Duke Power Company
McGuire Nuclear Generation Department
12700 Hagers Ferry Road (MG01A)
Huntersville, NC 28078-8985

T. C. McMEEKIN
Vice President
(704)875-4800
(704)875-4809 Fax

DUKE POWER

April 17, 1992

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

Subject: McGuire Nuclear Station Unit 2
Docket No. 50-370
Licensee Event Report 370/92-03

Gentlemen:

Pursuant to 10 CFR 50.73 Sections (a) (1) and (d), attached is Licensee Event Report 370/92-03 concerning the Unit 2 Residual Heat Removal System being inoperable. This report is being submitted in accordance with 10 CFR 50.73 (a) (2) (i). This event is considered to be of no significance with respect to the health and safety of the public.

Very truly yours,

T.C. McMeekin

TLP/bcb

Attachment

xc: Mr. S.D. Ebneter
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

Mr. Tim Reed
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

IE22
1/1

LICENSEE EVENT REPORT (LER)

FACILITY NAME(1)	DOCKET NUMBER(2)	PAGE(3)
McGuire Nuclear Station, Unit 2	05000 370	1 OF 8

TITLE(4) Train B Of The Unit 2 Residual Heat Removal System Was Inoperable Due To A Degraded Flow Path Caused By Equipment Failure

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)
									N/A	05000
03	18	92	92	03	0	04	17	92		05000

OPERATING MODE(9)	5	THIS REPORT IS SUBMITTED PURSUANT TO REQUIREMENTS OF 10CFR (Check one or more of the following)(11)								
POWER LEVEL(10)	0%		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)	
			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	
Terry L. Pedersen, Supervisor, Safety Review Group	704	875-4487

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	
BG AZ	WBD	VALVOP	FISHER	YES							

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 March 5, 1992, at approximately 1130, a Maintenance Engineering Support (MES) person assisting with vibration analysis on Component Cooling (KC) Pump 2B1 noticed that the actuator on valve 2KC-82B, Engineered Safety Features Residual Heat Removal Heat Exchanger 2B Outlet Flow Control, appeared to be sagging slightly. Upon investigation, the MES person determined that two of the four bolts which secure the actuator to the valve had failed. The MES person immediately took action to initiate repair of the problem. An emergency work request was generated and the bolts replaced. It was subsequently determined on March 18, 1992, that valve 2KC-82B was technically inoperable for an unknown period because the actuator to valve bolting configuration was seismically degraded. The Design analysis could not confirm with reasonable assurance that the valve could perform its design function during a seismic event. Unit 2 was in Mode 5 (Cold Shutdown) and Unit 1 was in Mode 1 (Power Operation) at 97 percent power at the time of the event discovery; however, because the valve was inoperable for an unknown period, it must be assumed that the valve was degraded during modes when operability was required. A cause of Equipment Failure has been assigned to this event. An inspection of similar valves on Units 1 and 2 revealed no other bolting problems. Periodic inspection of the actuator to valve bolting will be initiated to ensure degradation is not occurring.

EVALUATION:

Background

The Component Cooling (KC) system [EIIS:CC] serves as a second boundary between the Reactor Coolant (NC) system [EIIS:AB] and the Nuclear Service Water (RN) system [EIIS:BI] to reduce the probability of leakage of radioactivity to the environment. The KC system is designed to:

1. Remove residual and sensible heat from the NC system via the Residual Heat Removal (ND) system [EIIS:BP] during plant startup and shutdown.

2. Cool the letdown flow to the Chemical and Volume Control (NV) system [EIIS:CB].

3. Cool the Spent Fuel Pool [EIIS:DA].

4. Provide cooling to dissipate waste heat from various other primary plant components.

5. Provide cooling to Engineered Safeguards (ESF) loads after an accident.

The KC system consists of two separate trains per unit which are provided with two pumps [EIIS:P], one heat exchanger [EIIS:HX], associated valves [EIIS:V], piping, and instrumentation.

Valve 2KC-82B, ND Heat Exchanger B Outlet Flow Control, is a 12 inch butterfly valve located in the KC discharge piping of ND Heat Exchanger 2B. The ND System is operated in such a manner that flow is regulated manually by throttling valve 2KC-81B, valve 2KC-82B provides no control function. Valve 2KC-82B is equipped with a Fisher model 3580 positioner and model 656-60 diaphragm actuator [EIIS:FCV].

Technical Specification (TS) 3/4.7.3 specifies that two independent KC trains shall be operable during Modes 1 (Power Operation), 2 (Startup), 3 (Hot Standby), and 4 (Hot Shutdown). TS 3/4.7.4 specifies that two independent RN trains shall be operable during Modes 1, 2, 3, 4. The RN trains cool KC system water. Both TSs require that with only one cooling train operable, restore the other train to operable status within 72 hours or be in Mode 3 within the next 6 hours and in Mode 5 (Cold Shutdown) within the following 30 hours.

Description of Event

On March 4, 1992, a Unit 2 Engineered Safety Features (ESF) periodic test was performed using procedure PT/2/A/4200/09A, ESF Actuation Periodic Test. During this test, valve 2KC-82B, ND 2B Outlet Flow Control, was demonstrated to be operable and stroke timed to assure the safety position was verified to be within required limits. This data is documented on enclosures 13.4.3, Valve Alignment, and 13.8.3, Valve Timing, of procedure PT/2/A/4200/09A. The valve was required to assume the safety position in 60 seconds, it responded in 1.4 seconds.

On March 5, 1992, at approximately 1130, a Maintenance Engineering Support (MES) person assisting with vibration analysis on KC Pump 2B1 noted that the actuator for valve 2KC-82B appeared to be sagging slightly. Upon investigation, the MES person discovered that two of the four bolts which secure the actuator to the valve had failed. The MES person immediately took action to initiate repair of the problem.

Work request 507452 was generated to replace the failed bolts. The MES person contacted the Shift Manager and a decision was made to perform the work as an emergency priority. This would ensure that the work was handled quickly and that valve 2KC-82B was restored to an operable condition as quickly as possible. However, Unit 2 was in Mode 5 at the time of the discovery; therefore, neither the valve nor the KC system were required to be operable.

The work was performed satisfactorily and the valve was restored to operable status at 2015 on March 7, 1992.

Subsequently, Problem Investigation Report (PIR) 2-M92-0070 was initiated by the Component Engineering person responsible for butterfly valves. The purpose of the PIR was to further investigate the event and ensure adequate corrective actions were taken. As a part of the evaluation process associated with the PIR, a Design Engineering Operability Evaluation was performed to determine past operability for valve 2KC-82B.

As a result, the following recommendation was made on March 18, 1992.

> Past Operability Recommendation
> Valve 2KC-82B is recommended to be inoperable as a result of a degraded actuator to valve bolting configuration. The analysis could not confirm with reasonable assurance that the valve would be able to assume its safety position under design considerations. This recommendation is based upon the evaluation and may be contrary to the fact that the valve had been performing as required under normal and simulated accident operating conditions.

Because of this evaluation, the valve is considered to be past inoperable for an unknown

period due to seismic considerations but was determined presently operable due to the repairs made on March 7, 1992.

Conclusion

This event is assigned a cause of Equipment Failure due to the failed bolts which secure the actuator to the valve body on valve 2KC-82B. Two of the four bolts had failed at an unknown time prior to discovery. One of the remaining bolts was determined to be approximately 95 percent corroded. Therefore, the valve actuator was held in place, at the time, by one intact bolt.

On March 4, 1992, the valve had been demonstrated operable by performing as required during performance of an ESF components operability test. However, the Design Engineering operability evaluation performed during the investigation of PIR 2-M92-0070 could not confirm with reasonable assurance that the valve would have been able to perform during a seismic event. Therefore, it was determined that valve 2KC-82B was technically inoperable for an unknown period prior to March 5, 1992.

Two bolt heads were missing from the valve assembly at the time of discovery. MES Component Engineering personnel visually examined the remaining bolt parts during repair activities. They felt confident with the results of the visual inspection and subsequently determined that a full metallurgical analysis was not needed to determine the cause of failure. The cause of failure of the bolts was determined by MES personnel to be brittle failure due to reduced cross sectional area induced by general corrosion. Over a long period of time the cross sectional area of the mounting bolts was reduced due to corrosion from a packing leak on valve 2KC-82B. The bolts finally broke in brittle failure due to the tensile load applied by the weight of the valve actuator on the necked down bolts. A secondary possible contributing cause was system vibration and is currently being evaluated by Design Engineering personnel. MES personnel theorized the corrosion was caused by a packing leak on valve 2KC-82B, which had self-sealed at some previous unknown time. The actuator for valve 2KC-82B is oriented horizontally such that leakage from the valve stem will wet the valve operator mounting bolts. The identical valves on the redundant train (2KC-57A, ESF Residual Heat Removal Heat Exchanger 2A Outlet Flow Control) and Unit 1, (1KC-57A, ESF Residual Heat Removal Heat Exchanger 1A Outlet Flow Control, and 1KC-82B, ESF Residual Heat Removal Heat Exchanger 1B Outlet Flow Control) are not oriented in the same position and therefore are not susceptible to a similar failure.

It has been determined that the problem does not represent an immediate operability concern on the redundant train. However, as a conservative measure, work requests were generated to disassemble and inspect the identical valve for the redundant train and both Unit 1 trains.

Those bolts will be examined by MES personnel and appropriate metallurgical analysis will be performed as deemed necessary. During analysis of the event, MES Component Engineering personnel considered changing the mounting orientation of valve 2KC-82B to eliminate the possibility of future packing leaks affecting the valve mounting bolts. This option was eliminated because of other existing interference items. Therefore, a long term periodic inspection activity will be initiated to inspect the mounting bolts for valve 2KC-82B.

A review of the Operating Experience Program Data Base for the 24 months prior to this event revealed no events which involved an inoperable train due to Equipment Failure or Possible Equipment Failure. Therefore, this event is not considered recurring.

This event is Nuclear Plant Reliability Data System (NPRDS) reportable.

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

CORRECTIVE ACTIONS:

Immediate: 1) MES personnel generated emergency work request 507452 to repair valve 2KC-82B.

2) The valve operator mounting bolts were replaced on valve 2KC-82B as directed by work request 507452.

3) MES Component Engineering personnel began an evaluation of the broken/missing bolts on valve 2KC-82B.

Subsequent: 1) A determination was made by MES Component Engineering personnel that a PIR was needed to ensure adequate resolution of the problem; therefore, PIR 2-M92-0070 was generated.

2) A past operability evaluation was performed by Design Engineering personnel for valve 2KC-82B.

3) MES Component Engineering personnel performed a visual inspection of the identical valves on the redundant train and Unit 1.

4) McGuire Component Engineering personnel informed Catawba Component

Engineering personnel of the bolting failure for their evaluation of similar problems at Catawba.

Planned:

1) The actuator mounting bolts on valves 2KC-57A, 1KC-57A, 1KC-82B will be replaced with grade B7 bolts.

2) MES Component Engineering personnel will evaluate the bolts removed from valves 2KC-57A, 1KC-57A, 1KC-82B and take appropriate action based on the results of this analysis.

3) MES Component Engineering personnel will work with Design Engineering personnel to evaluate the effects of flow induced vibration on valve 2KC-82B and determine if additional support is needed.

4) MES Component Engineering personnel will implement a preventative maintenance activity to inspect the actuator mounting bolts on valve 2KC-82B.

5) The valve stem packing will be replaced on valve 2KC-82B.

SAFETY ANALYSIS:

Because this investigation was unable to determine the exact time of bolt failure, it must be conservatively assumed that the failure occurred during a mode when valve 2KC-82B was required to be operable. The Past Operability Evaluation concluded that the stresses exerted on the remaining bolt exceed the yield stress in shear of 60 ksi for the analyzed SA-193 Grade B7 bolting. The evaluation also determined that upon failure of the remaining bolt resulting from flow induced vibration or a seismic event, the actuator could have sagged in such a manner as to close the valve or bind the stem or fallen completely off of the valve.

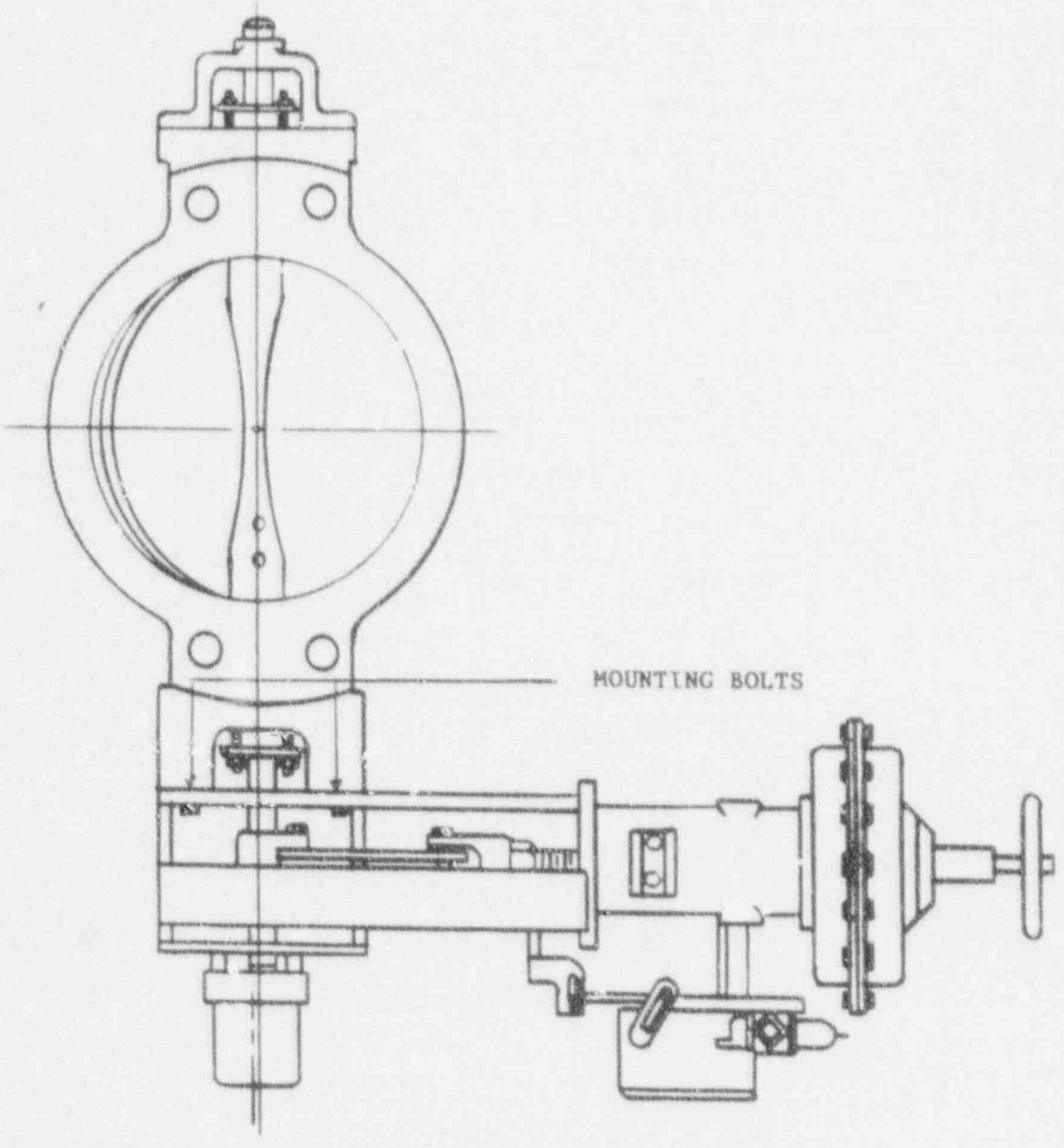
Unit 2 was in Mode 5 (cold shutdown) at the time of discovery. Valve 2KC-82B is not required to be operable in this mode. Valve 2KC-82B had been among the components tested on March 4, 1992 during the Unit 2 Engineered Safety Features (ESF) periodic test and had performed satisfactorily moving from fully closed to its safety position (full open) in 1.4 seconds. The required time to assume this position is 60 seconds.

There have been no seismic events at this site. Based on the ESF test results from the previous day, it is reasonable to assume that in the event of a design basis accident without a seismic event, the valve would have again performed satisfactorily. If the bolt had failed from flow induced vibration, Control Room personnel would have been able to place the unit in a condition in which the ND system would have been capable of performing its design function. Additionally, if the actuator had completely separated from the valve while that

FACILITY NAME(1)	DOCKET NUMBER(2)	LER NUMBER(6)			PAGE(3)		
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
McGuire Nuclear Station, Unit 2	05000 370	92	03	0	7	OF	8

train was in service, the established flow through the valve would have been sufficient to keep the valve in the open position.

FACILITY NAME(1)	DOCKET NUMBER(2)	LER NUMBER(6)			PAGE(3)		
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
McGuire Nuclear Station, Unit 2	05000 370	92	03	0	8	OF	8



12" FISHER BUTTERFLY VALVE