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 RECIP. NAME RECIPIENT AFFILIATION

SUBJECT: LER 89-031-00: on 890806, reactor scram due to low RPV level
 as result of loss of reactor feedwater pump.

W/8 ltr.

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 TITLE: 50.73/50.9 Licensee Event Report (LER), Incident Rpt, etc.

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WASHINGTON PUBLIC POWER SUPPLY SYSTEM

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

Docket No. 50-397

September 5, 1989

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

Subject: NUCLEAR PLANT NO. 2
LICENSEE EVENT REPORT NO. 89-031

Dear Sir:

Transmitted herewith is Licensee Event Report No. 89-031 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. 89-031

cc: Mr. John B. Martin, NRC - Region V
Mr. C. J. Bosted, NRC Site (M/D 901A)
INPO Records Center - Atlanta, GA
Ms. Dottie Sherman, ANI
Mr. D. L. Williams, BPA (M/D 399)

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LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)
Washington Nuclear Plant - Unit 2DOCKET NUMBER (2)
0 5 0 0 0 3 9 7 1 OF 0 6

TITLE (4) Reactor Scram Due to Low RPV Level as a Result of Loss of Reactor Feedwater Pump During Lube Oil Pump Surveillance Testing - Cause Indeterminate

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	8	0	6	8	9	8	9	0	3	1	0	0	0	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)	<input checked="" type="checkbox"/>	50.73(a)(2)(iv)	73.71(b)			
				20.405(a)(1)(i)	50.36(c)(1)	<input type="checkbox"/>	50.73(a)(2)(v)	73.71(c)			
				20.405(a)(1)(ii)	50.36(c)(2)	<input type="checkbox"/>	50.73(a)(2)(vi)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)			
				20.405(a)(1)(iii)	50.73(a)(2)(i)	<input type="checkbox"/>	50.73(a)(2)(viii)(A)				
				20.405(a)(1)(iv)	50.73(a)(2)(ii)	<input type="checkbox"/>	50.73(a)(2)(vi)(B)				
				20.405(a)(1)(v)	50.73(a)(2)(iii)	<input type="checkbox"/>	50.73(a)(2)(x)				

LICENSEE CONTACT FOR THIS LER (12)
NAME
W. S. Davison, Compliance Engineer
TELEPHONE NUMBER
5 0 9 6 2 7 - 4 3 9 4

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)									
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC

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

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single space typewritten lines) (16)

At 2027 hours on August 6, 1989, a low Reactor Pressure Vessel (RPV) level Reactor Scram was initiated by the Reactor Protective System in response to an actual low water level condition caused by an unplanned trip of Reactor Feedwater Pump 1B (RFW-P-1B). The scram occurred during surveillance testing of the auxiliary and emergency lube oil pumps for Reactor Feedwater Turbine 1B (RFW-DT-1B) with the plant at 100% power. When a solenoid operated drain valve was actuated to depressurize only the auto start pressure switch for the auxiliary lube oil pump, the entire "B" feedwater pump lube oil system was subjected to a low lube oil pressure transient sufficient to cause a low lube oil trip of RFW-P-1B. The remaining feedwater pump was unable to supply enough capacity to maintain RPV level above the reactor scram setpoint. The root cause investigation is still in progress. Two major areas have been identified: 1) Inappropriate RRC FCV Runback setpoint coupled with the change in feedwater pump governor maximum speed capability; 2) Inadvertent trip of RFW-P-1B on low lube pressure during testing of the auxiliary and emergency oil pumps.

Corrective actions consist of:

1. Revision of the operating procedure for reactor feedwater pumps to incorporate instruction to ensure that the test pushbutton is depressed for a sufficient length of time during feedwater turbine startup to assist adequate venting of the lube oil system.

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

2. The procedures which govern the plant setpoint control program will be evaluated to ensure that devices controlled outside the scope of the current program receive an adequate level of review.
3. The procedures which govern the setpoint control program will be revised to provide a method to assess the impact of setpoint changes on related systems.
4. Both the RRC FCV runback and the Reactor Feedwater Turbine Governor setpoint control documentation will be modified to reflect the connection between these two parameters.
5. The scheduling process for plant surveillances will be evaluated to determine the advisability of performing the feedwater pump surveillances at a lower plant power level.
6. An evaluation will be performed to determine the necessity for design/changes to the reactor feedwater turbine lube oil system to provide for self venting.
7. The regulator for RFW-P-1B lube oil system was replaced.
8. The plant procedure used to set the RRC FCV Runback was changed to include the appropriate setting specific to WNP-2.

The plant operators reacted correctly in concert with the installed plant safety systems to promptly bring the plant to a safe shutdown condition. This event posed no threat to the safety of the public or plant personnel.

Plant Conditions

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

Event Description

At 2027 hours on August 6, 1989, a low Reactor Pressure Vessel (RPV) level Reactor Scram was initiated by the Reactor Protective System in response to an actual low water level condition caused by an unplanned trip of Reactor Feedwater Pump 1B (RFW-P-1B). The scram occurred during surveillance testing of the auxiliary and emergency lube oil pumps for Reactor Feedwater Turbine 1B (RFW-DT-1B) with the plant at 100% power.

This particular surveillance test checks the operability of the auto start feature for the auxiliary and emergency lube oil pumps by use of a solenoid operated drain valve which is actuated with a pushbutton on control board "B" in the control room. Opening this valve depressurizes a small section of the lube oil piping on which the auto start pressure switches for the auxiliary and emergency lube oil pumps are located. Only that section of the oil header is depressurized because it is separated from the remainder of the oil system by a flow restricting orifice. When

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APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/88

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the oil pressure in the separate section drops to the setpoint of the auto start pressure switches, the lube oil pump starts and an annunciator is actuated in the control room.

At approximately 2027 hours, the plant operators concluded a successful test of RFW-DT-1B auxiliary lube oil pump. In accordance with procedure, the operator then depressed the test pushbutton for the emergency lube oil pump. Within about 3 seconds, a low lube oil pressure alarm for the RFW-DT-1B was received and the feedwater pump automatically tripped. As designed, RFW-DT-1A then began to increase speed to replace the reactor feedwater capacity lost due to the trip of the "B" feedwater pump. At approximately 2027 hours and 23 seconds (6 seconds after the feed pump trip), RPV level had decreased to Level 4 (31.5 inches above vessel level reference zero) and was still decreasing. At this point, the Reactor Recirculation System (RRC) initiated an automatic Flow Control Valve (FCV) Runback which changed the valve position of both FCVs from approximately 80% open valve position down to 30% open valve position. It was later determined that 30% open was a generic setting and that the correct runback position for these valves at WNP-2 was 20% open.

Reactor water level continued to decrease as feed pump speed gradually reduced from a normal speed overshoot transient down to the maximum speed control setting allowed by its electronic governor. At this point, as a result of higher than expected reactor power (governed by RRC System FCV position), feedwater mass flow rate was just below (1 to 3%) the mass flow rate of the steam leaving the reactor. Level continued to decrease at a progressively slower rate until at 2027 hours and 45 seconds the Reactor Protective System initiated an automatic Low RPV Level 3 (+13 inches) Reactor Scram.

Immediate Corrective Action

The plant operators acted promptly in accordance with approved plant procedures to maneuver the power plant to a safe shutdown condition. During the ensuing plant shutdown period, the RRC FCV runback valve position setpoint was reset to the plant specific value of 20% open valve position.

Further Evaluation and Corrective Action

A. Further Evaluation

1. This event is being reported as an event that resulted in automatic actuation of an Engineered Safety Feature per the requirements of 10CFR50.73(a)(2)(iv).
2. The root cause evaluation of the event is still in progress. Two major areas of investigation have been identified: 1) The inappropriate RRC FCV Runback setpoint coupled with a previous change in feedwater pump governor maximum speed capability; 2) The inadvertent trip of RFW-P-1B on low lube pressure during testing of the auxiliary and emergency oil pumps. Any substantive information which results from continuation of the root cause effort will be reported in a supplemental LER. The following is a summary of pertinent information and current conclusions:

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o Potential Cause - Equipment Failure

The feedwater pump control oil and lube oil pressure regulators are spring operated relief valves. The lube oil regulator is set dynamically to provide 15-20 psig at the most remote bearing. Equipment history shows three documented instances of improper regulator operation. On August 18, 1989, RFW-P-1B was removed from service due to a damaged thrust bearing. Inspection of the lube oil regulator valve revealed that a small piece was missing from the valve seat. Slight wear marks were also noted on the operating piston. A possible failure mode for this valve could have resulted in failure to maintain sufficient pressure on the lube oil system and could have resulted in loss of the 1B feedwater pump on low lube oil system pressure.

o Potential Cause - Design Deficiency/Problem Not Anticipated -

The piping runs associated with the feedwater turbine emergency and auxiliary lube oil pump pressure switches include an elevated section which was evaluated as being susceptible to air entrapment. Based on successive repeats of the lube oil surveillance test conducted after the event, it was concluded that a possible cause of the RFW turbine trip was that air in the feedwater turbine lube oil system could have caused rapid depressurization of the balance of the oil system by allowing rapid volume displacement of air through the testing orifice. This could have resulted in lube oil pressure low enough to actuate the low lube oil pressure trip function for RFW-DT-1B leaving only RFW-DT-1A to supply the RPV with feedwater.

o Root Cause - Procedures Less Than Adequate/Instructions Ambiguous-

The RRC Flow Control Valve runback setpoint was improperly set as a result of the fact that data obtained in 1984 during the power ascension testing program was not utilized to update the Certified Vendor Information (CVI) files. Although it was customary work practice to update the files, no procedural requirement existed to do so. Additionally, in 1984, no requirement existed to include this setpoint in the plant controlled setpoint program. In June of 1989, the RRC FCV runback feature was adjusted to agree with that setpoint listed in the CVI files per a recently approved plant procedure. This setpoint, however, was a generic data point and was not appropriate for WNP-2. This resulted in the FCVs running back to 30% open vice 20% open, causing reactor power to be higher than the capacity of a single feedwater pump and directly resulting in the decreased RPV level which caused the reactor scram.

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A contributing factor related to the RRC FCV Runback setpoint involved the fact that the maximum speed (and thus the maximum pumping capacity) of the RFW pumps had been decreased as a result of a previous event involving overfeeding of the RPV. The setting of the RRC FCV Runback was not also evaluated since no procedural requirement existed to coordinate the two setpoints. The lack of feedwater capacity combined with the improper RRC FCV Runback setpoint established the initiating conditions which resulted in the unanticipated reactor scram on loss of a single feedwater pump.

3. There were no plant structures, components, or systems inoperable at the start of this event that contributed to the event.

B. Further Corrective Action

1. The operating procedure for the reactor feedwater pumps will be revised to incorporate instruction to ensure that the test pushbutton is depressed for a sufficient length of time during feedwater turbine startup to assist adequate venting of the lube oil system.
2. The procedures which govern the plant setpoint control program will be evaluated to ensure that devices controlled outside the scope of the current program receive an adequate level of review.
3. The procedures which govern the setpoint control program will be revised to provide a method to assess the impact of setpoint changes on related systems.
4. Both the RRC FCV runback and the Reactor Feedwater Turbine Governor setpoint control processes will be modified to reflect the connection between these two parameters.
5. The scheduling process for plant surveillances will be evaluated to determine the advisability of performing the feedwater pump surveillances at a lower plant power level.
6. An evaluation will be performed to determine the necessity for design changes to the reactor feedwater turbine lube oil system to provide for self venting.
7. The regulator for RFW-P-1B lube oil system was replaced.
8. The plant procedure used to set the RRC FCV Runback was changed to include the appropriate setting specific to WNP-2.

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Safety Significance

The plant operators reacted correctly in concert with the installed plant safety systems to promptly bring the plant to a safe shutdown condition. Although an actual RPV low level condition did exist for a short period, with vessel level decreasing to +16 inches (lowest recorded level prior to the scram), the transient was well within the bounds of WNP-2 safety analysis calculations. The inadvertent setting of the RRC FCV runback to 30% open instead of 20% open was in the conservative direction and caused a reactor scram during a plant transient which the plant has previously demonstrated the ability to survive. This event posed no threat to the safety of the public or plant personnel.

Similar Events

None

EIIS InformationText ReferenceEIIS Reference

Reactor Pressure Vessel
Reactor Protective System
Auxiliary lube oil pump
Emergency lube oil pump
Reactor Feedwater Turbine 1B
Reactor Feedwater Turbine 1A
Solenoid operated drain valve
Auto start pressure switches
Annunciator
Piping runs
Feedwater lube oil system
RRC Flow Control Valve

<u>System</u>	<u>Component</u>
AC	RPV
JC	---
SJ	P
SJ	P
SJ	TRB
SJ	TRB
SJ	V
SJ	PS
SJ	ANN
SJ	---
SJ	---
AD	FCV