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SUBJECT: LER 89-039-00:on 890914,inadequate electrical separation & non-failsafe design of RB exhaust air RM sys.

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WASHINGTON PUBLIC POWER SUPPLY SYSTEM

P.O. Box 968 • 3000 George Washington Way • Richland, Washington 99352

Docket No. 50-397

October 13, 1989

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: NUCLEAR PLANT NO. 2
LICENSEE EVENT REPORT NO. 89-039

Dear Sir:

Transmitted herewith is Licensee Event Report No. 89-039 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.

Very truly yours,

C. M. Powers (M/D 927M)
WNP-2 Plant Manager

CMP:lr

Enclosure:
Licensee Event Report No. 89-039

cc: Mr. John B. Martin, NRC - Region V
Mr. C. J. Bosted, NRC Site (M/D 901A)
INPO Records Center - Atlanta, GA
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(9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/88

LICENSEE EVENT REPORT (LER)

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TITLE (4) Inadequate Electrical Separation and Non-Failsafe Design of Reactor Building Exhaust Air Radiation Monitoring System

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 9	1 4	8 9	8 9	0 3 9	0 0	1 0	1 3	8 9		0 5 0 0 0

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
POWER LEVEL (10)	1 0 0	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)	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
R. E. Fuller, Compliance Engineer	5 0 9 3 7 7 - 2 5 0 1

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13) EXT 2797

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 September 14, 1989 an Electrical Design Engineer identified three discrepancies with the current configuration of the Reactor Building Exhaust Air (REA) radiation monitoring system that do not satisfy the design basis requirements. They consisted of inadequate electrical separation in Control Room cabinets, routing of failsafe cable in non-failsafe raceways outside of the Power Generation Control Complex (PGCC), and a non-failsafe design response of the radiation monitors to inoperative/downscale conditions. These conditions were discovered by the Engineer during preparation of a power supply modification to the REA Radiation monitoring system.

The immediate corrective actions include: 1) The failsafe circuits routed in non-failsafe raceways were placed on an hourly fire tour to minimize the probability of a fire that could cause a circuit fault, and 2) the REA radiation monitor downscale annunciator response procedure was revised to require operator action to place the affected trip monitor (REA-RIS-609A, -609B, -609C, and/or -609D) in a tripped condition upon receipt of a valid downscale condition.

The root causes of the REA Radiation monitoring system being outside of the Plant design basis include: 1) equipment designation was less than adequate because of incorrect assignment of failsafe circuits to electrical divisions by the NSSS

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TEXT *(If more space is required, use additional NRC Form 366A's)* (17)

supplier (i.e., General Electric) during the design process, and 2) equipment design of the REA radiation monitor system did not satisfy specific failsafe design requirements.

Corrective actions include changes to Supply System criteria documentation and training to increase awareness of failsafe and non-failsafe separation requirements, and modifications to the REA radiation monitoring system to comply with 10CFR50, Appendix A, General Design Criterion 23. A letter will be sent to General Electric suggesting a 10CFR Part 21 evaluation be performed on the electrical separation and design discrepancies identified in the REA radiation monitor system for WNP-2.

The Safety significance of the condition with the REA system is considered negligible. The safety function of the REA Radiation monitoring system is to initiate a Reactor Building isolation (Z signal). A qualitative evaluation determined the low probability of failure of the REA system to control the release of radionuclides to the environment in response to an event which has a low probability of occurrence qualitatively results in a negligible increase in probability of radionuclide release in excess of 10CFR100 guidelines.

Plant Conditions

a) Power Level - 100%
b) Plant Mode - 1 (Power Operation)

Event Description

On September 14, 1989 an Electrical Design Engineer identified three discrepancies with the current configuration of the Reactor Building Exhaust Air (REA) radiation monitoring system that do not satisfy the design basis requirements. They consisted of inadequate electrical separation, routing of failsafe cable in non-failsafe raceways, and a non-failsafe design response of the radiation monitors to inoperative conditions. These conditions were discovered by the Engineer during preparation of a power supply modification to the REA Radiation monitoring system.

The first discrepancy consisted of inadequate electrical separation between the trip monitors REA-RIS-609B and REA-RIS-609C in the Control Room panels P633 and P606, respectively, and other divisionalized equipment in the same panels. There was less than the six inch separation between redundant divisions of internal panel wirings required by the WNP-2 electrical separation criteria. This configuration could result in a circuit fault that could bypass redundant sensor inputs and possibly prevent the radiation monitors from tripping if trip conditions existed.

The second discrepancy was inappropriate routing of the REA Radiation monitoring system failsafe sensor cable for instruments REA-RE-9A, -9B, -9C, & -9D in non-failsafe raceways outside of the Power Generation Control Complex (PGCC). These cables were routed with other safety related non-failsafe circuits in cable trays. This configuration could result in faulted circuit conditions with similar consequences as described for the first discrepancy.

The third discrepancy consisted of a non-failsafe design of the REA radiation monitor system. The inoperative/downscale indication of the radiation monitors provides only annunciation in the Control Room and is not included as part of the trip function as required per 10CFR50 Appendix A, General Design Criterion 23 to be failsafe.

Immediate Corrective Action

The failsafe circuits located in cabinets in the Control Room are continuously watched as a result of the continuously manned Control Room and panel fire detectors. The failsafe circuits routed in non-failsafe raceways were placed on an hourly fire tour to minimize the probability of a fire that could cause a circuit fault. In addition, the REA radiation monitor downscale annunciator response procedure was revised to require operator action to place the affected trip monitor (REA-RIS-609A, -609B, -609C, and/or -609D) in a tripped condition upon receipt of a valid downscale condition.

Further Evaluation and Corrective Action

A. Further Evaluation

1. This event is reportable per 10CFR50.73(a)(2)(ii)(B) as a condition outside of the Plant design basis. Less than adequate electrical separation of the REA trip monitors from other equipment, routing of REA failsafe circuits in non-failsafe raceways, and a non-failsafe REA inoperative response design do not satisfy the WNP-2 design requirements.

   A 10CFR Part 21 evaluation was performed on the discrepancies with the REA Radiation monitoring system. The as-found configuration of the REA radiation monitor system was evaluated and determined to not be a substantial safety hazard, and therefore, is not reportable per 10CFR Part 21.

2. There were no structures, components, or systems inoperable prior to the event which contributed to the event.

3. The root causes of the REA Radiation monitoring system being outside of the Plant design basis include: 1) equipment designation was less than adequate because of incorrect assignment of failsafe circuits to electrical divisions by the NSSS supplier (i.e., General Electric) during the design process, and 2) equipment design of the REA radiation monitor system did not satisfy specific failsafe design requirements.

a. In the original design process, General Electric inadvertently identified the PGCC portion of the REA radiation monitors and corresponding sensor cable route as Engineered Safety System (ESS). Circuits labeled "ESS" are routed in non-failsafe raceways. The REA radiation monitor system circuits are required to be failsafe and should have been labeled with a failsafe designator of A1, B1, A2, or B2.

b. The General Electric logic design for trip units REA-RIS-609 A,B,C, and D is not in accordance with the failsafe design requirements of 10CFR50 Appendix A, General Design Criterion 23. Compliance with this criterion requires that failsafe logic include instrument "inoperative" trips in parallel with the "upscale" trips. The "inoperative" trip was inadvertently wired to the alarm circuit only.

B. Further Corrective Action

1. Appendix 3 (Electrical Separation) of the Engineering Criteria Document will be revised to emphasize the use and assignment of failsafe and non-failsafe channel identifiers.

2. The differences between failsafe and non-failsafe separation requirements will be emphasized during future Electrical Separation Training classes.

3. Engineering technical checklists will be revised to include specific checks of failsafe channel criteria.

4. A letter will be sent to General Electric suggesting a 10CFR Part 21 evaluation be performed on the electrical separation and design discrepancies identified in the REA radiation monitor system for WNP-2.

5. The non-failsafe designations of trip units REA-RIS-609A, REA-RIS-609B, REA-RIS-609C, and REA-RIS-609D will be redesignated failsafe.

6. Trip units REA-RIS-609A and REA-RIS-609B in Control Room panel H13-P606 and trip units REA-RIS-609C and REA-RIS-609D in Control Room panel H13-P633 will be electrically separated per the WNP-2 electrical separation criteria.

7. Output circuits of trip units REA-RIS-609A, -609B, -609C, and -609D will be modified to provide a trip function on inoperative/downscale conditions per 10CFR50, Appendix A, General Design Criterion 23.

8. Circuits from each REA radiation trip unit channel to relay cabinets RC-1 and RC-2 will be routed in separate conduits containing only failsafe circuits compatible with each respective channel.

9. The current routing of failsafe cables from sensors REA-RE-9A, -9B, -9C, and -9D in non-failsafe raceways will be evaluated for acceptability.

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10. Randomly selected failsafe circuits in "RPS" and "NSSSS" have been sampled to provide added assurance that similar conditions as found with the REA radiation monitor system do not exist with other failsafe trip circuits.

With these modifications, the REA radiation monitor system will comply with General Design Criterion 23.

Safety Significance

The safety significance of the condition with the REA system is considered negligible. There are potentially two ways a circuit fault could be achieved in raceways or panels: by internal fire or by pipe whips and missiles. For the first discrepancy, there are no high energy lines or missile generating equipment in the vicinity of these monitors since these monitors are located in the Control Room. For the second discrepancy, an internal raceway fire is not considered credible since these are low energy circuits and there is insufficient flammable material in the raceways to sustain an internal fire. Additionally, since these circuits were routed in Division I and II signal raceways (grounded and totally enclosed by sheet metal covers) there is generally sufficient protection from missiles, pipe whips, and fire. In the areas where these raceways become vulnerable to high energy line breaks, this radiation monitor system is not required to perform a mitigating function. For the third discrepancy, there is no common mode failure that would result in an inoperable/downscale signal on selected channels that would result in the radiation monitor system becoming inoperable, except for the external conditions described above. Therefore, a single inoperable/downscale signal would not violate the single failure criteria, and would not affect the function of the radiation monitor system.

The potential for the REA Radiation monitoring system to be rendered incapable of performing its safety function due to inadequate electrical separation in the proximity of low energy electrical circuits or due to less than adequate operator response to an REA system "inoperative" annunciation instead of the failsafe trip actuation qualitatively results in a low probability of failure of the REA system. This low probability of failure coupled with a qualitatively low probability of occurrence of an event that requires automatic actuation signals from the REA system (i.e., Reactor Building isolation) to control the release of radionuclides to the environment qualitatively results in a negligible increase in probability of radionuclide release in excess of 10CFR100 guidelines.

The safety function of the REA Radiation monitoring system is to initiate a Reactor Building isolation (Z signal) trip upon detection of radioactivity releases from a fuel handling accident only. Annunciation and automatic Plant response to all other accident conditions are provided for by other Reactor Plant safety systems.

Although the FSAR describes the REA Radiation monitoring system with an inoperative/downscale trip, the Technical Specifications require the Radiation monitoring system provide an automatic trip only on high-high radiation detection. There is no Technical Specification requirement for the REA Radiation monitoring system to provide a downscale trip function.

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Since failure of the REA Radiation monitoring system or an event/requiring the REA system to perform its safety function did not actually occur even singly, or more importantly, coincidentally, this condition did not threaten the health and safety of the public or Plant personnel.

Similar Events

LER 84-031, "10CFR50 Appendix "R" Cable Fire Protection," reported inadequate electrical separation between the control switches for two series high to low reactor pressure system interface valves (RHR-V-53A and RHR-V-123A) to preclude circuit faults from opening both valves simultaneously and failing the low pressure reactor safe shutdown system during a Control Room fire. LER 85-023, "10CFR50 Appendix "R" Cable Fire Protection and Electrical Separation," reported in part, inadequate spatial separation involving raceways carrying prime circuits (Non-Class 1E circuits connected to Class 1E power supply) due to missing cable tray covers. The immediate corrective actions for the events described in the above two LERs were to place the components and areas of concern on the fire watch tour except for those items inside of the Control Room, which is continuously manned. Similar immediate corrective actions were used for the condition described in this LER related to electrical and separation outside of the Control Room. LER 89-034, "Technical Specification Required Shutdown Completed as a Result of Inoperability of Class 1E 480 Volt AC Power Distribution System Caused By Design Deficiency", reported a fault tripping design deficiency with specific Class 1E 480 volt Division 1 and 2 motor control centers. The design failed to extend the depth of the coordination for the WNP-2 AC Electrical System protective tripping past the major 480 volt distribution centers down to the subfed motor control center level. LER 89-06, "Entry Into Technical Specification 3.0.3 Caused by Discovery of Calculation Errors in Post LOCA Integrated Control Room Dose", documented an event in which discovery of a design deficiency resulted in application of Technical Specification 3.0.3 to shut down the reactor plant. Cold Shutdown was not achieved because the condition was corrected within the time frame of the LCO. The corrective actions resulting from the above described LERs were not applicable to the event reported by this LER. Furthermore, the conditions described in LERs 89-034 and 89-06 were the result of services provided by the Architect/Engineer, whereas the conditions of the REA radiation monitoring system were the result of services provided by General Electric.

EIIS Information

Text Reference	EIIS Reference System	EIIS Reference Component
Cable Tray System	FA	
Fire Detection System	IC	
Radiation Monitoring System (Radiation Trip Monitors REA-RIS-609A, -609B, -609C, and -609D)	IL	RI
Radiation Monitoring System (Radiation Sensors REA-RE-9A, -9B, -9C, and -9D)	IL	RIT
Class 1E Power System	EE	
Reactor Building	NG	
Reactor Building HVAC	VA	