

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 5									

TABLE 14.1

Feedwater Isolation/Unit Trip from Apparent Grounding on Doghouse Level Switches

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	6	0	1	8	5	8	5	-	0	1	7	-	0	0	0	7	1	7	8	5	0	5	0	0	0				
0	6	0	1	8	5	8	5	-	0	1	7	-	0	0	0	7	1	7	8	5	0	5	0	0	0				

OPERATING MODE (B)		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR § (Check one or more of the following) (51)					
1		20.402(b)	20.405(c)	X	50.73(a)(2)(iv)	73.71(b)	
POWER LEVEL (10)	1010	20.405(a)(1)(i)	50.36(a)(1)		50.73(a)(2)(v)	73.71(c)	
		20.405(a)(1)(ii)	50.36(a)(2)	X	50.73(a)(2)(vi)	OTHER (Specify in Abstract below and in Text, NRC Form 165A)	
		20.405(a)(1)(iii)	50.73(a)(2)(i)		50.73(a)(2)(vii)(A)		
		20.405(a)(1)(iv)	50.73(a)(2)(ii)		50.73(a)(2)(vii)(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	
Jerry Day - Licensing	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 NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	
	I	I I I	I I I				I	I I I	I I I		
	I	I I I	I I I				I	I I I	I I I		

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 June 1, 1985 at 0919, the unit experienced a reactor trip from an actuation of the inner doghouse safety level switches. The high doghouse level signal was initiated by an electrical ground in the control circuitry. This caused the relay actuation which tripped both feedwater pumps, which tripped the turbine and the reactor.

During the investigation of this incident, station personnel discovered that an area termination cabinet was severely corroded and that some of the relays did not operate smoothly. Three safety related relays were determined to be inoperable due to severe corrosion. Compensatory actions were initiated to allow unit operation until the corroded relays could be replaced during an outage.

This incident is attributed to component failure/malfunction. The exact location of the circuit grounds have not been located, but one ground must have existed inside the cover of one of the doghouse level switches as the ground cleared after the level switch covers were removed to inspect the wiring.

All relays in the affected cabinet have been or will be replaced and the cabinet will be sealed to prevent water entry.

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LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

APPROVED OMB NO. 3150-0104

EXPIRES: 8/31/85

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TEXT (If more space is required, use additional NRC Form 365A's) (17)

On June 1, 1985, at 0919, Unit 2 experienced a reactor trip from an actuation of the inner doghouse safety level switches. The high doghouse level signal was apparently initiated because of an electrical ground on the control circuitry. This ground caused the relay actuation which tripped both turbine driven feedwater pumps; tripped the turbine on loss of both feedwater pumps; and tripped the reactor on turbine trip.

The exact location of the ground could not be determined but it is believed that two electrical grounds occurred (one ground was already present on the positive battery bus) which gave a current flow path to pick up the high doghouse level signal.

The doghouse safety level switch system provides flood protection for safety related equipment during line break accidents in the doghouses. Level switches provide a 2 out of 3 feedwater isolation logic in the event of an increasing water level caused by a feedwater pipe break.

During the investigation of this incident, it was discovered that an area termination cabinet was severely corroded and that some of the relays did not operate smoothly. Analysis of the corroded cabinet components determined that three safety related relays were determined to be inoperable because of the severe corrosion. Compensatory actions were initiated to allow unit operation until the corroded relays could be replaced during an outage.

The personnel that investigated the actuation of the doghouse high level circuitry believe that a combination of two things: (1) a hard electrical ground somewhere on the EVDA positive battery bus and (2) a ground inside the electrical enclosure of one of the level switches provided the current path for energizing the DLHA/GG relay (FDW Control Bypass valves, containment isolation, and tempering isolation S/G's B and C). Their reasons for this conclusion were:

- 1) Relay DLHA/GG was energized without an actual level switch actuation.
- 2) A hard electrical ground was present on the positive battery bus which supplied power to this circuitry (battery grounds are detected from a test circuit in the control room).
- 3) The second electrical ground, which was holding the relay energized, cleared when the level switch covers were removed.
- 4) The electrical wires in the level switches are large and fit tightly inside the electrical cover.

The batteries are intended to have a "floating ground" or no ground. If one ground does occur, the system would still operate while the ground is investigated and repaired.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

APPROVED OMB NO. 3150-0104

EXPIRES 8/31/85

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

It was determined that three safety related relay devices (GB, GC, and IC) were severely corroded and possibly would not perform their intended function. Relay IC was replaced that evening. Because the likelihood of another reactor trip existed, relays GB and GC were not replaced. Compensatory measures were taken so that unit operation could continue without the operability of these components. Following an unrelated reactor trip on June 24, the safety related and other important relays were replaced and compensatory measures were terminated.

The corrosion in the cabinet was extensive on components and fuse holders at the bottom of the enclosure. The screw terminals on many of the relays were badly corroded along with the wire lugs attached to them. The extent of the internal relay corrosion could not be seen but some of the screws which hold the relays together were corroded on the outside of the relay.

The source of the moisture which caused this corrosion is no longer present but it is obvious that much of it had seeped down through the PLM electrical connectors in the top of the cabinet. PLM connectors are sheathed, armored cable connectors used to terminate cables to panels. These electrical connectors have two rubber seals to prevent water from leaking into the cabinet. The water must have been on the top of the cabinet for some time to allow the water seepage. Several PLM electrical connectors in the top of the cabinet were severely corroded.

Preventive maintenance is performed on all electrical cabinets on a six month basis. This preventive maintenance is aimed primarily at cleanliness of the cabinets. Also, if a cabinet door is sealed with a plastic door seal, an inspection is not required. This inspection was performed on April 30, 1985 for the cabinet. The Inspection Procedure "MCC and Panelboard Preventive Maintenance" was used to inspect the cabinets for dirt and dust accumulations and wiring deterioration. The technicians performing this work inspected cabinets with and without door seals at this plant elevation. The corrosion in the cabinet was not noticed during this inspection.

Transient Assessment Reactor side temperature and pressure response was good as all parameters recovered to their no-load target values. Steam pressure response was good though the PORV's on S/G's A and B opened at 1103 and 1102 psig, respectively (nominal setpoint 1125 psig). The S/G B PORV was isolated at the time because it had previously been leaking by. Levels in S/G's B and C dropped to approximately 2% and 8% (narrow range) respectively due to the pre-trip reduction in feedwater to these generators. The low levels did not adversely affect heat transfer.

CORRECTIVE ACTIONS: (Reactor Trip)

Immediate: Following the reactor trip, Operations personnel implemented Abnormal Procedure "Reactor Trip" and the NRC was notified.

Subsequent: It was determined that a grounding problem had caused the partial feedwater isolation signal and the ground was cleared.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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

Planned: IAE Personnel will continue to investigate new developments in equipment used to detect battery grounds.

CORRECTIVE ACTIONS: (Inoperable Relays)

Immediate: Following notification of the inoperable relay devices in the cabinet, personnel initiated compensation measures by using personal observation and continuous communication to replace inoperable equipment.

Subsequent: One relay device (IC) was replaced with the unit on line.

A video camera was setup in the outer doghouse with a monitor in the control room for continuous water level observation. This action was taken to replace the function of the GB and GC relays.

Following the reactor trip on June 24, 1985, the remaining six critical application relays were replaced. The relays were disassembled and inspected for internal corrosion. The corrosion was found to be limited to the external terminal surfaces and screw heads. The relays operated normally when bench tested.

The remaining relays and affected components in the cabinet will be replaced, as time and equipment availability permit, during the next trip or mini-outage.

Planned: The cabinet will be sealed to prevent water from entering in the future.

Preventive maintenance work requests for cabinet inspections will be changed to include inspections in all accessible electrical cabinets with or without door seals.

The Inspection Procedure "MCC Panelboard Preventive Maintenance" will be enhanced to include inspections of cabinet sealing and corrosion during preventive maintenance.

Personnel will be reminded during shift meetings to identify moisture problems around electrical components.

SAFETY ANALYSIS: The partial feedwater isolation and subsequent reactor trip demonstrated the effectiveness of the doghouse level system. The unit was shutdown safely and all safety systems performed as required. The Direct Current system grounds at the station have been an ongoing problem for station maintenance.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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EXPIRES: 8/31/85

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

These electrical grounds need to be corrected expeditiously to ensure that safety systems respond as required. If the relay in this circuit had been "normally energized" as in many plant circuits, its function would have been defeated by this type of ground.

The corroded relays and components in the cabinet could possibly be the source of several system electrical grounds. This corrosion could cause undesirable component malfunctions and actuations. Even though the Train "A" equipment was affected by this corrosion, the Train "B" circuitry in a separate cabinet remained operable.

Emergency power was not required. No emergency core cooling systems were actuated. Residual heat was removed by auxiliary feedwater and relieved to the atmosphere or dumped to the condenser.

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

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VICE PRESIDENT
NUCLEAR PRODUCTION

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July 17, 1985

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

Subject: McGuire Nuclear Station, Unit 2
Docket No. 50-370
LER 370/85-17

Gentlemen:

Pursuant to 10 CFR 50.73 Sections (a)(1) and (d), attached is Licensee Event Report 370/85-17 concerning a reactor trip due to an apparent ground on the doghouse level switches. This event was considered to be of no significance with respect to the health and safety of the public. This report was not submitted within thirty days; please reference my letter of July 8, 1985.

Very truly yours,

H.B. Tucker / BT

Hal B. Tucker

JBD/mjf

Attachment

cc: Dr. J. Nelson Grace, Regional Administrator
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