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FACIL:50-410 Nine Mile Point Nuclear Station, Unit 2, Niagara Moha 05000410

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RECIP.NAME	RECIPIENT AFFILIATION

SUBJECT: LER 94-001-00:on 940312,experienced several Egineered Safety Feature actuations.Cause was faulty pushbutton test switch. Corrective action:replaced faulty test switch.W/940411 ltr.

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NIAGARA MOHAWK
NINE MILE POINT—UNIT 2/P.O. BOX 63, LYCOMING, NY 13093

John H. Mueller
Plant Manager-Unit 2
Nuclear Generation

April 11 , 1994
NMP89380

United States Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

RE: Docket No. 50-410
LER 94-01

Gentlemen:

In accordance with 10CFR50.73 (a)(2)(iv), we are submitting LER 94-01, "Reactor Scram and ESF Actuations Caused by a Faulty Test Switch."

A telephone report of this event was made in accordance with 10CFR50.72 (b)(2)(ii) at 2054 hours on March 12, 1994.

Very truly yours,

John H. Mueller
Plant Manager - NMP2

JHM/JTP/lmc
Attachment

xc: Mr. Thomas T. Martin, Regional Administrator, Region I
Mr. Barry S. Norris, Senior Resident Inspector

180015

IE22 ///

NRC Form 366 (9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/88

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Nine Mile Point Unit 2	0 5 0 0 0 4 1 0	1 OF 0 6

TITLE (4)
Reactor Scram and ESF Actuations Caused by a Faulty Test Switch

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 3	1 2	9 4	9 4	— 0 0 1 —	0 0	0 4	1 1	9 4	N/A	0 5 0 0 0
									N/A	0 5 0 0 0

OPERATING MODE (9): 1
POWER LEVEL (10): 1 0 0

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: *(Check one or more of the following)* (11)

[ ] 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)	
John T. Conway, Manager Operations NMP2	3 1 5	3 4 9 - 2 6 9 8

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
B	T G	I S	M 1 2 8	Y					

SUPPLEMENTAL REPORT EXPECTED (14)

[ ] YES *(If yes, complete EXPECTED SUBMISSION DATE)* [X] NO

EXPECTED SUBMISSION DATE (15) MONTH DAY YEAR

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

On March 12, 1994 at 1923 hours, Nine Mile Point Unit 2 (NMP2) experienced several Engineered Safety Feature actuations. Specifically, an automatic reactor scram caused by turbine control valve fast closure and primary containment and reactor vessel isolations caused by low (Level 3) reactor vessel water level. At the time of the event, the reactor mode switch was in the "RUN" position (Operational Condition 1) with the plant operating at approximately 100 percent of rated thermal power.

The cause of the event was a faulty pushbutton test switch in the power/load unbalance trip circuit of the Turbine Electrohydraulic Control (EHC) system. This caused the power/load unbalance trip circuit to become energized and subsequently, the turbine control valves to fast close on a power/load unbalance trip signal initiating this event. The root cause of this event is poor equipment design.

Corrective actions include replacement of the faulty test switch, a review of similar switches used in similar applications and a review of all safety related control circuitry for the impact of a similar failure. Changes to the test circuit design and test frequency will be evaluated. Additional corrective actions identified will be implemented by the completion of the next refueling outage.

NRC FORM 366A (6-89)

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-0104
EXPIRES: 4/30/92

ESTIMATED BURDEN PER RESPONSE TO COMPLY WTH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6) YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	PAGE (3)
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TEXT (If more space is required, use additional NRC Form 366A's) (17)

I. DESCRIPTION OF EVENT

On March 12, 1994 at 1923 hours, Nine Mile Point Unit 2 (NMP2) experienced several Engineered Safety Feature actuations. Specifically, an automatic reactor scram caused by turbine control valve fast closure, and primary containment and reactor vessel isolations caused by low (Level 3) reactor vessel water level. At the time of the event, the reactor mode switch was in the "RUN" position (Operational Condition 1) with the plant operating at approximately 100 percent of rated thermal power.

During the performance of preventive maintenance procedure N2-PM-W3, "Weekly Testing of Turbine Protective Devices," while testing the power/load unbalance circuit, the operator pushed and held the "push to test" pushbutton according to procedure. The pushbutton failed, resulting in the power/load unbalance circuit being energized without blocking the trip portion of the circuit. Subsequently, the turbine control valves fast closed on a power/load unbalance trip signal. The Reactor Protection System (RPS) initiated scram signals from the turbine control valve fast closure, and the reactor recirculation pumps downshifted to slow speed. The Redundant Reactivity Control System (RRCS) initiated an Alternate Rod Insertion (ARI) on high reactor pressure, which cleared several seconds after initiation. Operators backed up the automatic scram by placing the reactor mode switch to the "SHUTDOWN" position.

The turbine control valve fast closure and reactor scram from high power caused reactor vessel pressure to rise and reactor vessel water level to decrease. The pressure rise caused six of eighteen safety/relief valves to cycle open. Subsequently, the turbine control valves reopened, three turbine bypass valves opened and the safety/relief valves closed. The peak reactor vessel pressure recorded was 1090 pounds per square inch gauge. The reactor vessel water level dropped below the Level 3 trip setpoint (159.3 inches) to 130.1 inches (144.5 inches above top of active fuel). At Level 3, the Primary Containment Isolation Control system (PCIS) initiated a Group 4 (Residual Heat Removal System sample lines) and a Group 5 (Shutdown Cooling suction line) isolation. The Control Room operators entered the Emergency Operating Procedure N2-EOP-RPV, "RPV Control," on high reactor pressure and low reactor vessel water level. Upon recovery of reactor vessel level, the operators shut the feedwater control valves at 195 inches and the level rise peaked at 198 inches.

Operators reset the RRCS signal, the RPS scram signal, the PCIS isolations and exited the EOPs. The plant was then stabilized in "HOT SHUTDOWN" (Operational Condition 3).

II. CAUSE OF EVENT

The cause of the event was a faulty test switch in the power/load unbalance trip circuit of the Turbine Electrohydraulic Control (EHC) system. The faulty test switch is a four pole pushbutton type switch with a backlight. Testing the power/load unbalance circuit as part of procedure N2-PM-W3, "Weekly Testing of Turbine Protective Devices," requires the operator to push and hold this pushbutton switch depressed. Subsequent testing revealed that when depressed, this pushbutton switch failed to break contacts in the power/load unbalance trip circuit before making contacts in the test signal circuit. The opening and closing of contacts was not correctly synchronized by the switch. The result was that the power/load unbalance trip circuit became energized and subsequently, the turbine control valves fast closed on a power/load unbalance trip signal, initiating this event.

The root cause of this event was determined to be poor equipment design. Specifically, this failure mode of the switch was not identified during design of the power/load unbalance circuit as potentially initiating events that could lead to a reactor scram.

III. ANALYSIS OF EVENT

This event is reportable in accordance with 10CFR50.73 (a)(2)(iv), "any event or condition that resulted in a manual or automatic actuation of any engineered safety feature (ESF), including the reactor protection system (RPS)."

The sequence of events in this LER is similar to that described in the Nine Mile Point Unit 2 Updated Safety Analysis Report Appendix A, "Reload Analysis, Reload 3, Cycle 4", the "Increase in Reactor Pressure" section, "Generator Load Reject with Bypass Failure" analysis. In that analysis, fast closure of the turbine control valves (TCVs) is initiated by a loss of electrical load on the generator. The TCVs close as rapidly as possible to prevent excessive overspeed of the turbine generator. Fast closure of the TCVs causes a reactor scram and sudden reduction in steam flow, which results in an increase in system pressure. The primary concerns are effects on fuel thermal limits and Reactor Pressure Vessel (RPV) overpressure. However, the Reload Analysis assumes initial plant conditions more severe than actual plant conditions experienced. Assumed initial plant conditions are 100 percent power at 105 percent core flow, failure of the turbine bypass valves and failure of the two lowest setpoint safety/relief valves for the entire transient.

For the events in this LER, mitigation of the pressure induced power increase was accomplished by the TCV closure scram and reactor recirculation pump trip to slow speed. The opening of six safety/relief valves, followed by the reopening of the TCVs and the

III. ANALYSIS OF EVENT (cont.)

opening of three turbine bypass valves approximately three seconds into this event reduced the magnitude of the pressure transient to well below that described in the Reload Analysis. Therefore, the event described in this LER is bounded by the Reload Analysis. The consequences of the Reload Analysis event do not result in exceeding any fuel thermal limits, or threat to the reactor coolant pressure boundary or the primary containment from RPV overpressure. Thus, there was no threat to the health and safety of the general public or plant personnel as a result of the event described in this LER.

IV. CORRECTIVE ACTIONS

The immediate corrective action was for the operators to implement immediate actions for the scram in accordance with Operating Procedure N2-OP-101C, "Plant Shutdown." The EOPs were entered to control reactor pressure vessel parameters and exited as appropriate. The unit was then stabilized in a hot shutdown condition.

Further corrective actions include:

1. The faulty pushbutton switch in the power/load unbalance trip circuit was replaced prior to plant restart. Post-maintenance tests showed that the new switch worked correctly.

2. A review of all switches used in similar applications in the EHC system was performed. A review of EHC drawings including Load Reference Circuit Logic, Pressure Control Unit Logic, Bypass Control Unit Logic, Backup Overspeed Logic and Chest/Shell Warming Circuit Logic showed no adverse effects will result if a similar failure occurs in any of the above circuits.

3. The same type of switches, used either for testing or indication, were reviewed in the following systems: the Reactor Protection System, Nuclear Steam Supply System Shutoff, Reactor Recirculation System, Reactor Core Isolation Cooling System, Residual Heat Removal System, Low Pressure Core Spray System, Automatic Depressurization System, Standby Liquid Control System, High Pressure Core Spray System and its power supply, and the Reactor Water Cleanup System and filter demineralizers. A similar failure of any of these switches could not cause or prevent a system protective function from occurring.

IV. CORRECTIVE ACTIONS (cont.)

4. An evaluation of changes to the test circuit design and test frequency will be performed. Additional corrective actions identified will be implemented by the completion of the next refueling outage.

V. ADDITIONAL INFORMATION

A. Failed components:

Component:	Master Specialty 10 EF four pole pushbutton switch with backlight
Description:	Power/load unbalance circuit "push to test" pushbutton switch
Manufacturer:	Master Specialty
Component ID:	None
Part Number:	222A8178P0001

B. Previous similar events:

Three previous instances of EHC trip logic malfunctions have occurred. LER 91-22, "Reactor Scram Caused by a Turbine Control System Malfunction," describes a scram from approximately 90 percent rated thermal power that was most probably caused by a malfunctioning mercury wetted relay in the speed select circuit of the EHC system. LER 89-14, "Nine Mile Point Unit 2 Reactor Scram due to Turbine Trip Caused by Loose Wire Connections," describes a scram from approximately 100 percent rated thermal power caused by a disconnected wire in the main generator potential transformer cubicle. LER 89-40, "Reactor Scram on High Neutron Flux due to EHC Malfunction," describes a scram from approximately 97 percent rated thermal power caused by a malfunction in the EHC system. None of these malfunctions involved the same EHC trip logic nor similar switch failures as in this LER. Therefore, the corrective actions from these previous events would not have prevented this event from occurring.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

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

V. ADDITIONAL INFORMATION (cont.)

C. Identification of components referred to in this LER:

COMPONENT	IEEE 803 EIIS FUNCTION	IEEE 805 SYSTEM ID
Reactor Protection System	N/A	JC
Electrohydaulic Control System	N/A	TG
Reactor Recirculation System	N/A	AD
Main Turbine Generator System	N/A	TA/TB
Turbine Control Valves	SCV	TA
Primary Containment	N/A	NH
Reactor Vessel	RPV	SB
Pushbutton Switch	XIS	TG
Power/Load Unbalance Logic Circuit	N/A	TG
Redundant Reactivity Control System	N/A	JC
Reactor Mode Switch	HS	JC
Turbine Bypass Valves	PCV	TG
Nuclear Steam Supply System Shutoff	N/A	JC
Reactor Core Isolation Cooling System	N/A	BN
Low Pressure Core Spray System	N/A	BM
Automatic Depressurization System	N/A	JC
Standby Liquid Control System	N/A	BR
High Pressure Core Spray System	N/A	BJ
Reactor Water Cleanup System	N/A	CE
Residual Heat Removal System	N/A	BO