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 RECIP NAME: RECIPIENT AFFILIATION

SUBJECT: LER 90-009-01: on 900430, three separate spurious trips of RPS Electrical Protection Assembly (EPA) circuit breaker occurred. Caused by degraded component in logic board of EPA. RPS-EPA-3F breaker & logic board replaced. W/920624 ltr.

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WASHINGTON PUBLIC POWER SUPPLY SYSTEM

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September 24, 1992
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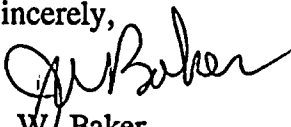
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**SUBJECT: NUCLEAR PLANT WNP-2, OPERATING LICENSE NPF-21
LICENSEE EVENT REPORT NO. 90-009-01**

Transmitted herewith is Licensee Event Report No. 90-009-01 for the WNP-2 Plant. This supplement is a major revision of the original LER due to the significant amount of new information obtained during the evaluation process. This revision was identified in our response to Inspection Report 90-09 with an expected submittal date of November 30, 1990. This revision was initially awaiting the completion of a root cause analysis. Although the root cause was identified shortly after issuance of the original LER, the revision was delayed due to higher priority work. Eventually, it became part of an LER supplement "backlog". A supplemental LER has been committed, or needs to be evaluated, for approximately ten other issues. Management recognizes this supplemental "backlog" is inappropriate and is taking corrective action to resolve these items. 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. W. Baker
WNP-2 Plant Manager (Mail Drop 927M)

JWB/REF/lr
Enclosure

cc: Mr. J. B. Martin, NRC - Region V
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INPO Records Center - Atlanta, GA
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LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)

Washington Nuclear Plant - Unit 2

DOCKET NUMBER (2)

PAGE (3)

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TITLE (4)

ENGINEERED SAFETY FEATURE (ESF) ISOLATIONS AND ACTUATIONS DUE TO LOSS OF REACTOR PROTECTION SYSTEM (RPS) BUS DURING MODE 5 (REFUELING)

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	4	3	0	9	0	0	0	9		05000
0	4	3	0	9	0	0	9	2	4	05000

OPERATING MODE (9)	5	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)
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POWER LEVEL (10)		20.402(b)		20.405(C)	x	50.73(a)(2)(iv)		77.71(b)
		20.405(a)(1)(i)		50.36(c)(1)		50.73(a)(2)(v)		73.73(c)
	0	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)
	0	20.405(a)(1)(iii)		50.73(a)(2)(i)		50.73(a)(2)(viii)(A)		
	0	20.405(a)(1)(iv)		50.73(a)(2)(ii)		50.73(a)(2)(viii)(B)		
	0	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										
R. E. Fuller, Compliance Engineer	5	0	9	3	7	7	-	4	1	4	8

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	
B	J	C	B	K	R		G	O	8	2	YES														

SUPPLEMENTAL REPORT EXPECTED (14)

EXPECTED SUBMISSION DATE (15)	
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MONTH	DAY	YEAR
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<input type="checkbox"/>	YES (If yes, complete EXPECTED SUBMISSION DATE)	X	NO
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ABSTRACT (16)

On April 30, 1990, three separate spurious trips of a Reactor Protection System (RPS) Electrical Protection Assembly (EPA) circuit breaker (RPS-EPA-3F) occurred at 1442, 1641 and 1712 hours. This caused a loss of power to RPS Bus B each time. Each trip resulted in a half-scam in the RPS Division B and multiple containment isolations which are Engineered Safety Feature (ESF) actuations. Prior to this event, the associated logic board was changed on April 24, 1990.

The loss of RPS Bus B power causes Nuclear Steam Supply Shutoff System (NSSSS) containment inboard and outboard isolations for Groups 1,2,4,5,6 and 7. Plant Operators responded to the first two events by restoring all systems, including the Residual Heat Removal (RHR) System Shutdown Cooling (SDC), Loop "A", to its pre-event lineup status. The EPA breaker 3F could not be readily reset following the third spurious trip. This prevented restoration of the affected systems to their pre-event lineup including RHR SDC since normal RPS power for this division was unavailable. The Plant Operators responded by initiating Alternate SDC using Reactor Recirculation (RRC) and Fuel Pool Cooling (FPC). The breaker was later reset and RHR SDC restored.

The root cause of these events was a degraded component in the associated logic board of the EPA breaker.

The RPS-EPA-3F breaker and associated logic board were replaced.

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There is no safety significance associated with these events. No actual Plant conditions requiring the ESF actuations and isolations existed, and all systems responded as designed. These events posed no threat to the health and safety of Plant personnel or the public.

Plant Conditions

Power Level - 0%
Plant Mode - 5 (Refueling)

Event Description

On April 30, 1990, three separate spurious trips of a Reactor Protection System (RPS) Electrical Protection Assembly (EPA) circuit breaker (RPS-EPA-3F) occurred at 1442, 1641 and 1712 hours. This caused a loss of power to RPS Bus B each time. Each trip resulted in a half-scam in the RPS Division B and multiple containment isolations which are Engineered Safety Feature (ESF) actuations. The RPS Bus B was on the alternate power supply. Concurrent maintenance activities were being performed on the EPA circuit breakers, hereinafter referred to as EPA breakers, from the normal power supply and the Division 2 safety-related bus SM-8. At the time of the event, the Plant was shut down for the annual maintenance and refueling outage. Reactor water level was greater than 22 feet above the Reactor Vessel Flange.

The loss of RPS Bus power causes Nuclear Steam Supply Shutoff System (NSSSS) Containment Inboard and Outboard Isolations for Group 1 (Main Steam Line Drain Valves only), Group 2 (Reactor Water Sample Valves), Group 4 [Miscellaneous Balance of Plant (BOP) Floor Drain Radioactive System (FDR) Valves and Equipment Drain Radioactive System (EDR) Valves only], Group 5 [RHR and Traversing In-Core Probe (TIP) Systems], Group 6 (RHR Shutdown Cooling, and Group 7 [Reactor Water Cleanup (RWCU) System]. At the time of the event, the RWCU System was out-of-service for maintenance. Also, RHR-V-9 (Inboard Containment Isolation Valve on RHR Shutdown Cooling Supply Line) was open and inoperable due to maintenance activities.

At 1442 hours, a spurious overvoltage trip of RPS-EPA-3F breaker occurred causing a loss of alternate power to RPS Bus B. The breaker and RPS half-scam were reset and the associated containment isolations were restored to their pre-event lineup status at 1503 hours. In addition, preparations were initiated to troubleshoot the EPA breaker and associated logic board.

A second spurious overvoltage trip of RPS-EPA-3F was received at 1641 hours. This caused a second half-scam, ESF actuations and isolations as before. Since the preparations to troubleshoot the EPA breaker and associated logic circuit board were not complete, the breaker was reset and the various systems restored at 1652 hours.

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At 1712 hours, a third spurious overvoltage trip of RPS-EPA-3F breaker occurred. The Control Room Operator received the same alarms, valve actuations, and subsequent RHR pump trip. The associated logic circuit board was replaced. When attempts to reset the tripped breaker were unsuccessful, the RPS-EPA-3F breaker was declared inoperable.

Immediate Corrective Action

In response to the inoperable EPA breaker RPS-EPA-3F and the inability to reestablish normal RHR SDC, the Technical Specification Action Statements (TSAS) 3.8.4.4.a, RPS Electric Power Monitoring, and TSAS 3.9.11.1, Residual Heat Removal and Coolant Circulation High Water Level, were entered. As required per the Technical Specifications (TS), the Reactor Operators established alternate shutdown cooling at 1811 hours using the Reactor Recirculation Pump RRC-P-1A and Fuel Pool Cooling. The Reactor coolant temperature was at 117°F when alternate shutdown cooling was initiated. The Reactor coolant temperature did not exceed the TS allowable of 140°F for Mode 5 (Refueling).

The problem encountered with resetting the RPS-EPA-3F breaker after the third trip was that 12 VDC power was being supplied by the new logic board to the undervoltage release (UVR) coil as opposed to the 15 VDC supplied by the original logic board. Further checks showed that the breaker could be closed with 15 VDC. Based upon Plant Engineering evaluation, temporary 15 VDC power was provided to the RPS-EPA-3F breaker. The breaker was subsequently reset and all affected systems were restored to their pre-event lineup status at 1919 hours, including RHR SDC.

Further Evaluation and Corrective Action

A. Further Evaluation

1. These events are reportable under 10CFR50.73(a)(2)(iv) as events that resulted in automatic actuation of Engineered Safety Features (ESF), including the RPS.
2. On April 24, 1990, the logic boards for RPS-EPA-3E and -3F were replaced with modified circuit boards, Serial Numbers 89K068-10 and -07, respectively. The purpose of the change was to provide a more reliable RPS power source by installing General Electric's (GE) EPA Upgrade Kit. These changes had been developed to correct a number of problems associated with the RPS power transfer scheme: 1) alternate power supply susceptibility to grid disturbances (LER 88-013); 2) alternate power supply susceptibility to large in-house motor starts causing undervoltage EPA breaker trips (LER 89-023); 3) EPA inherent design deficiencies documented in GE Service Information Letter (SIL) No. 496, and 4) reduction of voltage to the UVR coil from 15 VDC to 12 VDC to prevent oxide formation and resultant spurious trips as described in LER 87-25-01.

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On April 26, 1990, the underfrequency light on RPS-EPA-3F was found energized. However, the breaker had not tripped. The light indication was reset.

As described above, RPS-EPA-3F breaker received 3 spurious overvoltage trips on April 30, 1990. The associated logic board, No. 89K068-07, was replaced with board No. 89K068-06 and temporary 15 VDC power was provided to allow reset of the breaker as described above.

On May 1, 1990, maintenance work on SM-8 was completed and RPS Bus B was returned to normal power through motor generator set RPS-MG-B. The alternate power circuit breaker RPS-EPA-3F was replaced. Both the logic circuit board and new circuit breaker were calibrated and functionally tested. The replacement circuit breaker operated properly with board No. 89K068-06 and RPS-EPA-3F was returned to operable status.

The logic board No. 89K068-07 was sent to the manufacturer for diagnostic testing on May 11, 1990. No defect was found.

Later in May, logic boards No. 89K068-08, -09, -11 were sent to the manufacturer for a second upgrade. The second upgrade was performed to correct testing problems with regard to time delay calibration and underfrequency trip setpoint. Logic board No. 89K068-07 was also upgraded.

On May 22, 1990, the upgraded logic boards No. 89K068-09 and -08 were installed in RPS-EPA-3B and 3D, respectively. On May 28, 1990, logic boards No. 89K068-10 and -06 were removed from RPS-EPA-3E and -3F, respectively, and sent to the manufacturer for upgrade. The upgraded logic boards No. 89K068-07 and -11 were installed in RPS-EPA-3E and -3F, respectively.

On June 2, 1990, RPS-EPA-3E, logic board No. 89K068-07, failed in a permanent overvoltage trip condition. An RPS system Bus was not connected to the alternate power supply at the time. Therefore, no RPS nor ESF actuations occurred from the failure.

On June 3, 1990, logic board No. 89K068-07 was sent to the manufacturer. Logic board No. 89K068-06 was installed in RPS-EPA-3E. The manufacturer determined that a capacitor had failed. The capacitor was replaced and the board returned. On June 13, 1990, logic board No. 89K068-07 and -10 were installed in RPS-EPA-3A and -3C, respectively. To date, there have been no further performance problems with the RPS electrical protection assemblies.

3. The root cause of these events is Plant System Operation - Degraded Subcomponent Contributed to Failure. Supply System personnel judged that the capacitor associated with overvoltage sensing in logic board No. 89K068-07 had degraded causing the spurious breaker trips and resultant ESF actuations before permanently failing. The upgrades did not change this capacitor nor would it have affected performance of the capacitor.

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4. There were no systems, structure or components out-of-service prior to the event that contributed to these events. Residual Heat Removal Inboard Containment Isolation Valve RHR-V-9 was deenergized in the Open position prior to this event to perform maintenance on the valve. If this valve had been operable, it would have closed on loss of RPS Bus B power. The closure of either RHR-V-9 or RHR-V-8 results in isolation of the RHR Shutdown Cooling supply path.
5. All of the EPA breakers were replaced in 1987 with 1987 model breakers as discussed in LER 87-25-01. LER 87-25-01 documents ESF actuations caused by a spurious trip of one of the RPS Bus "A" EPA breakers, RPS-EPA-3A, in August 1987. Further evaluation revealed that oxide formation on the coil plunger end of the UVR coil had caused the spurious trip. The oxide formation was attributed to overheating caused by higher than design voltage being applied to the coil, i.e., 15 VDC instead of 12 VDC. As described above, the GE EPA Upgrade Kit of the logic boards included reduction of the supplied voltage to 12 VDC.

The breaker RPS-EPA-3F was replaced again in May 1990 with the 1987 model breaker when it failed to reset with installation of the modified logic board. Operation of the breaker at the higher voltage for three years may have caused sufficient oxide formation to prevent the breaker from resetting at the lower supplied voltage of 12 VDC. With reduction of the supplied voltage to within design limits, the EPA breakers are expected to operate to their qualified life stated in GE SIL 496. Except for the noted occurrence, WNP-2 has not experienced any abnormal operation of the RPS EPA breakers (excluding logic boards) since they were replaced in 1987.

B. Further Corrective Action Taken

1. The remaining EPA circuit breakers were replaced during the 1990 Refueling outage with 1987 model breakers because they were on a three-year replacement period per LER 87-25-01. The corresponding logic boards were upgraded as discussed above. Information received from GE in February 1992 indicated the breakers assembled between August 1979 and April 1991 could fail to trip if the load amperage exceeded 50 percent of the unit rating or 87.5 amperes. Action was taken to monitor the load amperage until the breakers are replaced. Five of the six EPA breakers were replaced during the 1992 Refueling outage with 1992 model breakers. The remaining breaker, RPS-EPA-3F, will be replaced by the end of the 1993 Refueling outage. Operability of the breaker was verified through testing per GE Service Advice Letter (SAL) 91-2F, as a manufacturer validated alternative in lieu of replacement.
2. The original LER 90-009-00 committed to performing a failure analysis of the old model breakers. This commitment was made before the root cause of the spurious trips was determined to be degradation of a capacitor in the EPA logic board. Since the EPA breaker was not the cause of the ESF actuations, a failure analysis was not needed. Therefore, a failure analysis will not be performed on the EPA breakers removed during the 1990 Refueling outage.

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3. A letter was sent to GE Nuclear Energy (San Jose, CA) on May 25, 1990, requesting that they perform a 10CFR Part 21 evaluation of this condition. This letter was sent before the root cause of the spurious actions was determined to be the degraded capacitor. Further evaluation indicates that this condition is not reportable per Part 21. The EPA assembly represents a basic component of the Plant. Degradation of the capacitor represents a defect in a basic component. Failure of the capacitor results in an automatic trip of the associated EPA breaker. This is a fail safe action. All resultant automatic actuations, e.g., RHR Shutdown cooling isolation, are within the design basis considerations. Therefore, failure of the capacitor does not inhibit the EPA assembly from performing its safety function, and therefore, does not represent a significant safety hazard.

C. Further Corrective Action

No further corrective action was identified.

Safety Significance

There is no safety significance associated with this event because no Plant condition requiring the ESF isolations and actuations existed, and all ESF actuations occurred as designed.

There is no safety significance associated with the RPS-EPA-3F breaker trips. The trips were spurious and in the safe direction. The RPS EPA safety function is to protect RPS from power line transients. Therefore, tripping a breaker is a planned safety action. RPS-EPA-3E is in series with the -3F breaker and also should have tripped during these events if a real trip condition existed. Both EPAs 3E and 3F successfully passed Technical Specification surveillance tests prior to these events. Therefore, it is expected the EPAs would have properly responded to a real condition.

Also, there is no safety significance associated with the loss of RHR Shutdown Cooling. Loss of RPS Bus B causes the inboard and outboard RHR SDC Isolation Valves RHR-V-8 and RHR-V-9 to close, while loss of RPS Bus A causes only outboard valve RHR-V-8 to close. Either valve closing causes a loss of shutdown cooling. Plant Technical Specifications require either one or two RHR Shutdown Cooling loops to be available and in operation during Operational Modes 4 and 5. In addition, if the Technical Specification requirement for RHR Shutdown cooling cannot be met, an alternate method of Reactor Core Circulation and Cooling must be established.

There are numerous ways that alternate shutdown cooling can be established at WNP-2. For this event, the Fuel Pool Cooling System in parallel with the Reactor Recirculation System was used. The loss of RHR Shutdown Cooling due to the isolation of the RHR Shutdown Cooling Containment Isolation Valves does not create a significant safety hazard.

This event posed no threat to the health and safety of Plant personnel or the public.

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Similar Events

Three previous similar events have occurred at WNP-2.

- LER 86-011-00, "Nuclear Steam Supply Shutoff System Actuation due to Momentary Loss of Instrument Power," documented a momentary loss of power to RPS Bus B. The cause of this event was not able to be determined.
- LER 87-025-01, "Engineered Safety Feature Isolations and Actuations Caused by Reactor Protection System Equipment Failure," documented a loss of the RPS Bus A which was attributed to failure of the RPS-EPA-3A circuit breaker undervoltage release coil as described above.
- LER 89-021, "Engineered Safety Feature (ESF) Isolations and Actuations Due to a Reactor Protection System (RPS) Electrical Protection Assembly (EPA) Breaker Trip," documented loss of power to RPS Bus B. The cause of the event was not conclusive and is unknown.

EIIS Information

Text Reference

EIIS Reference

	<u>System</u>	<u>Component</u>
Electrical Protection Assembly (EPA) Breaker RPS-EPA-3F	JC	BKR
Reactor Protection System (RPS)	JC	---
RPS Bus B	JC	BU
Nuclear Steam Supply Shutoff System (NSSSS)	BD	---
Residual Heat Removal (RHR) System	BD	---
Reactor Recirculation (RRC) System	AD	---
Fuel Pool Cooling (FPC) System	DA	---
Pump RRC-P-1A	AD	P
Reactor Vessel (RPV) Flange	AC	RPV
Main Steam Line (MS) Drain Valves	SN	LOV
Reactor Water Sample Valves	AD	SMV
Floor Drain Radioactive (FDR) System Valves	BD	LOV
Equipment Drain Radioactive (EDR) System valves	BD	LOV
Traversing Incore Probe (TIP) System	IG	---
Reactor Water Cleanup (RWCU) System	CE	---
Valve RHR-V-9	BD	ISO
Breakers RPS-EPA-3A through -3E	JC	BKR
Valve RHR-V-8	BD	ISO
Critical Bus SM-8	EB	BU
RPS Motor Generator Set RPS-MG-1B	EB	MG