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SUBJECT: LER 90-021-00: on 900925, manual reactor scram caused by turbine control oil leak due to pipe nipple failure.

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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

October 22, 1990

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

Subject: NUCLEAR PLANT NO. 2
LICENSEE EVENT REPORT NO. 90-021

Dear Sir:

Transmitted herewith is Licensee Event Report No. 90-021 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,



J. W. Baker (M/D 927M)
WNP-2 Plant Manager

JWB:lr

Enclosure:

Licensee Event Report No. 90-021

cc: Mr. John B. Martin, NRC - Region V
Mr. C. Sorensen, NRC Resident Inspector (M/D 901A)
INPO Records Center - Atlanta, GA
Ms. Dottie Sherman, ANI
Mr. D. L. Williams, BPA (M/D 399)
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ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

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

The event posed no threat to the health and safety of either the public or plant personnel].

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

ESTIMATE BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 60.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

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DOCKET NUMBER (2)

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

Plant Conditions

Power Level -45 %

Plant Mode - 1

Event Description

At approximately 0440 hours on September 25, 1990 plant operators received a "DEH RETURN HEADER HI PRESS" alarm in the control room. Plant equipment operators were sent to investigate the cause of the alarm and reported an unusually high pressure drop across the Digital Electro-Hydraulic (DEH) Pump (DEH-P-1A) discharge filter. The standby DEH Pump (DEH-P-1B) was manually started but was stopped shortly thereafter when a leak was discovered on the discharge filter. Plant operators also noted that the DEH fluid temperature was rising and the pressure in the system was dropping. At 0528 hours, when DEH oil header pressure had dropped to 1850 psig from its normal value of 2100 psig, plant operators began to reduce reactor power. At 0552, with the Reactor Power at approximately 55%, Main Steam Bypass Valve Number 4 (MS-V-160A) opened for no apparent reason. At approximately the same time, when DEH pressure had decreased to 1750 psig, DEH-P-1B was started again and DEH pressure increased rapidly to 2000 psig. At 0556 hours a "TG AUTO-STOP TRIP" alarm was received in the control room. This alarm is associated with low pressure (45 psig) in the Auto Stop header and Plant Annunciator Procedures (PPM 4.820.B1-1.5) associated with this alarm requests confirmation of a Main Turbine Trip. At 0557 hours plant operators manually scrammed the reactor and tripped the turbine. In response to the turbine trip Bypass Valve Number 4 (MS-V- 160A) reacted normally by closing to maintain reactor pressure.

Immediate Corrective Action

Immediate corrective action was taken to place the plant in a cold shutdown condition. All systems and components performed as designed.

Further Evaluation and Corrective Action

A. Further Evaluation

1. This event is being reported per the requirements of 10CFR50.73(a)(2)(iv) as "Any event or condition that resulted in manual or automatic actuation of.....the Reactor Protection System (RPS)".
2. After plant shutdown an attempt was made to inspect the DEH system in both the latched and unlatched mode. When it was found that the turbine could not be latched the inspection led to the Interface Valve (DEH-V-22) which was not fully closing. Normal latching of the turbine pressurizes the Auto Stop Oil System to 100 psig. This closes the interface valve, DEH-V-22, which allows the DEH high pressure trip header to pressurize. The pressure in the DEH system is used to control the position of the bypass, governor, throttle, intercept and reheat stop valves.

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3. Disassembly of the Auto Stop header disclosed that there was a crack in the nipple leading to one of the auto-stop header relief valves which permitted the auto stop header pressure to bleed off to the point that DEH-V-22 started to open during power operation. This resulted in a gradual loss of pressure in the DEH system and led to the abnormal behavior of the DEH system observed by plant operators. Further evaluation showed that abnormal flow paths were established through the hydraulic control valves associated with the bypass valves which resulted in higher than normal system flows and the observed high differential pressure across the DEH return filters. The abnormal flows bypassed the heat exchanger and picked up additional heat which resulted in the temperature increase in the DEH system. The abnormal flow path through the hydraulic control valves for MS-V-160A also resulted in the opening of the valve. The oil leak in the Auto Stop header was not visible as it drained through the turbine pedestal back into the Turbine Lube Oil (TO) system.
4. A review of the Auto Stop System showed there are three pressure switches that all have a setpoint of 45 plus or minus 2 psig. The pressure switch that provides an alarm (TO-PS-1AST) was actuated as the pressure drifted down near the setpoint. The other two pressure switches (TO-PS-2AST and TO-PS-AM) initiate a turbine trip but were not actuated during the pressure decrease.
5. Metallurgical examination of the pipe nipple determined that the failure mechanism was due to low load fatigue failure. The nipple had cracked about 340 degrees around the diameter before leakage commenced. The crack initiated at the root of a thread at or near the point of entry into the valve block. The described failure was typical of vibration induced fatigue.
6. The cause of this event was traced to a broken nipple in the Auto Stop oil system. The preliminary root cause of the event was traced to the improper installation of a stabilizer strap that may have contributed to the failure. The installation combined with the unanticipated vibration in the area of the pipe nipple led to fatigue failure. This stabilizer strap is removed and reinstalled each refueling outage during inspection of the Auto Stop oil system. The root cause analysis is not complete at this time. Any significant change from that described above will be submitted as a revision to this LER.
7. There were no structures, components or systems that were inoperable prior to the start of this event which contributed to the event.

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B. Further Corrective Action

1. Plant maintenance personnel replaced the broken pipe nipple and reinstalled the relief valve and the associated stabilizer strap. A general inspection was performed in the area including a similar pipe nipple associated with a second relief valve.
2. The overall configuration in the vicinity of the nipple, relief valve and hanger will be evaluated to assure no similar failures will occur over the long term.

Safety Significance

There is no safety significance associated with this event. Plant operators took the proper action to place the plant in the safe shutdown condition when the DEH system did not respond to corrective actions. There was no threat to the health and safety of Plant personnel or to the public.

Similar Events

LER 84-109 describes an event that occurred on October 13, 1984 which was somewhat similar since it involved a manual scram in response to Turbine Governor and Bypass valve cycling. However, that event was caused by radio frequency interference with the DEH pressure control system.

EIIS InformationText ReferenceEIIS Reference

	<u>System</u>	<u>Component</u>
Digital Electro-Hydraulic System (DEH)	TG	--
Turbine Lube Oil System (TO)	LL	--
DEH Pump 1A (DEH-P-1A)	TG	P
DEH Pump 1B (DEH-P-1B)	TG	P
Main Steam Bypass Valve	SO	V
DEH Valve 22 (DEH-V-22)	TG	V
To Pressure Switch 1AST (TO-PS-1AST)	LL	PS
To Pressure Switch 2AST (TO-PS-2AST)	LL	PS
To Pressure Switch AM (TP-PS-AM)	LL	PS