft. lb. or 24 percent using spring force only. DE personnel recommended that Unit 1 and Unit 2 continue operating until the Unit 2 Refueling Outage when testing without air assist to close the MSIVs could be performed.

On September 8, 1989, Performance personnel using procedure PT/2/A/4255/03A and 03B, SM Train A and B Valve Stroke Timing Test, valve stroke timed the MSIVs without air assist to close by isolating the air supply to the top of the actuator. MSIVs 2SM-5, and 2SM-7 did not close within the required 5 seconds using Train A

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1) McGuire Nuclear Station, Unit 1	DOCKET NUMBER (2) 0 5 0 0 0 3 6 9	LER NUMBER (6)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
		8 9	— 0 2 4	— 0 0	0 3	OF 0 6

TEXT (If more space is required, use additional NRC Form 388A's) (17)

solenoid valves. MSIVs 2SM-3, 2SM-5, 2SM-7, did not close within 5 seconds using Train B solenoid valves.

The valve stroke timing results were as follows:

Valve	Time For Valve To Close Without Air Assistance
2SM-5A	13.8 seconds
2SM-7A	7.6 seconds
2SM-3B	5.4 seconds
2SM-5B	9.0 seconds
2SM-7B	7.0 seconds.

On September 8, 1989, based upon these results, Performance personnel initiated PIR 0-M89-0239. DE personnel were contacted, and on September 11, 1989, DE personnel issued an Operability Evaluation that determined that the MSIVs were operable in their existing configuration (with air assist) and capable of performing their intended safety function with air assistance to close.

DE personnel determined the safety status and design basis for the air assist feature of the MSIVs. The air assisted closure feature of the MSIVs begins as a branch line off the Instrument Air [EIIIS:LD] (VI) system. This portion of the VI system is classified as ASME III - Class 3. The materials used in the components of the air assisted closure feature and the methods used to manufacture them are commensurate with those used in environmentally qualified components. A Seismic Qualification Utility Group (SQUG) evaluation of the components was performed and the components were determined to be seismically qualified. DE personnel determined that the air supply and control systems that constitute the air assisting closure feature to the MSIVs to be operable.

Performance personnel successfully completed PT/2/A/4255/03A and 03B, SM Train A and B Valve Stroke Timing Test, on September 12, 1989. All MSIVs closed within the required 5 seconds using both Train A and Train P solenoid valves with the air assistance to close.

Conclusion

This event is assigned a cause of Installation Deficiency because during initial installation of the MSIVs, brass guide screws that the actuator plates ride on were installed too tightly. The brass guide screws being too tight caused the actuator to bind and slow the closure time. If the brass set screws had been set properly during initial installation the MSIVs would have closed within the required 5 seconds with spring force alone. The air assistance to close components would not have been added to the MSIVs because there would not have been a problem meeting the 5 second closure time. The MSIVs would have been tested properly if the brass set screws had not been misadjusted. The cause of the guide screws being installed too tight could not be determined during this investigation. This fact was not discovered until after the air assistance to close components were added to the MSIVs during preoperational testing. Once the brass set screws were set properly, the MSIVs were fully capable of closing using spring force alone. The air

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1) McGuire Nuclear Station, Unit 1	DOCKET NUMBER (2) 0 5 0 0 0 3 6 9 8 9 - 0 2 4 - 0 0 0 4	LER NUMBER (6)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		

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

assistance to close components were then an added feature not needed to close the MSIVs within the required 5 seconds. The components used to construct the air assistance to close portion of the MSIVs were of the highest grade available but were not seismically qualified. The air assistance to close portion of the MSIVs should not have been used when valve stroke timing tests were performed; however, it is not obvious that it is not safety related equipment. The McGuire Final Safety Analysis Report (FSAR), Section 9.3.1.3 states in part that, "ASME, Section III, Class 3 air reservoirs are provided on the instrument air to each MSIV operator. Redundant ASME, Section III, Class 3 check valves are provided upstream of each reservoir for isolation from the remainder of the VI system. The interconnecting piping between the check valves, air reservoir, and the MSIV operators is Duke Class C. These safety class air reservoirs are provided as a redundant means of closure for each MSIV. These valves are also capable of being closed by spring action. Each reservoir has air capacity for a single closure of its respective MSIV."

The flow diagrams for the MSIVs show a seismic safety related valve that receives a safety signal and power. The flow diagrams do not show clearly that a portion of the components are not safety related. FSAR Section 9.3.1.3 does not state that any portion of the air assistance to close portion of the MSIVs is not safety related. It would have been difficult for someone to determine that a portion of the air assistance to close feature of the MSIVs was not safety related.

DE and MES personnel investigated the MSIVs to determine the cause of the MSIVs not closing within the required 5 seconds. DE personnel determined that the lack of a vent to atmosphere for the instrument air supply directed to the top of the actuator piston caused the MSIVs to fail to close within 5 seconds. When the air is failed to the top of the actuator piston and the valves close by spring force alone, a vacuum is pulled within the cylinder slowing the closure time of the MSIVs. At the direction of DE personnel, supplemental testing was performed with the air supply disconnected and entirely vented during testing. The air supply was disconnected to the top of the actuator of valve 2SM-5, and the MSIV closed within the required 5 seconds using spring force alone.

Performance personnel stated that it is possible that the test method used to stroke time the MSIVs without air assistance to close was too conservative. During the testing, the air supply was isolated from the top of the actuator and all the pressure relieved from the tank and lines. During an event that would require closure of the MSIVs, some pressure would be available in the instrument air components supplying air to the top of the actuator and upon closing the MSIVs would not pull a vacuum in the cylinder. In the event the non seismic portion of the air assistance to close components failed, the failure would create a vent path. Testing by MES and DE personnel has proved that with a vent path established, the MSIVs will close on spring force alone. Performance personnel will perform testing on the MSIVs during the 1990 Unit 1 Refueling Outage to determine if the test method for stroke timing the MSIVs was too conservative.

DE personnel reviewed all the test data compiled by Station personnel and made the following recommendations:

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1) McGuire Nuclear Station, Unit 1	DOCKET NUMBER (2) 0 5 0 0 0 3 6 9	LER NUMBER (6)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
		8 9	— 0 2 4	— 0 0	0 5	OF 0 6

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

- The MSIV air assist components and the MSIVs are fully operable as built. The only limitation is that if the station elects to retain the air assist feature, additional maintenance and inspection activities will be required. The air assist portion of the MSIVs will have to be evaluated in two years because of the time limitations of the SQUG evaluation.
- As stated in the resolution for PIR 0-M89-0122, a calculated closure force margin of 24 percent exists for the MSIVs using spring force alone. This margin and additional test data on MSIV 2SM-5 with the top of the actuator cylinder vented provides evidence that the air assist feature is unnecessary. Modifications would be required to vent the actuator cylinders if the air assist feature is deleted.

MES personnel initiated a Station Problem Report to request DE personnel begin a design study to determine the best resolution to the problem. MES personnel will perform a test of the valve packing drag of the MSIVs and will also perform a survey of other utilities that do not use the air assistance to close feature to determine if they are experiencing any MSIV closure problems. Based on the design study and results of the testing and utility survey, Project Services will initiate modifications as necessary.

This event is not Nuclear Plant Reliability Data System (NPRDS) reportable.

A review of McGuire incidents for the past 12 months did not reveal any events involving the MSIVs with a cause of Installation Deficiency. This event is not recurring.

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

CORRECTIVE ACTIONS:

Immediate: None

- Subsequent:
- DE personnel issued an Operability Evaluation stating the MSIVs were operable with air assist to close.
 - Performance personnel performed the Valve Stroke Timing Test with air assistance to close, and all MSIVs closed within 5 seconds.
 - MES personnel wrote a Station Problem Report requesting DE personnel perform a design study determine the best resolution to the problem.

Planned: 1) Performance personnel will perform testing of the MSIVs to determine if the valve stroke timing tests are appropriate.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1) McGuire Nuclear Station, Unit 1	DOCKET NUMBER (2) 0 5 0 0 0 3 6 9 8 9	LER NUMBER (6)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
			0 2 4	0 0	0 6	OF

TEXT (If more space is required, use additional NRC Form 388A's) (17)

- 2) DE personnel will perform a design study to determine the best resolution of the problem and the associated scope and costs of the proposed resolutions.
- 3) MES personnel will perform a test of the valve packing drag of the MSIVs and will also perform a survey of other utilities that do not use the air assist to close to determine if they are experiencing any MSIV closure problems.
- 4) Based on the results of planned corrective actions number 1 and 2, Project Services personnel will initiate an NSM to implement the changes required.

SAFETY ANALYSIS:

DE personnel determined during the Operability Evaluation that the MSIVs are operable and fully capable of performing their intended function using the air assist closure feature.

A failure of the nonseismic portion of the air assistance to close portion of the MSIVs is considered to be a passive failure. A passive failure would have provided a vent path to the top of the MSIV actuator and the MSIVs would have closed within 5 seconds using spring force alone.

This event did not affect the health and safety of the public.