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SUBJECT: LER 93-027-00:on 930803,reactor scram occurred during MSL high radiation channel calibration due to full isolation of MSIV.Entered emergency operating procedures on low reactor level & high reactor pressure.W/930901 ltr.

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WASHINGTON PUBLIC POWER SUPPLY SYSTEM

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September 1, 1993
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Docket No. 50-397

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

Subject: **NUCLEAR PLANT WNP-2, OPERATING LICENSE NPF-21**
LICENSEE EVENT REPORT NO. 93-027

Transmitted herewith is Licensee Event Report No. 93-027 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/KBL/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
Mr. D. L. Williams, BPA (Mail Drop 399)

IE22

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Washington Nuclear Plant - Unit 2	0 5 0 0 0 3 9 7	1 OF 7

TITLE (4)
REACTOR SCRAM DURING MSL HIGH RADIATION CHANNEL CALIBRATION

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 8	0 3	9 3	9 3	-- 0 2 7	-- 0 0	0 9	0 1	9 3	NA	0 5 0 0 0
										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)	20.405(C)	X 50.73(a)(2)(iv)	77.71(b)
POWER LEVEL (10) 1 0 0	20.405(a)(1)(i)	50.36(c)(1)	50.73(a)(2)(v)	73.73(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)	X 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
K. B. Lewis, Licensing Engineer	AREA CODE 5 0 9 3 7 7 - 4 1 4 5

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
AH	CC A	VA LV OP	A 6 1 U	Yes					

SUPPLEMENTAL REPORT EXPECTED (14)	EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE) X NO				

ABSTRACT (16)

At 0539 hours on August 3, 1993, during performance of a surveillance procedure to calibrate Main Steam Radiation Indicating Switch MS-RIS-610D, the reactor unexpectedly scrammed from 100% power due to a full isolation of the Main Steam Isolation Valves (MSIVs). The isolation was due to higher than normal steam flow through three of the main steam lines.

Control Room personnel immediately implemented the Emergency Operating Procedures to stabilize the plant in a safe shutdown condition. Additionally, shift management declared an Unusual Event (UE) to promote increased awareness on the part of plant operating staff.

There were three root causes of the MSIV isolation/reactor scram: self-checking not applied, job scoping not thorough, and post-maintenance testing inadequate. Further corrective action consisted of performing a failure analysis on a failed MSIV component and determining the operability of all of the MSIVs.

This event posed no threat to the safety of the public or plant personnel.

Plant Conditions

Power Level - 100%
Plant Mode - 1 (Power)

Event Description

At 0539 hours on August 3, 1993, during performance of a surveillance procedure to calibrate Main Steam Radiation Indicating Switch MS-RIS-610D, the reactor unexpectedly scrammed from 100% power due to a full isolation of the MSIVs.

While Instrument and Control (I&C) technicians were troubleshooting MS-RIS-610D, Control Room personnel received a MAIN STEAM LINE RADIATION HIGH alarm. Operators determined that "D" Main Steam Line radiation indicating switch MS-RIS-610D triggered the alarm at 1800 mr/hr. At 0424 hours, I&C technicians performed surveillance procedure MSL HIGH RADIATION CHANNEL D - CHANNEL CALIBRATION (Rev. 5) to verify the operability of MS-RIS-610D. During I&C's performance of the surveillance, an unanticipated closure of the inboard MSIV on "B" Main Steam Line occurred. As a result, steam flow through the other three main steam lines increased sufficiently to generate a Nuclear Steam Supply Shutoff System (NSSSS) isolation signal on high main-steam-line flow. The isolation signal closed all MSIVs automatically. By design, the MSIV isolation initiated a reactor scram.

Immediate Corrective Actions

At 0540 hours on August 3, 1993, Control Room personnel entered the Emergency Operating Procedures on low reactor water level, high reactor pressure, and subsequently on high Suppression Pool temperature. Operators used the Main Steam Safety Relief Valves to control reactor pressure, the Reactor Core Isolation Cooling System (RCIC) to restore reactor water level, and the Residual Heat Removal (RHR) System to remove heat from the Suppression Pool. During the Suppression Pool's use as a heat sink, its water level increased sufficiently to require entry into the Emergency Operating Procedures on high Suppression Pool water level. Operators subsequently transferred the excess water to Radwaste facilities for reprocessing. The increase in Suppression Pool water level also caused the High Pressure Core Spray System (HPCS) to automatically transfer its suction source from the Condensate Storage Tanks (CSTs) to the Suppression Pool.

At 0600 hours, Control Room personnel declared an Unusual Event (UE) based on a situation "that warranted increased awareness on the part of plant operating staff" and subsequently made the required 15 minute notifications to local and state agencies. At 0750 hours, the plant was in a stable condition, the Emergency Operating Procedures were exited, and the UE was terminated.

Further Evaluation, Root Cause, and Corrective Action

Further Evaluation

1. At 0629 hours on August 3, 1993, this event was reported in accordance with 10CFR50.72(a)(1)(i) and (b)(2)ii). The MSIV isolation and ESF actuations are being reported under 10CFR50.73(a)(2)(iv).

2. During further evaluation on August 3, 1993, Plant Technical determined that closure of "B" Main Steam Line Inboard Isolation Valve MS-V-22B subsequently caused all MSIVs to isolate fully. The determination was made from Transient Data Acquisition System (TDAS) traces showing MSIV closure times as a function of MSIV valve position switches. At approximately 1858 hours, Supply System management approved a troubleshooting plan to determine the cause of the unexpected valve closure.

   a. Each MSIV includes an AC powered, dual-solenoid, pilot-operated valve. The pilot valve routes pneumatic pressure to its associated MSIV to open the valve during normal evolutions. The RPS divisionally supplies power to each solenoid installed with the pilot valve. Only one of the two solenoids must be energized to open the corresponding MSIV, but both solenoids must be deenergized to close the corresponding MSIV.

   b. Initial troubleshooting determined that a mechanical (rather than electrical) problem existed with the pilot valve serving Main Steam Line Isolation Valve MS-V-22B.

3. On August 4, 1993, a Drywell entry was made to retrieve the pilot valve assembly.

   a. To prepare for Drywell entry, operations commenced venting/deinerting activities on August 3, 1993, at approximately 2341 hours.

   b. At approximately 1407 hours on August 4, 1993, initial entry was completed, the pilot valve was subsequently retrieved, and a failure analysis was performed.

4. Analysis determined that personnel refurbishing this particular pilot valve during the R-8 Outage had inadvertently installed the original valve stem rather than the stem provided in the ASCO refurbishing kit.

   a. The work area used to refurbish the valve was cramped and many work activities adjacent to the work area were in progress during refurbishment.

b. During maintenance on the pilot valve, the craftsmen had noted a discrepancy between the existing pilot valve stem and that provided in the refurbishing kit. The stem provided in the refurbishing kit was slightly longer and was square, rather than hexagonal, in cross-section. A maintenance engineer and a plant technical engineer were called to the work area to resolve the discrepancy. The issue of which stem to use and the effect the choice of stems might have on the valve's operability was discussed. A second kit was subsequently brought to the work area, and the stems in the two kits were compared against the existing stem. From the comparison and further discussion, the two engineers recommended refurbishing the valve solely with parts from the kit. This recommendation was based on a high reliance that post-maintenance and operability testing would confirm that the stem provided in the kit would work (the manufacturer's spare parts supply was the first barrier considered). However, the original stem was inadvertently picked up and installed.

c. Inadvertent installation of the original valve stem mechanically caused a portion of the pilot valve associated with one of its solenoids to remain inoperable after the complete pilot valve assembly was reinstalled and reenergized. Thus, the pilot valve was mechanically inoperable prior to this event and was a contributor to the cause of this event.

5. The pilot valve was reinstalled exactly as it was found prior to its removal. When the workers routed the pneumatic supply to the pilot valve, it still leaked. The workers determined that the pilot valve was not oriented properly, so they reinstalled it correctly, reapplied its pneumatic supply, and observed no leaks.

a. Operations cycled the MSIV; the MSIV functioned properly and no leaks were observed.

b. The plant technical engineer later concluded that ASCO must have two separate designs, either of which is acceptable as long as the pneumatic supply was ported correctly.

c. The plant technical engineer had several ensuing conversations with ASCO concerning the discrepancy between the valve stems; all conversations were nonconclusive.

6. On August 5, 1993, with the plant in Mode 3 (Hot Shutdown), during ongoing work associated with the MSIV isolation/reactor scram problem in the Drywell, the system engineer discovered a small steam leak located upstream of "A" Main Steam Line inboard Main Steam Isolation Valve (MSIV) MS-V-22A. The flow was an unisolable pinhole leak emanating from the "A" Main Steam Line flow element MS-FE-5A sensing line weld. On August 5, 1993, at 0846 hours, Control Room personnel initiated a plant cooldown from Mode 3 to Mode 4 (Cold Shutdown) to repair the steam leak and to maintain compliance with Technical Specifications associated with PRESSURE BOUNDARY LEAKAGE in Modes 1, 2, or 3. Materials and Inspection personnel subsequently performed a failure analysis on the weld and determined that a crack introduced into the bottom or heel of the weld during installation caused the weld to fail. The failure mechanism was a weld

defect, not fatigue failure. Based on these results, no further evaluation or examination was required. On August 5, 1993, at approximately 0838 hours, this event was reported to the NRC by telephone in accordance with 10CFR50.72(b)(2)(i). This is also reportable under 10CFR50.73 (a)(2)(i).

Root Cause

There were three root causes of the MSIV isolation/reactor scram: self-checking not applied, job scoping not thorough, and post-maintenace testing inadequate. During refurbishing of the dual-solenoid, pilot-operated valve supplied with MSIV MS-V-22B, the original valve stem, rather than the stem supplied in the refurbishing kit, was inadvertently installed. Self-checking on final installation could have prevented this from happening. Poor job scoping resulted in refurbishing the valve in an inadequate work area. Post-maintenance testing of the pilot valve was inadequate, because each solenoid of the affected pilot valve was not tested individually.

There were three contributing causes of the MSIV isolation/reactor scram: inadequate training of craft personnel, inadequate communication, and a missed opportunity to verify use of the correct valve stem. Training for the craft on refurbishing ASCO valves is performed on a single solenoid type valve, but no training is conducted for the dual-solenoid type. Due to the distinct difference between the single and dual-solenoid design, the craft has not adequately been trained to troubleshoot the dual-solenoid design. During the time period after the pilot valve was refurbished and after the event, conversation took place between the Supply System and ASCO, but little or no communication to management nor the system engineer of these conversations transpired. One of the Quality Control inspector's roles during the refurbishing job was to verify new parts are the same as removed parts. Although the inspector correctly stopped the job until the technical and maintenance engineers arrived to resolve the difference in valve stems, the inspector missed an opportunity to verify use of the correct valve stem.

The root cause of the steam leak associated with an "A" Main Steam Line flow element sensing line was a weld defect. As previously stated, a crack introduced into the bottom or heel of the weld during installation caused the weld to fail.

Further Corrective Action

1. Maintenance work request AP 4868 was implemented to rebuild the pilot valve provided with MS-V-22B, and on August 6, 1993, at 0233 hours, the Control Room declared MS-V-22B operable.

2. In parallel with work associated with the MS-V-22B pilot valve, plant technical staff developed a troubleshooting plan to determine the operability of the remaining seven MSIVs; results showed that each MSIV solenoid operated correctly.

3. After results of the failure analysis performed on the MS-V-22B pilot valve were known, maintenance personnel bench tested similar, maintenance-spare pilot valves that had been refurbished with ASCO kits; all valves operated correctly.

4. The post-maintenance testing requirements for dual-solenoid valves for the following applications will be revised: 1) scram valves, 2) scram discharge volume vent and drain valves, 3) Containment isolation valves, 4) Emergency Core Cooling Systems (ECCS), and 5) MSIVs. This will be completed by December 1, 1993.

5. The training program for craft on the ASCO valves will be revised to include transparencies and/or diagrams, assembly and disassembly in accordance with the O&M manual, and special tool usage for a dual-solenoid. This will be completed by December 1, 1993.

6. Electrical Maintenance Engineering, Electrical craft, Technical staff, and Quality Control will be trained on lessons learned from this event. All training will be completed by December 1, 1993.

7. General training on post maintenance/modification testing will be provided to maintenance engineering, system engineers, and project engineers by December 1, 1993.

Safety Significance

After the MSIV isolation/reactor scram, operations personnel correctly implemented the Emergency Operating Procedures to shutdown, stabilize, and maintain the plant in a safe condition. The MSIV isolation caused reactor pressure to increase to 1089 $\pm$ 20 psig as read from TDAS; Control Room personnel responded to the pressure transient by controlling reactor pressure between 800 psig to 1000 psig with Main Steam Safety Relief Valves. Additionally, reactor water level dropped to minus 43 inches briefly during the event; however, operations manually initiated the RCIC System to restore water level promptly. This event was within the bounds of WNP-2 safety analysis. As designed, all MSIVs closed and all rods scrammed fully. Accordingly, this event posed no threat to the safety of the public or plant personnel. With respect to the steam leak/defective weld, plant records documenting Drywell Floor Drain leakage from August 2, 1993, to August 6, 1993, report zero leakage; therefore, the weld defect did not directly challenge plant safety prior to or after discovery of the pressure boundary leakage.

Similar events

Four previous events involving full isolation of MSIVs have occurred at WNP-2. LER 84-108 and LER 85-024 discussed MSIV isolations caused by NSSSS logic involving reactor pressure and the reactor MODE SWITCH. LER 87-020 discussed an MSIV isolation caused by a loss of RPS bus "A" and "B". LER 88-03 discussed an MSIV isolation caused by I&C technicians while they were performing a surveillance involving Main Condenser low vacuum trip channels. There were no similar LERs associated with Main Steam (MS) system steam leaks inside the Drywell.

EIIS Information

Text Reference	EIIS Reference System	EIIS Reference Component
MS-RIS-610D		RIS
Main Steam Isolation Valves		ISV
Nuclear Steam Supply Shutoff System	BD	
Main Steam Safety Relief Valves		RV
Reactor Core Isolation Cooling System	BN	
Residual Heat Removal System	BO	
Suppression Pool	--	
High Pressure Core Spray System	BG	
Condensate Storage Tanks	KA	
Reactor Protection System	JC	
Technical Data Acquisition System	IP	
Drywell	--	
MS-FE-5A		FE
Scram Valves	AA	
Scram Discharge Volume Vent & Drain Valves	AA	
Containment Isolation Valves		ISV
Emergency Core Cooling System	--	
Main Steam System	SB	