



February 7, 1992

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SUBJECT: Arkansas Nuclear One - Unit 1
Docket No. 50-313
License No. DPR-51
Licensee Event Report 50-313/88-024-01

Gentlemen:

In accordance with 10CFR50.73(a)(2)(vii), enclosed is a supplement to the subject report to clarify a commitment concerning evaluation of HGA relays. The original report contained a commitment to evaluate these relays in applications that are not safety-related. The past failure rate of these relays at ANO was determined to be significantly lower than the industry failure rate. The particular relays that were the subject of the original report were changed to a model less susceptible to mechanical shock. During a subsequent review of documentation, ANO determined that performing a detailed evaluation on non-safety-related applications of HGA relays would provide minimal benefit. Therefore, ANO considers a review of HGA relays in safety-related applications to be sufficient corrective action.

Very truly yours,

Rich J. King for JJF
James J. Fisicaro
Director, Licensing

JJF/TFS/mmg

Enclosure

cc: Regional Administrator
Region IV
U. S. Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 400
Arlington, TX 76011-8064

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

JJF

L I C E N S E E V E N T R E P O R T (L E R)

FACILITY NAME (1) Arkansas Nuclear One, Unit One

DOCKET NUMBER (2) PAGE (3)
050003 13105

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	Sequential Number	Revision Number	Month	Day	Year	Facility Names	Docket Number(s)
1	2	1988	024	01	0	2	07		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)	20.402(b)	20.405(a)(1)(i)	20.405(a)(1)(ii)	20.405(a)(1)(iii)	20.405(a)(1)(iv)	20.405(a)(1)(v)	20.405(c)	50.36(c)(1)	50.36(c)(2)	50.73(a)(2)(i)	50.73(a)(2)(ii)	50.73(a)(2)(iii)	50.73(a)(2)(iv)	50.73(a)(2)(v)	50.73(a)(2)(vi)	50.73(a)(2)(vii)	50.73(a)(2)(viii)(A)	50.73(a)(2)(viii)(B)	50.73(a)(2)(ix)	73.71(b)	73.71(c)	Other (Specify in Abstract below and in Text, NRC Form 366A)	
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L I C E N S E E V E N T R E P O R T (L E R)

Name	Telephone Number
Thomas F. Scott, Nuclear Safety and Licensing Specialist	Area Code: 501964-5000

C O M P L E T E O N E L I N E F O R E A C H C O M P O N E N T F A I L U R E D E S C R I B E D I N T H I S R E P O R T (1 3)

Cause	System	Component	Manufacturer	Reportable to NRC	Cause	System	Component	Manufacturer	Reportable to NRC

S U P P L E M E N T R E P O R T E X P E C T E D (1 4)

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 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 opening 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 has been implemented to replace this relay with a model less sensitive to mechanical shock. Additionally, safety-related relays of this type have been reviewed for possible safety or operational problems due to susceptibility of these relays to mechanical shock.

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Arkansas Nuclear One, Unit One	0 5 0 0 0 3 1 3	8 8	-- 0 2 4	-- 0 1	0 2 0 5			

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

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

... 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.

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		88	-- 024	-- 01				

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

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 [B]. 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.

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

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. This included troubleshooting of the logic circuitry and a review of similar events. A caution label was placed at the control panel housing relay 69X2/5255 to caution against mechanical agitation of the panel. A plant modification was implemented to replace relay 69X2/5255 with a model less sensitive to mechanical shock. Additionally, safety-related HGA model relays used at ANO were reviewed for possible safety or operational problems due to susceptibility of these relays to mechanical shock. This review concluded that none of the relay contacts failing open momentarily would preclude the safe operation of the plant if a seismic event were to occur. Based upon a comparison of the failure rate at ANO with the industry failure rate of this model relay and the expected minimal benefit from a detailed review, it was determined that HGA relays in applications that are not safety-related did not warrant a detailed evaluation to determine the consequences of their experiencing mechanical shock.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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

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 with 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].