NRC FORM 366 U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
EXPIRES 04/30/98

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY INFORMATION COLLECTION REQUEST: 50.0 HRS. REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (T-6 F33), 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 5

TITLE (4)
Reactor Trip Due To Reactor Coolant Pump Motor 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
07	11	97	97	-	02	-	0	08	07	97	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)	100	20.402(b)	20.405(c)	X 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, NRC Form 366A)	
		20.405(a)(1)(iii)	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	
J. W. Pitesa, Safety Review Group Manager	(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 100 percent power.

Event Description: On July 11, 1997, at approximately 0516 hours, Unit 2 Reactor Coolant (NC) Pump 2D tripped due to a ground fault in the motor stator winding. Subsequently, the reactor tripped on low flow in one of four loops with reactor power greater than P-8. This event is not considered to be significant with respect to the health and safety of the public.

Event Cause: A design/manufacturing deficiency existed in the NC Pump motor. The inadequate tying down of the stator wiring end turns to the stator surge ring was found to have allowed excessive vibration of the stator windings. This caused degradation of the winding insulation during years of operation. The degradation resulted in a ground fault in the stator windings.

Corrective Action: The 2D motor stator was replaced with a rewound spare. The only two remaining NC Pump motor stators that have not been rewound will be replaced during the next refueling outage for their respective Unit. Upon completion of the NC Pump motor stator replacements, a long-term maintenance and monitoring program will be implemented.

EVALUATION:

Background:

The Reactor Coolant (NC) Pump [EIIS:P] motors [EISS:MO] at McGuire were known to be experiencing degradation of the insulating material on the motor stator windings due to internal vibration caused by the vendor's failure to individually tie the end turns 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 NC Pump motors (Reference LER 370/96-03 concerning the 1996 reactor trip due to the NC Pump 2B motor stator failure). The station was engaged in a program to inspect and rewind all of the NC Pump motor stators on a rotational basis. The rewind process incorporates tying back all the ends turns and the use of the advanced, vacuum pressure impregnation process which provides additional rigidity.

As of the date of this event, NC Pump 1A, 1B, 1C, 2A, and 2C motor stators had been replaced with completely rewound stators. The NC Pump 1D motor stator had at least 90 percent of the end turns tied to the surge ring as a result of a 1993 refurbishment.

The NC Pump 2B motor stator had been replaced with a stator that had been rewound using a standard industrial process during the 1996 stator failure outage. The 2C motor stator (which had been previously rewound) had also been refurbished during that outage. The 2D motor stator had been refurbished and the windings tied back at the same time.

Description of Event:

On July 11, 1997, at approximately 0516 hours, Unit 2 was at 100 percent power when Reactor Coolant Pump 2D tripped on 50G (Ground Fault) and 87M (Motor Differential). Subsequently, the Reactor tripped due to low flow in one of four loops with Reactor power at greater than P-8.

The secondary side transient resulting from the trip caused the "C" Steam Generator (SG) [EIIS:SG] level to reach the Low Low Reactor Trip Logic setpoint. The Auxiliary Feedwater (CA) system [EIIS:BA] Motor [EIIS:MO] Driven Pumps started as designed and operated properly to assist in returning SG levels to normal.

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.

The required four hour NRC notification to the NRC was made at 0540 hours in accordance with procedure RP/0/A/5700/10, NRC Immediate Notification Requirements.

Motor and breaker testing during Mode 3 determined that an electrical fault existed in the motor stator.

Unit 2 was taken to Mode 5 (Cold Shutdown) for further evaluation of the NC Pump 2D motor.

Subsequent analysis determined that the number 84 stator winding coil had failed to ground.

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 short circuit to ground.

The grounding of this winding caused the actuation of the protective relaying circuits that tripped the pump motor. The resulting single loop loss of flow in the NC system tripped the reactor, as designed.

A review of the Operating Experience Program (OEP) and Problem Investigation Process (PIP) databases for the past 24 months revealed one reportable event attributed to inadequately secured motor stator windings. That failure occurred at Duke Power Company, McGuire Nuclear Station in 1996 (Reference LER 370/96-03 on the 1996 reactor trip due to the NC Pump 2B motor stator failure). Therefore, this event is considered to be recurring.

McGuire was in the process of implementing corrective actions, including replacing all NC Pump Motor Stators with rewound stators, at the time of this second event.

When the first failure occurred (2EOC1[illegible]A) in 1996, McGuire replaced that NC Pump motor stator with its lone spare. The NC Pump 2D motor stator was cleaned and the windings were tied back, during the same outage, to provide additional confidence in the ability of the 2D motor to run until 2EOC11.

The work done by the vendor helped prevent further degradation, but did not reverse damage that had already been done. The Pump 2D motor was scheduled to be the next one to receive a rewound stator at the time of the failure.

CORRECTIVE ACTION:

Immediate:

1. 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.

2. Motor and breaker testing during Mode 3 determined that an electrical fault existed in the Pump 2D motor stator.

3. Unit 2 was taken to Mode 5 (Cold Shutdown) for further evaluation of the motor failure.

Subsequent:

NC Pump 2D motor stator was replaced with a rewound spare.

Planned:

1. The NC Pump 2B motor stator will be replaced with a rewound stator during the next Unit 2 refueling outage. The NC Pump 1D motor stator will be replaced during the next Unit 1 refueling outage. These are the only NC pump motors at McGuire that do not have rewound stators.

2. Upon completion of the NC Pump motor stator replacements, a long-term maintenance and monitoring program will be implemented.

SAFETY ANALYSIS:

Based on the analysis below, this event is not considered to be significant. At no time were the health and safety of the public or plant personnel affected as a result of this event.

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 secondary side transient resulting from the trip caused the "C" Steam Generator (SG) [EIIS:SG] level to reach the Low Low Reactor Trip Logic setpoint. The Auxiliary Feedwater (CA) system [EIIS:BA] Motor [EIIS:MO] Driven Pumps started as designed and operated properly to assist in returning SG levels to normal.

The Main Steam Line Code Safety Valves [EIIS:RV] and SG Power Operated Relief Valves did not operate nor were they challenged. All Steam Dump To Condenser Valves operated properly. No Atmospheric Dump Valves opened. No Pressurizer [EIIS:PZR] Code Safety or Pressurizer Power Operated Relief Valves opened, nor were the setpoints for these valves reached.

The Unit responded to the Reactor Trip as expected. Key primary and secondary parameters including S/G no load pressure, S/G levels, and T-ave, 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.