

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) Arkansas Nuclear One, Unit One

DOCKET NUMBER (2) | PAGE (3)
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TITLE (4) Reactor Trip on High Reactor Coolant System Pressure Due to Turbine Control System Malfunction

EVENT DATE (5)			LER NUMBER (6)		REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
Month	Day	Year	Sequential Number	Revision Number	Month	Day	Year	Facility Names	Docket Number(s)
01	4	0	8	8 6 8 6 -	0	0	4 -	0 0 0 5 0 8 8 6	0 5 0 0 0
OPERATING MODE (9) <input checked="" type="checkbox"/> THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §:									
POWER LEVEL (10) <input checked="" type="checkbox"/> 20.402(b) <input checked="" type="checkbox"/> 20.405(a)(1)(i) <input checked="" type="checkbox"/> 20.405(a)(1)(ii) <input checked="" type="checkbox"/> 20.405(a)(1)(iii) <input checked="" type="checkbox"/> 20.405(a)(1)(iv) <input checked="" type="checkbox"/> 20.405(a)(1)(v) <input type="checkbox"/> 20.405(c)(1) <input type="checkbox"/> 50.36(c)(2) <input type="checkbox"/> 50.73(a)(2)(i) <input type="checkbox"/> 50.73(a)(2)(ii) <input type="checkbox"/> 50.73(a)(2)(iii) <input type="checkbox"/> 50.73(a)(2)(iv) <input type="checkbox"/> 50.73(a)(2)(v) <input type="checkbox"/> 50.73(a)(2)(vi) <input type="checkbox"/> 50.73(a)(2)(vii) <input type="checkbox"/> 50.73(a)(2)(viii)(A) <input type="checkbox"/> 50.73(a)(2)(viii)(B) <input type="checkbox"/> 50.73(a)(2)(x) <input type="checkbox"/> 73.71(b) <input type="checkbox"/> 73.71(c) <input type="checkbox"/> Other (Specify in Abstract below and in Text, NRC Form 366A)									
N <input type="checkbox"/> (Check one or more of the following) (11)									

LICENSEE CONTACT FOR THIS LER (12)

Name	Telephone Number
Dwight J. Johnson, Plant Licensing Engineer	Area
	Code

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

Cause	System	Component	Manufacturer	Reportable to NPPDS	Cause	System	Component	Manufacturer	Reportable to NPPDS
C	J	J	R	I	J	X	L	O	4 5 N

SUPPLEMENT REPORT EXPECTED (14)

EXPECTED SUBMISSION DATE (15) | Month Day Year

 Yes (If yes, complete Expected Submission Date) No

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

On 4/8/86 at 0228 hours, the reactor automatically tripped on high reactor coolant system (RCS) pressure from 82% power following a secondary system transient. Emergency feedwater was actuated due to pressure induced steam generator level oscillations that resulted from the secondary system transient. The secondary system upset was due to a turbine electrohydraulic control (EHC) system malfunction that resulted in the turbine governor valves closing rapidly (generator output dropped 300 megawatts in 2 seconds). The closing of the governor valves caused a primary to secondary heat transfer mismatch which caused RCS pressure to exceed the reactor protection system high RCS pressure trip setpoint. The turbine EHC system malfunction was the result of an electrical perturbation caused by a lightning strike which apparently fed through one of the turbine EHC electrical system regulated power supplies due to a malfunction internal to the power supply. The power supply output voltage was reset to its nominal rating. The power supply will be replaced as soon as an 'on-order' power supply is received. At the time of the event a severe electrical storm was passing over the plant site and a lightning strike was observed in the electrical switchyard just prior to the trip. This event was an uncomplicated reactor trip and posed no threat to the health and safety of the general public.

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LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)

Arkansas Nuclear One, Unit One

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

DOCKET NUMBER (2)	LER NUMBER (6)	PAGE (3)
Year	Sequential Number	Revision Number
1015 0 0 0 3 1 3 8 6 --	0 0 4 --	0 0 0 2 0F 0 3

I. Description of Event

A. Unit Status

Arkansas Nuclear One, Unit One (ANO-1) was operating at 82% power with a reactor coolant system (RCS) hot leg temperature of 598 degrees fahrenheit and pressurizer pressure of 2141 psig. ANO-1 had been operating at reduced power due to high indicated level in the 'A' once through steam generator (OTSG).

B. Component Identification

+15V DC Power Supply (PS); ETIS Identifier = JJ-RJX

The suspect power supply involved in this event is part of the turbine electrohydraulic control (EHC) system and was manufactured by Lambda Electronics. The turbine EHC system utilized at ANO-1 was designed and manufactured by Westinghouse Electric Corporation. The power supplies used in the ANO-1 turbine EHC system are designed to supply isolated, regulated DC power to the control circuits of the turbine EHC system.

C. Sequence of Events

On 4/8/86 at 0228 hours, the unit tripped from 82% power on high RCS pressure. The computer generated sequence of events showed the following significant details:

02:28:52 - Turbine EHC system no longer being controlled by the integrated control system (ICS), based on computer alarm

02:28:54 - Emergency feedwater (EFW) auto-actuated due to transient secondary pressure induced OTSG level spike

02:28:55 - ICS changes from auto to tracking mode

02:28:57 - Reactor trip on high RCS pressure of 2300 psig (peak RCS pressure during transient 2302.95 psig). Also, main steam line relief valves lifted for a few seconds (peak secondary pressure during transient 1061.96 psig).

Post trip response was normal, the main steam relief valves reseated properly. RCS heat removal was accomplished by the OTSGs and main condensers utilizing the turbine bypass valves. The EFW system was manually secured approximately 7 minutes after actuation following verification that 'B' main feedwater (MFW) pump was supplying both OTSGs. At 10 minutes after the trip, the 'B' MFW pump was secured and OTSG feed was accomplished by use of the auxiliary feedwater pump (P-75). The plant was stabilized within the hour in a normal hot shutdown mode. Upon completion of maintenance troubleshooting and corrective actions the unit was returned to power operation on 4/9/86.

II. Event Cause

A. Event Analysis

Prior to and during the transient event a severe electrical storm was in progress in the area around the plant. Immediately prior to the reactor trip, a lightning strike was observed in the plant electrical switchyard. This lightning strike was followed by a turbine EHC system malfunction. The turbine EHC system malfunction caused the turbine governor valves to start closing rapidly. This caused main generator output to drop approximately 300 megawatts in 2 seconds. The secondary system pressure transient caused a level oscillation in the OTSGs which actuated EFW and additionally caused a trip of the reactor on high RCS pressure due to primary to secondary heat transfer mismatch.

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	Year	Sequential Number	Revision Number	Number	
Arkansas Nuclear One, Unit One	10 5 0 0 0 3	1 3 8 6 --	0 0 4 -- 0	0 0 3 0 F 0 3	

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

B. Root Cause

Based on a review of the sequence of events and the event analysis, the root cause of the turbine EHC system malfunction appears to be a lightning strike which entered the turbine EHC electrical system through the plant grounding system. The electrical perturbation caused the surge from the lightning strike apparently fed through one of the turbine EHC electrical system regulated power supplies due to a malfunction internal to the power supply. The change in control configuration with the large difference that existed between actual turbine closing. It was this closure of the main turbine governor valves to start secondary system mismatch that resulted in the reactor trip on high RCS pressure.

C. Basis for Reportability

This event is being reported under the provisions of 10CFR50.73 (a)(2)(iv). The turbine EHC system malfunction resulted in an unanticipated automatic actuation of the Engineered Safeguards Actuation System/Reactor Protection System. This event was an uncomplicated reactor trip and posed no threat to the health and safety of the general public.

III. Corrective Actions

A. Immediate

Immediate corrective actions consisted of verifying all the reactor trip safety functions of the emergency operating procedure. This resulted in placing the plant in a safe shutdown condition (hot shutdown mode). Included in this action was establishment of normal primary to secondary heat removal utilizing the OTSGs, turbine bypass valves, and the main condenser with feedwater being supplied to the OTSGs via P-75. These plant conditions were established and maintained within 1 hour of the trip.

B. Subsequent

Subsequent actions were focused on evaluating the turbine EHC system circuitry to identify any components that may have been damaged or may have contributed to this event. A reactor startup was initiated and completed on 4/9/86. The EHC performance evaluation continued during this time as the turbine was "latched" and power was escalated to 17% and held for 30 hours. Reactor startup and low power generation was required to allow on-line trouble shooting and performance testing of the turbine EHC system. The only abnormalities identified during this evaluation period was a bad turbine EHC electrical system +15VDC regulated power supply output voltage. This power supply output was reset to a nominal rating of +16.001VDC. At the end of the 30 hour monitoring period, a power escalation was initiated and the plant was eventually returned to normal power operations.

C. Future

Future corrective actions include replacement of the power supply that was identified as having a bad output. This action will be accomplished as soon as a new power supply (on order) is received at ANO-1 and plant conditions allow. No other actions are planned.

IV. Additional Information

A. Similar Events

There have been no similar events of reactor trips caused by lightning strikes reported for ANO-1. No supplemental report is planned.



ARKANSAS POWER & LIGHT COMPANY

POST OFFICE BOX 551 LITTLE ROCK, ARKANSAS 72203 (501) 371-4000
May 8, 1986

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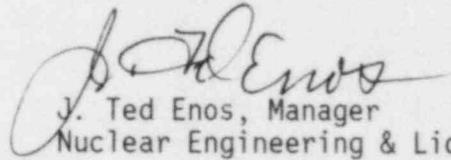
U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Subject: Arkansas Nuclear One - Unit 1
Docket No. 50-313
License No. DPR-51
Licensee Event Report
No. 86-004-00

Gentlemen:

In accordance with 10CFR50.73(a)(2)(iv), enclosed is the subject report concerning a reactor trip on high reactor coolant system pressure due to a turbine control system malfunction.

Very truly yours,


J. Ted Enos, Manager
Nuclear Engineering & Licensing

JTE:RJS:lw

Enclosure

cc: Mr. James M. Taylor, Director
Office of Inspection and Enforcement
U. S. Nuclear Regulatory Commission
Washington, DC 20555

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