PSEG

Public Service Electric and Gas Company P.O. Box 236 Hancocks Bridge, New Jersey 08038

Salem Generating Station

March 11, 1994

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

Dear Sir:

SALEM GENERATING STATION
LICENSE NO. DPR-70
DOCKET NO. 50-272
UNIT NO. 1

LICENSEE EVENT REPORT 94-005-00

This Licensee Event Report is being submitted pursuant to the requirements of Code of Federal Regulation 10CFR50.73(a)(2)(iv). Issuance of this report is required within thirty (30) days of event discovery.

Sincerely yours,

J. J. Hagan
General Manager -
Salem Operations

MJPJ:pc

Distribution

IE22 1/1

NRC FORM 366 (5-92) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
EXPIRES 5/31/95

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Salem Generating Station - Unit 1	05000 272	1 OF 05

TITLE (4)
Turbine Trip Due To Loss of Direct Current Control Power To Electro-Hydraulic Control Syst.

EVENT DATE (5)			LER NUMBER (6)			REPORT NUMBER (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
02	10	94	94	-- 005 --	00	03	11	94		05000
									FACILITY NAME	DOCKET NUMBER
										05000

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)							
POWER LEVEL (10)	99	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	
		20.405(a)(1)(iii)		50.73(a)(2)(i)		50.73(a)(2)(viii)(A)		(Specify in Abstract below and in Text, NRC Form 366A)	
		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 (Include Area Code)
M. J. Pastva, Jr. - LER Coordinator	(609) 339-5165

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 15 single-spaced typewritten lines) (16)

On 2/10/94, at 1258 hours, a control power failure of the turbine Electro-Hydraulic Control (EHC) System occurred causing a turbine/reactor trip. The Unit was stabilized in Mode 3, at approximately 1315 hours (same day). Insufficient margin between the EHC overvoltage protection setpoints and normal EHC power supply voltage allowed a variation in voltage to actuate the overvoltage protection circuitry. The margin resulted from design/installation of the EHC power supplies and use of a 17.3VDC setpoint. A contributor was EHC procedures that did not record power supply voltages in a manner that would reveal a reduced margin to trip. No component failures were identified as contributors to this event. EHC power supplies were monitored and no problems or transients/pulses were recorded. The overvoltage protection circuits were replaced and the circuits' setpoints were reset to 17.9 +/- .1 VDC, and the EHC +15 VDC bus wiring was reworked. Procedure changes have been implemented to ensure adequate margin below the overvoltage protection setpoint. The A +15VDC power supply was replaced and additional testing will be conducted to evaluate transient effects. During the next Unit 2 outage, voltage readings of the Unit 2 EHC 15VDC power supply will be taken to verify adequacy of the overvoltage protection margin to trip setpoint.

REQUIRED NUMBER OF DIGITS/CHARACTERS FOR EACH BLOCK

BLOCK NUMBER	NUMBER OF DIGITS/CHARACTERS	TITLE
1	UP TO 46	FACILITY NAME
2	8 TOTAL 3 IN ADDITION TO 05000	DOCKET NUMBER
3	VARIES	PAGE NUMBER
4	UP TO 76	TITLE
5	6 TOTAL 2 PER BLOCK	EVENT DATE
6	7 TOTAL 2 FOR YEAR 3 FOR SEQUENTIAL NUMBER 2 FOR REVISION NUMBER	LER NUMBER
7	6 TOTAL 2 PER BLOCK	REPORT DATE
8	UP TO 18 – FACILITY NAME 8 TOTAL -- DOCKET NUMBER 3 IN ADDITION TO 05000	OTHER FACILITIES INVOLVED
9	1	OPERATING MODE
10	3	POWER LEVEL
11	1 CHECK BOX THAT APPLIES	REQUIREMENTS OF 10 CFR
12	UP TO 50 FOR NAME 14 FOR TELEPHONE	LICENSEE CONTACT
13	CAUSE VARIES 2 FOR SYSTEM 4 FOR COMPONENT 4 FOR MANUFACTURER NPRDS VARIES	EACH COMPONENT FAILURE
14	1 CHECK BOX THAT APPLIES	SUPPLEMENTAL REPORT EXPECTED
15	6 TOTAL 2 PER BLOCK	EXPECTED SUBMISSION DATE

PLANT AND SYSTEM IDENTIFICATION:

Westinghouse - Pressurized Water Reactor

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

IDENTIFICATION OF OCCURRENCE:

Turbine/Reactor Trip Due To Loss Of Direct Current Control Power To Electro-Hydraulic Control System

Event Date: 2/10/94

Report Date: 3/11/94

This report was initiated by Incident Report No. 94-045.

CONDITIONS PRIOR TO OCCURRENCE:

Mode 1 Reactor Power 99 % - Unit Load 1136 MWe

DESCRIPTION OF OCCURRENCE:

On February 10, 1994, at 1258 hours, a turbine/reactor trip {JC} occurred due to a turbine trip signal while above the P-9 reactor power interlock setpoint. The turbine trip was initiated from a direct current (DC) control power failure of the turbine Electro-Hydraulic Control (EHC) System. Emergency Operating Procedure (EOP)-TRIP-1, "Reactor Trip Or Safety Injection" and EOP-TRIP-2, "Reactor Trip Response" were entered and the Unit was stabilized in Mode 3, at approximately 1315 hours (same day).

At 1403 hours (same day) the NRC was notified of this event in accordance with 10CFR50.72(b)(2)(ii).

ANALYSIS OF OCCURRENCE:

The turbine EHC system controls steam flow through the turbine to govern turbine speed and load during startup, normal operation and shutdown. In addition, the system trips the turbine if required. The two +15-volt DC control power supplies (A and B) to the system are utilized via an auctioneering circuit. Over-voltage protection of the EHC power supplies is provided. Loss of both power supplies is indicated by a Control Room overhead alarm annunciator "EH DC PWR FAIL" first out window (F-32).

The turbine/reactor trip occurred due to a DC control power failure of the turbine EHC System which caused a turbine trip signal while above

ANALYSIS OF OCCURRENCE: (cont'd)

the P-9 reactor power interlock setpoint (>/=50% rated thermal power). Emergency Operating Procedure (EOP)-TRIP-1, "Reactor Trip Or Safety Injection", was entered. Main Steam was isolated in accordance with EOP-TRIP-2, "Reactor Trip Response" to limit cooldown of the Reactor Coolant System {AB}. The Unit was stabilized and placed in Mode 3 and Integrated Operating Procedure IOP-8 was entered.

This event resulted from insufficient margin between the overvoltage protection setpoints and normal EHC power supply voltage. Consequently, a variation in voltage actuated the overvoltage protection circuitry. The A power supply was set at approximately 220 millivolts (mV) below the overvoltage protection setpoint of 17.3 volts and the B power supply was set at approximately 340 mV below the overvoltage protection setpoint of 17.3 volts. Guidance for the power supply, Lambda Electronics, Division of VEEC Instrument Co., recommends a setpoint of 115% of the power supply voltage plus 1.0 volt (i.e. > 18 volts). The Westinghouse EHC field calibration procedure recommends an overvoltage protection setpoint of 17.3 volts. However, Engineering & Plant Betterment analysis determined 18VDC as the maximum overvoltage protection setpoint.

Probable contributors to the insufficient setpoint margins:

- The power supply bus employed 18 gauge wiring, which may contribute to high line resistance which caused voltage drops from the power supply to the bus. Encountered high line resistance has required setting the power supply voltage relatively high in order to maintain proper bus voltage.

- Improperly crimped and loose wiring lugs in the power distribution panel wiring, confirmed by observed voltage transients during movement of the power supply output wiring.

- Recommendations in the Westinghouse EHC field calibration procedure required the overvoltage protection setpoint to be 17.3 volts, which was used by PSE&G.

- The potentiometer used to adjust the A power supply showed erratic response/high sensitivity to adjustments.

- EHC calibration procedure did not record power supply voltages in a manner that would reveal a reduced margin to trip.

No component failures were identified as contributors to this event. In addition, the loss of one 15 volt power supply resulting in loss

ANALYSIS OF OCCURRENCE: (cont'd)

of the other could not be duplicated. However, troubleshooting showed that the A power supply did not adequately control under large load transients.

At the time of this event, efforts were in progress to develop design changes to replace and upgrade the power supplies in response to previously encountered EHC power supply and distribution chassis problems, dating back to August 1992.

APPARENT CAUSE OF OCCURRENCE:

The cause of this event is "Design, Manufacturing, Construction/Installation", as classified in Appendix B of NUREG-1022. Methods used during installation and design of the EHC power supplies (i.e. wire size used) resulted in minimum margin between the overvoltage protection setpoints and normal EHC power supply voltage. In addition, EHC calibration procedures did not record power supply voltages in a manner that would reveal a reduced margin to trip. The conservative 17.3VDC setpoint contributed to the reduced margin. No component failures were identified as contributors to this event.

PREVIOUS OCCURRENCES:

Review of documentation showed this event to be an isolated occurrence.

SAFETY SIGNIFICANCE:

This event did not affect the health and safety of the public. It is reportable as an automatic RPS actuation in accordance with 10 CFR50.73(a)(2)(iv).

The RPS functioned as designed and the heat sink was maintained during this event. The reduction in T_{avg}, requiring main steamline isolation, has been experienced during other reactor trips (e.g.,Unit 1 LER 272/93-002-00 and Unit 2 LER 311/92-009-00). Engineering is investigating T_{avg} reduction following trips and potential corrective actions are being assessed.

CORRECTIVE ACTION:

EHC power supplies were monitored for voltage stability and no problems or transients/pulses were recorded.

The overvoltage protection circuits were replaced and the overvoltage

CORRECTIVE ACTION: (cont'd)

protection setpoints reset to 17.9 +/- .1 VDC to provide greater margin to trip.

The EHC +15 VDC bus wiring was reworked to reduce voltage losses in the wiring.

Procedure changes have been implemented to require recording of final EHC power supply voltage values in order to ensure adequate margin below the overvoltage protection trip setpoint.

The A +15VDC power supply, including its potentiometer, was replaced as a precautionary measure. The B +15VDC power supply potentiometer was cycled to assure proper performance.

Additional testing of the replaced A power supply and the overvoltage protection circuits will be conducted to evaluate transient effects.

During the next Unit 2 outage, voltage readings of the Unit 2 EHC 15VDC power supply will be taken to verify adequacy of the overvoltage protection margin to trip setpoint.

PSE&G is continuing to investigate T_{avg} reduction following reactor trips and potential corrective actions are being assessed.

General Manager -
Salem Operations

MJPJ:pc

SORC Mtg. 94-022