



Entergy Operations

Entergy Operations, Inc.

Route 2 Box 1570

Littleton, AR 72601

Tel 501-964-2100

April 29, 1991

1CAN349106

U. S. Nuclear Regulatory Commission

Document Control Desk

Mail Station P1-137

Washington, D. C. 20555

SUBJECT: Arkansas Nuclear One - Unit 1
Docket No. 50-313
License No. DPR-51
Licensee Event Report 50-313/91-001-01

Gentlemen:

In accordance with 10CFR50.73(a)(2)(iv), attached is a supplement to the subject report concerning an automatic reactor trip due to a main turbine trip which was caused by failure of the turbine generator exciter.

This supplement is being submitted to provide the results of the root cause evaluation of the exciter failure.

Very truly yours,

James J. Fisicaro
James J. Fisicaro
Director, Licensing

JJF/RHS/mmg

Attachment

cc: Regional Administrator
Region IV
U. S. Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 1000
Arlington, TX 76011

INPC Records Center Suite 1500
1100 Circle, 75 Parkway
Atlanta, GA 30339-3064

9105030252 910429
PDR ADOCK 05000313
S PDR

11
IE22

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) Arkansas Nuclear One, Unit One

DOCKET NUMBER (2) PAGE (3)
050003 1 31 OF 04

TITLE (4) Automatic Reactor Trip Due To A Main Turbine Trip Which
Was Caused By Failure Of The Turbine Generator Exciter

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
0	1	1	0	9	1	0	1	--	0
0	1	1	0	9	1	0	4	2	9
									Docket Number(s)
									050003

OPERATING MODE (9) N 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)	X	50.73(a)(2)(iv)	73.71(b)
				20.405(a)(1)(i)	50.36(c)(1)		50.73(a)(2)(v)	73.71(c)
				20.405(a)(1)(ii)	50.36(c)(2)		50.73(a)(2)(vii)	Other (Specify in
				20.405(a)(1)(iii)	50.73(a)(2)(i)		50.73(a)(2)(viii)(A)	Abstract below and
				20.405(a)(1)(iv)	50.73(a)(2)(ii)		50.73(a)(2)(viii)(B)	in Text, NRC Form
				20.405(a)(1)(v)	50.73(a)(2)(iii)		50.73(a)(2)(x)	366A)

LICENSEE CONTACT FOR THIS LER (12)

Name	Telephone Number
Richard H. Scheide, Nuclear Safety and Licensing Specialist	Area Code 501 964-5000

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

SUPPLEMENT REPORT EXPECTED (14)

Yes (If yes, complete Expected Submission Date)	No	EXPECTED SUBMISSION DATE (15)	Month	Day	Year
	X				

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

On January 10, 1991, at approximately 2326, with the plant at 100 percent of rated power, a reactor trip occurred as a result of the main turbine tripping due to loss of field excitation to the main generator. An anticipatory Reactor Protection System (RPS) trip was initiated, as designed, when the main turbine tripped while reactor power was greater than 43 percent. Plant response to the trip was as expected. Reactor Coolant System (RCS) pressure decreased to 1828 psig and was quickly recovered into the post trip window. Minimum post trip RCS temperature was 553 degrees. A temporary exciter was installed while the plant remained in the hot shutdown condition and the reactor was returned to power on January 17, 1991. The temporary exciter was replaced with a permanent exciter during mid cycle outage 1M91, which began on April 7, 1991. The cause of the exciter failure was inadequate cleanliness/material accountability controls. Strengthened controls were implemented during the permanent exciter installation.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)						PAGE (3)
		Year	Sequential Number	Revision Number				
Arkansas Nuclear One, Unit One	05000313	91	-- 001	-- 01				02 OF 04

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

A. Plant Status

At the time of this event, Arkansas Nuclear One, Unit 1 (ANO-1) was operating at approximately 100 percent of rated power. Reactor Coolant System (RCS) [AB] average temperature was 579 degrees and RCS pressure was approximately 2153 psig. No major equipment was out of service.

B. Event Description

On January 10, 1991, at approximately 2326, an automatic reactor trip occurred as a result of the main turbine [TA] tripping due to loss of field excitation to the main generator [EL]. An anticipatory Reactor Protection System (RPS) [JC] trip was initiated, as designed, when the main turbine tripped while reactor power was greater than 43 percent.

Plant response to the trip was as expected. RCS pressure decreased to 1828 psig and was quickly recovered into the post trip window. Minimum post trip RCS temperature was 553 degrees. The Integrated Control System (ICS) [JA] initiated a runback of the 'A' and 'B' main feedwater pumps (MFPs). Fifteen of the sixteen main steam safety valves (MSSVs) opened to relieve the excess steam pressure/RCS energy. All MSSVs which opened reseated properly. Forced flow was maintained with all four (4) reactor coolant pumps operating. The ability to remove heat from the RCS was maintained by the use of the turbine bypass valves.

Approximately 30 minutes after the trip, the 'B' MFP was secured and the auxiliary feedwater pump (P-75) was placed in service. After placing P-75 in service, the 'A' MFP was secured. The plant was maintained at hot shutdown conditions while an investigation was conducted to determine the cause of the exciter problem.

No equipment malfunctions or failures were noted that complicated the plant recovery effort. Additionally, no procedural or operator inadequacies were found as transient response was in a timely and professional manner.

C. Root Cause

An evaluation was conducted by the vendor (Westinghouse) which concluded that the most likely cause of the exciter failure was the presence of a foreign object in the exciter which created a short circuit between the diode heat sink (AC potential) and the diode wheel fuse rim (DC potential). The resultant short circuit current generated sufficient heating to melt the aluminum heat sinks causing the loss of the exciter field relay and a subsequent main generator/reactor trip. It is not known when the foreign object was introduced into the exciter.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)						PAGE (3)
Arkansas Nuclear One, Unit One		Year	Sequential Number	Revision Number				
	05000313	91	001	01				03 OF 04

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

The root cause of this event is considered to be inadequate material accountability and cleanliness controls regarding the turbine generator/exciter.

D. Corrective Actions

A temporary exciter was installed and the reactor was returned to power on January 17, 1991.

The temporary exciter was replaced with a permanent exciter during mid cycle outage 1M91, which began on April 7, 1991. During the installation, additional controls were implemented to ensure that cleanliness and material accountability were maintained. These controls included:

- Around the clock ANO System Engineering supervisory interface.
- Strengthened material accountability controls which included the establishment of a security fence around the exciter work area. This fence had only one entrance at which all materials entering and leaving the area were logged and accounted for.
- Work was accomplished using a detailed job order package which included Quality Control (QC) hold points and required periodic inspections and signoffs by vendor as well as ANO System Engineering and QC personnel.

E. Safety Significance

The RPS initiated a reactor trip due to the main turbine tripping while reactor power was greater than 43 percent, as designed. The plant response to the transient was as expected, with no major complications, and normal post trip parameters were maintained. Therefore, there was no safety significance associated with this event.

F. Basis For Reportability

This event is reportable pursuant to 10CFR50.73(a)(2)(iv) since an automatic reactor trip was initiated by the RPS.

This event was also reported in accordance with 10CFR50.72 at 0147 on January 11, 1991.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)						PAGE (3)
Arkansas Nuclear One, Unit One		Year	Sequential Number	Revision Number				
		9 1 --	0 0 1 --	0 1				0 4 CF 0 4

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

G. Additional Information

A similar event in which a reactor trip was caused by a main generator exciter failure was reported in LER 50-313/89-002-00.

Energy Industry Information System (EIIS) codes are indicated in the text as [XX].