

## LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) McGuire Nuclear Station - Unit 2										DOCKET NUMBER (2) 0 5 0 0 0 3 7 0				PAGE (3) 1 OF 0 4											
TITLE (4) Manual Reactor Trip at Power Due to Loss of Main Feedwater Pump 2A																									
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)												
0	5	0	8	8	5	8	5	0	1	2	0	0	0	6	0	7	8	5	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		20.402(b)				20.405(c)				<input checked="" type="checkbox"/> 50.73(a)(2)(iv)				73.71(b)									
POWER LEVEL (10)		0110		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)(vi)				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)(ix)													
LICENSEE CONTACT FOR THIS LER (12)																									
NAME Jerry Day - Licensing										TELEPHONE NUMBER AREA CODE 7 0 4 3 7 3 - 7 0 3 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															
SUPPLEMENTAL REPORT EXPECTED (14)												EXPECTED SUBMISSION DATE (15)		MONTH	DAY	YEAR									
<input type="checkbox"/> YES (If yes, complete EXPECTED SUBMISSION DATE)												<input checked="" type="checkbox"/> NO													

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

On May 8, 1985 at 0647, Main Feedwater Pump 2A tripped on high discharge pressure during an attempt to swap the pump's steam supply from auxiliary steam to main steam. Auxiliary feedwater autostarted on a "loss of both main feedwater pumps" signal. The reactor was manually tripped, according to procedure.

The unit was in Mode 1 at 10% power at the time of the trip. The main turbine had not been placed on-line.

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## LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-0104

EXPIRES: 8/31/85

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		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
McGuire Nuclear Station - Unit 2	0 5 0 0 0 3 7 0 8 5 - 0 1 2 - 0 0 0 2				OF	0 4

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

INTRODUCTION: On May 8, 1985, at 0647, main feedwater (CF) pump 2A tripped on high discharge pressure during an attempt to swap the pump's steam supply from auxiliary steam (AS) to main steam (SM) (CF Pump 2B was not running). Auxiliary feedwater (CA) autostarted on a "loss of both main feedwater pumps" signal. The reactor was manually tripped as required by procedure (Loss of Steam Generator Feedwater).

Unit Two was in Mode 1 at approximately 10% power at the time of the incident. The main turbine had not been placed on-line. The reactor was quickly stabilized and parameters returned to no-load target values. All systems responded as expected.

This incident is classified as a Component Malfunction, due to the CF pump control system for CF pump 2A not properly responding to speed change signals.

EVALUATION: The CF pump turbine speed control system utilizes small orifi to admit control oil to the speed control servomotors. Control oil pressure is governed by the amount of leakage through 4 cup valves. The seating force on these valves change as control signals vary. As the leakage through the cup increases, the control oil pressure decreases to control the servomotors.

The CF pump turbine trip was caused by the control system not properly responding to the speed controller. This improper response could possibly be due to the flyball governor mechanism on the control system sticking in an intermediate position and not allowing the turbine to increase in speed as the speed controller was increased. Operator A stated the speed controller was reading ~75% when the pump turbine speed suddenly increased. The flyball governor probably became free at this point and allowed oil pressure to suddenly increase, causing a sudden increase in turbine speed. This sudden increase in turbine speed apparently happened too fast for the flyball governor mechanism to react. There is also the possibility that the flyball governor mechanism became stuck again at this point and could not have slowed the turbine. Operations personnel state that problems have occurred in the past with the flyball governor mechanism sticking for unknown reasons on Unit One and Unit Two.

A second CF pump turbine trip occurred within minutes after the same CF pump was re-started. Again, as the operator tried to increase the pump turbine speed with the speed controller, the response was very slow. Then, as before, the controller indication suddenly increased (as did the turbine speed and pump discharge indicators) and again the CF pump turbine tripped on high discharge pressure.

A third attempt to restart the pump and swap over to SM was successful as extra time was taken to allow pump response to controller inputs. The next day station personnel were able to confirm that the flyball governor mechanism was sticking after Operations swapped CF pumps due to leaks. This may have been the reason the control speed system malfunctioned.

Another possible cause for the control system lagging in response to the speed controller is that debris in the control oil could have become lodged in one or more of the orifi and restricted oil flow. Since this is a dynamic system, restriction of oil flow through any orifi could drastically affect oil pressure and thus affect turbine speed control. A more drastic effect could occur if the debris were suddenly flushed away, causing a sudden change in oil pressure, which is possibly what occurred in this incident. It is more probable, however, that the problem was in fact with the flyball governor since it was later confirmed to be sticking.

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The reactor had to be manually tripped in this incident per AP/2/A/5500/06, (Loss of Steam Generator Feedwater) which requires a manual trip when both CF pumps are lost and the reactor power is above 3%. According to the controlling procedure for unit startup, reactor power should be approximately 1% when swapping CF pump steam supply from AS to SM. However, Zero Power Physics Testing was taking place and requires steady state conditions. Thus AS continued to supply the CF turbine up to ~3% power during this test. Per Operations Management Procedure 1-2, procedure step sequence can be deviated from as long as the original intent is maintained. If the swap had occurred before reactor power reached 3% (as normally required by procedure), no manual reactor trip would have been necessary. However, this does not preclude that a similar incident could not have happened at a higher power level as steam supply to the CF pumps would be increased.

Transient Assessment

Reactivity was controlled by the manual reactor trip. Peak pressurizer pressure was 2236 psig, minimum post-trip pressure was 2184 psig before recovering to the post trip target of 2235 psig. Peak average temperature was 564°F (pre-trip). Average temperature following the trip fell to a minimum of 540°F due to initially high CA flow rates on automatic pump start combined with SM flow to the CF pump turbines. Average temperature recovered to its no-load target after CA flow was throttled and steam to the CF pump turbines was isolated. Pressurizer level dropped from 28.5% to 16% after the trip, isolating letdown. Level began to recover immediately, and was stabilized at the no-load level (25%). Letdown was then restored.

All steam was relieved to the condenser. Steam Generator levels increased post-trip due to auxiliary feedwater flow. Flow was reduced, and level was brought to the no-load target (38%). Maximum narrow range steam generator level was 45%; the minimum was 34%. Both motor drive CA pumps actuated on loss of both main feedwater pumps prior to the reactor trip; the turbine driven CA pump was not actuated.

No emergency core cooling systems were actuated during this event; emergency power was not required. The pressurizer PORV's and code safeties were not challenged. Pressure remained well above the Safety Injection actuation setpoint. Steam Generator PORV's did not open and the main steam line code relief valves did not lift. Valve 2CF-26 (CF isolation to S/G D) alarmed on low accumulator nitrogen pressure. The valve did close on CF isolation. All other safety systems responded as expected during this event.

CORRECTIVE ACTION:

Immediate: A manual reactor trip was initiated immediately per AP/2/A/5500/06.

Subsequent: CF pump 2A was restarted and successfully switched to SM supply after two attempts.

The flyball governor mechanism was verified to be sticking and was freed.

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McGuire Nuclear Station - Unit 2	0500037085	—	012	—	00	04	OF 04

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

Planned: The current CF pump turbine speed control system (by Westinghouse) will be replaced with LOVEJOY brand electric control system.

Operations supervision will review this incident with their personnel to emphasize caution required when performing steps of a procedure out of order.

Operations personnel will review OP/2/A/6100/01 for possible revisions giving guidance to when certain steps/sections can be performed out of order.

SAFETY ANALYSIS: Operator A manually tripped the reactor immediately following the loss of CF pump A per AP/2/A/5500/06. Even though the CA M/D pumps started as required, the reactor would probably have tripped on low steam generator level because the reactor was at greater than 3% power. The CA M/D pumps could have maintained adequate steam generator level at or below 3% power. The health and safety of the public were not affected by this incident.



**DUKE POWER COMPANY**

P.O. BOX 33189  
CHARLOTTE, N.C. 28242

HAL B. TUCKER  
VICE PRESIDENT  
NUCLEAR PRODUCTION

TELEPHONE  
(704) 373-4531

June 7, 1985

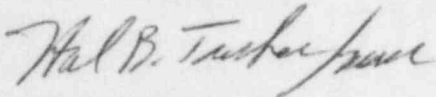
Document Control Desk  
U. S. Nuclear Regulatory Commission  
Washington, D. C. 20555

Subject: McGuire Nuclear Station, Unit 2  
Docket No. 50-370  
LER 370/85-12

Gentlemen:

Pursuant to 10 CFR 50.73 Sections (a)(1) and (d), attached is Licensee Event Report 370/85-12 concerning a manual reactor trip due to loss of a main feedwater pump. This event was considered to be of no significance with respect to the health and safety of the public.

Very truly yours,



Hal B. Tucker

JBD/mjf

Attachment

cc: Dr. J. Nelson Grace, Regional Administrator  
U. S. Nuclear Regulatory Commission  
Region II  
101 Marietta Street, NW, Suite 2900

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

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

Mr. W. T. Orders  
NRC Resident Inspector  
McGuire Nuclear Station

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

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