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U. S. Nuclear Regulatory Commission
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SUBJECT: Arkansas Nuclear One - Unit 2
Docket No. 50-368
License No. NPF-6
Licensee Event Report 50-368/91-005-00

Gentlemen:

In accordance with 10CFR50.73(a)(2)(iv), attached is the subject report concerning the inadvertent actuation of a protective relay due to vibration which resulted in tripping of a reactor coolant pump motor breaker and subsequent automatic reactor trip.

Very truly yours,

James J. Fisicaro

James J. Fisicaro
Manager, Licensing

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NRC Form 366
Commission
(6-89)

U.S. Nuclear Regulatory

Approved OMB No. 3150-0104
Expires: 4/30/92

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Arkansas Nuclear One, Unit Two	0 5 0 0 0 3 6 8	1 OF 0 4

TITLE (4) Inadvertent Actuation Of Protective Relay Due To Vibration Results In Trip Of Reactor Coolant Pump Motor Breaker And Subsequent Automatic Reactor Trip

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 2	0 1	9 1	9 1	-- 0 0 5	-- 0 0	0 3	0 4	9 1		0 5 0 0 0
										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)	0 8 8	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 Abstract below and in Text, NRC Form 366A)
		20.405(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	
		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)(x)	

LICENSEE CONTACT FOR THIS LER (12)

Name	Telephone Number (Area Code)
Larry A. Taylor, Nuclear Safety and Licensing Specialist	5 0 1 9 6 4 - 5 0 0 0

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

Cause	System	Component	Manufacturer	Reportable to NPRDS	Cause	System	Component	Manufacturer	Reportable to NPRDS

SUPPLEMENT REPORT EXPECTED (14)	EXPECTED SUBMISSION DATE (15)	Month	Day	Year
[ ] Yes (If yes, complete Expected Submission Date) [X] No				

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

On February 1, 1991 at 1722 hours, while operating at 88 percent power an automatic reactor trip was initiated by the Core Protection Calculators (CPCs) due to a loss of power to reactor coolant pump 2P-32B. The emergency feedwater system actuated automatically due to post trip steam generator water level response (shrink) and was used to restore water levels to normal. Other plant system responded as designed to the transient and no significant malfunctions of equipment occurred. Investigations revealed that the RCP motor power supply feeder breaker had tripped due to inadvertent actuation of a motor phase differential relay for the breaker. The relay is mounted in a hinged door on the front of the breaker cubicle and was actuated due to vibration of the door. A faulty racking motor being used to rack up a breaker adjacent to the RCP breaker caused the excessive vibration. The faulty racking motor was removed from service. An engineering evaluation is being conducted to determine the feasibility of using a different type of protective relay to enhance the system design. The CPCs functioned properly to initiate an automatic reactor trip upon loss of an operating RCP. There was no actual safety significance to this event.

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

A. Plant Status

At the time of occurrence of this event, Arkansas Nuclear One, Unit 2 (ANO-2) was operating at approximately 88 percent of rated thermal power in Mode 1 (Power Operation). Reactor coolant system (RCS) [AB] temperature was 573 degrees Fahrenheit and pressurizer pressure was approximately 2250 psia.

B. Event Description

On February 1, 1991 at 1722 hours an automatic reactor trip was initiated by the Core Protection Calculators (CPCs) [JC] due to the inadvertent opening of the 6900 volt power supply feeder breaker for reactor coolant pump 2P-32B.

Operations personnel responded to the transient by performing the immediate actions of the Emergency Operating Procedure. The main turbine generator tripped as designed following the reactor trip. All Control Element Assemblies (CEAs) inserted fully into the reactor core. The emergency feedwater (EFW) system [BA] actuated automatically due to post reactor trip S/G water level response (shrink) with both EFW pumps starting and supplying feedwater to the S/G's. The main feedwater (MFW) control system [JB] responded as designed to the reactor trip condition and the 'B' MFW pump and EFW system were used to restore S/G water levels to normal. The steam dump and bypass control system [JI] responded by automatically opening steam dump valves to the main condenser and one atmospheric steam dump valve to control the S/G pressures. Approximately five minutes after the reactor trip a small change in radioactivity was noted on the secondary side of the 'A' steam generator.

The plant was stabilized in a hot standby (Mode 3) condition and actions were initiated to determine the cause of the RCP breaker trip.

C. Root Cause

The power supply feeder breaker for RCP 2P-32B is physically located adjacent to the 6900 volt breaker for one of the two main condenser circulating water pumps, 2P-3B. Protective relays (e.g., motor phase differential, overcurrent relays, etc.) for the RCP motor are mounted in a hinged door on the front of the breaker cubicle.

The breaker for circulating water pump 2P-3B had been previously opened and placed in a racked down position for a maintenance activity. At the time of the RCP breaker trip, Operations personnel were in the process of racking the 2P-3B breaker up to an operating position in preparation for restoring the pump to service.

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

Investigations conducted following the reactor trip revealed that a motor phase differential relay for the RCP breaker had actuated resulting in automatic tripping of the breaker. The affected relay was removed and tested for proper operation and calibration. The relay contact gap and pickup values were found to be within allowable values. The relay was reinstalled in breaker cubicle door and a test was performed to determine if the relay actuation could have been associated with racking up the breaker for the circulating water pump. The RCP breaker was placed in a test position and closed and the adjacent circulating water pump breaker was racked up. While racking up the 2P-3B breaker, vibration of the RCP breaker door was noted. The phase differential relay actuated momentarily due to the vibration and the breaker tripped open. The test was repeated using a different racking motor for the 2P-3B breaker. During this test no abnormal vibration occurred and the 2P-32B relay did not actuate. Based on this information, the root cause of this event was determined to be excessive vibration of the RCP breaker cubicle door caused by a defective racking motor used to rack up the circulating water pump breaker.

D. Corrective Action

The racking motor was removed from service and inspected. No electrical problems were found with the motor. A collar located on the end of the motor shaft which engages the lifting mechanism for the breaker was found to be worn possibly allowing slippage between these components which could cause excessive vibration while racking up a breaker.

Subsequent visual inspections of the circulating water pump breaker, the RCP breaker and mounting of the RCP motor protective relay did not reveal any abnormal conditions which could have caused the vibration or increased the susceptibility of the relay to trip due to vibration.

Qualified auxiliary operators who normally perform breaker operations were interviewed following the event. Based on the results of these discussions it was concluded that additional training of these personnel would be beneficial to increase awareness of abnormal conditions such as excessive vibration which could occur while operating breakers. Additional training will be provided to appropriate operations personnel by September 1, 1991.

Additionally, it was decided that Design Engineering will review the feasibility of using a different type of protective relay to enhance the system design.

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

E. Safety Significance

The Core Protection Calculators (CPCs) are a subsystem of the ANO-2 Reactor Protection System (RPS) [JC] and are designed to provide automatic reactor trip signals to ensure specified acceptable fuel design limits (SAFDLs) are not exceeded as the result of Anticipated Operational Occurrences (AOOs).

During this event, the CPCs functioned properly to initiate a reactor trip based on pump adjusted Departure from Nucleate Boiling Ratio (DNBR) following deenergization of RCP 2P-32B. Operations personnel responded to the event by performing the immediate actions and recovery actions of the Emergency Operating Procedure with no problems noted. The response of the primary and secondary plant systems was as expected for a transient of this nature with no significant malfunctions of equipment noted.

With respect to the indicated small primary to secondary leak, the ANO-2 Technical Specifications (TS) allow plant operation with primary to secondary leakage of up to .5 gpm. The indicated leakage is extremely small and significantly less than that allowed by the TS. Additionally, no significant secondary system contamination has occurred as a result of the leak. The slight increase in leakage following the reactor trip was similar to that observed during previous reactor trips on August 21, 1990 and September 28, 1990.

Based on evaluation of overall system response to the transient there was no actual safety significance to this event.

F. Basis For Reportability

This event resulted in an unplanned automatic actuation of the Reactor Protection System and the Emergency Feedwater System (an ESF) and is reportable per 10CFR50.73(a)(2)(iv). The event was reported per 10CFR50.72(B)(2)(ii) at 1815 on February 1, 1991.

G. Additional Information

There have been no previous similar events reported.

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