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DUKE POWER

DATE: June 21, 1996

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

Subject: McGuire Nuclear Station Unit 1
Docket No. 50-370

Licensee Event Report 370/96-03, Revision 0
Problem Investigation Process No.: 2-M96-1479

Gentlemen:

Pursuant to 10 CFR 50.73 Sections (a) (1) and (d), attached is Licensee Event Report 370/96-03 concerning the Unit 2 Reactor Trip that occurred May 22, 1996. This report is being submitted in accordance with 10 CFR 50.73 (a) (2) (iv). 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

RJD/bcb

Attachment

cc: Mr. S.D. Ebneter
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U.S. Nuclear Regulatory Commission
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Mr. George Maxwell
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NRC FORM 366 U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMD NO. 3150-0104
EXPIRES: 5/31/95
ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
McGuire Nuclear Station, Unit 2	05000370	1 of 6

TITLE (4)
A Unit 2 Reactor Trip Occurred Due To Reactor Coolant Pump Motor 2B 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 NAME	DOCKET NUMBER(S)
										05000
05	22	96	96	- 03	- 0	06	21	96	N/A	05000

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR (Check one or more of the following) (11)			
POWER LEVEL (10)	99%	20.402(b)	20.405(c)	X 50.73(a)(2)(iv)	73.71(b)
		20.405(a)(*)(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
		20.405(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	Abstract below and
		20.405(a)(1)(iv)	50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	in Text, NRC Form
		20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)	366A)

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER	
	AREA CODE	
J. W. Pitesa, Manager, Safety Review Group	(704)	875-4788

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	
B7e	CBH	MOTOR	W120	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)

Unit Status: Unit 2 - Mode 1 (Power Operation) at approximately 99 percent power.

Event Description: On May 22, 1996, at 0425, the Unit 2 Reactor tripped due to low Reactor Coolant (NC) system flow. The X phase in NC Pump Motor 2B stator shorted to ground, causing the motor circuit breakers to trip on high ground fault current

Event Cause: A cause of Design/Manufacturing Deficiency has been assigned in that the upper end turns of the stator windings were not sufficiently secured to the stator surge ring. This allowed excess movement and vibration in the windings and subsequent degradation of the insulating material on the windings. This degradation of the insulating material resulted in the ground fault on the X-phase of the stator winding.

Corrective Actions: NC Pump Motors 2D and 2C are being replaced with refurbished motors and NC Pump Motor 2B has been inspected, removed, and sent offsite for complete rewind. NC Pump Motor 2A was replaced with a rewound motor during refueling outage 2EOC-10 and is therefore not suspect. The remaining NC Pump Motor 1A will be replaced with a rewound motor during 1EOC-11 refueling outage. Engineering personnel will evaluate the current periodic maintenance program for adequacy in inspecting for evidence of this type of impending failure.

EVALUATION:

Description of Event

The NC pump motors at McGuire were known to be experiencing degradation of the insulating material on the motor stator windings because the end turns had not been individually tied to the stator surge ring during manufacturing.

McGuire Nuclear Station personnel were aware of this condition and its effect on the long-term reliability of the reactor coolant pump motors. Consequently, the station was engaged in a program to inspect and refurbish all of the NC pump motors on a rotational basis. This plan involved installing the spare motor, rewinding the stator which was removed, and then using it to replace the next motor scheduled to be worked. As of the date of this event, NC Pump Motors 1B, 1C, and 2A had been replaced with completely rewound motors, with each end turn tied to the surge ring individually. In addition, NC Pump Motor 1D had been replaced with a refurbished motor, which had at least 90 percent of the end turns tied to the surge ring. This provides sufficient rigidity to prevent the vibration which caused the degradation of the winding insulating material. It should also be noted that NC Pump Motor 2B had been scheduled to be replaced during the 2EOC-10 refueling, but had not been replaced due to a delay by the vendor in delivering the motor as scheduled.

On May 22, 1996, Unit 2 was in Mode 1 (Power Operation) at approximately 99 percent power.

- The Unit 2 Reactor [EIIS:RCT] tripped at 0425, due to low Reactor Coolant (NC) [EIIS:AB] system flow in 1 loop with reactor power greater than Permissive [P-8](48 percent Rated Thermal Power). NC Pump Motor 2B [EIIS:MO] had tripped on a 50G ground fault relay [EIIS:RLY] actuation causing the loss of flow.

- Both the NC Pump Motor 2B feeder breaker and safety breaker were tripped by their respective ground fault relays.

- Operations (OPS) personnel entered procedure EP/2/A/5000/E-0, Reactor Trip or Safety Injection, and then entered procedure EP/2/A/5000/ES-0.1, Reactor Trip Response.

- Both Motor Driven Auxiliary Feedwater (CA) [EIIS:BA] pumps [EIIS:P] started on low-low level in Steam Generator (S/G) [EIIS:SG] 2C.

- The required 4 hour notification to the NRC was made at 0543 in accordance with procedure RP/0/A/5700/10, NRC Immediate Notification Requirements.

- An extensive investigation was performed by Engineering and Maintenance (MNT) to identify a viable failure scenario. A detailed listing of possible failure modes was developed using the Failure Investigation Process.

- A Failure Mode Troubleshooting Plan was developed to support or eliminate the proposed failure modes identified.

- MNT personnel performed tests/inspections on the NC pump 2B motor, supply and safety breakers, all associated power cables [EIIS:CBL] and penetrations [EIIS:PEN], and ground fault relays. All possible failure modes were systematically investigated.

- Megohmeter tests determined that the X-phase of the stator winding had failed to ground.

- Unit 2 was taken to Mode 5 (Cold Shutdown) for further evaluation of the NC pump motors and recovery plans.

Conclusion

There were no personnel injuries, radiation overexposures, or uncontrolled releases of radioactive material resulting from this event. This event is Nuclear Plant Reliability Data System (NPRDS) reportable.

A cause of Design/Manufacturing Deficiency, Unanticipated Environmental Interaction-Vibration Loads, has been assigned to this event. The inadequate tying down of the stator winding end turns to the stator surge ring allowed vibration in the motor windings. This vibration resulted in sufficient degradation of the winding insulating material to cause the X-phase to short circuit to ground.

- The Failure Investigation Process was used to identify all possible failure modes and then to systematically eliminate each failure

possibility until the root cause was identified. The possible failure modes identified were stator failure, surge capacitor failure, loose terminations/poor insulation, electrical penetration failure, cable failure, and protective relay failure.

- MNT personnel performed tests/inspections on NC Pump motor 2B, its supply and safety breakers, all associated power cables and penetrations, and ground fault relays. Ground resistance checks indicated that the X-phase of the stator winding was found to have shorted to ground.

- The grounding of this winding caused the actuation of the protective relaying circuits which functioned as designed and opened both the NC Pump 2B supply and safety breakers. The resulting single loop loss of flow in the NC system caused the reactor trip, as designed.

A review of the Operating Experience Program (OEP) and Problem Investigation Process (PIP) databases for the past 24 months revealed one other reportable event involving a reactor trip due to failed stator winding in Westinghouse reactor coolant pump motors. This failure, at the Commanche Peak 2 Nuclear plant, was determined to be a foreign material problem which occurred during the coating of the stator windings by the manufacturer. A search of the NPRDS database indicates that failure of windings in some Westinghouse Reactor Coolant pump motors has occurred since 1987. One failure occurred at Duke Power Company in 1980. One other NC pump motor stator failure has occurred at another facility due to a different cause in the last two years. This event is not considered to be recurring.

CORRECTIVE ACTION:

Immediate:

OPS personnel entered procedure EP/1/A/5000/E-0, Reactor Trip or Safety Injection, and then entered procedure EP/1/A/5000/ES-0.1, Reactor Trip Response.

Subsequent:

1. OPS personnel were dispatched to observe the relaying for the NC pump supply and safety breakers.

2. OPS personnel notified Engineering and Maintenance personnel that the respective 50G ground, 87m differential, and 50 overcurrent relays had tripped the breakers.

3. Personnel from Engineering, Maintenance, Operations, and other site groups met and a more detailed investigation of possible failure modes was initiated.

4. Maintenance personnel performed tests/inspections on the NC Pump 2B motor, supply and safety breakers, all associated power cables and penetrations, and ground fault relays.

5. A Nuclear Network Message was issued to inform the industry of the circumstances associated with the event.

Planned:

1. NC Pump Motors 2D and 2C will be replaced with refurbished motors that have at least 90 percent of the motor stator end turns tied to the stator surge ring. NC Pump Motor 2B will be replaced with a rewound motor that has 100 percent of the stator end turns tied to the stator surge ring.

2. The refurbishment plan calls for the remaining NC Pump Motor 1A to be replaced during the 1 EOC-11 refueling outage as planned.

3. Engineering personnel will evaluate the current periodic maintenance program for any needed changes.

SAFETY ANALYSIS:

The health and safety of the public and plant personnel were not affected as a result of this event. Therefore, this event is not considered significant.

The accident description for the loss of one NC pump with four loops in operation has been analyzed in Section 15.3.1, "Partial Loss OF Forced Reactor Coolant Flow", of the Final Safety Analysis Report (FSAR). Above P-8, a partial loss of Reactor Coolant flow in any loop would result in a Reactor Trip and Turbine Trip. The analysis shows core flow will reach a new equilibrium value corresponding to the number of pumps still in operation. With the Reactor tripped, a stable plant condition will eventually be obtained. Therefore, this incident is bounded by the accident analysis of FSAR Section 15.3.1.

The Unit responded to the Reactor Trip as expected. The key primary and secondary parameters were at their approximate no-load value 30 minutes after the trip. Adequate core cooling was maintained throughout the transient and the NC system pressure boundary was not challenged.

ENCLOSURE 1

SIGNATURE SHEET

Prepared By:	Daniel E. Helton	Date:	June 17, 1996
Revised By:		Date:	
Reviewed By:	Henry I Underwood, Jr	Date:	June 17, 1996
	Gary T. Small	Date:	June 17, 1996
	Khaled Hashim	Date:	June 17, 1996
	Brian Travis	Date:	June 18, 1996
		Date:	
		Date:	
Approved By:	Bill Putesa Manager, SRG	Date:	June 17, 1996
Reviewed By:	 Station Manager	Date:	6/18/96

ENCLOSURES:

1. Safety Review Signature Sheet
2. References
3. Corrective Action Schedule
4. Personnel Contacted
5. Cause Code Summary
6. Sequence of Events