



May 25, 1990

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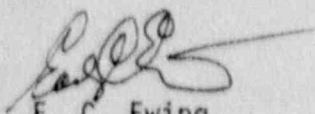
U. S. Nuclear Regulatory Commission  
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SUBJECT: Arkansas Nuclear One - Unit 2  
Docket No. 50-368  
License No. NPF-6  
Licensee Event Report No. 50-368/90-011-00

Gentlemen:

In accordance with 10CFR50.73(a)(2)(ii), attached is the subject report concerning a design oversight which resulted in a lack of independence in the Post Accident Hydrogen Analyzer system.

Very truly yours,

  
E. C. Ewing  
General Manager,  
Technical Support  
and Assessment

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(6-89)U.S. Nuclear Regulatory Commission  
Approved OMB No. 3150-0104  
Expires: 4/30/92

## LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) Arkansas Nuclear One, Unit Two

DOCKET NUMBER (2) PAGE (3)

01510101 31 61 8110F1013

TITLE (4) Design Oversight Resulted in a Lack of Independence in the Post Accident Hydrogen Analyzer System

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)
01	4	21	5	91	01	5	91		01510101
OPERATING MODE (9) 1 THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5: (Check one or more of the following) (11)									
POWER LEVEL (10)	121010	20.402(b)	20.405(a)(1)(i)	50.36(c)(1)	50.73(a)(2)(iv)	73.71(b)			
		20.405(a)(1)(ii)	50.36(c)(2)	50.73(a)(2)(v)	73.71(c)				
		20.405(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(vii)	Other (Specify in				
		20.405(a)(1)(iv)	50.73(a)(2)(ii)	50.73(a)(2)(viii)(A)	Abstract below and				
		20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(viii)(B)	in Text, NRC Form				
			50.73(a)(2)(ii)	50.73(a)(2)(x)	366A)				

LICENSEE CONTACT FOR THIS LER (12)

Name	Telephone Number
Dana Miller, Nuclear Safety and Licensing Specialist	Area Code 510191641-1311010

## 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)

[ ] Yes (If yes, complete Expected Submission Date) [X] No

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

On April 25, 1990, while reviewing the Post Accident Hydrogen Analyzer system, as part of an NRC inspection, Operations personnel identified that the analyzers did not appear independent as required by Technical Specifications. Two redundant Hydrogen Analyzer channels are designed to provide the control room operator with the status of the hydrogen concentration in containment following a Loss of Coolant Accident (LOCA). A reference gas, nitrogen, is used by the analyzers to provide indication of the gas composition in containment by comparing the reference gas to the gases drawn from the containment atmosphere. A common nitrogen bottle supplies both analyzers and, therefore, independence was not established. The root cause of this event was design oversight. A review of the purchase order and specifications for the Post Accident Hydrogen Analyzers was performed and did not reveal that the potential for a single failure of the nitrogen supply system was considered at the time. A plant modification has been performed to provide independent nitrogen supplies for each analyzer. Although only one nitrogen supply was available, in the past, either analyzer could be aligned with the nitrogen supply and the hydrogen concentration could have been monitored. Therefore, there were no significant safety concerns related to this event. This condition is reportable pursuant to 10CFR50.73(a)(2)(ii).

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)				PAGE (3)				
Arkansas Nuclear One, Unit Two	0151010131618	Sequential		Revision		012101013				
		Year	Number	Number	Number					
TEXT (If more space is required, use additional NRC Form 366A's) (17)		9	0	--	0	1	1	--	0	0

A. Plant Status

At the time of discovery of this condition, Arkansas Nuclear One, Unit Two (ANO-2) was operating at 100% of rated thermal power in Mode 1 (Power Operation). Reactor Coolant System (RCS) [AB] temperature was about 580 degrees Fahrenheit and RCS pressure approximately 2250 psia.

B. Event Description

During an NRC inspection associated with Regulatory Guide 1.97 the Post Accident Hydrogen Analyzer system was reviewed. On April 25, 1990, while continuing the review ANO Operations personnel identified that the analyzers did not appear independent as required by Technical Specification 3.6.4.1.

ANO-2 is equipped with two redundant hydrogen analyzer channels which are designed to provide the control room operator with the status of the hydrogen concentration in containment following a loss of Coolant Accident (LOCA). Each channel contains independent sample suction lines from containment and sample return lines to containment. Hydrogen sampling is required following a LOCA.

The detector in the hydrogen analyzer consists of a block which contains appropriately arranged cavities and gas passages. Four elements forming a helix are mounted in the cavities. Two elements are exposed to a reference gas of constant composition. The other elements are exposed to the sample. The elements are electrically connected to form a bridge through which current is passed to heat elements. The two elements exposed to the reference gas lose heat at a constant rate to the block and consequently have a constant temperature. The two elements exposed to the sample dissipate heat at rates which vary with the sample composition and consequently vary in temperature with sample variations. The element resistance changes with temperature so that the bridge is electrically unbalanced by the difference in composition between the sample and reference gas. Through passive circuitry this unbalance is exhibited as a voltage change which is indicated or recorded as a measure of gas composition.

The reference gas used by the analyzer detector is nitrogen. A common nitrogen bottle supplies both analyzers, therefore, independence as required by Technical Specifications was not established. On April 25, 1990, at approximately 2105 hours, the thirty day action statement for an inoperable Hydrogen Analyzer was entered. Actions were initiated to ensure two independent systems were established.

C. Root Cause

The root cause of this event was design oversight during initial plant construction. A review of the purchase order and specifications for the Post Accident Hydrogen Analyzers was performed and did not reveal that the potential for a single failure of the nitrogen supply system was considered at the time. A single nitrogen supply bottle was installed to supply the Post Accident Hydrogen Monitoring System and Waste Gas Analyzers. The nitrogen gas is required for calibration and operation of the hydrogen analyzers, and for calibration only of the Waste Gas Analyzers. A review of the ANO-1 Hydrogen Analyzer system was performed. The nitrogen gas for the ANO-1 Hydrogen Analyzers is used only for calibration and independence is not an issue. Although the system operation is the same and the theory of operation the same for both the ANO-1 and ANO-2 Hydrogen Analyzers, the nitrogen gas is used differently. It is possible that during the design of the ANO-2 system, it was assumed that the nitrogen gas was used for calibration only, as it is for the ANO-1 system.

D. Corrective Actions

A Hydrogen Analyzer was declared inoperable when ANO Operations personnel identified that the system did not appear to be independent. A plant modification has been performed to provide independent supplies of nitrogen for each Hydrogen Analyzer and an independent supply for the Waste Gas Analyzer. A Design Configuration Documentation (DCD) project has been established to develop complete, correct, consistent and accessible documentation defining the design of ANO systems. The Post Accident Hydrogen Analyzer system will be reviewed in the DCD project. If any discrepancies are identified, appropriate actions will be taken at that time.



LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (2)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
Arkansas Nuclear One, Unit Two		Year	Sequential Number	Revision Number	
TEXT (If more space is required, use additional NRC Form 366A's) (17)	05000368	90	011	0	0101013

E. Safety Significance

Since the installation of the Post Accident Hydrogen Analyzer System a quarterly surveillance has been performed on each analyzer. Although a common reference gas supply existed for both analyzers, there has continuously been one hydrogen analyzer available to which the nitrogen reference gas could be aligned. Therefore, in a LOCA condition when an analyzer is needed to monitor hydrogen concentration in the containment building, one analyzer would have been operable. AND has concluded that there were no significant safety concerns related to this finding.

F. Basis for Reportability

This condition is reportable pursuant to 10CFR50.73(a)(2)(ii), as a condition which resulted in the plant being outside the design basis. A 10CFR50.72(b)(1)(ii)(B) notification was made to the NRC Operations Center on April 27, 1990, after further evaluation of the system design.

G. Additional Information

Similar events were reported in LER 50-313/87-001-00 and 50-368/89-014-00.

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