PSEG

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

Salem Generating Station

July 9, 1992

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

SUPPLEMENTAL LICENSEE EVENT REPORT 91-008-01

This Supplemental Licensee Event Report is being submitted pursuant to Code of Federal Regulations 10CFR50.73. The Apparent Cause of Occurrence and Corrective Action sections have been modified based upon completed Engineering investigations.

Sincerely yours,

C. A. Vondra
General Manager -
Salem Operations

MJP:pc

Distribution

The Energy People

95-2189 (10M) 12-89

NRC FORM 366 (6-89) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-0104
EXPIRES: 4/30/92

ESTIMATED BURDEN PER RESPONSE TO COMPLY WTH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

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)

4KV Vital Bus UV Relay Setpoints Found Below Minimum Tech. Spec. Allowable Value.

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)
									Salem Unit 1	0 5 0 0 0 2 7 2
0 6	0 3	9 1	9 1	0 0 8	0 1	0 7	0 9	9 2		0 5 0 0 0

OPERATING MODE (9)	1
POWER LEVEL (10)	1 0 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)		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)	X	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 - 2 0 2 2

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	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 June 3, 1991, the 91.6% sustained undervoltage relay minimum drop out trip setpoint voltage, for two (2) of the three (3) of the 2A 4KV Vital Bus undervoltage relays and for all three (3) 2B 4KV Vital Bus undervoltage relays, were found to be below the Technical Specification minimum allowable value of 91%. This was discovered during Technical Specification Surveillance 4.3.2.1.1 testing which requires monthly testing of undervoltage relay setpoints. Procedures (S2.MD-FT.4KV-0001(Q) (0002), "ESFAS Instrumentation Monthly Functional Test-2A (2B) 4KV Vital Bus Under Voltage") were being used to support the surveillance testing. The lowest as-found trip setpoint, of the five subject relays was 90.5%. The causal factors of the setpoint variance are relay design inadequacy and procedure inadequacy. Special relay tests show that the relay circuitry is influenced by the amount/type of harmonics present in the external test signal. The worst case scenario (i.e., assume that the %THD measured was all third harmonics) would have the relays trip at 108.38 VAC. The minimum allowable Technical Specification value is 108.2 VAC. Weekly testing of the installed relays was performed under the direction of System Engineering. In addition, controlled bench tests were performed on identical relays. The relay test procedure has been revised as applicable. The 4KV Vital Bus 91.6% undervoltage Rochester relays (both Salem Units) were replaced with ASEA Brown Boveri type 27N relays. Since installation, setpoint variance has not been observed.

PLANT AND SYSTEM IDENTIFICATION:

Westinghouse - Pressurized Water Reactor

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

IDENTIFICATION OF OCCURRENCE:

The Vital Bus 91.6% undervoltage relay setpoints were found below the minimum Technical Specification allowable value

Discovery Date: 6/03/91

Report Date: 7/9/92

This report was initiated by Incident Report Nos. 91-403, 91-404, 91-464, 91-506, 91-632, 91-633, 91-657, and 91-685.

CONDITIONS PRIOR TO OCCURRENCE:

Mode 1 Reactor Power 100% - Unit Load 1150 MWe

DESCRIPTION OF OCCURRENCE:

On June 3, 1991, the 91.6% sustained undervoltage relays' minimum drop out trip setpoint voltage, for two (2) of the three (3) of the 2A 4KV Vital Bus undervoltage relays and for all three (3) 2B 4KV Vital Bus undervoltage relays, were found to be below the Technical Specification minimum allowable value of 91%. This was discovered during Technical Specification Surveillance 4.3.2.1.1 testing which requires monthly testing of undervoltage relay setpoints. Procedures (S2.MD-FT.4KV-0001(Q) (0002), "ESFAS Instrumentation Monthly Functional Test-2A (2B) 4KV Vital Bus Under Voltage") were being used to support the surveillance testing.

The trip setpoint, per Technical Specifications, is 91.6% (108.9 VAC) while the allowable value is 91% (108.2 VAC). The trip setpoints, of the five subject relays, were found to be 107.52 VAC and 107.63 VAC for the 2A 4KV Vital Bus and 107.83, 107.76 and 107.78 VAC for the 2B 4KV Vital Bus. The lowest reading (107.52 VAC) equates to a setpoint of 90.5%.

The as-found condition of the Vital Bus relays potentially prevented their protective functioning. Consequently, the Nuclear Regulatory Commission was notified of this event on June 3, 1991 at 1556 hours in accordance with Code of Federal Regulations 10CFR 50.72(b)(2)(iii)(B).

APPARENT CAUSE OF OCCURRENCE:

The causal factors of the setpoint variance are relay design inadequacy and procedure inadequacy. Special relay tests show that

APPARENT CAUSE OF OCCURRENCE: (cont'd)

the relay circuitry is influenced by the amount/type of harmonics present in the external test signal; the relay trip/reset setpoints change on subsequent checks when the test signal contains a different amount/type of harmonics/noise plus the relay's allowable design setpoint drift.

Factory testing of the spare relay showed that relay setpoint variance was ± 0.3 VAC plus another -0.25% for each 1% of third harmonic present in the input signal. Percent total harmonic distortion (%THD), which measures all the frequencies present in the input signal, was measured at the input of all three (3) 91.6% UV relays of 1A 4KV Vital Bus. The %THD measured between 0.6 - 0.8%. The worst case scenario (i.e., assume that the %THD measured was all third harmonics) would have the relays trip at 108.38 VAC. Therefore, the present relays will perform their design base trip function prior to reaching the minimum allowable Technical Specification value of 108.2 VAC.

Investigation of the setpoint variance, found during monthly and weekly testing of installed relays, revealed several additional contributing causal factors that included:

1. calibrating relays in an ambient temperature range of 50°F in the winter to 120°F in the summer

2. specifying the relay's administrative trip setpoint band of 0.15 VAC when the relay's allowable design band is 0.65 VAC; therefore, subsequent as found setpoints are more likely to be outside the administrative band requiring more frequent setpoint recalibration

3. use of an external test circuit (i.e., unshielded test leads, slidewire & resistor network, and power supply) that allowed pickup of harmonic and noise from the surrounding area

ANALYSIS OF OCCURRENCE:

The Vital Bus (1E) 70% Loss of Voltage, 91.6% Sustained Degraded Voltage, and 35% Vital Bus Undervoltage Bus Transfer relays monitor the Vital Bus voltage via 35:1 ratio potential transformers (PTs). Each Vital Bus contains one (1) 70% IAV relay three (3) 91.6% Rochester Instrument Systems model PR-2035 P1-T1-0 relays, and one (1) 35% ITE-27H relay. The 70% and 91.6% relays provide input to the Safeguard Equipment Control (SEC) Systems so the SEC can determine Vital Bus emergency loading requirements.

On June 3, 1991, the 91.6% relay's as-found trip setpoint was found to be less than the minimum Technical Specification allowable value (91%). The relays were then recalibrated to the 91.6% value specified

ANALYSIS OF OCCURRENCE: (cont'd)

in the applicable Surveillance Test Procedure S2.MD-FT.4KV-0001(Q) (0002). Recalibration was completed for each relay of each Vital Bus, at the time each out of specification reading was found. The two (2) Vital Bus relays (total of five relays) were recalibrated on June 3, 1991.

An engineering analysis (reference Engineering letter ELE-91-0364), considering several scenarios that could result in low voltage at the 4KV, 480V, and 230V Vital Busses, was performed to determine the impact the low as-found 91.6% relay setpoints (90%) would have had on Unit 2's Vital Bus motors and loads. In all considered scenarios, the undervoltage relays would have performed their design function and would have provided adequate protection to Vital Bus motors and loads despite their lower as-found trip setpoints.

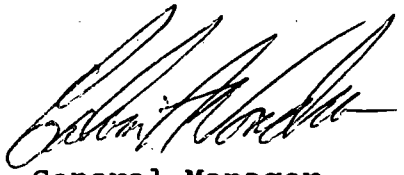
Therefore, based on the engineering analysis, this event did not affect the health or safety of the public. However, since the Technical Specification requirement for the undervoltage relay setpoint was not met, this event is reportable to the commission in accordance with Code of Federal Regulations 10CFR 50.73(a)(2)(i)(B).

CORRECTIVE ACTION:

Weekly testing and trending of test results of the installed Rochester relays was performed under the direction of System Engineering. In addition, controlled bench tests were performed on identical relays (i.e., spare relays purchased when the installed relays were purchased). The relay manufacturer (Rochester Instrument Systems) actively supported and contributed to the investigation.

The relay test procedure has been revised to minimize harmonic/noise effects by: 1) use of the California Instruments model 161T AC power supply (< 0.3% THD) (or equivalent equipment) instead of the Doble power supply (> 0.5% THD); 2) use of shielded test leads; and 3) use of a more accurate digital voltmeter.

The 4KV Vital Bus 91.6% undervoltage Rochester relays (both Salem Units) were replaced with ASEA Brown Boveri type 27N relays. Since installation, setpoint variance has not been observed. The additional weekly surveillance testing has been discontinued.



General Manager -
Salem Operations

MJP:pc
SORC Mtg. 92-076