

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) McGuire Nuclear Station, Unit 1	DOCKET NUMBER (2) 0 5 0 0 0 3 6 9 1	PAGE (3) 1 OF 07
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TITLE (4)
Both Trains of the Safety Injection System Were Inoperable Due to Poor Planning/
Scheduling and a Possible Installation Deficiency

EVENT DATE (5)			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)
08	12	88	88	020	00	09	12	88	N/A		0 5 0 0 0

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

OPERATING MODE (9) 1	<input type="checkbox"/> 20.402(b)	<input type="checkbox"/> 20.405(e)	<input type="checkbox"/> 50.73(a)(2)(iv)	<input type="checkbox"/> 73.71(b)
	<input type="checkbox"/> 20.405(a)(1)(i)	<input type="checkbox"/> 50.38(e)(1)	<input type="checkbox"/> 50.73(a)(2)(v)	<input type="checkbox"/> 73.71(e)
	<input type="checkbox"/> 20.405(a)(1)(ii)	<input type="checkbox"/> 50.38(e)(2)	<input type="checkbox"/> 50.73(a)(2)(vi)	OTHER (Specify in Abstract below and in Text, NRC Form 388A)
	<input type="checkbox"/> 20.405(a)(1)(iii)	<input checked="" type="checkbox"/> 50.73(a)(2)(i)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)	
	<input type="checkbox"/> 20.405(a)(1)(iv)	<input type="checkbox"/> 50.73(a)(2)(ii)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)	
	<input type="checkbox"/> 20.405(a)(1)(v)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)	

LICENSEE CONTACT FOR THIS LER (12)

NAME Steven E. LeRoy, Licensing	TELEPHONE NUMBER	
	AREA CODE 7 0 4	3 7 3 1 - 6 2 3 3

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPROS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPROS

SUPPLEMENTAL REPORT EXPECTED (14)

<input type="checkbox"/> YES (If yes, complete EXPECTED SUBMISSION DATE)	<input checked="" type="checkbox"/> NO	EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR

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

On 08/12/88 at about 1100, Performance began a routine valve stroke timing test of valve INI-144B, Safety Injection Pump 1B Mini-flow Line Isolation. The valve moved from the open to the closed position satisfactorily. When Operations attempted to open valve INI-144B, the actuator became disconnected from the valve stem at the actuator to valve stem coupling. At 1113, Operations declared Safety Injection Train 1B inoperable because valve INI-144B was closed, which denied Safety Injection Pump 1B of a recirculation flow path. Safety Injection Train 1A was already inoperable because Component Cooling system Heat Exchanger 1A was out of service for non-routine maintenance. With both trains of the Safety Injection system inoperable, Unit 1 entered the action statement of Technical Specification 3.0.3. At 1133, Operations manually opened valve INI-144B, returned Safety Injection Pump 1B to operable status, and exited Unit 1 from the action statement of Tech Spec 3.0.3. Valve INI-144B was repaired and a change is planned to restrict valve stroke timing tests to only one safety related train of equipment at a time. This event is assigned a cause of Other because of the failure of the valve INI-144B actuator to valve stem coupling. This event is also assigned a cause of Management Deficiency because of poor planning/scheduling by Operations.

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TEXT (If more space is required, use additional NRC Form 368A's) (17)

INTRODUCTION:

On August 12, 1988 at approximately 1100, Performance personnel began a routine valve stroke timing test of valve INI-144B, Safety Injection Pump 1B Mini-flow Line Isolation. The valve moved from the open to the closed position satisfactorily. When Operations personnel attempted to open valve INI-144B, the actuator became disconnected from the valve stem at the actuator to valve stem coupling. At 1113, Operations personnel declared Safety Injection Train 1B inoperable because valve INI-144B was closed, and this denied Safety Injection Pump 1B of a recirculation flow path. Safety Injection Train 1A was already inoperable because Component Cooling system Heat Exchanger 1A was out of service for non-routine maintenance. With both trains of the Safety Injection system inoperable, Unit 1 entered the action statement of Technical Specification 3.0.3. At 1133, Operations personnel manually opened valve INI-144B, returned Safety Injection Pump 1B to operable status, and exited Unit 1 from the action statement of Technical Specification 3.0.3.

Unit 1 was in Mode 1, Power Operation, at the time of this event.

This event is assigned a cause of Other because of the failure of the valve INI-144B actuator to valve stem coupling. This event is also assigned a cause of Management Deficiency because of poor planning/scheduling by Operations Control Room personnel. Operations Control Room personnel allowed Performance personnel to test a component on an operable train of equipment with the redundant train inoperable, which is contrary to an established Station Management policy.

EVALUATION:

Background

The Emergency Core Cooling System (ECCS) provides borated water to cool the Reactor [EIS:RCT] core in the event of an accidental depressurization of the Reactor Coolant system [EIS:AB]. The ECCS is comprised of two separate and independent flow paths and redundancy in active components to ensure that the required functions are performed if a single failure occurs. The Safety Injection system [EIS:BQ] is a subsystem of the ECCS. The Safety Injection pumps [EIS:P] deliver water from the Refueling Water Storage Tank [EIS:TK] after the Reactor Coolant system pressure is reduced below the shutoff head of 1520 psig. A minimum flow bypass line is provided on each pump discharge to recirculate flow to the Refueling Water Storage Tank in the event the pumps are started with the normal flow paths blocked. Two motor operated valves in series are provided in this line. These valves are closed by operator action at the beginning of the recirculation mode of ECCS operation to prevent pumping cooling water from the Reactor Building Sump back to the Refueling Water Storage Tank. The Component Cooling system [EIS:CC] provides cooling water to the Safety Injection pump motors [EIS:MO] and bearings.

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

Technical Specification (TS) 3.5.2 requires that two independent ECCS subsystems comprised of an operable Safety Injection pump be operable in Mode 1 (Operations), Mode 2 (Start-up), and Mode 3 (Hot Standby). With one ECCS subsystem inoperable, it must be returned to operable status within 72 hours, or the unit must be in Mode 3 within the next 6 hours and in Mode 4 (Hot Shutdown) within the following 6 hours.

TS 4.0.5 requires that all ASME code class 1, 2, and 3 components meet the in-service inspection and testing requirements of section XI of the ASME Boiler and Pressure Vessel Code. Accordingly, valve INI-144B must be tested quarterly to document the time required for the valve to move from the open to the closed position (stroke time) and this time must be less than 10 seconds. The ASME Boiler and Pressure Vessel Code also requires that any electric valve that has been moved manually be stroke time tested prior to returning the valve to service.

TS 3.0.3 requires that whenever a Limiting Condition For Operation cannot be met (i.e. both trains of a safety related system inoperable), within 1 hour action shall be taken to place the unit in a mode in which the Technical Specification does not apply.

Valve INI-144B is a Kerotest 1.5 inch globe valve, serial number DG12-3, with a Rotork actuator, model number 14NA2. The actuator to valve stem coupling is supplied by Kerotest as part of the valve.

Description of Event

On August 11, 1988 at 0450, Operations personnel removed Component Cooling Heat Exchanger 1A from service and declared Safety Injection Pump 1A inoperable. At approximately 0800, Mechanical Maintenance personnel began a non-routine tube cleaning of the Component Cooling Heat Exchanger [EIIS:HX].

On the morning of August 12, 1988, Performance personnel started routine valve stroke timing tests of several valves in the Safety Injection system. Performance personnel consulted with Operations Control Room personnel about whether it would be acceptable to perform the valve stroke timing tests at this time. Operations Control Room personnel told Performance personnel to proceed with the testing. At approximately 1100, Performance personnel began to test valve INI-144B. Operations personnel closed valve INI-144B from the Control Room, and Performance personnel recorded the time required for the valve to move from the open to the closed position. Operations personnel then attempted to open valve INI-144B from the Control Room. Open indication on the Control Board did not appear. At 1113, Operations Control Room personnel declared Safety Injection Pump 1B inoperable because with valve INI-144B failed in the closed position, the required recirculation flow path was lost. Operations personnel went to visually inspect valve INI-144B and found the coupling between the valve actuator and valve stem damaged and disconnected and the actuator motor running. Operations personnel opened the breaker for the actuator motor.

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

At 1133, Operations personnel opened valve INI-144B manually and returned Safety Injection Pump 1B to operable status.

During the afternoon of August 12, 1988, Operations personnel prepared an Operability Evaluation to justify continued operation of Unit 1 with Safety Injection Pump 1A inoperable and valve INI-144B inoperable. Procedure EP/1/A/5000/02, High Energy Line Break Inside Containment, was changed to include a step for Operations personnel to dispatch an operator to manually close valve INI-144B in the event the ECCS was activated, when swapping Safety Injection Pump 1B suction from the Refueling Water Storage Tank to the Reactor Building Sump. The use of this procedure change was valid until valve INI-144B repairs were complete.

On August 12, 1988 at 1715, Operations personnel started Safety Injection Pump 1B and verified that valve INI-144B was open, and that a recirculation flow path was available.

On August 13, 1988 at 2350, maintenance on Component Cooling Heat Exchanger 1A was completed, the Heat Exchanger was returned to service, and Safety Injection Pump 1A was returned to operable status by Operations personnel.

On August 15, 1988, Mechanical Maintenance and Instrumentation and Electrical personnel completed repairs on valve INI-144B. Performance personnel successfully completed a valve stroke timing tes. of the valve and returned the valve to service.

Conclusion

This event is assigned a cause of Other because of the failure of the valve INI-144B actuator to valve stem coupling from a possible installation deficiency. Instrumentation and Electrical personnel believe the open limit switch for the valve was set too far in the open direction, so when the valve opened, the actuator motor would continue to pull the coupling plate in the open direction. The valve stem would only travel until the valve was fully open, but the motor would continue to pull on the coupling plate until the plate bent enough for the open limit switch to engage and stop the motor. This put excessive torque on the coupling plate connector bolts. This happened every time the valve was cycled until the coupling plate connector bolts finally broke during this incident. Instrumentation and Electrical personnel will change the procedure for limit switch adjustment for these valves, incorporating an extra margin of safety in the limit switch settings that should help prevent this type of failure from recurring. A search of the work request history for valve INI-144B did not reveal any work having been done on the actuator coupling that would have readjusted the limit switches. The limit switch may have been set incorrectly during initial installation of this valve. However, Instrumentation and Electrical personnel believe that if the limit switch was set wrong during installation, the coupling would have failed before this event.

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

This event is also assigned a cause of Management Deficiency because of poor planning/scheduling by Operations Control Room personnel. Operations Control Room personnel allowed Performance personnel to test a component on an operable train of equipment with the redundant train inoperable. This is contrary to an established Station Management policy. The Operations Control Room personnel involved were aware of this policy and also that Safety Injection Pump 1A was inoperable at the time of this event. When Performance personnel requested permission from Operations Control Room personnel to begin valve stroke timing on the Safety Injection system valves, Operations Control Room personnel did not think that valve stroke timing tests could challenge system operability and were not restricted by the policy and allowed Performance personnel to continue with the testing. Performance personnel were also aware of this Management policy but were not aware that Safety Injection Pump 1A was inoperable. They consulted with Operations Control Room personnel to continue the testing relying on the judgement of Operations Control Room personnel as to whether testing should continue.

Operations personnel returned Safety Injection Pump 1B to operable status by opening valve INI-144B within the 1 hour allowed by TS 3.0.3; therefore, a Unit 1 shutdown was not initiated. However, according to T.S. 4.0.5, a valve stroke timing test must be performed on valve INI-144B before returning it to service because it was moved from the closed to open position manually. The Operability Evaluation and resultant procedure change made by Operations personnel justified continued operation of Unit 1 with valve INI-144B in a degraded condition. With the valve open, Safety Injection Pump 1B was operable for an event that would require initiation of the ECCS. The compensatory action specified by the change to the High Energy Line Break Inside Containment procedure would allow for proper realignment of valve INI-144B by manual action within the time allowed by the McGuire Final Safety Analysis Report (FSAR).

A review of McGuire Licensee Event Reports (LER) did not reveal any other events when Unit 1 or Unit 2 entered the Action Statement of TS 3.0.3 because of a planning/scheduling management deficiency or a possible installation deficiency. Therefore, this event is not considered recurring.

This event is reportable to the Nuclear Plant Reliability Data System (NPRDS). A search of the NPRDS database revealed several failures of valve stem to actuator couplings. The failures were mostly attributed to component malfunctions and none were caused by mis-adjusted limit switches.

CORRECTIVE ACTIONS:

Immediate: Operations personnel manually opened valve INI-144B to return Safety Injection Pump 1B to operable status.

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TEXT (If more space is required, use additional NRC Form 365A's) (17)

- Subsequent:
- 1) Operations personnel started Safety Injection Pump 1B and verified that valve INI-144B was open, and a recirculation flow path was available.
 - 2) Operations personnel made a restricted change to the High Energy Line Break Inside Containment procedure to allow manually closing valve INI-144B if necessary.
 - 3) Mechanical Maintenance and Instrumentation and Electrical personnel repaired valve INI-144B.
 - 4) Performance personnel successfully completed a valve stroke timing test of valve INI-144B.
 - 5) This event has been reviewed with the Operations personnel involved to reiterate the Station Management policy concerning testing of one safety related train of equipment with the redundant train inoperable.

- Planned:
- 1) Performance personnel will change the valve stroke timing test procedures to restrict testing to only one safety related train of equipment at a time.
 - 2) Integrated Scheduling personnel will begin scheduling all safety related valve stroke timing tests on a train related basis.
 - 3) Instrumentation and Electrical personnel will change procedure IP/O/A/3066/02A, Installation, Removal, and Set-Up Of Rotork Actuators, to modify the limit switch adjustment steps to prevent excessive torque on the coupling.

SAFETY ANALYSIS:

The McGuire FSAR specifies valve INI-144B to be open for the initial injection phase of the ECCS operation following an accidental depressurization of the Reactor Coolant system. The FSAR then specifies that valve INI-144B be closed when suction to Safety Injection Pump 1B is swapped from the Refueling Water Storage Tank to the Reactor Building Sump. The suction source is swapped when the Refueling Water Storage Tank is nearly depleted, and the cooling water then becomes the water in the Reactor Building Sump for the recirculation phase of ECCS operation. Water from the Reactor Building Sump would be pumped back to the Refueling Water Storage Tank depleting the supply of water in the Reactor Building Sump if valve INI-144B were to remain in the open position. The FSAR accident analysis for the worst case Loss of Coolant Accident allows a minimum of 13 minutes from the initiation of the ECCS until swap over would take place.

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Therefore, there would be enough time for Operations Control Room personnel to dispatch Operations personnel to close valve 1NI-144B at the necessary time. The recirculation flow for each Safety Injection pump is approximately 20 gallons per minute. At this rate, there would be ample time beyond the FSAR estimated time before any significant water depletion from the Reactor Building Sump would occur.

For approximately 30 minutes on August 12, 1988, both trains of the Unit 1 Safety Injection system were inoperable. TS 3.0.3 requires that action be initiated within 1 hour to shut down the unit when both trains are inoperable. This requirement is necessary because the FSAR accident analysis assumes that at least one train of equipment is available. Safety Injection Pump 1B was returned to operable status within the 1 hour time allowed. There were no challenges to the Safety Injection system or any transients that required the use of the Safety Injection system during this time.

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.

Duke Power Company
P.O. Box 33198
Charlotte, N.C. 28242

Hal B. Tucker
Vice President
Nuclear Production
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DUKE POWER

September 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 369/88-20

Gentlemen:

Pursuant to 10CFR 50.73 Sections (a)(1) and (d), attached is Licensee Event Report 369/88-20 concerning both trains of the Unit 1 Safety Injection system being inoperable. This report is being submitted in accordance with 10 CFR 50.73(a)(2)(1)(B). This event is considered to be of no significance with respect to the health and safety of the public.

Very truly yours,

A handwritten signature in cursive script that reads "Hal B. Tucker".

Hal B. Tucker

SEL/325/mmf

Attachment

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