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March 30, 1990

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U.S. Nuclear Regulatory Commission
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SUBJECT: Arkansas Nuclear One - Unit 1
Docket No. 50-313
License No. DPR-51
Report No. 1-90-V01-00

Gentlemen:

Attached is a voluntary report discussing a condition involving reactor coolant pump hydraulic snubber degradation due to fluid loss induced by electrolysis corrosion of snubber components in relation to inadequate reactor coolant pump grounding.

Very truly yours,

E.C. Ewing
General Manager
Technical Support
and Assessment

ECE/DBS/abw
Attachments

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NRC Form 366
(9-83)U.S. Nuclear Regulatory Commission
Approved OMB No. 3150-0104
Expires: 04/30/92

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) Arkansas Nuclear One, Unit One

DOCKET NUMBER (2) 10151010101 31 31 313101013

TITLE (4) Reactor Coolant Pump Snubber Degradation Due to Ground Current Induced Electrolysis Corrosion of Snubber Components in Relation to Inadequate Reactor Coolant Pump Grounding

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)
31	2	01	4	81	91	01	--	VI 01 1--	01 01 01 31 31 01 91 01
OPERATING MODE (9) NI									
THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5:									
(Check one or more of the following) (11)									
POWER LEVEL (10)	101010	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)
		50.73(a)(2)(iv)	50.73(a)(2)(v)	50.73(a)(2)(vii)	50.73(a)(2)(viii)(A)	50.73(a)(2)(viii)(B)	50.73(a)(2)(x)	73.71(b)	73.71(c)
								Other (Specify in Abstract below and in Text, NRC Form 366A)	

Name: Daryl Saulsberry, Nuclear Safety and Licensing Specialist

LICENSEE CONTACT FOR THIS LER (12)

Telephone Number: 5101319161413131010

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	
B	A1 B	S1 N1 B		N						
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)

During a maintenance outage at Arkansas Nuclear One, Unit One, four reactor coolant pump (RCP) snubbers were discovered to be either leaking hydraulic fluid or showing evidence of previous leakage when they were inspected as part of a visual inspection surveillance. In the installed configuration, three of the snubbers were found to be leaking in the rod seal area with the remaining snubber demonstrating leakage at the joint between the snubber body and head when subjected to a functional test. The snubbers leaking from the rod seal area did not satisfactorily pass a functional test. The root cause of the RCP snubber failures was determined to be the method of electrically grounding the RCP. An engineering evaluation of the condition concluded that although during a seismic event the Reactor Coolant System cold leg piping stresses might exceed the value allowed by the ASME code, a pipe break or rupture would not be expected to occur. To prevent this condition from recurring, snubber grounding straps were removed and a parallel electrical jumper was installed to alleviate circulating ground currents through the snubber. In addition, an increased visual inspection frequency has been implemented as required by Technical Specification 4.16.1 to more closely monitor for snubber degradation. Due to generic concern related to failures of large bore hydraulic snubbers and the common mode failure mechanism associated with these snubbers, this report is being submitted for information.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (2)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
Arkansas Nuclear One, Unit One		Year	Sequential Number	Revision Number	
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TEXT (If more space is required, use additional NRC Form 366A's) (17)

A. Plant Status

At the time this condition was discovered, Arkansas Nuclear One, Unit 1 (AND-1) was in cold shutdown with maintenance being conducted as part of a mid-cycle outage (1MB9). The Reactor Coolant System (RCS) [AB] temperature was approximately 97 degrees Fahrenheit.

B. Event Description

On December 4, 1989, while conducting visual inspections of hydraulic snubbers [SNB] in accordance with Technical Specification surveillance requirements, plant maintenance personnel identified four reactor coolant pump (RCP) snubbers either leaking or indicating previous hydraulic fluid leakage. These snubbers are part of a shock suppression system comprised of eight total hydraulic snubbers with two hydraulic snubbers serving each RCP. A common reservoir supplies hydraulic fluid to four snubbers serving two RCPs. The snubbers serving 'A' and 'B' RCPs share a common reservoir and those snubbers serving 'C' and 'D' share a common reservoir. Each reservoir has an approximate volume of one gallon. This volume is in addition to the fluid contained within the supply line between the reservoir and the snubber.

Inspections on safety related snubbers are performed periodically depending on the number of inoperable snubbers found during the previous inspection period. Functional testing is conducted on a representative sampling of hydraulic snubbers and on those snubbers visually found to be degraded.

Three of the snubbers found to be degraded during the visual inspection, were leaking hydraulic fluid from the piston rod seal area. The visual inspection of the fourth snubber, RCP 1A on the 'A' RCP (RCP1A), determined the fluid port level to be below minimum level with no indication of leakage present. The snubber started leaking during the functional test, at the body to head joint, but stopped leaking toward the end of the test. In addition, observation of this snubber revealed damage to its chrome piston rod.

Snubbers found to be leaking during the visual inspection were removed and functionally tested to determine the effectiveness of the snubbers to perform their designed function. The three snubbers characterized by leakage from the rod seal area failed the functional test; whereas, the snubber which appeared to be leaking at the joint between the snubber body and head passed.

Since no firm evidence exists for establishing when snubber failures occurred, AND assumed time of discovery consistent with reportability guidelines. In this operating condition (Cold Shutdown), AND determined that the snubber failure was not reportable. However, due to the concern related to a common mode failure mechanism associated with RCP snubbers, a voluntary report is being provided.

C. Root Cause

The root cause of the RCP snubber failures was determined to be the method of electrically grounding the RCPs. The failure mechanism associated with the grounding method was electrolysis corrosion. In the four cases being considered in this report, failure by electrolysis corrosion resulted in critical snubber part damage with subsequent sealing surface deterioration and fluid leakage. The electrical current involved with electrolysis corrosion accelerates the deterioration of the sealing surfaces by abrasive action resulting from hydraulic fluid becoming contaminated with metallic particles. Additionally, circulating electrical ground currents, through the mechanism of electrolysis corrosion, promote damage to the snubber sealing surface by pitting the chrome plated finish. Chrome pitting was evident on the shaft and on the interior of the snubber where the shaft or internal piston are in close proximity to the bushing or cylinder wall. Pitting and disposition on the piston rod combined with rod movement is the predominate cause of seal degradation and subsequent seal leakage. The extent of corrosion is directly dependent on the time and magnitude of existing electrical circulating ground current.

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D. Corrective Actions

To retard or eliminate the effects of electrolysis corrosion on RCP snubbers, it is necessary to remove or substantially reduce the circulating ground current flowing through the snubbers. This objective has been accomplished by providing a parallel path around the snubber to split the current and increasing the resistance from the snubber base plate to ground by removing the ground connections to the snubber base plates. These corrective actions were undertaken for all RCP snubbers due to their potential susceptibility to the same problem. Corrective Actions were completed by a modification during 1M9.

In addition to installing modifications to limit the amount of circulating ground currents passing through the RCP snubbers and being more sensitive to the presence of black stain or discolored hydraulic fluid during visual inspections, an increased visual inspection frequency was implemented (124 days \pm 25%) as required by Technical Specification 4.16.1 to more closely monitor for snubber degradation. The next inspections are currently scheduled for April 30, 1990, to observe and determine the status of RCP snubbers.

E. Safety Significance

Review of existing calculations performed by Babcock and Wilcox (B&W) pertaining to the safety margin inherent to the RCP snubber design revealed that with both snubbers operable on each RCP, a 3.5% margin of safety exists to meet the seismic response spectra criteria design equation for the RCP. With one snubber inoperable due to loss of hydraulic fluid, the B&W assessment indicated that RCP damage would not result. According to a report generated from the B&W Nuclear Service Company, in their engineering judgement, if a seismic event had occurred simultaneously with the failure of both snubbers on any RCP, ASME code allowable stresses for cold leg piping would have been exceeded. However, the associated RCS piping would not have degraded to a point which would have resulted in a pipe break. Since no seismic events have occurred at ANO, the failed snubbers have had a minimal safety significance to existing plant operation.

F. Additional Information

Similar events related to inoperable piping system snubbers discovered during inservice inspections were reported in licensee event reports 50-313/84-001, 50-313/85-009, and 50-313/88-009.

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