Commonwealth Edison
Dresden Nuclear Power Station
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January 21, 1993

CWS PMLTR 93-0032

U.S. Nuclear Regulatory Commission
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License Event Report 92-025, Docket 050249 is being submitted as required by Technical Specification 6.6, NUREG 1022 and 10 CFR 50.72 (6)(2)(ii).

for 1-22-93
Charles W. Schroeder
Station Manager
Dresden Station

CWS/slb

Enclosure

cc: A. Bert Davis, Regional Administrator, Region III
NRC Resident Inspector's Office
File/NRC
File/Numerical

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IE22

LICENSEE EVENT REPORT (LER)

Form Rev 2.0

Facility Name (1)	Docket Number (2)	Page (3)
Dresden Nuclear Power Station, Unit 3	0 5 0 0 0 2 4 9	1 of 0 6

Title (4) Reactor Scram Caused By Turbine Invalid Trip Signal #3 Bearing As A Result of Electronic Card Failure In Turbine Vibration Control Circuitry.

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 5 0 0 0
1 2	2 5	9 2	9 2	0 2 5	0 0					0 5 0 0 0

OPERATING MODE (9)	N
POWER LEVEL (10)	0 7 3

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10CFR (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
___ 20.405(a)(1)(iii)	___ 50.73(a)(2)(i)	___ 50.73(a)(2)(viii)(A)	in Abstract
___ 20.405(a)(1)(iv)	___ 50.73(a)(2)(ii)	___ 50.73(a)(2)(viii)(B)	below and in
___ 20.405(a)(1)(v)	___ 50.73(a)(2)(iii)	___ 50.73(a)(2)(x)	Text)

LICENSEE CONTACT FOR THIS LER (12)

Name	TELEPHONE NUMBER AREA CODE
Ed McKenna - Tech Staff Turbine System Engineer Ext. 2887	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
B	J J	V A	G 0 8 0						

SUPPLEMENTAL REPORT EXPECTED (14)

___ Yes (If yes, complete EXPECTED SUBMISSION DATE) ___ NO

Expected Submission Date (15)	Month	Day	Year
	0 2	2 2	9 3

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

On December 25, 1992 at 21:43:35 hours with Unit 3 operating at a steady thermal power of 73%, an automatic reactor scram occured due to the Main Turbine tripping on a high vibration trip signal. The 3A Feedwater Regulating Valve (FWRV) locked out during the turbine trip. There were no surveillances being performed and the 3A FWRV and 3B FWRV were in auto and manual respectively. A root cause investigation was initiated to determine the cause of the high vibration trip of the turbine and the FWRV lockout. It was determined that there was no actual high vibration on the main turbine during or after the scram; if it had been a real vibration problem then excessive vibration readings would have been present from full speed to below critical speed on the coastdown. It was found during troubleshooting of the turbine trip circuitry that the reference trip signal required for turbine bearing #3 had failed low. There have been no previous Main Turbine trips resulting from failed vibration alarm cards found in a history search. The 3A FWRV lockout is believed to be the result of electrical load changes, due to equipment starts and stops occurring in the plant. The failed vibration alarm card was replaced with a new unit. It was noted after the scram that Main Steam Safety Valves (MCCV) 3-203-4B and 3-203-4D were weeping, according to the temperature fluctuations noted on the leak detection recorder.

ZDVR/92

PLANT AND SYSTEM IDENTIFICATION:

EVENT IDENTIFICATION:

Reactor scram due to an invalid turbine vibration trip signal on #3 bearing as a result of an electronic card failure in turbine vibration control circuitry.

A. CONDITIONS PRIOR TO EVENT:

Unit: 3 Event Date: December 25, 1992 Event Time: 2143 hrs.

Reactor Mode: N Mode Name: Run Power Level: 73%

Reactor Coolant System (RCS) Pressure: 1000 psig

B. DESCRIPTION OF EVENT:

At 21:43 hours on December 25, 1992 while Unit 3 was operating at 73% thermal load, the control room received an Electrical Hydraulic Control (EHC) [TG] malfunction and Main Turbine [TA] overspeed trip alarm. At 21:43:35 the reactor scrammed and the Main Turbine Stop Valve closure alarm annunciated. At 21:43:36 hours the 3A FWRV [SK] actuator trouble "hi-temperature alarm" came up. An automatic low reactor water level scram then occurred at 21:43:37 hrs. Primary Containment Group II and Group III Isolation Valve closures occurred as designed at low water level conditions. The reactor mode switch was placed in shutdown per Dresden General Procedures (DGP) 02-03, (Unit 2/3 Reactor Scram). At 21:43:43 Unit 3 Main Generator [TB] output breaker tripped and subsequently the Unit 3 Main Generator tripped as designed. Approximately one minute after the reactor scram the reactor water level was at 11 inches and increasing. At 21:44:39 the 3A Reactor Feed Pump (RFP) [SJ] was manually tripped at 20 inches reactor water level. The Unit 3 Nuclear Station Operator (NSO) manually closed the 3B FWRV and and both FWRV isolation valves on reactor water level increase. As expected the 3B RFP tripped at 55 inches of reactor water level. At 21:45:25 the reactor water level was at 54 inches and decreasing when the NSO found the 3A FWRV Hydraulic Operator (HO) 3-642A locked out at 10% open. The NSO reset the valve and it went closed due to the high level. At 22:33:21 the 3 A FWRV actuator trouble "hi-temperature alarm" came up. At 22:58:57 hours the 3A FWRV actuator trouble "hi-temperature alarm" was reset. Normal scram recovery continued after this point with the Unit 3 Main Turbine approaching turning gear operation with no abnormal vibration seen on the roll down.

During the Main Turbine Trip and subsequent scram, it was noted that the leak-off line for the Main Steam Safety Valves (MSSV's) 3-203-4B and 3-203-4D showed an increase in temperature, as recorded on leak detection recorder 3-260-20A located on panel 903-21. The leak-off temperatures for both safety valves reached approximately 215 degrees F (an increase of approximately 65 degrees on MSSV 3-203-4B and approximately 45 degrees on MSSV 3-203-4D). Following the scram, leak-off temperatures on both valves were observed to decline as the reactor/main steam piping cooled down.

DESCRIPTION OF EVENT Cont'd.:

The scram investigation committee was assembled in accordance with the Dresden Administrative Procedure (DAP) 7-15. The following problems were identified and are discussed in this report:

1. Main Turbine trip due to #3 bearing high vibration
2. Lockouts of the 3A FWRV during scram
3. MSSVs 3-203-4B and 3-203-4D weeping behavior observed after the scram

C. APPARENT CAUSE OF EVENT:

This report is being submitted in accordance with Title 10 of the Code of Federal Regulations part 50 section 73 (a)(2)(iv), which states that any event that results in manual or automatic actuation of any Engineered Safety Feature (ESF), including the Reactor Protection System (RPS) must be reported. As stated previously the reactor SCRAM was caused by the failure of a Dual Vibration Alarm Card which improperly detected high vibration on the #3 Main Turbine bearing. A summary of the root cause for each of the identified concerns is provided below:

1. Main Turbine Trip Due to #3 Bearing High Vibration:

On December 27, 1992 work request D15004 was initiated for the Instrument Maintenance Department (IMD) to troubleshoot and repair the vibration problem on the #3 Main Turbine bearing. Using Dresden Instrument Procedure (DIP) 5600-1 (Main Turbine Vibration Detectors Removal, Installation, Inspection, and TSI Vibration Channel Calibration) to check the 'as found' calibration settings of the turbine vibration channels, it was found that channel 3 (Main Turbine bearing #3) had a set point voltage of zero volts. The proper set point voltage should have been 7.33 volts (equal to 10 mils). All other channels had the proper set point voltage of 7.33 volts. It was attempted to readjust channel 3 but it continued to fail at 0 volts. The dual vibration (card bearings #3 and #4) was removed and a new card installed and calibrated to the set point of 7.33 volts. During a maintenance and calibration history search of the other turbine vibration alarm cards, it was found that the dual vibration card for bearing #5 and #6 exhibited a history of drift. Therefore, a work request D15078 was written to replace the card with a new one. Normal maintenance of electronic components is usually done in the form of cleaning, calibration or replacement of parts before failure. Dresden does not perform cleaning of these cards since they are in an enclosed cabinet and thus cleaning is not required. The Instrument Maintenance Department does perform a routine refueling outage calibration surveillance. This surveillance frequency is believed to be adequate since very few setpoint drifts have been noted over the life of the plant as mentioned above; however, Dresden does not have a preventative maintenance program to periodically replace these electronic cards prior to the end of their service life. The current service life is not known but the station is requesting this information from General Electric (GE) (original manufacturer). There has been no history of setpoint drift problems with the #3 and #4 dual vibration alarm card. In addition a visual examination of the card found no evidence of arcing, burning, heat damage, dust/dirt accumulation or loose parts. From a review of the component history it is believed that these alarms cards are original equipment to Dresden station. The failed alarm card will be sent out to GE Services for a failure analysis, and a supplemental report will be issued after a review of the received report. New preventative maintenance measures or component replacement will be considered and reviewed at that time. Until the failure analysis report is received, any cards showing a history of drift or multiple recalibrations will be replaced with new ones.

C. APPARENT CAUSE OF EVENT (Cont'd):

2. Lockouts of the 3 'A' FWRV:

The 3A FWRV experienced multiple lockouts during the December 25, 1992 Unit 3 scram. These lockouts are believed to be the result of electrical noise induced into the valves control circuitry similar to the phenomenon recently experienced by the 3B FWRV. Troubleshooting on the 3B FWRV revealed that actuator control cable shielding wires were susceptible to electrical noise. This noise would cause a comparator at the valve to sense a loss of signal when the signal was still present. When this comparator senses a loss of signal it trips the hydraulic pump resulting in a low hydraulic fluid pressure. A similar comparator in the Bailey Network 90 is also looking for the same loss of signal, which would alarm the 903-5 panel window a at G-7 (FW CONTROL SIGNAL FAILURE). This alarm never came up. In an attempt to suppress this noise on the 3B FWRV, the shielding wires were lifted form the electrical ground at the actuator and tied into the control room ground per temporary system alteration (TSA) #3-47-92 and currently under TSA #3-48-92. All 3A FWRV lockout signals were easily reset at the 903-5 panel. Also, it is known that the 3A 'FW CONTROL SIGNAL FAILURE' alarm, indicative of a loss of feedwater controller lockout condition was not received at the 903-5 panel, window G-7. However, the '3A FWRV ACTUATOR TROUBLE' alarm was received at the 903-6 panel, window E-10. The sequence of events recorder demonstrated that these alarms occurred due to high hydraulic fluid temperature at the actuator but the alarm was believed to be false. A system description review revealed that high fluid temperature does not produce a lockout signal; a lockout is produced by a loss of FW flow controller input signal at the actuator due to a failure of the FWRV controller, or by the trip of the hydraulic pump at the local control station. There was no evidence of loss of FWRV controller output demand per the sequence of events recorder, nor was the hydraulic pump tripped locally, so it is believed that a low hydraulic fluid pressure did occur on the hydraulic pump trip. A field walkdown determined that the temperature sensor and pressure sensor leads were swapped at the FWRV.

3. MSSV's 3-203-4B and 3-203-4D Weeping Behavior:

During the scram event the oncoming Station Control Room Engineer (SCRE) observed high leak-off temperatures on the leak detection recorder for safety valves 3-203-4B and 3-203-4D. Investigation revealed that leak-off temperatures for both safety valves had been cycling on a continuous basis, shortly after Unit start up on October 23, 1992. The 3-203-4B valve showed cycling of approximately 150 degrees F to 200 degrees F; while the 3-203-4D valve showed cycling of approximately 170 degrees F to 200 degrees F. The period of the cycling, for both valves, was about 4 hours. The probable cause of the cycling temperature for the safety valves is light seat leakage due to 1) a minor mis-alignment between the seat and disk, 2) a small piece of foreign matter stuck on the seat, or 3) a slight imperfection or nick in the seat area. Any of these would allow slight leakage past the seat, which would heat up the discharge area. This could in turn cause the valve to seat, due to thermal expansion, and stop the minor seat leakage. The valve discharge area would then cool, allowing the minor leakage to resume, which would start the process over again. Reference letter dated December 28, 1992 from G. Zwarich to B. Viehl (#0118214) about safety valve weeping.

After the planned unit shutdown and subsequent start-up on November 10, 1992, the MSSV 3-203-4D was again observed to weep. The temperatures for the valve continued the same cycle pattern as noted previously (ie. 30 degree F fluctuations within a 4 hour period). The MSSV 3-203-3B, however did not continue to weep and maintained a steady (normal) leak-off temperature of approximately 150 degree F.

C. APPARENT CAUSE OF EVENT (Cont'd.):

Following the Unit start-up, subsequent to the event described in this report, MSSV 3-203-4D was again observed to weep in the same manner as described above. MSSV 3-203-4B continued to maintain a steady leak-off temperature of 150 degree F.

D. SAFETY ANALYSIS OF EVENT:

1. Main Turbine Trip Due to #3 Bearing High Vibration:

The safety significance of the Main Turbine trip is considered to be minimal because the control circuitry performed as designed upon failure of this alarm card. The Main Turbine tripped and came to turning gear operation with no abnormal events.

2. MSSV's 3-203-4B and 3-203-4D Weeping Behavior:

The safety significance of the weeping MSSVs is considered minimal as this has been an observed phenomenon over a period of time with no evidence of worsening. Weeping of the MSSV would not prevent the valve from opening if required during an overpressurization event. In the unlikely event that the MSSV were to fail open an uncontrolled blowdown to the drywell would result, which is an analyzed condition.

E. CORRECTIVE ACTIONS:

1. Main Turbine Trip Due to #3 Bearing High Vibration:

The Instrument Maintenance Department replaced the failed dual vibration card with a new one. The alarm card for the #5 and #6 bearing which was showing a drifting problem was also replaced. The root cause of the alarm card failure is unknown at this time but the dual vibration alarm card for the #3 and #4 bearing will be sent to General Electric Services for a failure analysis. Upon receiving the GE report, a supplemental report will be issued to include new preventive maintenance measures needed or component replacement/upgrade recommendation. Until that time, any alarm cards showing a history of drift or multiple recalibrations will be replaced by IMD with a new calibrated alarm card, this will be documented by NTS item number 249-180-92-19901.

2. 3A FWRV Lockout

The 3A FWRV lockout problem will be corrected by work request D131988. Temporary system alteration #3-51-92 was installed to perform the shield wire change on the FWRV, once all data is reviewed, and if the results are acceptable to the station then a permanent change will be made. The 3A FWRV will be monitored by the operating department and the results provided to Technical Staff for review to determine if the spurious lockouts cease NTS item number 249-180-92-19902 will be used to track and document the results. The swapped wires on the pressure and temperature sensors were corrected under Work Request D15065. Because of possible interface with the electrical distribution grounding system and the spurious signal during the event, the Technical Staff electrical group will determine if the station grounding system had an interface with the FWRV operation and determine if any station actions are required, this will be documented and tracked by NTS item number 249-180-92-19903.

E. CORRECTIVE ACTIONS (Cont'd):

3. MSSV's 3-203-4B and 3-203-4D Weeping Behavior:

The MSSV leak-off temperatures were monitored by the operating department during Unit start-up and after the Unit reached full power following the scram. MSSV 3-203-4D continued to weep in the same manner as described in this report. No weeping was observed on MSSV 3-203-4B. Monitoring of the leak-off temperature will continue, and appropriate actions will be taken if the weeping behavior for MSSV 3-203-4D worsens. MSSV's 3-203-4B and 3-203-4D will be removed during the next refuel outage (D3R13). The valves will then be inspected and rebuilt at that time. NTS item number 249-180-92-19904.

F. PREVIOUS OCCURRENCES:

A component history search, NTS search and a NPRDS search failed to locate any previous turbine trips caused by failed bearing dual vibration alarm card.

G. COMPONENT FAILURE DATA:

Manufacturer	Nomenclature	Mfg. Part Number
General Electric Co.	Circuit Board, Dual Channel, Vibration	1589K29G700