NRC Form 366
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/85

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
McGuire Nuclear Station - Unit 2	0 5 0 0 0 3 7 0	1 OF 0 6

TITLE (4)
Reactor Trip on Intermediate Range High Flux Signal During Unit Shutdown

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 1	2 3	8 6	8 6	— 0 0 2	— 0 0	0 2	2 4	8 6		0 5 0 0 0
										0 5 0 0 0

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)	0 0 8	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	
Julio G. Torre - Licensing	7 0 4	3 7 3 - 8 0 2 9

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

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 January 23, 1986, at 1306, a Unit 2 reactor trip occurred as a result of an Intermediate Range (IR) High Flux Reactor Trip signal. Unit 2 tripped from 8% power when the Power Range (PR) detectors reached the P-10 reset point (8% power on 3 out of 4 PR detectors) before the IR channel N35 high flux reactor trip bistable had reset. Unit 2 was being shutdown per Technical Specification 3.4.6.2 due to an unidentified Reactor Coolant (NC) [EIIS:AB] System leakage of about 1.5 gallons per minute at the time of the Reactor trip.

Unit 2 was in Mode 1 at 8% power at the time of this incident.

Immediately after the trip, the IR trip reset values for Unit 2 were changed from 12 1/2% reactor thermal power to 15% reactor thermal power. Unit 1 and Unit 2 IR detectors will be recalibrated using more appropriate reset values. The new values will prevent this type of inadvertent reactor trips. Also, the unidentified NC leakage was reduced below the Technical Specification limit.

This incident is attributed to a defective procedure. IR detector N35 was replaced on December 20, 1985, and the procedure for detector replacement did not require new IR detectors to be normalized in a timely manner.

All reactor protection systems responded normally during this event.

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☆U.S.GPO:1984-0-454-481/18759

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

On January 23, 1986, at 1306, a Unit 2 reactor trip occurred as a result of an Intermediate Range (IR) High Flux Reactor Trip signal. Unit 2 tripped from 8% power when the Power Range (PR) detectors reached the P-10 reset point (8% power on 3 out of 4 PR detectors) before the IR channel N35 high flux reactor trip bistable had reset. Unit 2 was being shutdown per Technical Specification 3.4.6.2 due to an unidentified Reactor Coolant (NC) [EIIS:AB] System leakage of about 1.5 gallons per minute at the time of the Reactor trip.

Unit 2 was in Mode 1 at 8% power at the time of this incident.

This incident is attributed to a defective procedure. IR detector N35 was replaced on December 20, 1985, and the procedure for detector replacement did not require new IR detectors to be normalized in a timely manner.

BACKGROUND:

The Excore Nuclear Instrumentation [EIIS:AB] system protects the reactor core by monitoring neutron flux and generating appropriate alarms and trips during all power levels from shutdown to full power operation. This system provides secondary control functions by indicating reactor status during shutdown and through full power operation.

The system consists of 3 ranges of power indications:

1) Source range [1 - 10^6 counts per second (cps)]; and

2) Intermediate range (10^{-11} - 10^{-3} amps); and

3) Power range (1 - 100% reactor power).

The High Flux Reactor Trip signal is set at a current which corresponds to 25% full power. During power escalation when reactor power reaches 10% (P-10) on PR, the IR High Flux Reactor Trip signal is manually blocked. A trip signal is generated at 25% power, but the signal is blocked and cannot trip the reactor. When decreasing power, the IR trip resets (goes to "not tripped") at about 50% of its trip setpoint or 12 1/2% full power. When reactor power reaches 8% (P-10 reset) on 3 out of 4 PR detectors, the IR High Flux Reactor Trip signal is enabled. There are two detectors associated with the IR, N35 and N36. IR detector N35 had been replaced with a new detector on December 20, 1985.

DESCRIPTION OF EVENT:

On January 22, 1986, a NC leakage Calculation Performance Test was performed on Unit 2 and revealed an unidentified NC system leakage of about 1.5 gpm. The leakage could not be found and was declared out-of-specification at 0400. Technical Specification 3.4.6.2 states that with any unidentified NC system leakage greater than 1 gpm, "reduce the

leakage rate to within limits within 4 hours or be in at least Hot Standby within the next 6 hours and in Cold Shutdown within the following 30 hours". Unit 2 shutdown commenced at 1000 at a rate of 25% power per hour, and the NRC was notified of an unusual event.

At 1306, the reactor tripped from 8% power on an IR High Flux Reactor Trip signal. Immediately following the trip, a main turbine [EIIS:TA] trip and subsequent actuation of the condenser dump valves occurred. The reactor trip occurred when 3 out of 4 PR channels indicated less than 8% power. At this power level the P-10 permissive automatically reset, and therefore it reinstated IR High Flux Reactor Trip capability. The reactor trip signal for IR channel N35 high flux had not reset at this time (it should have reset to "not tripped" at ~12.5% power). Thus, when the IR High Flux Reactor Trip signal was enabled at 8% power, there was still a reactor trip signal present on IR detector N35 and a reactor trip was initiated. The high flux trip bistable for IR channel N35 did not reset at 12.5% reactor power because: 1) There were inadequate procedure controls for detector replacement (when IR detector N35 was replaced, the procedure did not require that overlap data be taken during power escalation and be used to recalibrate the IR bistables); and 2) Inconsistent overlap data was available to Duke Power personnel.

After unit startup, it was verified that IR channel N35 was indicating in the conservative direction (relative to the flux trip setpoint). Since operating with conservative trip setpoints is allowable per Technical Specifications, and is not unusual (this unavoidably occurs during initial startup and beginning of cycle), the task of recording overlap data and calculating the new setpoints was assigned a lesser priority. The appropriate personnel calculated that the new detector had a sensitivity 1.22 times greater than the old detector, which resulted in a calculated high flux trip reset value of 10.2% reactor thermal power (RTP) for N35 instead of 12.5% RTP. This alone would not have caused the trip; however, computer log data shows that the PR indication was 3 to 4% RTP lower than Best Estimate Thermal Power. Thus, at slightly above 10% RTP, with the IR N35 bistable still tripped, 3 out of 4 PR channels indicated less than 8% power, clearing P-10, and initiating the IR trip. The discrepancy at lower power levels between Thermal Power Best Estimate and the PR has been observed before. This discrepancy is attributed to control rod control bank D 'shading' the neutron flux reaching the PR detectors. This calorimetric mismatch phenomena was previously reported in October of 1985 to the General Office Reactor Safety group, and it is still being evaluated.

At 1312, a control room operator was attempting to increase the speed on the only operating main feedwater [EIIS:SJ] pump (CF pump 2A) to restore feedwater to the steam generators. However, the pump speed increased rapidly and tripped due to high discharge pressure. The pump trip caused an autostart of both motor-driven auxiliary feedwater [EIIS:BA] (CA) pumps. The plant recovered to no load conditions within 30 minutes of the trip.

Duke Power believes there was no equipment malfunction or failure which caused CF pump 2A to trip during feedwater restoration. The control room operators were not familiar with the response time of the recently installed feedwater pump speed control system (manufactured by LOVEJOY). Duke Power will provide training to all control room operators about the control system in order to prevent this type of main feedwater pump trip.

Immediately after the trip, the IR trip reset values for Unit 2 were changed from 12.5% RTP to 15% RTP. After discussions with Westinghouse personnel, it was decided that a reset point of 20% RTP is an optimum value. Unit 1 and Unit 2 IR detectors will be recalibrated using the new reset values. Although the calorimetric mismatch phenomena is still an outstanding issue, the new reset values will prevent inadvertent reactor trips due to this mismatch. This reactor trip could not have occurred at a higher power since the IR High Flux Reactor Trip signal is enabled when reactor power reaches 8% (P-10 reset) on 3 out of 4 PR detectors.

After the reactor trip, Duke Power personnel maintained the unit in Mode 3 and resumed the search for the NC system leak. On January 24, inputs to the Nuclear Sampling (NM) [EIIS:KN] system purge header were isolated, and the leak dropped below 1 gpm. This was verified by 2 consecutive leakage calculation tests. When the NM system header was unisolated, the leak did not return. It is suspected that the leak was probably caused by a relief valve or an air operated diaphragm valve on the NM header that was not properly seated. It is also suspected that when the inputs to the NM header were isolated, the valves were relieved of any pressure and properly seated. At 1154, the leakage was declared in specification. Unit startup began at 1500 on January 22, and Unit 2 entered Mode 2 at 0035 on January 25, 1986.

A review of past Licensee Event Reports indicates that there have been no previous reportable incidents of this type. Therefore the subject event is considered an isolated incident.

There were no releases of radioactive materials, radiation exposures, or personal injuries as a result of this incident.

CORRECTIVE ACTIONS:

Immediate: Load reduction was commenced due to excessive NC system leakage.

Subsequent: The Unit 2 IR detectors (N35 and N36) were recalibrated. The trip reset point was changed from 12.5% power to 15% power.

The Unit 1 IR detectors (N35 and N36) were recalibrated. The trip reset point was changed from 12.5% power to 20% power.

The reset value for the Unit 1 IR bistables was included in the appropriate procedure.

The appropriate controlling procedures for unit shutdown have been revised to ensure that the responsible Duke Power personnel check status lights to verify the intermediate range trip signal is not present before reducing reactor power below the P-10 setpoint.

The NM system purge header was successfully isolated, and two successful NC system leakage calculations tests were performed.

Planned: The Unit 2 IR detectors (N35 and N36) will be recalibrated for a more conservative trip reset value of 20% power.

The new reset value for the Unit 2 IR bistables will be included in the appropriate procedure.

The Detector Replacement and Connector Maintenance Procedure will be modified as appropriate to ensure recalibration will be performed as soon as practical after detector replacement.

The Initial Startup Procedure will be reviewed, and the need for appropriate changes and precautions during unit startup will be evaluated.

The appropriate Duke Power personnel will receive training on the CF pump LOVEJOY speed control system.

SAFETY ANALYSIS:

All reactor protection systems responded normally during this event. The reactor trip did not initiate any engineered safeguards signals. At the time of the reactor trip, temperature was below the low Tave setpoint (564 degrees F), therefore Feedwater Isolation occurred with the trip. Immediately following the trip, a main turbine trip and subsequent actuation of the condenser dump valves occurred. Steam pressure was controlled by the condenser dumps and the opening of one Steam Generator power operated relief valve (PORV). No steam generator safety relief valves were challenged.

Six minutes after the reactor trip, as main feedwater flow was being reestablished following Feedwater Isolation, CF Pump 2A tripped on high discharge pressure. Both motor-driven Auxiliary Feedwater Pumps auto-started on loss of CF pumps. As expected, no pressurizer code safety or PORVs were challenged with this reactor trip. Steam Generator levels remained on scale at all times.

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

Adequate core cooling was maintained at all times without emergency actuation, and containment integrity was preserved. There were no radiation releases to the environment. Additionally, if the reactor had not tripped, it would have been brought down safely to Mode 3 Hot Standby.

The health and safety of the public were not affected by this incident.

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February 24, 1986

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

Subject: McGuire Nuclear Station, Unit 2
Docket No. 50-370
LER 370-86-02

Gentlemen:

Pursuant to 10 CFR 50.73 Sections (a)(2)(IV), attached is Licensee Event Report 370-86-02 concerning a Reactor Trip on Intermediate Range High Flux Signal During Unit Shutdown. 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

JGT/jgm

Attachment

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