

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)

Salem Generating Station - Unit 2

DOCKET NUMBER (2)

0 5 0 0 0 3 1 1 1 OF 0 6

PAGE (3)

TITLE (4)

Electrical Power Systems - Loss of 2B 4KV Vital Bus

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	3	1	8	8	4	8	4	0	0	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)													
	1	20.402(b)				20.408(e)				90.73(a)(2)(iv)				73.71(b)	
		20.408(a)(1)(i)				90.38(a)(1)				90.73(a)(2)(v)				73.71(e)	
		20.408(a)(1)(ii)				90.38(a)(2)				90.73(a)(2)(vi)				X OTHER (Specify in Abstract below and in Text, NRC Form 308A)	
		20.408(a)(1)(iii)				X 90.73(a)(2)(i)				90.73(a)(2)(viii)(A)				Surveillance Requirement	
		20.408(a)(1)(iv)				90.73(a)(2)(ii)				90.73(a)(2)(viii)(B)					
		20.408(a)(1)(v)				90.73(a)(2)(iii)				90.73(a)(2)(x)					

LICENSEE CONTACT FOR THIS LER (12)										TELEPHONE NUMBER			
NAME J. L. Rupp										AREA CODE 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 NRC		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC	

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)

At 0213 hours, March 18, 1984, during routine surveillance testing, a loss of 2B 4KV Vital Bus occurred while paralleling 2B Emergency Diesel Generator with the grid. The Bus Differential Protection Relay actuated, which, in turn, actuated the Multi-Trip Relay and tripped 2B Emergency Diesel Generator Breaker and the 4KV Vital Bus Infeed Breaker. The plant was verified to be in a stable condition. Although the Individual Rod Position Indication (IRPI) failed at zero, and the rod bottom lights illuminated, reactor power level remained steady at one-hundred percent. The plant was maintained stable while the IRPI and rod bottom indication were restored. At 0610 hours, a unit shutdown was commenced in accordance with the Technical Specifications, due to the inoperability of three containment isolation valves. The event was attributed to paralleling the generator out-of-phase. Testing verified that the bus, breakers, relays and all equipment were unaffected by the transient. The bus was reenergized at 1123 hours. The containment isolation valves were restored to an operable status, and the reactor shutdown was terminated. The event involved no undue risk to the health or safety of the public. This report is submitted in accordance with 10CFR 50.73 (a)(2)(i) and Surveillance Requirement 4.8.1.1.4.

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PLANT AND SYSTEM IDENTIFICATION:

Westinghouse - Pressurized Water Reactor

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

IDENTIFICATION OF OCCURRENCE:

Electrical Power Systems - Loss of 2B 4KV Vital Bus

Event Date: 03/18/84

Report Date: 04/17/84

This report was initiated by Incident Report No. 84-044

CONDITIONS PRIOR TO OCCURRENCE:

Mode 1 - Rx Power 100 % - Unit Load 1150 MWe

DESCRIPTION OF OCCURRENCE:

On March 18, 1984, during routine power operation, surveillance testing of 2B Emergency Diesel Generator [EK] was in progress. The diesel had been successfully started, and the generator was being synchronized with the grid. At 0213 hours, closed indication of the diesel generator output breaker (2BDD) was observed in the control room, followed by an almost instantaneous opening. Approximately five to ten (5-10) seconds later the diesel output breaker again indicated closed, and again instantaneously opened. This time, the diesel breaker opening was accompanied by the opening of 2B 4KV Vital Bus Infeed Breaker (21BSD), and consequently, the loss of the 2B 4KV Vital Bus [EB]. Other indications observed in the control room immediately following the occurrence were: 2B Emergency Diesel Generator "Start" indication; 2B Diesel Generator Output Breaker "Open" indication; both Station Power Transformer Infeed Breakers "Open" indication; "2B 4KV Vital Bus Differential Protection" and "2B 4KV Vital Bus Undervoltage" alarms on the overhead annunciator; Individual Rod Position Indication (IRPI) failed at zero; all rod bottom lights illuminated; and, primary and secondary plant parameters stable, with reactor power at one-hundred percent (100%).

Shift personnel immediately verified equipment/system status, and confirmed that the plant was in a stable condition. Personnel were dispatched to verify relay actuations on the Elevation 64' Switchgear Room. The shift then directed their attention to identifying applicable Technical Specifications and the actions necessary to comply with the Limiting Conditions For Operation (LCO) for one inoperable vital bus.

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DESCRIPTION OF OCCURRENCE: (cont'd)

At approximately 0230 hours, the actuated relays were identified, and it was determined that the diesel breaker and the vital bus infeed breaker had tripped as the result of "Bus Differential Current Protection". Orders were given not to reenergize the bus until a thorough investigation of the bus and of the supplied loads could be performed. The NRC was immediately notified of the occurrence at 0245 hours, in accordance with the requirements of 10CFR 50.72.

Technical Specification Limiting Condition for Operation 3.1.3.2.1 requires the Control Rod Position Indication System [AA] to be operable and capable of determining the control rod positions within plus or minus twelve (+/-12) steps. It was determined that the most restrictive LCO (3.0.3) was applicable since 0213 hours, due to the loss of power to the IRPI; therefore, efforts were directed in restoring power to the IRPI System.

Limiting Condition for Operation 3.0.3 states:

When a Limiting Condition for Operation is not met except as provided in the associated Action Requirements, within one hour action shall be initiated to place the unit in a mode in which the specification does not apply by placing it in at least hot standby within the next six (6) hours.

Knowing that the plant was in a stable condition, and realizing that an improperly monitored shutdown transient was unsafe when compared to steady state conditions, at 0310 hours, the Senior Shift Supervisor directed that the unit was to be maintained stable while other possible causes could be eliminated. He also ordered a manual reactor trip to be initiated immediately in the event of any transient. At 0344 hours, after checking all possible causes, it was determined that the IRPI System failure was due to loss of the normal power supply (2B 230V Bus, breaker 2B9Y). The alternate power supply breaker from the 2A 230V Bus was ordered closed, and at 0400 hours, the IRPI and Rod Bottom indication was returned to operable status.

Technical Specification 3.8.1.1 requires three operable emergency diesel generators. With one diesel generator inoperable, Action Statement 3.8.1.1.a requires that the two remaining diesel generators be demonstrated operable within one (1) hour, and at least eight (8) hours thereafter. In addition, the inoperable diesel generator must be returned to an operable status within seventy-two (72) hours, or the unit must be in hot standby within the next six (6) hours and in cold shutdown within the following thirty (30) hours.

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DESCRIPTION OF OCCURRENCE: (cont'd)

At 0411 hours, the surveillance requirements were completed and the operability of 2A and 2C Emergency Diesel Generators was verified. Although the surveillances were fifty-eight minutes overdue, the verification was performed as soon as the IRPI System was returned to service, and the requirements for the most Limiting Condition for Operation had been satisfied.

At this point, the most Limiting Condition for Operation was determined to be 3.6.3, due to the inoperability of containment isolation valves [JM] 2CV284 (RCP Seal Water Return Header Stop Valve), 2CV68 (Charging Header Motor Operated Stop Valve), and 2FP147 (Fire Protection Stop Valve). Technical Specification Action Statements 3.6.3.a and 3.6.3.d require the inoperable valves to be restored to an operable status within four (4) hours, or be in hot standby within the next six (6) hours and in cold shutdown within the following thirty (30) hours. These Action Statements became effective at 0213 hours. At 0610 hours, a controlled plant shutdown was initiated to comply with the Action Requirements. The NRC was notified of the initiation of the plant shutdown and of the intention to be off-line at 1200 hours, if the 2B Vital Bus was not restored.

APPARENT CAUSE OF OCCURRENCE:

The occurrence was attributed to paralleling 2B Emergency Diesel Generator out-of-phase. The current and voltage transient, caused by the phase mismatch, resulted in actuation of the Bus Differential Protection Relay. This, in turn, actuated the Multi-Trip (MT) Relay which tripped the diesel generator breaker and the 4KV infeed breaker; isolating the bus, and protecting it from damage.

Since the entire event occurred in an extremely short time period (10-14 seconds), the exact sequence of events, observations and actions (at the diesel control panel) could not be confirmed by the operator; although the following is the most probable scenario. The operator had performed all of the preliminaries required by the procedure and proceeded with the diesel starting sequence. With the diesel running, he increased the generator voltage to a value slightly higher than that of the bus. He then closed the breaker at the "Twelve O'Clock" position. Although not confirmed by the operator, it appears that an inadvertent manual trip was initiated on the breaker (possibly by turning the control switch too far) while returning the switch to the "Neutral" position. A manual trip is the only thing that would allow reclosure of the breaker.

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APPARENT CAUSE OF OCCURRENCE: (cont'd)

It was discovered later, during subsequent investigation, that 2B Diesel Generator breaker "Open" indicating light (on the local control panel) was not functioning, which could have caused confusion as to the status of the breaker. Observing no "Closed" indication, and thinking that the breaker did not close (not realizing that it had closed and been inadvertently tripped), he then attempted to close it when the synchroscope reached the "Twelve O'Clock" position again. At this point, one of two things occurred. Either he attempted to reclose the breaker before the breaker closing springs had completely charged, in which case the closing of the breaker (after the the springs were fully charged) came sometime after the point where the generator was synchronized with the bus; or, trying to synchronize by catching the synchroscope on the first pass, and not allowing the synchroscope to complete a few revolutions, resulted in incorrect indication of synchronization.

ANALYSIS OF OCCURRENCE:

A thorough review of the Technical Specifications identified seventeen (17) applicable Action Statements. After identification, efforts were systematically directed toward compliance with the most Limiting Condition for Operation. LCO 3.0.3 requires the plant to be in hot standby within six (6) hours. Although it implies that a shutdown shall be commenced within one (1) hour, six hours is more than a sufficient amount of time to place the plant in hot standby to ensure compliance with the action requirement. The decision to delay the commencement of the shutdown was based on the knowledge that the plant was in a very stable condition; the knowledge that sufficient instrumentation was available to ensure continuous monitoring of the condition of the plant; and, the fact that the transient resulting from either a controlled shutdown or from a manual trip (without the ability to monitor the position of the control rods) would be unsafe in comparison to the steady state operating conditions at the time. Sufficient direction was provided to the operating shift personnel as to the corrective actions required, in the event of any observed transient. This event involved no undue risk to the health or safety of the public. Because the surveillance testing (to prove operability) of 2A and 2C Emergency Diesel Generators was performed fifty-eight minutes past the time specified by the Technical Specifications, this report is being submitted in accordance with the Code of Federal Regulations, 10CFR 50.73(a)(2)(i). In addition, Technical Specification Surveillance Requirement 4.8.1.1.4 requires all diesel generator failures (both valid and non-valid) be reported to the Commission, pursuant to Specification 6.9.1.

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ANALYSIS OF OCCURRENCE: (cont'd)

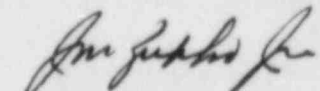
Since the cause of the diesel failure was not immediately known, this was classified as a valid test failure in accordance with Regulatory Guide 1.108, Regulatory Position C.2.e.(5). This marked the third diesel failure in the last one-hundred (100) valid tests. As a result, the testing interval has been increased to seven (7) days in accordance with Regulatory Position C.2.d.(3).

CORRECTIVE ACTION:

All 4KV breakers, including the diesel generator breaker, were racked out and inspected for possible damage. The 2B 4KV Bus was meggered phase to ground; each load was meggered phase to ground; the phase to phase resistance of each load was checked; the synchroscope was checked for proper indication and operation; and, the Bus Differential Relay was checked for proper operation and for correct settings. 2B Diesel Generator breaker was verified to be operating correctly. All inspections and tests were satisfactory. No problems with the bus, loads, breakers or relays could be found. 2B Diesel Generator breaker "Open" indicating light was replaced. All other diesel breaker indicating lights (including those associated with the other diesel units) were verified to be operational.

At 1123 hours, March 18, 1984, 2B 4KV Vital Bus Infeed Breaker (21BSD) was closed, reenergizing the 2B 4KV Vital Bus. At 1128 hours, the 230V Bus Breakers were closed, and loads were restored. By 1250 hours, reactor power was restored to 100%. At 1418 hours, 2B Emergency Diesel was started for testing. At 1431 hours, the generator was successfully paralleled with the grid. Surveillance testing was satisfactorily completed on 2B Emergency Diesel Generator at 1541 hours.

LER 83-001/03L documented an occurrence (on January 5, 1983) when Unit 1 1B 4KV Vital Bus Infeed Breakers tripped on Bus Differential Relay Protection, for no apparent reason. Because of this, and since the inadvertent manual trip (on March 18, 1984) could not be verified, an investigation into the occurrence is continuing to ensure that no undetected problems exist with the Bus Differential Relay Protection circuitry. If testing results should reveal any potential problems, a supplement will be issued.


General Manager-
Salem Operations

JLR:tns

SORC Mtg 84-043



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

Salem Generating Station

April 17, 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 84-006-00

This Licensee Event Report is being submitted pursuant to the requirements of 10CFR 50.73(a)(2)(i) and Surveillance Requirement 4.8.1.1.4. This report is required within thirty (30) days of discovery.

Sincerely yours,

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

JR:k11 *262*

CC: Distribution

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