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)
Salem Generating Station - Unit 1	0 5 0 0 0 2 7 2	1 OF 0 5

TITLE (4)

Rx Trip 70% - #12 SG Low-Low Lev./Rx Trip 36% - #11 SG Low Lev. & SF>FF

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
0 8	0 5	8 6	8 6	- 0 1 6 -	0 1	1 0	1 4	8 6		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)			
POWER LEVEL (10)	0 7 0	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
M. J. Pollack - LER Coordinator	6 0 9 3 3 9 - 4 0 2 2

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	S J	P D	G 0 8 0	N							

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 5, 1986, No. 11 Steam Generator Feed Pump tripped on the overspeed trip. The operators performed the normal initial actions, including a main turbine runback. The steam dump opened due to the load rejection signal and remained open following the power reduction to 70% and steam generator levels decreased. The steam dump was then closed causing No. 12 Steam Generator level to shrink to the low-low level setpoint and at 0612 hours the reactor tripped. The cause of the Steam Generator Feed Pump overspeed trip was a failed diode in the governor actuator control. This diode and similar ones on the other steam generator feed pump controls has been replaced. On August 6, 1986 during the investigation of the August 5, 1986 trip, the technician performing the investigation accidentally grounded the control circuit common for Nos. 11 and 12 Steam Generator Feed Pumps (SGFP), No. 11 SGFP was not available and No. 12 SGFP transferred from automatic to manual control at minimum speed. The operator shifted No. 12 SGFP from manual to automatic control but reverted to manual control to avoid an overspeed trip. The pump speed then dropped to minimum and the reactor tripped due to Feed Flow/Steam Flow Mismatch and Low Level in No. 11 Steam Generator. The accidental grounding was due to mispositioned wiring in the control panel. All suspect wiring and connectors have been replaced and correctly positioned in the SGFP control panels. The I&C technicians were cautioned concerning the sensitivity of the SGFP control circuitry.

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DESCRIPTION OF OCCURRENCE: (cont'd)

The bezel indication for No. 12 SGFP showed that the individual pump speed control had tripped from automatic to manual while the master controller for both feedwater pumps remained in automatic. Observing that the pump speed had decreased to its minimum setting, the operator unsuccessfully attempted to increase the pump speed in manual. The controls for No 12 SGFP were then returned to automatic and the pump speed accelerated rapidly. The operator returned the controls to manual to prevent the pump from overspeeding. The pump speed quickly dropped to minimum. A few seconds later, at 0839 hours, the reactor tripped due to the feed flow/steam flow mismatch and low level in No. 11 Steam Generator.

The Unit was stabilized in Mode 3 (Hot Standby), and at 0845 hours, in accordance with the requirements of the Code of Federal Regulations, 10CFR 50.72 (b) (2) (ii), the Nuclear Regulatory Commission was notified of the automatic actuation of the Reactor Protection System [JC].

APPARENT CAUSE OF OCCURRENCE:

The "root cause" of the reactor trip on August 5, 1986, has been traced to a failed diode (probably due to age) in the governor actuator control for No. 11 Steam Generator Feedwater Pump. These diodes are original equipment and have never been replaced. It is surmised that during its failure, the diode first caused the governor control actuator to go shut and then full open. Due to the rate of increase of speed, the pump oversped its normal high speed limitation and reached the overspeed trip setpoint.

This is consistent with the most common diode failure scenario (ie. the diode first shorts then opens the circuit). Subsequent testing which simulated this type of failure has produced results consistent with the postulated events.

On August 6, 1986, the reactor tripped on a steam flow/feed flow mismatch and low level condition in No. 11 Steam Generator. This was due to No. 12 SGFP control transferring to manual at minimum speed while No. 11 SGFP was unavailable. The "root cause" of this event has been attributed to section of the mylar cable shielding being previously left mispositioned within the electrical controls panel of No. 11 SGFP. An I&C Technician working on the diode of No. 11 SGFP controls (during the investigation of the reactor trip of August 5, 1986) inadvertently "earth grounded" the control circuit common for both SGFPs when the screwdriver he was using touched the mylar and the diode simultaneously. This caused a pulse to be generated in the control circuitry of No. 12 SGFP, resulting in the runback of the pump to minimum speed and transfer from automatic to manual control.

ANALYSIS OF OCCURRENCE:

Following the loss of No. 11 SGFP, on August 5, 1986, the reduction in load resulted in opening of the steam dump. With the steam dump open, the total steam flow decreased only as fast as the control rods reduced Tave. Therefore, steam flow remained significantly above feed flow and resulted in a decreasing steam generator level. When this condition was recognized and the steam dump turned off, the increase in steam generator pressure was apparently enough to cause a decrease in the indicated water level of No. 12 Steam Generator to the low-low level trip setpoint.

The primary purpose of this trip is to provide core protection by preventing operation of the unit with steam generator water level below the minimum volume required for adequate heat removal capacity. The setpoint assures that there is adequate inventory in the steam generator at the time of the trip to allow for starting delays of auxiliary feedwater pump. This prevents dryout of the steam generator and the resulting reactor coolant system thermal and hydraulic transients associated with the loss of heat sink. It should be noted that as a result of the shrink induced by the termination of steam dump, the mass of water in the steam generator was actually greater than that which would normally be present at the low-low level setpoint. Therefore additional heat removal capability was provided. Since this trip occurred from approximately seventy percent (70%) power, the thermal and hydraulic affects on the reactor coolant system were less than those for a trip from full power.

On August 6, 1986, No. 12 Steam Generator Feedwater Pump transferred from automatic to manual with speed reduced to mimimum rpm, with No. 11 Steam Generator Feedwater Pump unavailable, resulted in a steam flow/feed flow mismatch and low steam generator level reactor trip. This is an anticipatory trip to prevent loss of heat sink by sensing conditions which would eventually result in a dry steam generator. By tripping the reactor prior to reaching the low-low level setpoint in the steam generator, the required starting time and capacity requirements for the Auxiliary Feedwater System are reduced. Since this trip occurred from approximately thirty six percent (36%) power, the thermal and hydraulic affects on the reactor coolant system were less than those for a trip from full power.

In both of the above occurrences the Reactor Protection System functioned as designed. These occurrences involved no undue risk to the health and safety of the public. However, because of the automatic actuations of the Reactor Protection System, the events are reportable in accordance with the Code of Federal Regulations, 10CFR 50.73 (a)(2)(iv).

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

Salem Generating Station	DOCKET NUMBER	LER NUMBER	PAGE
Unit 1	05000272	86-016-01	5 of 5

ANALYSIS OF OCCURRENCE: (cont'd)

Since these trips were from less than full power, seventy percent (70%) in the first occurrence and thirty six percent (36%) in the second, the resultant transients were well within the design limits of the plant.

CORRECTIVE ACTION:

The failed diode in No. 11 SGFP controls was replaced. As a precautionary measure, the corresponding diodes in the other SGFP controls were replaced. All four SGFP electrical control panels were completely refurbished. All suspect wiring and connectors were replaced and relugged. The wiring in No. 11 SGFP controls panel has been relocated within the panel to minimize the possibility of inadvertent grounding during maintenance. The I&C Technicians were cautioned concerning the sensitivity of the SGFP control circuitry.

This occurrence will be reviewed by the Nuclear Training Department for possible incorporation into existing or future training programs.

General Manager -
Salem Operations

RKH:pc

SORC Mtg. 86-070

PLANT AND SYSTEM IDENTIFICATION:

Westinghouse - Pressurized Water Reactor

Energy Industry Identification System (EIIS) codes are identified in the test as {xx}

IDENTIFICATION OF OCCURRENCE:

Reactor Trip From 70% Power - #12 Steam Generator Low-Low Level
Reactor Trip From 36% Power - #11 Steam Generator Flow Mismatch and Low Steam Generator Level

Event Dates: 08/05/86 & 08/06/86

Report Date: 09/04/86

This report was initiated by Incident Reports Nos. 86-245 & 86-249

CONDITIONS PRIOR TO OCCURRENCE:

Mode 1 - Rx Power 100% - Unit Load 1130 MWe
Mode 1 - Rx Power 36% - Unit Load 330 MWe

DESCRIPTION OF OCCURRENCE:

On August 5, 1986, during routine power operation, No. 11 Steam Generator Feedwater Pump (SGFP) [SJ] tripped on the overspeed trip. The operators responded with the normal initial actions including a Main Turbine [TA] runback, and increasing speed on No. 12 SGFP. The steam dump was open due to the load rejection signal. The levels in all of the steam generators shrank to 10-15% and then began increasing. The turbine runback was terminated and the steam dump remained open. Steam generator water levels began decreasing again, with the level in No. 12 Steam Generator dropping faster than the others. Shortly after securing steam dump, at 0612 hours, the reactor tripped due to a low-low level condition in No. 12 Steam Generator.

The unit was stabilized in Mode 3 (Hot Standby), and at 0740 hours, in accordance with the requirements of the Code of Federal Regulations, 10CFR50.72 (b) (2) (ii), the Nuclear Regulatory Commission was notified of the automatic actuation of the Reactor Protection System [JC].

On August 6, 1986, as part of the August 5, 1986 trip investigation, the unit was brought up in power using No. 12 Steam Generator Feedwater Pump (SGFP) [SJ]. Once the Unit was at fifty percent (50%) power, No. 11 SGFP was to be tested to determine the cause of its overspeed trip. During the power ascension a feed flow/steam flow mismatch alarm for No. 11 Steam Generator was received in the control room.

PSE&G

Public Service Electric and Gas Company P.O. Box E Hancocks Bridge, New Jersey 08038

Salem Generating Station

October 14, 1986

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

Dear Sir:

SALEM GENERATING STATION
LICENSE NO. DPR-75
DOCKET NO. 50-272
UNIT NO. 1
LICENSEE EVENT REPORT 86-016-01

This revision to Licensee Event Report 86-016-00 corrects the LER Abstract page. The abstract did not clearly refer to the second trip which occurred on 8/6/86 after the first trip of 8/5/86. This is the only change in this report.

Sincerely yours,

J. M. Zupko, Jr.
General Manager-
Salem Operations

MJP:pc

Distribution

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