Form 1062.01A

NRC Form 366
(9-83)

U.S. Nuclear Regulatory Commission
Approved OMB No. 3150-0104
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LICENSEE EVENT REPORT (LER)

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

TITLE (4) Inadvertent Jarring of Relay Sensitive to Mechanical Shock Results in Closure of Decay Heat Removal Suction Valve and Loss of Decay Heat Removal System Flow

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)
1 2	1 9	8 8	8 8	-- 0 2 4	-- 0 0	0 3	1 0	8 9		0 5 0 0 0
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OPERATING MODE (9): N

POWER LEVEL (10): 0 0 0

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)

20.402(b)	20.405(c)	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)	X 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 Taylor, Nuclear Safety and Licensing Specialist	5 0 1 9 6 4 - 3 1 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 December 19, 1988 the Decay Heat Removal (DHR) system inboard suction valve (CV-1050) closed resulting in a loss of DHR system flow. Following indication that the DHR suction valve was closing, the plant operator followed the appropriate procedures to secure the operating DHR pump. Actions were then taken which returned the DHR system to operation in approximately 12 minutes. At the time of the event, a contract electrician was performing equipment inspections in the room which contains a panel housing the control relays for CV-1050. This individual inadvertently jarred the panel housing the control relays for CV-1050 at approximately the time of this event. The cause of this event has been determined to be inadvertent openiny of the normally closed permissive contacts of a control relay for CV-1050. As determined during the investigation of this event, the permissive contacts of this relay are sensitive to mechanical shock. As a result of this event, a caution label has been placed at this control panel to caution against mechanical agitation of the panel. A plant modification will be implemented to replace this relay with a model less sensitive to mechanical shock. Additionally, other relays of this type will be reviewed for possible safety or operational problems due to susceptibility of these relays to mechanical shock.

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I. Description of Event

A. Plant Status

At the time of discovery of this event on December 19, 1988, Arkansas Nuclear One, Unit 1 (ANO-1) was in the Cold Shutdown Operating Condition. ANO-1 had been shutdown on December 16 to repair a leaking valve (see LER 50-313/88-023). The average core exit thermocouples (CET) temperature was approximately 135 degrees Fahrenheit.

B. Component Identification

The component involved in this event is a relay [RLY] in the open permissive circuit for the Decay Heat Removal (DHR) system [BP] inboard suction valve (CV-1050). This relay is manufactured by General Electric (GE) (Manufacturer Code G080) and is a model HGA-11. Actuation of this relay results in an automatic closure signal being applied to the DHR suction valve when a high Reactor Coolant System (RCS) pressure (greater than 320 psig) exists. Deficiencies of the seismic capability of this model relay were discussed in NRC Information Notice IEN-88-14.

C. Sequence of Event

On December 19, 1988, at approximately 0900, the control room operator was apprised of the closing of the DHR system suction valve CV-1050 by the "Decay Heat Removal Flow Low" annunciator. The operator observed degrading DHR system flow and noted that CV-1050 was in the intermediate position. In accordance with the Abnormal Operating Procedure for loss of DHR, the operator secured the operating DHR pump. The valve was opened and DHR system flow was reestablished within approximately 12 minutes in accordance with the Operating Procedure for the DHR system. The rise in average CET temperature indication during this event was approximately 12 degrees Fahrenheit.

II. Event Cause

A. Event Analysis

The DHR system is designed to remove decay heat from the core and the sensible heat from the RCS during the latter stages of cooldown. The DHR system also provides auxiliary spray to the pressurizer for complete depressurization, maintains the reactor coolant temperature during refueling, and provides a means for filling and partial draining of the fuel transfer canal. In the event of a Loss of Coolant Accident (LOCA) the Low Pressure Injection (LPI) mode of the DHR system injects borated water into the reactor vessel for long-term emergency cooling.

The DHR system consists of two parallel trains which share a common suction line from a RCS hot leg. The common suction line contains two motor operated valves in series for isolation of the line. The DHR system piping is designed for low pressures and is protected from high RCS pressures by an automatic closure of the system suction valves when RCS pressure exceeds the high pressure setpoint. When RCS pressure exceeds 320 psig, relay 69X2/5255 is energized, opening the contact in the permissive circuit which results in an automatic closure signal to the inboard suction valve (CV-1050). Each train of the DHR system contains one pump and a cooler which transfers heat from the reactor coolant to the Service Water system [BI]. The reactor coolant is then returned to the RCS after passing through the coolers. Although the DHR system is not designed to be single failure proof, two trains of components are provided to increase system reliability. However, closure of either valve in the common suction line will result in loss of DHR flow for both trains.

Investigation of the cause of the inadvertent suction valve closure was initiated following this event. Control room indications did not show that the valve had closed due to an actual plant condition (i.e., high RCS pressure). A review of the data history during this event from the Safety Parameter Display System did not indicate a cause of the valve closure. At the time of the event, however, a contract electrician was performing equipment inspections in the Lower South Equipment Room which contains a panel housing the control relays for CV-1050. This individual inadvertently jarred the panel housing the control relays for CV-1050 at approximately the time of the automatic valve closure. Additionally, previous events involving inadvertent closures of the DHR suction valve due to unknown causes were reviewed.

Troubleshooting of relays located in the electrical circuitry for CV-1050 revealed that contacts in the open permissive circuit from relay 69X2/5255 were sensitive to mechanical shock of the cabinet housing the relay. In this event, it is believed that jarring the cabinet resulted in the normally closed permissive contacts of relay 69X2/5255 opening. This caused an automatic closure signal to be sent to the DHR system inboard suction valve CV-1050.

B. Root Cause

The cause of this event has been determined to be inadvertent opening of the permissive contacts of relay 69X2/5255. As determined during the investigation of this event, the permissive contacts of relay 69X2/5255 are sensitive to mechanical shock.

C. Safety Significance

During this event, the reactor coolant temperature increased approximately 12 degrees Fahrenheit to a final temperature of approximately 147 degrees. No change in reactor building radiological conditions, source range nuclear instrumentation count rate or reactor coolant level was noted. The actual reactor coolant heatup rate during this event was approximately 1 degree per minute. Therefore, this momentary loss of DHR system flow is considered to be of minor safety significance.

D. Basis for Reportability

Since this event involved a single cause which resulted in the loss of both trains of a system designed to remove residual heat, this event is reportable in accordance with 10CFR50.73(a)(2)(vii).

III. Corrective Actions

A. Immediate

Following indication that the DHR suction valve was closing, the plant operator followed the appropriate procedures to secure the operating DHR pump. Actions were then taken which returned the DHR system to operation in approximately 12 minutes.

B. Subsequent

Investigation of this event was initiated to determine the root cause of this event. This include troubleshooting of the suspected logic circuitry and a review of related events. Additionally, a caution label has been placed at the control panel housing relay 69X2/5255 to caution against mechanical agitation of the panel.

C. Future

As a result of this event, a plant modification will be implemented to replace relay 69X2/5255 with a model less sensitive to mechanical shock. Additionally, other nonquality designated HGA model relays used at ANO will be reviewed for possible safety or operational problems due to susceptibility of these relays to mechanical shock.

IV. Additional Information

A. Similar Events

A previous loss of DHR cooling occurred on October 26, 1988 following the loss of power to the controllers for both DHR cooler outlet valves. This event was reported in LER 50-313/88-014.

B. Supplemental Information

NRC Information Notice Number (IEN) 88-14, "Potential Problems with Electrical Relays," identified a concern with the seismic capability of model HGA relays. The revised seismic capability of the normally closed contacts of the relay in the de-energized state stated in the IEN is less than 0.5 g. The relay contacts involved in this event are normally closed with the relay de-energized when the DHR system is in operation (RCS pressure less than the high pressure setpoint).

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

ARKANSAS POWER & LIGHT COMPANY

March 10, 1989

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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 No. 50-313/88-024-00

Gentlemen:

In accordance with 10CFR50.73(a)(2)(vii), attached is the subject report concerning inadvertent jarring of a relay sensitive to mechanical shock which resulted in closure of a decay heat removal suction valve and loss of decay heat removal system flow.

Very truly yours,

J. M. Levine
Executive Director,
Nuclear Operations

JML:DAH:vgh
attachment

cc w/att: Regional Administrator
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