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SUBJECT: LER 89-002-00:on 890130,turbine control valve fast closure
 reactor scram due to main generator trip.

W/8 ltr.

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FULL TEXT

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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 0 6

TITLE (4)	Turbine Control Valve Fast Closure Reactor Scram Due to Main Generator Trip Caused by Equipment Failure - Shorted Main Transformer Output Line Insulator
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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	1	3	0	8	9	8	9	0	0	2	0	0	0	2	2	8	8	9	0	5	0	0	0				

OPERATING NUCLEUS		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)	73.71(b)
POWER LEVEL (10)	1 0 0 0	20.405(a)(1)(i)		50.38(c)(1)		50.73(a)(2)(v)	73.71(c)
		20.405(a)(1)(ii)		50.38(c)(2)		50.73(a)(2)(vi)	
		20.405(a)(1)(iii)		50.73(a)(2)(i)		50.73(a)(2)(vii)(A)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
		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)(ix)	

LICENSEE CONTACT FOR THIS LER (12)	
NAME	TELEPHONE NUMBER
W.S. Davison, Compliance Engineer	510 9 317 71-12 510 11

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)					
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	
X	EIL	I N I S I	A 50 O	N	

SUPPLEMENTAL REPORT EXPECTED (14)		EXPECTED SUBMISSION DATE '5'	MONTH	DAY	YEAR
YES (If yes complete EXPECTED SUBMISSION DATE)	<input checked="" type="checkbox"/> NO				

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

On January 30, 1989, at 0514 hours, a Reactor Scram occurred due to Turbine Control Valve Fast Closure actuation of the Reactor Protective System logic. This logic was actuated when the main generator 500KV output breakers tripped as a result of high currents created when a porcelain insulator on the output side of 25/500KV main transformer TR-M1 shorted to ground. Plant operators responded to maneuver the plant to a safe shutdown condition. The damaged 500KV insulator stack was replaced. All other 500KV and 115KV insulators in the transformer yard were cleaned and inspected. Transformer TR-M1 was tested to determine its acceptability for continued use. The immediate cause of the insulator failure was the build up of a chemical residue deposited by the vapor plume from the Circulating Water System cooling towers. This residue was found to be conductive when wet. The residue consisted of river water minerals and sulfate compounds generated by sulfuric acid addition used to control the ph of circulating water.

Two root causes were identified: 1) Equipment Design Deficiency (problem not anticipated) The insulators used at WNP-2 are not of the type or number recommended for contaminated environments. 2) Equipment Maintenance Deficiency. No formal maintenance/inspection program existed which specifically identified this equipment. The corrective actions consist of performing an evaluation to determine the need for design changes to the insulators and implementation of a preventative maintenance program to cover these insulators. No safety significance was associated with this event.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

APPROVED OMB NO. 3150-0104

EXPIRES: 8/31/88

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

Plant Conditions

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

Event Description

On January 30, 1989, at 0514 hours, a Reactor Scram occurred due to Turbine Control Valve Fast Closure actuation of the Reactor Protective System (RPS) logic. This logic was actuated when the main generator 500KV output breakers tripped as a result of high currents created when a porcelain insulator on the output side of 25/500KV main transformer TR-M1 shorted to ground.

Immediate Corrective Action

- o Plant operators responded in a timely manner to maneuver the plant to a safe shutdown condition in accordance with the General Operating Procedures.
- o The damaged 500KV insulator stack was replaced. All other 500KV and 115KV insulators in the main transformer yard were inspected and cleaned. Transformer TR-M1 was tested to determine its acceptability for continued use.

Further Evaluation and Corrective ActionFurther Evaluation

1. This event is being reported as an Engineered Safety Feature (ESF) actuation per the requirements of 10CFR50.73(a)(2)(iv).
2. There were no structures components or systems that were inoperable at the start of this event that contributed to the event.
3. A formal root cause analysis effort resulted in the conclusion that the immediate cause for the failure of the 500KV insulator was a buildup of conductive film on the surface of the insulator. Chemical analysis showed the film to be composed of chemical residue deposited by the vapor plume from the Circulating Water System cooling towers. The major constituents of the residue were river water minerals and sulfate compounds generated by sulfuric acid addition used to control the ph of circulating water.

Testing indicated that the film was only conductive in the presence of moisture. The conclusion drawn from this data is that the insulator failure occurred when wind conditions forced the cooling tower plume into the transformer yard such that the film on the surface of the insulator was wetted sufficiently for conduction to ground to occur. Two root causes were identified:

- a) Equipment Design Deficiency - (Problem Not Anticipated) The insulators used at WNP-2 are not of the type or number recommended to be used in contaminated environments (cooling tower vapor/conductive chemicals).



1

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LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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- b) Equipment Maintenance Deficiency - (Preventative Maintenance Less Than Adequate) No formal maintenance/inspection program exists which specifically identifies this equipment. These 500KV post insulators were not cleaned during the 1988 plant refueling and maintenance outage.

4. During this event five trip setpoints were reached as discussed below:

- a) The Reactor High Pressure RPS trip setpoint of 1037 psig was reached 1.7 seconds after the reactor scram. All four of the high pressure channels did trip. Since a scram signal had been previously generated (Turbine Control Valve Fast Closure) to actuate the RPS Scram logic, no other actuations are associated with this setpoint.
- b) The Reactor Low Water Level (Level 3) trip setpoint, +13 inches, was reached 2.6 seconds after the scram due to the initial reactor pressure transient. The actuations associated with a level 3 trip include RPS actuation (scram signal), shift of Reactor Recirculation (RRC) pumps to 15 hertz operation, Automatic Depressurization System (ADS) permissive signal, and NSSSS (Nuclear Steam Supply Shutoff System) Groups 5 and 6 isolation. All four of the RPV level 3 channels did trip. Since a scram signal had been previously generated (Turbine Control Valve Fast Closure) to actuate the RPS scram logic, no further actuation occurred. The RRC pumps did shift to 15 hertz operation and NSSSS Groups 5 and 6 were already closed in their isolation positions. NSSSS Group 5 consists of Residual Heat Removal (RHR) valves and Traversing Incore Probe withdrawal and Group 6 consists of RHR Shutdown Cooling valves.
- c) The Reactor High Water Level (Level 8) trip setpoint, +54.5 inches, was reached 2.3 minutes after the scram due to less than expected Reactor Feedwater Control System response capability. Level 8 actuations include tripping the Main Turbine, tripping the Reactor Feedwater Pumps (RFW-P-1A and 1B) and closing both the High Pressure Core Spray Injection Valve (HPCS-V-4) and RCIC Turbine Steam Stop Valve (RCIC-V-45). RFW-P-1B did trip as a result of the high water level trip. RCIC-V-45 was lined up in its normally closed position and did not operate. The Main Turbine was previously tripped due to the tripping of the Main Generator Output circuit breakers and, since there was no HPCS injection during this event, HPCS-V-4 was closed throughout the event.
- d) Six Main Steam Relief Valves (MS-RV-1B, 1C, 2B, 3B, 4B and 4C) automatically opened during the event when their respective trip setpoints were reached. The maximum pressure recorded during the event was 1079 psig. The relief valves all closed within their pressure switch reset tolerances.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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- e) The Scram Discharge Volume High Water level trip setpoint was reached 28.3 seconds after the reactor scram. This is a normal result of the Control Rod Drive (CRD) system operation during a reactor scram. All four channels of instrumentation did trip. Since a scram signal had been previously generated (Turbine Control Valve Fast Closure) to actuate the RPS scram logic, no further actuation occurred.
5. The voltage transient associated with the main generator trip resulted in the following; the start of both the Division One and Division Two emergency diesel generators, the loss of the alternate power supply for the Reactor Protective System (RPS), the loss of Reactor Water Cleanup Pump 1B, the loss of service air compressor 1, the loss of Sample Racks 18A, 20 and 21, and the loss of Division B supervisory control system for the Circulating Water, Tower Makeup, Plant Service Water and Cooling Tower Fan Systems. These occurrences were evaluated as being normally expected for the magnitude of the voltage transient which was experienced in this event.
6. Equipment abnormalities which were discovered during or as a result of this event are:
- a) The scram discharge vent valves (CRD-V-10, CRD-V-180) and drain valves (CRD-V-11, CRD-V-181) did not reopen when they were reset as a part of the scram recovery procedure. These valves open to allow the scram discharge volume to empty in preparation for subsequent reactor scrams during continued operation. Troubleshooting efforts did result in the correct operation of the scram discharge vent and drain valves on February 1, 1989. Troubleshooting involved disassembly and inspection of portions of the CRD System associated with air operation of these valves. Inspection of the 10 micron supply filter (CRD-F-6), portions of the downstream piping and valve internals revealed that the system was clean and free of contamination.
- b) After the reactor scram, Reactor Pressure Vessel (RPV) water level increased to the high RPV Level 8 (+54.5 inches) setpoint causing the operating Reactor Feedwater Pump, RFW-P-1B, to shutdown. RFW-P-1A was previously secured by the reactor operator. This transient occurred at an average level increase rate of 21 inches per minute with RPV level peaking at +55.3 inches 2.3 minutes after the scram and returning to the normal level of +36 inches 4.5 minutes later. The transient was moderate and was controlled by plant operators without difficulty. There was no significant impact on the scram recovery process as a result of this RPV level transient. The Reactor Feedwater Control System is being evaluated to determine methods for improving response capability after a scram.

Corrective Actions

1. An engineering evaluation will be completed to determine the need for design changes to the WNP-2 transformer yard insulators.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-0104

EXPIRES: 8/31/88

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2. A formal preventative maintenance program will be implemented to cover the transformer yard insulators.

Safety Significance

All manual and automatic safety system responses occurred as designed. The Reactor Protective System functioned correctly to cause an automatic actuation in response to an actual Turbine Control Valve Fast Closure event. The Plant response to the transient was as expected with the exception of the Reactor Feedwater System. The RPV High Level 8 condition did not significantly impact the response to the scram or pose any safety concern. Since overall Plant transient response was evaluated as being within the bounds of the WNP-2 Safety Analysis, no safety significance is associated with this event and it posed no threat to the safety of Plant personnel or the public.

Similar Events

LERs 87-018, 85-002 and 85-003 all document reactor scrams initiated by Turbine Control Valve Fast Closure as a result of electrical equipment problems.

EIIS InformationText ReferenceEIIS Reference

System Component

Turbine Control Valve	TA	XCV
Main Generator	TB	GEN
500KV Output Breakers	TB	52
TR-M1	TB	XFMR
500KV Insulator	TB	INS
115KV Insulators	TB	INS
CRD-V-10, 11, 180, 181	AA	V
Reactor Feedwater Pump	JB	P
Division One and Two Diesel Generators	EK	GEN.
Reactor Protective System	JC	- - - -
RCIC System	BN	- - - -
Sample Racks 18A, 20, 21	--	- - - -
Division B Supervisory System	JJ	- - - -
Circulating Water System	NN	- - - -
Tower Makeup System	KI	- - - -
Cooling Tower Fan System	NN	- - - -
RPV	AC	- - - -
Reactor Feedwater Control System	JB	- - - -
Main Turbine	TA	TRB
HPCS-V-4	BG	V
RCIC-V-45	BN	V

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EIIS InformationText Reference

MS-RV-1B, 1C, 2B, 3B, 4B, 4C
RRC-P-1A, 1B
NSSSS Group 5 and 6
RHR Valves
Traversing Incore Probe
Scram Discharge Volume
CRD-F-6
Plant Service Water System

EIIS Reference

System Component

SB	RV
AD	P
JC	- - - -
BO	V
IG	- - - -
AA	TK
AA	FLT
KG	- - - -

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

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

Docket No. 50-397

February 28, 1989

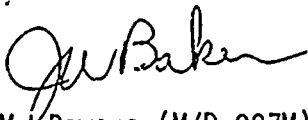
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Subject: NUCLEAR PLANT NO. 2
LICENSEE EVENT REPORT NO. 89-002

Dear Sir:

Transmitted herewith is Licensee Event Report No. 89-002 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:lg

Enclosure:
Licensee Event Report No. 89-002

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)

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

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

Docket No. 50-397

February 28, 1989

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

Subject: NUCLEAR PLANT NO. 2
LICENSEE EVENT REPORT NO. 89-002

Dear Sir:

Transmitted herewith is Licensee Event Report No. 89-002 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:lg

Enclosure:
Licensee Event Report No. 89-002

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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