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)
THREE MILE ISLAND, UNIT 1	0 5 0 0 0 2 8 9	1 OF 0 6

TITLE (4) RPS and HSPS Trip Due to Inadequate Procedural Guidance While Testing ICS/NNI Loss of Auto Power

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 8	1 3	8 8	8 8	— 0 0 4	— 0 0	0 9	1 2	8 8		0 5 0 0 0
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OPERATING MODE (9)		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
N		20.402(b)	20.405(a)	X 50.73(a)(2)(iv)	73.71(b)
POWER LEVEL (10)	0 0 0	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
M. R. Knight, TMI-1 Licensing Engineer	AREA CODE 7 1 7 9 4 8 1 - 8 5 1 4

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 August 13, 1988, TMI-1 was in hot shutdown. A test procedure was being conducted at the same time but unrelated to the Reactor Protection System (RPS) surveillance. Integrated Control System/Non Nuclear Instrumentation (ICS/NNI) "Auto" power was secured and then re-energized as part of the test procedure. When ICS/NNI "Auto" Power was restored as part of the test procedure, the Reactor Coolant Pumps (RCP's) tripped and the Heat Sink Protection System (HSPS) actuated to start the Emergency Feedwater (EFW) Pumps. The RCP trip was an unexpected result of the test. When an RCP was restarted, the Reactor Protection System (RPS) tripped. Response of the HSPS, EFW, and RPS were as expected for the plant conditions. All safety systems functioned as designed and there were no adverse safety consequences. The root cause of this event was inadequate procedural guidance. The test procedure was changed, and the test was successfully completed. The affected ICS/NNI Emergency Procedures have been changed. No additional corrective actions are planned. The HSPS and RPS trips are reportable in accordance with 10 CFR 50.73(a)(2)(iv).

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NRC Form 366 (9-83)

RPS and HSPS Trip due to Inadequate Procedural Guidance While Testing ICS/NNI Loss of "Auto" Power

I. Plant Operating Conditions Before the Event

TMI-1 was in Hot Shutdown conditions. Reactor coolant System temperature and pressure were 532°F and 2155 psig respectively. All four reactor coolant pumps (RCP's) were in operation. The heatup had been completed following the Cycle 7 Refueling Outage (7R). The Once Through Steam Generators (OTSG's), (AB/SG), were at the flooded nozzle level (97-99%) with the Reactor Coolant System (RCS) at the flooded nozzle boron concentration. Control Rod Groups 1-4 were withdrawn.

A planned Test Procedure, TP 349/7, "Functional Testing of ICS Control Loops on Loss of Power at Hot Shutdown," was being conducted prior to startup for cycle 7 operation. One of the purposes of this test was to verify the adequacy of the Emergency Procedures for use in restoring "auto" power to the ICS/NNI. Unrelated to the test procedure, Surveillance Procedure 1303-4.1. "Reactor Protection System" was also in progress.

II. Status of Structures, Components, or Systems that were Inoperable at the Start of the Event and that Contributed to the Event

At the start of the event, Integrated Control System/ Non-Nuclear Instrumentation (ICS/NNI) "Auto" power was unavailable because of the Test Procedure 349/7 which was in progress. Also, Reactor Protection System (RPS) channel "B" was in "manual bypass" to support the performance of Surveillance Procedure 1303-4.1

III. Event Description

At 11:31 AM on August 13, 1988, ICS/NNI (JA/-) "Auto" Power was restored as part of the planned test TP 349/7. On restoration of "Auto" Power, all four RCP's (AB/P) tripped resulting in actuation of the Heat Sink Protection System (HSPS), Emergency Feedwater (EFW) automatic initiation and start of all three EFW Pumps (BA/P). RPS (JC/-) Channel "D" tripped on a neutron flux/RCP signal.

The RCP trip was an unexpected result of the test being conducted. Response of the HSPS, EFW, and RPS were as expected for the plant conditions. Power Operation without forced flow is not permitted by the RPS. However, the RPS logic does not provide an automatic trip in every instance while in Hot Shutdown due to minor setpoint variations. It is for this reason that RPS Channels "A" and "C" were functioning normally even though they did not trip as a result of the RCP trip. RPS channel "B" did not trip because the channel was in "manual bypass" as part of the performance of Surveillance Procedure 1303-4.1.

The EFW Pumps were manually shutdown because the OTSG levels were adequate and EFW was not needed. No EFW injection took place because the OTSG levels were above the setpoint.

Initial attempts to restart RCP's were unsuccessful due to surveillance testing of RPS Channel "B" which was in progress. As part of this normal surveillance procedure, a test signal is inserted. This test signal prevented the RCP's from starting as a result of the 30% power interlock. After clearing this interlock, RC-P1B was restarted. RPS Channels "A" and "C" then tripped on a neutron flux/RCP signal causing the reactor to trip and inserting Control Rod Groups 1-4. (A single RCP operating also generates a zero (nominally) allowable power RPS setpoint.)

The remaining RCP's were then restarted and the RCS was returned to full flow conditions.

On Total Loss of ICS/NNI "Auto" Power, the RCP's do not trip because the Intermediate Closed Cooling Water interlock fails to the "tripped" condition, and the RCP seal injection flow Interlock fails to an "untripped" condition.

The reason that the RCP's tripped on restoration of ICS/NNI "auto" power is described as follows. The RCP seal injection flow interlock uses a signal monitor (MU42-FS), which fails to the "tripped" condition. This condition is not relayed to the RCP logic due to the de-energized state of Auxiliary (Aux) Relay 86/IFS which is also powered by ICS/NNI "auto" power. On restoration of power, the Aux Relay and the signal monitor are re-energized simultaneously, but the Aux Relay sees the

trip condition and relays it to the RCP logic before the signal monitor can clear the trip condition.

The root cause of this event was inadequate procedural guidance for restoration of "Auto" power in that the Plant Emergency Procedures did not address steps that would have prevented the RCP's trip. Test Procedure (TP 349/7) was being conducted following modifications to ICS/NNI power distribution to verify (among other purposes) the adequacy of the revised Emergency Procedures for use in restoring "Auto" power to the ICS/NNI. The unexpected trip of the RCP's on restoration of "Auto" power was unrelated to the modifications.

The Test Procedure was modified and the test was then repeated successfully. The affected ICS/NNI Emergency Procedures (1202-40, "Total Loss of ICS/NNI Power", and 1202-42, "Total or Partial Loss of ICS/NNI") have been revised to reflect the information learned from this event and prevent RCP trip on loss and restoration of ICS/NNI "auto" power. No additional corrective actions are planned.

The HSPS and RPS trips are reportable in accordance with 10 CFR 50.73(a)(2)(iv).

IV. Component Failure Data

None, there were no component failures during this event.

V. Automatic or Manually Initiated Safety System Responses

All safety systems functioned in accordance with their design. The HSPS actuated both "A" and "B" trains successfully and started all three EFW Pumps as designed for a loss of RCP condition. Therefore, the HSPS system initiation was as designed with no abnormal response. The RPS response was normal for the plant conditions. The neutron flux/RCP trip functions to limit reactor power based on the number of RCP's in service. The basis for this trip is to prevent minimum core DNBR (departure from nucleate boiling heat flux ratio) from decreasing below 1.3 during Power Operation by tripping the reactor due to loss of RCP's. Power Operation is thereby restricted, based upon the number of RCP's in operation.

RCP power is monitored by the Reactor Coolant Pump Power monitors (AB/MON) using voltage and current inputs. Upon detecting a reduction in pump power, a contact sends a signal to each RPS channel. The RPS pump contact monitor determines the number of pumps in operation in each loop. The output of the pump contact monitor along with a signal proportional to neutron power goes to a power/RCP comparator, which initiates an RPS trip if the setpoint requirements are exceeded.

Once the RCP was restarted, the "A" and "C" RPS channels tripped on a high neutron flux/RCP signal. This occurred because a different setpoint (also nominally zero) is generated by the RCP contact monitor as a result of seeing an RCP running. All channels produced a lower allowable neutron flux setpoint with the RCP start than a "no" pumps condition. Therefore, the new setpoint that was sent to the trip bistable was lower than the "no" pump setpoint and RPS channels "A" and "C" tripped.

VI. Assessment of the Safety Consequences and Implications of the Event

All safety systems performed as designed. There were no adverse safety consequences as a result of this incident. Test Procedure 349/7 was intentionally being performed prior to startup from the 7R Outage. If the loss and subsequent restoration of ICS/NNI "Auto" Power had occurred at full reactor power, a reactor trip with loss of flow would have occurred under the procedures that existed before this event. This is an analyzed transient from which there would have been no adverse safety consequences.

VII. Previous Events of a Similar Nature

None.

VIII. Corrective Actions Planned

The Test Procedure was changed and then the test was completed successfully. The affected ICS/NNI Emergency Procedures (1202-40, "Total Loss of ICS/NNI Power", and 1202-42, "Total or Partial Loss of ICS/NNI") have been revised to reflect the information learned from this event and to prevent RCP trip upon loss and restoration of

ICS/NNI "auto" power. No additional corrective actions are planned.

NOTE: The Energy Industry Identification System (EIIS),System Identification (SI) and Component Function Identification (CFI) Codes are included in brackets, "[SI/CFI]", where applicable, as required by 10 CFR 50.73(b)(2)(ii)(F).

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September 12, 1988
C311-88-2123

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

Dear Sir:

Three Mile Island Nuclear Station, Unit 1 (TMI-1)
Operating Licensing No. DPR-50
Docket No. 50-289
LER 88-004-00

This letter transmits Licensee Event Report (LER) No 88-004-00 regarding the Reactor Protection System (RPS) and Heat Sink Protection System (HSPS) trip due to inadequate procedural guidance while testing the Integrated Control System/Non-Nuclear Instrumentation System (ICS/NNI) loss of "auto" power. The event occurred on August 13, 1988. Public health and safety were unaffected.

This LER is being submitted pursuant to 10 CFR 50.73, using the required NRC forms (attached). NRC Form 366 contains an abstract which provides a brief description of the event. For a complete understanding of the event, refer to the text of the report which appears on Form 366A.

Sincerely,

H. D. Hukill
Vice President and Director, TMI-1

HDH/MRK

Attachment

cc: J. Stolz
R. Conte
R. Hernan
W. Russell

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