NRC Form 366 (9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/85

LICENSEE EVENT REPORT (LER)

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TITLE (4): Circulating Water Pump Trip Resulting in High Negative Flux Rate Reactor Trip

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 2	0 8	8 6	8 6	0 0 1	0 0	0 3	0 7	8 6	NA	0 5 0 0 0

OPERATING MODE (9)	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
1	20.402(b)	20.405(c)	X 50.73(a)(2)(iv)	73.71(b)
POWER LEVEL (10): 1 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
Scott A. Bauer, Onsite Regulation Engineer	AREA CODE: 5 0 3 — 5 5 6 - 3 7 1 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
B	B A	2 0	L 2 0 0	Yes					

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 February 8, 1986 the plant experienced an unplanned reactor trip from 100% power on high negative power range neutron flux rate. The trip occurred during a manual turbine load decrease following a trip of the "A" circulating water pump. The circulating water pump tripped due to low lube oil flow which resulted from a low lube oil temperature (75 degrees F) and the attendant increase in lube oil viscosity. The lube oil temperature decrease was a product of cold weather and an inappropriate cooling water valve lineup to the lube oil cooler. The procedures addressing the lube oil system operations have been revised to include cold weather conditions.

The occurrence of a high negative flux rate trip during a turbine runback was considered abnormal and was investigated. The trip rate setpoint had been reduced during the 1985 refueling outage in response to Westinghouse Electric Corporation Technical Bulletin NSID-TB-85-13. The setpoint is now set below the negative rate which can be expected during a continuous manual turbine load decrease. Westinghouse and PGE are working to resolve this issue.

An auxiliary feedwater control valve ("A" train inlet to the D steam generator) failed following the reactor trip and was repaired. The failure involved cracked insulation on the valve operator's motor shunt field lead wire resulting in a short circuit and a blown power supply fuse. The insulation was repaired and the fuse replaced. The failure did not affect the required operation of the auxiliary feedwater system.

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

DESCRIPTION OF EVENT

On February 8, 1986 at 0312 with the plant at 100% power, the "A" circulating water pump tripped. The cause of the pump trip was not immediately apparent. A manual turbine load decrease was initiated in accordance with Off-Normal Instruction (ONI) 25, "Loss of One Circulating Water Pump", to prevent loss of condenser vacuum. At 0313, with the load decrease in progress, the reactor tripped from high negative power range neutron flux rate. Immediate action was taken in accordance with Emergency Instruction (EI) 0, "Reactor Trip, Safety Injection and Diagnosis", and EI-0.1, "Reactor Trip Recovery", to ensure the reactor was safely shutdown and all safety systems were operating as required. The auxiliary feedwater pumps automatically started on low-low steam generator level and feedwater isolation occurred on low average reactor coolant temperature (564 degrees F) in coincidence with the reactor trip.

At 0331, the "A" (turbine-driven) auxiliary feedwater pump was secured and the steam generators were being fed from the "B" (diesel-driven) auxiliary feedwater pump. At 0430, the electric auxiliary feedwater pump was started and lined up to feed the steam generators via the "A" train. The "B" auxiliary feedwater pump was secured at 0432.

At 0541, while investigating the cause of the "A" circulating water pump trip, the "B" circulating water pump tripped. Immediate examination of the motor controller for the "B" circulating water pump revealed the trip was caused by low lube oil flow. A second lube oil pump was started, clearing the low flow condition and the "B" circulating water pump was restarted at 0550. Further investigation revealed the trip of the "A" circulating water pump was also caused by low lube oil flow.

At 1052, auxiliary feedwater flow control valve, CV-3004D1, "A" train to the D steam generator, failed to respond upon manipulation of the valve controller. The valve had been in the throttled open position. The discharge of the electric auxiliary feedwater was promptly switched to the "B" train and CV-3004D1 was declared inoperable. The "A" train of auxiliary feedwater, however, was still capable of performing its design function of providing auxiliary feedwater flow to two steam generators.

At 1233, on February 8, the "A" circulating water pump was restarted and at 1626, auxiliary feedwater control valve CV-3004D1 repairs were completed and the valve was declared operable. The plant entered Mode 2 (K_{eff} greater than or equal to 0.99; rated thermal power less than or equal to 5%; average coolant temperature greater than or equal to 350 degrees F) at 1630 and Mode 1 (rated thermal power greater than 5%) at 1748. The plant achieved 100% power at 0355 on February 10, 1986.

There have been previous problems of a similar nature regarding the circulating water pumps and the auxiliary feedwater flow control valve; however, they did not require the submittal of Licensee Event Reports. High negative flux rate reactor trips have occurred on January 25, 1977, August 27, 1977, and December 8, 1977 following single or multiple dropped control rods. These events did not require the submittal of Licensee Event Reports.

CAUSE OF OCCURRENCE

The cause of the trip of the circulating water pump was low lube oil flow. The low lube oil flow resulted from the lube oil temperature dropping from a desired value of 110 degrees F to 75 degrees F from an inappropriate lube oil cooler valve lineup for cold weather operation. The cooling water outlet valve for the lube oil cooler was throttled one turn open as delineated in Operating Instruction (OI) 8-7, "Circulating Water and Turbine Building Cooling Water". Operating experience, however, dictated that this valve should have been shut in order to maintain the lube oil temperature above 100 degrees F. The cooling water valve was last verified shut on January 27, 1986. Apparently between that time and February 8, the valve was throttled open in accordance with OI-8-7. Sufficient procedural guidance did not exist to prevent the valve from being opened during cold weather.

A lube oil low temperature alarm is installed in the circulating water system to actuate at 100 degrees F. The alarm had actuated in the control room between December 27, 1985 and January 5, 1986. Operator action was taken at that time to increase lube oil temperature, but the temperature could not be raised above 95 degrees F and the alarm never reset. No interim actions were implemented while the alarm condition was further evaluated. The presence of the continuous alarm with no contingent actions prevented the operators from being alerted to the subsequent drop in lube oil temperature. The failure to take effective action in response to the lube oil low temperature alarm is considered a cognitive personnel error.

As the lube oil temperature dropped to 75 degrees F, the viscosity of the lube oil increased by a factor of 3. This increased viscosity resulted in an increased lube oil pressure downstream of the positive displacement lube oil pumps causing the regulating valve upstream of the circulating water pump bearings to open and divert flow back to the lube oil sump. With the valve open, lube oil flow (normally in excess of 7 gpm to each pump) was reduced to the pump bearings. The flow switches upstream of the bearings sensed a low lube oil flow (< 5 gpm to each pump) and tripped the circulating water pumps.

The cause of the reactor trip was a high negative power range neutron flux rate which occurred during the manual turbine load decrease. The occurrence of this trip during a manual turbine load decrease is considered abnormal since the plant should be capable of such a load decrease without tripping. The power range negative and positive rate trip setpoints had been reset during the 1985 refueling outage in response to Westinghouse Electric Corporation Technical Bulletin NSID-TB-85-13. The Technical Bulletin was intended to correct a misinterpretation of the vendor technical manual that had led to the setpoints being set higher than the specified limits in Technical Specification Table 2.2-1. Licensee Event Report 85-07 was submitted to the NRC on July 25, 1985 discussing this issue. Subsequent to implementation of the Technical Bulletin correction, the rate trips were set at 4.5% power with a time constant of 2.5 seconds in order to be conservatively below the Technical Specification setpoint of less than or equal to 5% power with a time constant of greater than or equal to 2 seconds. The setpoint reduction resulted in the trip being set at or below a rate which could be expected during a normal turbine load decrease.

The failure of the CV-3004D1 motor operator following the trip was determined to be caused by cracked insulation on the valve motor shunt field lead wire. The cracked insulation caused a short between the shunt field and the heater wiring resulting in a blown power supply fuse. This is the second failure of this nature amongst the eight 125-V d-c Limitorque motor operators (Model No. SMB 000-2) which were installed during the 1985 refueling outage.

CORRECTIVE ACTION

Corrective action was taken to restore circulating water pump lube oil temperature to the operating band of 100 degrees F to 120 degrees F by closing the lube oil cooler valve and erecting a tent over the exposed area. The plant's cold weather instructions, the Turbine Building Watch routines and OI-8-7 were revised to ensure the lube oil temperatures are maintained between 100-120 degrees F under all weather conditions. The lube oil low temperature alarm setpoints on the plant computer and the Annunciator Response Guide were improved to ensure the alarm comes in at the appropriate value (100 degrees F) and sufficient action is taken in response to the alarm.

The high negative rate trip setpoint has been changed to 5% power with a time constant of 2.25 seconds. This rate will provide greater margin to the trip setpoint, but is still below that expected during a manual turbine load decrease and PGE is working with Westinghouse to resolve this issue. Interim guidance has been given to plant operators to limit manual turbine load decreases by not pressing the load decrease buttons for longer than 5 seconds at a time.

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The cracked insulation on the auxiliary feedwater valve motor operator was repaired using Ray Chem insulation and the blown power supply fuse was replaced. The valve was declared operable prior to entry into Operational Mode 2. Further evaluation of the valve operator failure is in progress in view of the fact this is a repetitive failure.

SIGNIFICANCE OF OCCURRENCE

This event did not affect the health and safety of the public since protective functions performed as required and the plant was safely shut down. All safety-related equipment operated as required. The failure of auxiliary feedwater control valve CV-3004D1 did not affect the capability of the auxiliary feedwater system to perform its safety-related function.

Portland General Electric Company
Trojan Nuclear Plant
P.O. Box 439
Rainier, Oregon 97048
(503) 556-3713

March 6, 1986
WSO-081-86

US Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Gentlemen:

Licensee Event Report No. 86-01 is attached.

Sincerely,

W. S. Orser
General Manager
Trojan Nuclear Plant

c: Mr. John B. Martin
Regional Administrator, Region V
U.S. Nuclear Regulatory Commission

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