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RECIP. NAME RECIPIENT AFFILIATION

SUBJECT: LER 93-019-00: on 930510, ESF isolations & actuations occurred due to 500KV load break disconnect failure. RHR loop "A" shutdown cooling was restored & returned plant sys to normal lineup status. W/930609 ltr.

DISTRIBUTION CODE: IE22T COPIES RECEIVED: LTR 1 ENCL 1 SIZE: 8
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WASHINGTON PUBLIC POWER SUPPLY SYSTEM

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June 9, 1993
G02-93-140

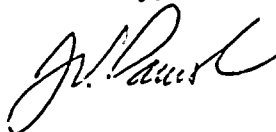
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U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: NUCLEAR PLANT WNP-2, OPERATING LICENSE NPF-21
LICENSEE EVENT REPORT NO. 93-019

Transmitted herewith is Licensee Event Report No. 93-019 for the WNP-2 Plant. This report is submitted in response to the report requirements of 10CFR50.73 and discusses the items of reportability, corrective action taken, and action taken to preclude recurrence.

Sincerely,



J. V. Parrish (Mail Drop 1023)
Assistant Managing Director, Operations

JVP/CDM/cgeh
Enclosure

cc: Mr. B. H. Faulkenberry, NRC - Region V
Mr. R. Barr, NRC Resident Inspector (Mail Drop 901A, 2 Copies)
INPO Records Center - Atlanta, GA
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LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)

Washington Nuclear Plant - Unit 2

DOCKET NUMBER (2)

0 5 0 0 0 3 9 7

PAGE (3)

1 OF 7

TITLE (4)

ENGINEERED SAFETY FEATURES (ESF) ISOLATIONS AND ACTUATIONS DUE TO A 500 KV
LOAD BREAK DISCONNECT (LBD) FAILURE

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 NUMBERS(S)		
0	5	1	0	9	3	9	3	0	1	9	0	0	0	6	0	9	9	3							0	5	0	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)

POWER LEVEL
(10)

0 0 0

20.402(b)
20.405(a)(1)(i)
20.405(a)(1)(ii)
20.405(a)(1)(iii)
20.405(a)(1)(iv)
20.405(a)(1)(v)

20.405(C)
50.36(c)(1)
50.36(c)(2)
50.73(a)(2)(i)
50.73(a)(2)(ii)
50.73(a)(2)(iii)

X 50.73(a)(2)(iv)
50.73(a)(2)(v)
50.73(a)(2)(vii)
50.73(a)(2)(viii)(A)
50.73(a)(2)(viii)(B)
50.73(a)(2)(x)

77.71(b)
73.73(c)
OTHER (Specify in Abstract
below and in Text, NRC
Form 366A)

LICENSEE CONTACT FOR THIS LER (12)

NAME

C. D. Mackaman, Licensing Engineer

TELEPHONE NUMBER

AREA CODE

5 0 9 3 7 7 - 4 4 5 1

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
X	F K	D I S C		NO					

SUPPLEMENTAL REPORT EXPECTED (14)

EXPECTED SUBMISSION
DATE (15)

MONTH DAY YEAR

☐ YES (If yes, complete EXPECTED SUBMISSION DATE) ☒ NO

ABSTRACT (16)

At 1115 hours on May 10, 1993, during the annual Maintenance and Refueling Outage, a loss of off-site 500 KV power occurred that resulted in plant critical AC electrical loads being supplied by the 115 KV Backup AC source. At the time, plant loads were being supplied by the off-site 500 KV South Bus via the backfeed configuration through Main Transformers E-TR-M1, E-TR-M3 and E-TR-M4; and Normal Auxiliary Transformers E-TR-N1 and E-TR-N2 (see Figure 1). The loss of power was caused by a failure of 500 KV South Bus Inductive Reactor Load Break Disconnect (LBD) 4909 during routine load voltage control by the Bonneville Power Administration (BPA) System Dispatcher. The loss of power resulted in load shedding from the Critical Switchgear E-SM-7 and E-SM-4 buses, Emergency Diesel Generator (DG) 1 and 3 automatic starts, an automatic transfer of E-SM-7 to Backup Transformer E-TR-B, an RPS full scram (all control rods were already fully inserted) and multiple Engineered Safety Features (ESF) isolations.

Plant Operators responded to this event by restoring RHR Loop "A" Shutdown Cooling at 1144 hours and returning all plant systems to normal lineup status by 1315 hours.

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TITLE (4) ENGINEERED SAFETY FEATURES (ESF) ISOLATIONS AND ACTUATIONS DUE TO A 500 KV LOAD BREAK DISCONNECT (LBD) FAILURE											

Abstract (Cont'd)

The root cause of this event was the equipment failure of LBD 4909. The failed LBD was inspected in place by a manufacturer's representative, then removed and shipped to their laboratory for analysis. The root cause of the component failure will be determined by review of the vendor analysis. Further corrective actions will be based on the findings.

There is no safety significance associated with this event as all plant systems functioned as designed, and Shutdown Cooling was restored to limit the reactor coolant temperature rise to only 1.7 °F.

Plant Conditions

Power Level - 0%

Plant Mode - 5 (Refueling)

Event Description

At 1115 hours on May 10, 1993, during the annual Maintenance and Refueling Outage, a loss of off-site 500 KV power occurred that resulted in plant critical AC electrical loads being supplied by the 115 KV Backup AC source. The loss of 500 KV power caused a loss of 120 VAC power to Reactor Protection System (RPS) Buses "A" and "B" due to RPS Electrical Protection Assembly (EPA) Breaker undervoltage trips. At the time, all plant AC electrical loads were being supplied by the off-site 500 KV South Bus via the backfeed configuration through Main Transformers E-TR-M1, E-TR-M3 and E-TR-M4; and Normal Auxiliary Transformers E-TR-N1 and E-TR-N2 (see Figure 1). The off-site 115 KV Backup and 230 KV Preferred Startup power sources, and Emergency Diesel Generators (DGs) 1 and 3 remained available throughout this event.

The loss of power was caused by a failure of 500 KV South Bus Inductive Reactor Load Break Disconnect (LBD) 4909 at the Ashe Substation. The LBD "B" phase interrupter failed to open during routine load voltage control by the Bonneville Power Administration (BPA) System Dispatcher. This caused a current imbalance on the 500 KV South Bus that was sensed by the inductive reactor neutral ground relay. The current imbalance was of sufficient magnitude and duration to cause the neutral ground relay to actuate the South Bus lock-out relay to trip the South Bus 500 KV Power Circuit Breakers (PCBs), including the WNP-2 backfeed supply breaker (PCB 4885). The event duration from the attempt to open LBD 4909 by the BPA System Dispatcher to the protective relaying trip of PCB 4885 was approximately 1.5 seconds. The loss of power actuated Critical Switchgear E-SM-4 and E-SM-7 bus undervoltage and Engineered Safety Features (ESF) relaying to automatically shed the loads on both buses, start DGs 1 and 3, and

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transfer E-SM-7 from E-TR-N1 to the 115 KV Backup source through Backup Transformer E-TR-B. As designed, the automatic transfer to E-TR-B reenergized E-SM-7 in approximately four seconds, and DG-3 automatically loaded to reenergize E-SM-4 in approximately thirteen seconds. The critical switchgear buses were not automatically reloaded because, by design, sequence loading occurs only if a Loss Of Coolant Accident (LOCA) condition exists.

The loss of power to RPS Buses "A" and "B" actuated RPS relaying to initiate a full scram (all control rods were already fully inserted) and multiple ESF isolations consisting of Nuclear Steam Supply Shutoff System (NSSSS) Primary Containment isolations for Isolation Groups 1 (Main Steam Line Drain Valves only), 2 (Reactor Water Sample Valves), 4 (Drywell Equipment and Floor Drain Valves, and Traversing In-Core Probe [TIP] isolations only), 5 (Residual Heat Removal [RHR]), 6 (RHR Shutdown Cooling) and 7 (Reactor Water Cleanup [RWCU]).

Pursuant to 10CFR50.72(b)(2)(ii), this event was reported to the NRC Operations Center via the Emergency Notification System (ENS) at 1226 hours on May 10, 1993, as "Any event or condition that results in a manual or automatic actuation of any engineered safety feature (ESF), including the reactor protection system (RPS). . . ."

Immediate Corrective Actions

Plant Operators responded to this event by restoring RHR Loop "A" Shutdown Cooling at 1144 hours and returning all plant systems to normal lineup status by 1315 hours. All plant electrical loads were reenergized from the 230 KV Preferred Startup source through E-TR-S. The 230 KV source does not have Inductive Reactor LBDs in the local area.

Further Evaluation and Corrective Action

A. Further Evaluation

1. This event is reportable under 10CFR50.73(a)(2)(iv) as "Any event or condition that resulted in a manual or automatic actuation of any engineered safety feature (ESF), including the reactor protection system (RPS). . . ."
2. Critical Switchgear E-SM-8 is designed to auto-transfer to E-TR-B along with E-SM-7 on a critical switchgear bus undervoltage condition. Also, DG-2 is designed to auto-start along with DG-1 and DG-3. However, these automatic actions were disabled during this event because DG-2 and the E-SM-8 backup supply circuit breaker (E-CB-B8) were out of service for the ongoing Division 2 maintenance outage. Control Room Operators manually reenergized E-SM-8 from the 230 KV Preferred Startup power source through Startup Transformer E-TR-S. No further corrective action was required.

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3. Normally, the protective relaying trip of PCB 4885 would not have resulted in a loss of WNP-2 backfeed power. The 500 KV North Bus is usually available in parallel with the South Bus for reliability. However, during this event, the North Bus was isolated for scheduled maintenance on PCB 4888.
4. The Plant Operating Committee (POC) was aware of the planned maintenance on PCB 4888 and its degrading effect on 500 KV power source reliability.
5. Plant design includes logic that can fast transfer plant electrical loads from E-TR-N to E-TR-S in the event of a Main Generator trip. However, when the plant is in the 500 KV backfeed configuration, the Main Generator is out of service, and the logic is only actuated by faults on the power distribution system between WNP-2 and the Ashe Substation. During this event, the LBD 4909 failure, the 500 KV Bus current imbalance and the PCB 4885 trip occurred at the substation. Consequently, the fast transfer logic was not actuated by design.
6. The DG-1 and DG-2 auto-starts are designed to be precautionary on a loss of normal power, as they will not auto-load if their E-SM-7 and E-SM-8 buses, respectively, are successfully reenergized by auto-transfer to E-TR-B. The DGs are maintained at normal voltage and frequency to allow them to be rapidly loaded to their critical switchgear buses in the event that the 115 KV Backup power source is lost. DG-3 is designed to auto-start and auto-load to E-SM-4 on a loss of normal power. There is no backup power source.
7. Shedding of the critical switchgear bus loads on an undervoltage condition ensures that the inrush current does not exceed the E-TR-S, E-TR-B or DG ratings when initially loaded. RHR Pump 2A was supplying Shutdown Cooling before the event, but was tripped on the E-SM-7 bus undervoltage relaying load shed signal.
8. The reliability of the LBD manufactured by S & C Electric Company of Chicago, Illinois and installed at the Ashe Substation is being evaluated. There were two other failures of similar LBD components on the BPA grid system within 24 hours of this event. Another similar event occurred at the Ashe Substation on March 25, 1993, where an LBD failure caused 500 KV South Bus PCB 4885 to trip. At the time, WNP-2 was operating near full power with the Main Generator connected to the 500 KV Bus. The event did not impact plant operation because, as described above, the parallel 500 KV North Bus was still available through PCB 4888.

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B. Root Cause

The root cause of this event was the equipment failure of LBD 4909. The root cause of the component failure is currently under investigation by BPA and the manufacturer.

A contributing cause was the planned maintenance of PCB 4888.

C. Further Corrective Action

1. As a compensatory measure, Supply System Management has elected to remain on the 230 KV Preferred Startup power source until PCB 4888 is returned to service. The 500 KV source is still available for use. BPA has agreed not to use the 500 KV Bus Inductive Reactor LBDs at the Ashe Substation to control load voltage unless no other options are available. The operability and reliability of all WNP-2 off-site power sources are still considered within Final Safety Analysis Report (FSAR), Section 8.2.2, Safety Analysis. In the event that the operability of any of these power sources is challenged, steps will be taken in accordance with WNP-2 procedures.
2. BPA, in conjunction with the manufacturer, will perform a failure analysis of the LBD failure and implement corrective actions based on the findings.
3. The Technical Staff High Voltage Distribution System Engineer and the Outage Managers will discuss the Plant Refueling Outage (R-8) loss of 500 KV power event "Lessons Learned" by July 28, 1993.

Safety Significance

All plant systems functioned as designed, and Shutdown Cooling was restored within 29 minutes to limit reactor coolant temperature rise to only 1.7 °F. WNP-2 Technical Specifications allows Shutdown Cooling to be out of service for up to two hours in any eight hour period. Thus, there is no safety significance associated with this event and there was no threat to the health and safety of either the public or plant personnel.

Similar Events

LER 91-017 reported the loss of 500 KV Bus power while on backfeed. The power loss was caused by a ground fault on a 500 KV line with protective relaying selector switches misaligned at the Ashe Substation. This condition resulted in DG-1 and DG-2 starts and a loss of Shutdown Cooling. The corrective actions addressed BPA personnel performance and protective relaying design.

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EIIS Information

Text Reference

EIIS Reference

	<u>System</u>	<u>Component</u>
Electrical Switchgear (E-SM-4, 7 & 8)	EB	SWGR
Main Transformers (E-TR-M1, M3 & M4)	EL	XFMR
Transformers (E-TR-B, N1 N2 & S)	EB	XFMR
Reactor Protection System (RPS)	JC	---
RPS Bus "A" and "B"	JC	BU
RPS Electrical Protection Assembly (EPA) Breaker	JC	BKR
Diesel Generator (DG) 1, 2 & 3	EB	DG
Residual Heat Removal (RHR) Pump	BO	P
Main Steam (MS) Line Drain Valves	SN	LOV
Reactor Water Sample Valves	AD	SMV
Equipment and Floor Drain Valves	WK	ISV
Traversing In-Core Probe (TIP) System	IG	---
Residual Heat Removal (RHR) System	BO	---
Reactor Water Cleanup (RWCU) System	CE	---
Neutral Ground Relay	FK	RLY
Load Break Disconnect (LBD)	FK	Disc

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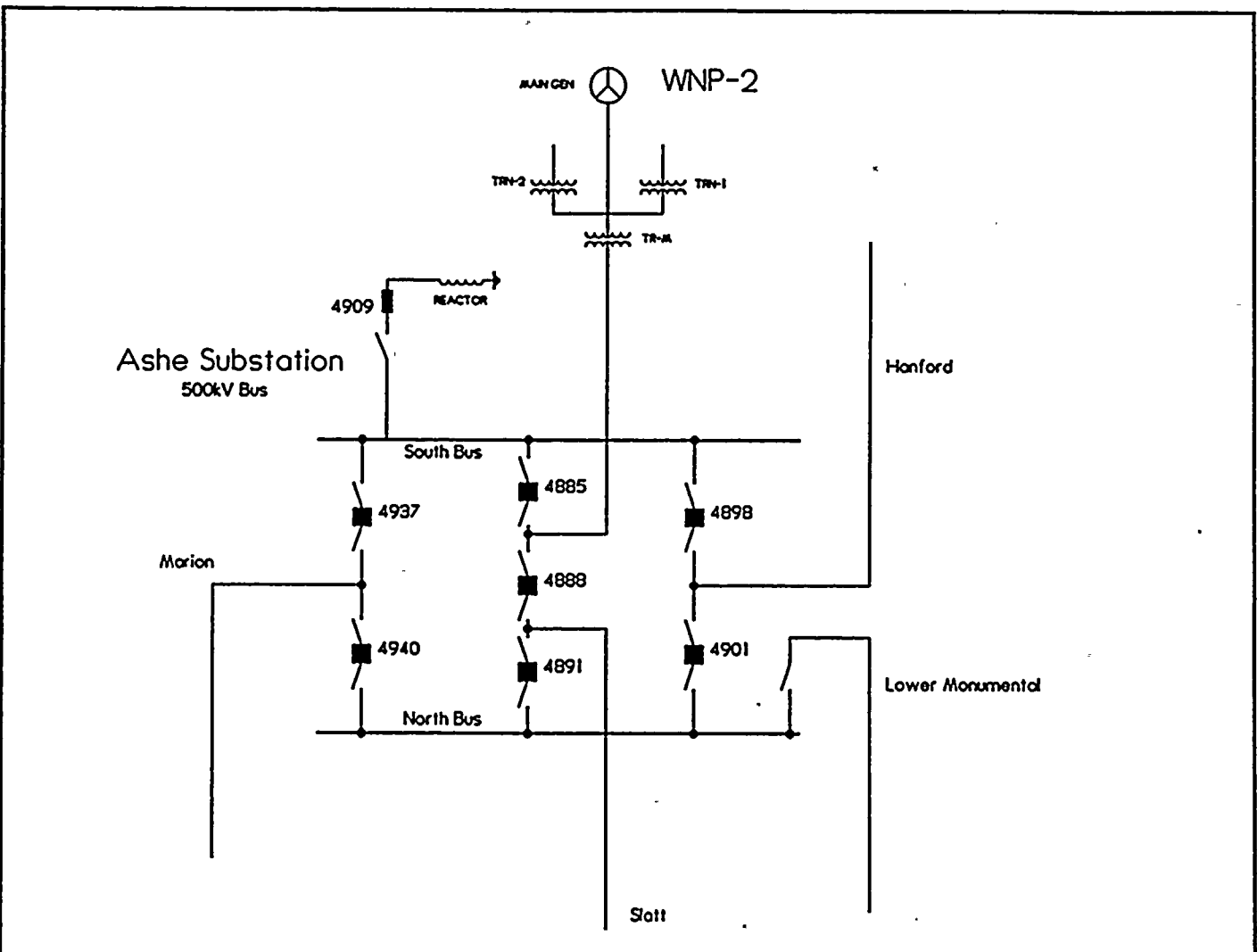


FIGURE 1