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 1	0 5 0 0 0 2 7 2	1 OF 0 7

TITLE (4)
Unit 1 Vital Bus Blackout Actuation

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 6	0 5	8 4	8 4	-	0 1 4	-	0 0	0 7	0 5	8 4		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)			
N		20.402(b)	20.405(c)	X 50.73(a)(2)(iv)	73.71(b)
POWER LEVEL (10)	0 0 0	20.405(a)(1)(i)	50.36(c)(1)	50.73(a)(2)(v)	73.71(e)
		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 June 5, 1984, during a refueling outage, 1A Vital Bus was de-energized when the 1A Vital Bus Infeed Breaker failed to close during breaker testing. Since 1B Vital Bus was de-energized for inspection at the time, a Blackout Loading signal started 1A and 1C Diesels and opened the 1C Vital Bus Infeed Breaker, de-energizing 1C Vital Bus. 1A Diesel loaded, but because the 1C 125VDC Bus was de-energized for maintenance, the 1C Safeguards Equipment Cabinet (SEC) was completely de-energized. This prevented 1C Diesel from loading. 1C Vital Bus remained de-energized, resulting in a loss of Service Water Cooling. Numerous control room indicators failed to mid-scale, leading the shift to believe that the 1C Vital Bus was still energized. As a result, the diesels ran for an extended period of time without cooling water; although, no diesel damage occurred. The root cause of this event was the lack of adequate procedural and/or administrative controls to ensure sufficient electrical systems remained in an operable status during a period when the plant was in a configuration which was not covered by the Technical Specifications (i.e., defueled). Numerous corrective actions, listed in this LER, have been initiated to prevent recurrence. Due to the automatic SEC actuation, 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:

Unit 1 Vital Bus Blackout Actuation

Event Date: 06/05/84

Report Date: 07/05/84

This report was initiated by Incident Report No. 84-087

CONDITIONS PRIOR TO OCCURRENCE:

Defueled

DESCRIPTION OF OCCURRENCE:

On June 5, 1984, during a refueling outage, a retest was being initiated on 12ASD (1A Vital Bus Infeed Breaker from No. 12 Station Power Transformer). The retest was required following the completion of maintenance activities on that breaker. At this time, 1A and 1C Vital Busses were energized, 1C 125VDC Bus was out of service and 1B Vital Bus was cleared and tagged for routine inspections. At 0551 hours, the Nuclear Control Operator (NCO) initiated a close on 12ASD, which caused 11ASD (1A Vital Bus Infeed Breaker from No. 11 Station Power Transformer) to open. However, since the 1A Vital Bus Automatic Transfer Relay was removed, a signal to close 12ASD was not sent to the breaker control system. 12ASD failed to close, resulting in the de-energization of 1A Vital Bus. This, in conjuction with the 1B Vital Bus being de-energized for inspection, caused the Vital Bus Blackout Relay to actuate. The Blackout Loading signal caused 1A and 1C Diesel Generators to start and attempt to load on their respective busses. 1A Diesel Generator Breaker closed on 1A Vital Bus and the sequencer loaded No. 11 Component Cooling Water Pump, No. 11 Fuel Handling Building Exhaust Fan and No. 11 Auxiliary Building Exhaust Fan. The remainder of the Blackout Equipment was cleared and tagged, therefore it remained out of service. In addition to starting 1C Diesel, the Blackout Loading signal also opened 1C Vital Bus Infeed Breaker, resulting in the loss of 1C Vital Bus. This, coupled with the 1C 125VDC Bus being out of service, resulted in the total loss of power to the 1C Safeguards Equipment Cabinet (SEC). Without the command from 1C SEC to close the 1C Diesel Generator Breaker, 1C Vital Bus remained de-energized and 1C Diesel continued to run unloaded.

DESCRIPTION OF OCCURRENCE: (cont'd)

This event resulted in a total loss of Service Water because the only available Service Water pump was supplied by the 1C Vital Bus. In addition to the loss of No. 11 Service Water Pump, the de-energization of 1C Vital Bus caused the loss of power to No. 11 and No. 12 MAC panels. The loss of these two power supplies resulted in the loss (actually the failure to mid-scale) of numerous control room indications.

At this point the plant conditions were as follows:

1. 1A Vital Bus was being powered by 1A Diesel.

2. 1B Vital Bus was de-energized for inspections.

3. 1C Vital Bus was de-energized.

4. 1C Diesel was running unloaded, with the inability to energize 1C Vital Bus, due to 1C SEC being de-energized.

5. No. 11 Service Water Pump was de-energized, although No. 11 Service Water Pump breaker closed light was lighted. The ammeter and No. 11 Service Water header pressure indicators had failed to mid-scale (indicating the approximate normal running current and header pressure).

6. Due to improperly colored lenses, the mimic bus indication led the Shift Supervisor to believe that 12CSD breaker was closed and that 1C Vital Bus was energized from the station power transformer.

Approximately one-half hour after the diesel start signals were received, the NCO stopped 1C Diesel and sent an Equipment Operator (EO) down to the Diesel Room to check the diesels. However, since the Security Computer is powered from the 1C Vital Bus (and the bus was de-energized), the EO was unable to gain access to the Diesel Room. The EO returned to the control room and Security was called to open the room. At 0630 hours, believing that 1C Vital Bus was still energized from the station power transformer, the Operators attempted to reset the 1A SEC and re-energize the 1A Vital Bus through an infeed breaker from a station power transformer. They were unable to reset the SEC (unknowingly due to the presence of the Blackout Loading signal). A jumper was installed in place of the 1A Vital Bus Automatic Transfer Relay (which had been previously removed) to allow closure of an infeed breaker. 1A Diesel Breaker (1ADD) was opened, and then 1A4D (the 460/230 volt supply breaker) was opened to strip the loads from 1A Vital Bus. An attempt was made to close 1A4D, but it would not close. This was also due to the presence of the Blackout Loading, because 1B and 1C Vital Busses were de-energized.

DESCRIPTION OF OCCURRENCE: (cont'd)

At approximately 0740 hours, an Operations Supervisor observed that the 1C Vital Bus Infeed Breakers (11CSD and 12CSD) were open. At this time, the shift realized that 1C Vital Bus was de-energized and that there had been no Service Water supplied to the diesels. To prevent thermal shock to the diesels, No. 11 Service Water Pump breaker was opened, and 11SW21 (Service Water Supply Valve to 1A and 1C Diesels) was shut prior to energizing 1C Vital Bus. At approximately 0751 hours, 1C Vital Bus was energized from No. 11 Station Power Transformer by closing 11CSD Infeed Breaker; 1A Diesel was secured. With No. 11 and No. 12 MAC panels now energized, the control room indication was restored. At this time, a CO_2 discharge occurred in the 1A Diesel room. Upon investigation it was discovered that the lube oil temperature on 1A Diesel was greater than 250°F, and approximately 160°F on 1C Diesel. The Nuclear Regulatory Commission was notified of the Engineered Safety Feature actuation at 0925 hours.

APPARENT CAUSE OF OCCURRENCE:

The root cause of this event was the lack of adequate procedural and/or administrative controls to ensure sufficient electrical systems remained in an operable status during a period when the plant was in a configuration which was not covered by the Technical Specifications (i.e., defueled). The event started with the removal of the 1A Vital Bus Automatic Transfer Relay. This relay had been removed for use in Unit 2. Shift personnel were aware of the transfer, but did not fully understand the operation of the relay, and the effect on the plant due to its removal. They believed that it functioned only during an "Automatic" transfer of a vital bus, and that its removal would not effect a manual transfer.

Secondly, 1C 125VDC Bus and 1B Vital Bus were out of service at the same time. With the de-energization of 1A Vital Bus, the resultant Blackout Loading signal de-energized 1C Vital Bus in preparation for 1C Diesel loading. With 1C 125VDC Bus was out of service, a complete loss of power to the 1C SEC prevented 1C Diesel output breaker from closing.

The failure of control room indication to mid-scale and mimic bus indication led operators to believe that 1C Vital Bus was energized. The "Diesel Trouble" alarm, which alarmed upon high diesel lube oil temperature was apparently masked by the large number of alarms which occurred as the result of loss of power.

ANALYSIS OF OCCURRENCE:

Had the Unit been in a configuration governed by Technical Specifications (i.e., with the core loaded), this sequence of events would not have occurred. With the core loaded, the requirements for operable vital busses and the systems available to supply core cooling (namely Residual Heat Removal, Component Cooling Water and Service Water), sufficient equipment would have been available to prevent the operation of the diesel without Service Water. Administrative controls would have prevented having the Automatic Transfer Relay for 1A Vital Bus removed, 1B Vital Bus cleared and tagged for inspections and the 1C 125VDC Bus out of service. Any one of these busses could have been inoperable, but not all three. Because of the automatic SEC actuation, this event is reportable in accordance with the requirements of the Code of Federal Regulations, 10CFR 50.73(a)(2)(iv).

CORRECTIVE ACTION:

The following inspections and tests were performed on 1A Diesel, under the supervision of an Alco Engine Division Service Engineer and a Research and Development Engineer:

1. The engine thrust and crankshaft deflection were checked and found to be within specifications.

2. A 55 psig hydrostatic test was performed on the engine Jacket Water System. Results of the test were satisfactory.

3. The thermostats in the Jacket Water Control and Main Oil control valves were replaced as a precautionary measure.

4. Four main bearings were inspected. The inspections were satisfactory, but the bearings were replaced as a precautionary measure.

5. Cylinder 7L connecting rod bearing was inspected. Inspection results were satisfactory, although the bearing was replaced as a precautionary measure.

6. Cylinder 7L head and piston were pulled and inspected. Inspection results were satisfactory, and the head and piston were re-installed.

7. All oil filters and strainers were inspected and replaced. No evidence could be found of any bearing or engine damage.

8. The oil sump was cleaned and filled with new oil.

9. Bearing break-in runs were performed, including a two hour full load diesel run.

CORRECTIVE ACTION: (cont'd)

All inspections and tests were satisfactory, and no evidence of any engine damage was found. Due to the complexity of this event, a committee was formed to review the event and to make recommendations for corrective actions required to prevent recurrence. The following is a list of concerns and corrective actions resulting from that meeting:

1. CONCERN: 1A Automatic Transfer Relay removed, and the 1C 125VDC Bus and 1B Vital Bus being out of service at the same time.

   ACTION: A review of the management control of equipment for plant conditions not covered by the Technical Specification requirements will be conducted. The review will specifically address electrical system, and vital equipment requirements during cold shutdown and defueled conditions, to ensure that sufficient equipment remains availabe to maintain the plant in a safe condition.

   Minimum equipment availability requirements will be established for specific conditions where operation is not covered by the Technical Specifications.

2. CONCERN: The failure of control room indicators to mid-scale upon loss of power.

   ACTION: An investigation into possible ways to provide positive indication of power failure to indicators (which causes mid-scale deflection) will be performed. The investigation will include the need for identifying valid/non-valid alarms during a loss of power to instruments.

3. CONCERN: Failure to gain access to Diesel Rooms.

   ACTION: Possible alternative methods for gaining access to vital areas in a more timely manner will be addressed.

4. CONCERN: We do not have the ability to transfer the DC (emergency) supply to the inverters to a backup source during a DC bus outage.

   ACTION: The possibility of providing an alternate DC supply to the inverters will be evaluated.

CORRECTIVE ACTION: (cont'd)

5. CONCERN: Loss of Fire Protection Instrumentation, security computer, and CO_2 and Halon dumps upor the loss of a single (1C) vital bus.

   ACTION: Engineering will review the acceptability of this situation. All vital bus loads will be included in this review to see if similar vital equipment losses exist upon the loss of 1A or 1B Vital Bus.

6. ADDITIONAL ACTIONS:

   The need for providing additional operator guidance during a blackout condition, to ensure operators check and evaluate the required indication, will be evaluated.

   The need for procedural guidance, to ensure that the operable Service Water Pump (and other vital equipment) is connected to a "fully operational" vital bus (i.e., a vital bus which is connected to an operable 125VDC bus) will be evaluated.

   The Station will ensure proper mimic bus indication, as per design.

   Due to difficulty encountered in reconstructing the exact sequence of events, during the post event review process, Engineering will evaluate the need for inclusion of the Vital 4KV Breakers into the sequence of events printout.

   This event will be reviewed during operator requal, including a discussion of the operation of the Automatic Transfer Relay.

General Manager-
Salem Operations

JLR:tns

SORC Mtg 84-081

PSE&G

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

Salem Generating Station

July 5, 1984

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 84-014-00

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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