NRC Form 366 (9-83)

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

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Salem Generating Station - Unit 2	0 5 0 0 0 3 1 1	1 OF 0 4

TITLE (4): Reactor Trip From 10% During Unit Shutdown Operations

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	3 0	8 4	8 4	0 1 5	0 0	0 6	2 9	8 4		0 5 0 0 0
										0 5 0 0 0

OPERATING MODE (9): 1

POWER LEVEL (10): 0 1 0

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (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 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	
J. L. Rupp	6 0 9	3 3 9 - 4 3 0 9

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 fifteen single-space typewritten lines) (16)

On May 30, 1984, while performing a controlled shutdown, a reactor trip occurred from ten percent power. This reactor trip was initiated by Channel N-35 Intermediate Range (I.R.) high flux circuitry. The cause was attributed to a conservative I.R. high flux trip bistable setpoint of twenty percent rated thermal power (versus a normal value of twenty-five to thirty percent). This, combined with an excessively large bistable "reset deadband", resulted in an I.R. high flux trip bistable reset value of approximately ten percent rated thermal power. During the shutdown, when reactor power level reached ten percent, P-10 permissive circuitry unblocked the I.R. high flux trips. Channel N-35 I.R. high flux trip bistable had not reset (was still in a tripped condition) resulting in the reactor trip signal. The trip setpoints were reset to the correct values, and the bistable reset points were increased (which decreased the "reset deadband"). The I.R. high flux trip is designed to protect the core in the event of an uncontrolled reactor startup. The failure of Channel N-35 to reset, upon decreasing reactor power, prior to reaching the P-10 setpoint did not affect the operability of the I.R. high flux protection. Due to the automatic actuation of the Reactor Protection System, this event is reportable in accordance with 10CFR 50.73(a)(2)(iv).

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PLANT AND SYSTEM IDENTIFICATION:

Westinghouse - Pressurized Water Reactor

Energy Industry Identification System (EIIS) codes are identified in the text as [XX].

IDENTIFICATION OF OCCURRENCE:

Reactor Protection System [JC] - Reactor Trip From 10% During Unit Shutdown Operations - Channel 35 Intermediate Range High Flux Circuitry - (Rx Trip #84-10)

Event Date: 05/30/84

Report Date: 06/29/84

This report was initiated by Incident Report No. **84-084**

CONDITIONS PRIOR TO OCCURRENCE:

Mode 1 - Rx Power 010 % - Unit Load 0040 MWe

DESCRIPTION OF OCCURRENCE:

On May 30, 1984, a controlled shutdown was in progress in accordance with the requirements of Technical Specification Limiting Condition For Operation 3.0.3. This shutdown was the result of declaring 21SJ16 and 22SJ16 (21 and 22 Reactor Coolant System cold-leg Charging/Safety Injection Throttle Valves) inoperable due to the plugs becoming detached from the valve stems. 11SJ16 (Unit 1) was also declared inoperable due to the plug becoming detached from the stem. See Unit 1 LER 84-012-00 for further information concerning circumstances surrounding both unit valve failures. At 1526 hours, a reactor trip and turbine trip occurred from ten percent (10%) rated thermal power (RTP). This reactor trip was initiated by Channel N-35 Intermediate Range (I.R.) high flux circuitry [IG].

APPARENT CAUSE OF OCCURRENCE:

The I.R. high flux trip is designed to protect the reactor core in the event of an uncontrolled reactor startup, and is supposed to occur between 25% and 30% increasing RTP. This reactor trip signal (which is provided by either I.R. high flux trip bistable) is manually blocked during normal reactor startups, after P-10 becomes active at ten percent (10%) RTP. During reactor shutdown operations, P-10 automatically reinstates the I.R. high flux trip, at ten percent (10%) RTP; although a reactor trip will not occur, provided the I.R. high flux bistables reset prior to reaching the P-10 setpoint.

APPARENT CAUSE OF OCCURRENCE: (cont'd)

Measurements performed at the Beginning of Life determined that 8.8×10^{-5} amps was the I.R. signal equivalent of twenty-five percent (25%) RTP; although, investigation revealed that the I.R. high flux trip setpoints were set at 7.0×10^{-5} amps. This setting (7.0×10^{-5} amps) was the I.R. signal equivalent of twenty percent (20%) RTP. Since this was in the conservative direction, the setpoint had been left at 7.0×10^{-5} amps. Because the I.R. high flux trip bistable reset points are one-half of the trip setpoint, the trip setpoint of 7.0×10^{-5} amps allowed a reset level of 3.5×10^{-5} amps, rather than 4.4×10^{-5} amps (one half of the measured Beginning of Life signal equivalent of 25% RTP). Consequently, this resulted in an I.R. high flux trip bistable reset point of approximately ten percent (10%), versus twelve and one-half percent (12.5%). This made the reset function of the I.R. bistables, prior to receipt of P-10, unlikely.

In addition, the "reset deadband" of one half the setpoint value contributed greatly, by making the reset of the I.R. bistables (prior to the receipt of P-10) very close, even under ideal conditions. Even with an I.R. setpoint at 8.8×10^{-5} amps (signal equivalent of 25% RTP), and a reset of 4.4×10^{-5} amps (signal equivalent of 12.5% RTP), the reset function should occur at 12.5% RTP and P-10 at 10% RTP. This means a nonlinearity or mistracking of I.R. to Power Range (P.R.) of only 2.5% RTP could cause a trip from 10% power. The I.R. detectors are sensitive to axial and radial power distribution changes (i.e., burnup, control rod position and xenon) and may not follow the P.R. channels to within 2.5% RTP. In addition, small interchannel differences in calibration, and flux symmetry could allow one channel to reset while one remained in the tripped condition upon receipt of P-10.

The cause of the reactor trip was attributed to a conservative setpoint value and an excessively large "reset deadband" of the I.R. high flux trip bistables. This, combined with present core conditions, prevented Channel N-35 I.R. bistable from reaching its reset value upon decreasing reactor power. When three out of four P.R. channels indicated ten percent (10%) RTP, the P-10 permissive unblocked the I.R. high flux trips. With Channel N-35 I.R. bistable still in the tripped condition, the one out of two logic was made, which resulted in the trip signal from the Reactor Protection System [JC]. It should be noted, at this time, that Channel N-36 I.R. bistable reached its reset point just prior to the reactor trip.

ANALYSIS OF OCCURRENCE:

The I.R. nuclear flux trip provides reactor core protection during reactor startup. This trip provides redundant protection to the low setpoint trip of the P.R. neutron flux channels. The I.R. channels will initiate a reactor trip at a current level proportional to approximately twenty-five percent (25%) RTP unless manually blocked when P-10 becomes active.

ANALYSIS OF OCCURRENCE: (cont'd)

No credit is taken for the operation of this trip in the accident analyses; however, its functional capability at the specified trip setting is required by the Technical Specifications to enhance the overall reliability of the Reactor Protection System. The failure of Channel N-35 I.R. high flux bistable to reset prior to reaching the P-10 setpoint did not affect the operability of the I.R. high flux protection (25% RTP setpoint). As previously stated the trip setpoint was conservatively set at approximately 20% RTP. The Reactor Protection System functioned as designed to trip the reactor upon sensing the I.R. high flux logic signal. This occurrence involved no undue risk to the health or safety of the public. Due to the automatic actuation of the Reactor Protection System, the event is reportable in accordance with the Code of Federal Regulations, 10CFR 50.73(a)(2)(iv).

CORRECTIVE ACTION:

In order to preserve margin between the I.R. high flux setpoint and P-10, during the following return to power the I.R. high flux setpoints were set to the measured values. The I.R. high flux bistable reset point was raised to as close to the trip setpoint as practical, thereby decreasing the large "reset deadband". In addition, an "On-The-Spot" change was made to Operating Procedure IOP-5 (Minimum Load to Hot Standby); i.e., during controlled shutdowns, the Nuclear Control Operator shall check the condition of the I.R. high flux bistables to ensure they have reset prior to reaching ten percent (10%) RTP, and the P-10 permissive.

General Manager-
Salem Operations

JLR:tns

SORC Mtg 84-075

PSE&G

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

Salem Generating Station

June 29, 1984

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

Dear Sir:

SALEM GENERATING STATION
LICENSE NO. DPR-75
DOCKET NO. 50-311
UNIT NO. 2
LICENSEE EVENT REPORT 84-015-00

This Licensee Event Report is being submitted pursuant to the requirements of 10CFR 50.73(a)(2)(iv). This report is required within thirty (30) days of discovery.

Sincerely yours,

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

JR:kll

CC: Distribution

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