LICENSEE EVENT REPORT (LER)

Form Rev 2.0

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Title (4)

Reactor Scram Due to Spurious Main Steam Line Low Pressure Signals Caused by Vibration

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)
1 1	2 7	8 8	8 8	0 1 7	0 0	1 2	2 2	8 8	N/A	
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OPERATING MODE (9)		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10CFR (Check one or more of the following) (11)			
N		___ 20.402(b)	___ 20.405(c)	X 50.73(a)(2)(iv)	___ 73.71(b)
POWER LEVEL (10)	0 1 7	___ 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)
		___ 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
John Geiger, Technical Staff Engineer Ext. 2610	AREA CODE 8 1 5 9 4 2 - 2 9 2 0

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
X	J M	6 3	B 0 7 0	Y					

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)

At 0111 hours on November 27, 1988, with Unit 3 at 17% rated core thermal power with a normal Unit shutdown in progress for a planned maintenance outage, an automatic trip of the main turbine on a high vibration signal occurred. Immediately following the turbine trip a spurious Primary Containment Group I Isolation occurred resulting in the automatic closure of various Primary Containment Isolation valves, including the Main Steam Isolation Valves (MSIVs). As a result of the MSIVs closing a reactor scram then occurred. The root cause of the spurious Primary Containment Group I Isolation and resulting reactor scram was attributed to vibration of a Main Steam Line (MSL) low pressure switch instrument rack during the turbine trip. Safety significance was minimal since the automatic isolation and scram logic functioned as designed. Corrective actions included disassembly and inspection of turbine components, improvement of the MSL low pressure switch mounting configuration, and development of a startup testing plan. A previous Dresden Unit 2 scram caused by a similar spurious Primary Containment Group I Isolation is reported under LER 87-32/050237.

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PLANT AND SYSTEM IDENTIFICATION:

General Electric - Boiling Water Reactor - 2527 MWt rated core thermal power.

Nuclear Tracking System (NTS) tracking code numbers are identified in the text as (XXX-XXX-XX-XXXXX).

EVENT IDENTIFICATION:

Reactor Scram Due to Spurious Main Steam [SB] Line Low Pressure Signals Caused by Vibration.

A. CONDITIONS PRIOR TO EVENT:

Unit: 3 Event Date: November 27, 1988 Event Time: 0111 hours

Reactor Mode: N Mode Name: Run Power Level: 17%

Reactor Coolant System (RCS) Pressure: 937 psig

B. DESCRIPTION OF EVENT:

At 0100 hours on November 27, 1988, Unit 3 was being shutdown for a planned maintenance outage in accordance with Dresden General Procedure (DGP) 2-2, Normal Unit Shutdown and Vessel [AC] Slow Fill Procedure. Generator [TB] output was approximately 110 MWe with reactor power approximately 17%. All feedwater heaters [SJ] had been removed from service three hours prior. The shutdown was being performed by two Reactor Operators who were also overseeing two licensed Reactor Operators in training. Control rod [AA] insertion was being performed by one trainee being overseen by one of the Reactor Operators. The shutdown was proceeding normally. At approximately 0109 hours, a main turbine [TA] high vibration alarm for main turbine bearing number 1 was received on Control Room panel 903-7. One Reactor Operator and one trainee were observing the turbine bearing vibration chart recorder waiting for a subsequent print of bearing number 1 which had printed a vibration of approximately 8 mils. After printout of the subsequent 21 recorder points, bearing number 1 printed approximately 11 mils. An automatic trip of the main turbine on a high turbine vibration signal then occurred at 0111 hours as bearing 1 was printed on the turbine bearing vibration chart recorder. Immediately following the turbine trip a spurious Primary Containment Group I Isolation [JM] occurred, causing closure of various Primary Containment Isolation valves, including the Main Steam Isolation Valves (MSIVs). As a result of the MSIVs closing a reactor scram then occurred.

The two Reactor Operators immediately responded by executing DGP 2-3, Reactor Scram. Review of plant parameters by the Reactor Operators and Shift Supervisors determined that the Primary Containment Group I Isolation had been caused by Main Steam Line (MSL) low pressure signals; however, it was confirmed that an actual MSL low pressure condition had not occurred. The Primary Containment Group I Isolation was then reset and the main condenser [SD] was reestablished as the primary heat sink. A normal Unit cool down was then initiated in preparation for the planned outage.

A Scram/Engineered Safety Features (ESF) actuation investigation committee was immediately formed by the Assistant Superintendent of Operations in accordance with Dresden Administrative Procedure (DAP) 7-15, Scram/ESF Actuation Investigation Program. Although plant response to the Primary Containment Group I Isolation was normal, the post-event investigation was complicated somewhat by the fact that the Primary Containment Group I Isolation signal was not recorded on the Control Room alarm typer although the Control Room panel annunciators operated satisfactorily. Also, the Station process computer [ID] did not generate a scram results log following the scram.

C. APPARENT CAUSE OF EVENT:

This report is submitted in accordance with 10CFR50.73(a)(2)(iv), which requires the reporting of any unplanned manual or automatic engineered safety feature actuation, including the Reactor Protection System (RPS). The proximate cause of the Primary Containment Group I Isolation signal and subsequent reactor scram was attibuted to spurious coincident Channel A and Channel B MSL low pressure signals. The root cause of the spurious MSL low pressure signals is believed to be vibration of instrument rack 2253-1, on which the MSL low pressure switches are mounted. The source of the instrument rack vibration was attibuted to the turbine trip.

During 1987, spurious MSL low pressure signals due to normal operation were a recurring problem on Dresden Unit 2. Recurring spurious Channel A/B MSL low pressure alarms resulted in vibration monitoring of the MSL low pressure instrument mounting assemblies by the Technical Staff and initiation of engineering work for installation of vibration isolators for these instruments. On October 20, 1987 a Unit 2 reactor scram occurred due to a spurious vibration-induced Channel B MSL low pressure signal coincident with a Channel A MSL radiation monitor [IL] high high radiation signal (which also generates a half Primary Containment Group I Isolation signal) generated during a routine surveillance.

Prior to restart of Unit 2 from the October 20, 1987 scram, Modification M12-2-87-33 was performed to install vibration isolators on the MSL low pressure switch mounting assemblies. This improvement was also implemented on Unit 3 under Modification M12-3-87-53. Following completion of this modification work, no recurrence of the spurious vibration-induced main steam line low pressure signal phenomena was observed until October 30, 1988 when a spurious Channel B MSL low pressure alarm was received on Unit 2 while performing a Unit 2 main turbine overspeed trip test. (This event had no effect on unit operation as no coincident Channel A Primary Containment Group I Isolation signals occurred and was investigated under non-reportable Deviation Report 12-2-88-130).

Investigation by Computer Group personnel revealed that the computer program which generates the scram results log had been taken out of service during a May, 1988 Unit 3 planned maintenance outage and had not been made operational prior to Unit 3 restart. Additionally, extensive testing and research concluded that printing of a MSL low pressure signal on the Control Room alarm typer is initiated only upon actuation of one of the four MSL low pressure switches. It is believed that the particular switch which drives printing of the alarm did not spuriously trip during this event and therefore the MSL low pressure alarm was not recorded on the alarm typer.

D. SAFETY ANALYSIS OF EVENT:

The MSL low pressure isolation circuitry is designed to provide automatic isolation of the MSLs during a postulated MSL break. Upon receipt of coincident Channel A and Channel B MSL low pressure signals, an automatic Primary Containment Group I Isolation occurred as designed, resulting in an automatic reactor scram upon the MSIVs reaching the 90% open position. In this event, the MSL low pressure signals were spurious, generated by vibrations of the MSL low pressure switches during an automatic trip of the main turbine; the main turbine trip occurred properly upon a 10 mil turbine high vibration signal. The Reactor Operators and Shift Supervisors responded immediately in accordance with appropriate procedures. For these reasons, the safety significance of this event was minimal.

E. CORRECTIVE ACTIONS:

Further review of the MSL low pressure switch mounting configuration performed by the Instrument Maintenance Department, Technical Staff, and Boiling Water Reactor Engineering Department (BWRED) personnel resulted in further improvements to help prevent transmission of vibration to the MSL low pressure switches. The conduits leading to the MSL low pressure switches was replaced with a two foot free length of flexible conduit (Work Request 80322).

A task force including Maintenance Staff and General Electric Turbine Engineering personnel was assembled to review all aspects of the turbine trip and implement appropriate corrective actions. The following actions were taken regarding the turbine.

1. Bearing number 1 was removed and inspected for signs of unusual wear or damage. Following completion of visual and ultrasonic inspections, it was determined that no unusual wear had occurred.

2. The N-1 packing housing was removed for inspection; it was determined that no packing rub had occurred.

3. Performance of an alignment check of the "A" coupling was satisfactory.

4. An inspection of the quill shaft was satisfactory.

5. Inspection of the front standard slide verified normal movement of the front standard from the running to cooldown position. (Items one through five were performed under Work Request 80192).

6. The turbine oil was analyzed, which revealed no indication of damaged bearings.

7. An extensive review of all turbine data from the event was performed and a startup program was developed in order to ensure that the turbine was in a satisfactory condition prior to startup.

In order to gather further data on the effect of turbine vibrarions on the MSL low pressure switches, BWRED personnel are developing a test plan involving installation of sensitive high-speed vibration data acquisition test equipment prior to a future pre-planned turbine trip (249-200-88-11901). Following analysis of this data, further corrective actions may be initiated on Unit 3 and on Unit 2 as appropriate (249-200-88-11902).

In order to prevent future unavailability of the scram results log program, the Unit 2/3 Master Startup Checklist (DGP 1-S1) and the Unit 2/3 Minimum Startup Checklist (DGP 1-S2) will be revised in order to require verification that this program is in service prior to commencing unit startup (249-200-88-11903). A modification request has also been submitted for review of possible changes to the MSL low pressure signal alarm printer logic and to consider adding the MSL low pressure switches to a sequence of events recorder program (249-200-88-11904).

A detailed On-Site Review was then performed under direction of the Station Manager prior to commencing startup of Unit 3 on December 7, 1988. Startup of Unit 3 proceeded smoothly with no incidences of spurious MSL low pressure alarms or unusual turbine vibration.

F. PREVIOUS EVENTS:

LER/Docket Number	Title
87-32/050237	Unit 2 Reactor Scram Due to Spurious Main Steam Line Low Pressure Signals Caused by Vibration.

The Primary Containment Group I Isolation associated with this event was caused by vibrations of the instrument rack holding the MSL low pressure switches. The corrective actions for this event led to the installation of vibration isolators on the MSL pressure switch housings.

G. COMPONENT FAILURE DATA:

Although component failure of the MSL low pressure switches did not occur, the following data is provided for information.

Manufacturer	Nomenclature	Model Number	MFG Part Number
Barksdale	MSL Low Pressure Switches	B2T-A12SS-GE-DS829	B2T-M12SSTC

Commonwealth Edison
Dresden Nuclear Power Station
R.R. #1
Morris, Illinois 60450
Telephone 815/942-2920

December 22, 1988

EDE LTR #88-957

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Washington, D.C. 20555

Licensee Event Report #88-017-0, Docket #050249 is being submitted as required by Technical Specification 6.6, NUREG 1022 and 10 CFR 50.73(a)(2)(iv).

E.D. Eenigenburg
Station Manager
Dresden Nuclear Power Station

EDE/ade

Enclosure

cc: A. Bert Davis, Regional Administrator, Region III
File/NRC
File/Numerical

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