

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) PAGE (3) 0500003113110F014									
TITLE (4) Inadequate Design Modification Created a Pathway for Unfiltered Air Inleakage in Excess of the Design Basis for Control Room Habitability Following a Loss of Coolant Accident																			
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)				
11	11	1987	11	1987	000000	00	11	11	1987	ANO-2					0500003113110F014				
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(c)		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 Abstract below and in Text, NRC Form 366A)											
		20.405(a)(1)(iv)		50.73(a)(2)(ii)		50.73(a)(2)(viii)(A)													
		20.405(a)(1)(v)		50.73(a)(2)(iii)		50.73(a)(2)(viii)(B)													
						50.73(a)(2)(x)													
LICENSEE CONTACT FOR THIS LER (12)																			
Name										Telephone Number									
Patricia L. Michalk, Plant Licensing Engineer										Area Code									
										501191641-1311010									
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)																			

During a review of the design of the Arkansas Nuclear One, Units 1 and 2 common control rooms emergency ventilation systems, a leakage pathway for unfiltered air was identified on 11/19/87. The pathway consisted of a 1/4 inch circumferential hole around a motor-to-fan drive shaft penetrating a control room emergency ventilation system fan housing. Testing conducted on 11/20/87 showed that approximately 16 cubic feet per minute (cfm) of unfiltered air inleakage into the control room existed. The control room habitability design basis for this system assumes only 3 cfm of unfiltered air inleakage for calculating control room operator radiation dose following a loss of coolant accident. Therefore, this was a condition outside the plant design basis. A modification to seal the opening was completed on 11/25/87. The condition was the result of an inadequate/incomplete design and review of a modification made to the system in March 1977. At that time, an additional filter bed was added to the system which required relocating the ventilation fan from upstream of the filter train to downstream of the filter train. It was apparently not recognized that the new fan housing penetration needed to be sealed to prevent unfiltered air inleakage. The condition was similar to LER 50-313/86-003, Breaches in Control Room Isolation Integrity Capability.

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	05000313	87	008	0	0020F04

TEXT (If more space is required, use additional NRC Form 365A's) (17)

I. Description of Event

A. Unit Status

At the time of the discovery of this event on 11/19/87, Arkansas Nuclear One, Unit 1 (ANO-1) was operating at 80 percent full power with a reactor coolant system (RCS) average temperature of 579 degrees Fahrenheit and pressure of 2150 psig. Arkansas Nuclear One, Unit 2 (ANO-2), the second affected unit, was operating at 100 percent full power with a RCS average temperature of 580 degrees Fahrenheit and pressure of 2250 psia. This event had no effect on the operating status of either unit.

B. Component Identification

Although no component failure occurred for this event, the component involved was an emergency ventilation system supply fan, VSF-9, which provides recirculation and filtered makeup air for the common control rooms for both units during a control room isolation condition. The fan is a radial, horizontal shaft, motor driven Clarage fan rated at 2000 cubic feet per minute (cfm). EIIIS Identifier = VI-FAN-C340.

C. Sequence of Events

On 11/20/87 at 1500 hours, during a review of the design of control room emergency ventilation systems, a determination was made that the installed configuration of VSF-9 provided a pathway for unfiltered air leakage in excess of the value assumed in the loss of coolant accident (LOCA) control room operator dose analysis. VSF-9 was declared inoperable and both ANO-1 and ANO-2 entered a seven-day limiting condition of operation action statement per the requirements of Technical Specifications 3.9.2 and 3.8.6.1, respectively. On 11/25/87 a modification to eliminate the unfiltered air leakage pathway was completed and VSF-9 was declared operable. An investigation was initiated to determine the cause of the design deficiency.

II. Event Cause

A. Event Analysis

On January 22 - 23, 1986, the Nuclear Regulatory Commission (NRC) performed a survey of the ANO control room habitability systems design, operating procedures, safety analyses, and technical specifications. The results of this survey were transmitted to Arkansas Power and Light (AP&L) in August, 1987. To address the recommendations and concerns identified in the survey report, AP&L initiated a project to conduct a detailed review of control room habitability systems.

As part of this project, the architect/engineering firm that designed and constructed ANO, Bechtel Corporation, is providing assistance in assessing the adequacy of the control room operator dose analysis and the design of the control room habitability systems to minimize control room operator radiation exposure during analyzed LOCA conditions. In the course of these reviews, a Bechtel engineer identified a potential pathway for air leakage into the control room through the VSF-9 system which could have exceeded the 3 cfm unfiltered air leakage used as an assumption in the design basis analysis. The engineer identified that an opening of approximately one quarter inch existed circumferentially around the motor-to-fan shaft which penetrates the fan housing of VSF-9 and that unsealed openings of this type have been known to draw air into the fan flow. A preliminary check of the direction of air flow at this unsealed opening conducted on 11/19/87, verified that air was being drawn into the fan flow. On 11/20/87, a detailed test of VSF-9 was conducted with the control room habitability systems operating in their post-LOCA configuration. A differential pressure measurement was taken between the fan housing exterior and interior. Calculations performed using the results of this measurement indicated that as much as 16 cfm of unfiltered air could be drawn into the fan flow and thereby enter the control room.

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Investigation into the cause of this event determined that during the initial licensing of ANO-2, the control rooms for ANO-1 and ANO-2 were combined into a common control room 'envelope'. This allowed both units to share control room habitability systems. Due to more stringent design criteria in effect at the time of ANO-2 licensing, modifications of the installed and operable ANO-1 equipment were necessary to reduce previously analyzed and acceptable post LOCA control room operator radiation doses.

To determine equipment modifications that were necessary, the principal factors considered affecting the control room operator dose rates were unfiltered air leakage into the control rooms and filtration efficiency of the control rooms emergency recirculation and makeup air ventilation systems. The resulting system design required a pressurization of the control room with 333 cfm filtered makeup air to minimize unfiltered air leakage into the 'envelope'. This modification reduced unfiltered air leakage to 10 cfm. The addition of double door vestibule entrances to the control rooms further reduced unfiltered air leakage to an assumed value of 3 cfm.

Additionally, it was determined that the depth of the existing ANO-1 emergency ventilation system filtration unit would have to be increased to improve filtration efficiency. In order to utilize the existing ANO-1 equipment, the 2 inch charcoal filter unit installed in the VSF-9 filter train system would be required to be replaced with a 4 inch filter unit. Because of space limitations, a 4 inch filter unit could not be installed. Therefore, a new 2 inch filter unit was added upstream of the existing 2 inch filter unit to act as a prefilter for the 333 cfm makeup air. This modification required relocating VSF-9 to the discharge (clean) side of the filter units. The modification was completed in March 1977. At that time, it was apparently not recognized that a pathway for unfiltered air leakage was created due to the opening that existed around the motor-to-fan shaft which penetrated the fan housing as a result of relocating VSF-9.

B. Root Cause

The root cause of the condition was inadequate and/or incomplete design and review of the modification made in March 1977.

C. Basis for Reportability

This condition allowed unfiltered air leakage in excess of that assumed for the system design basis analysis. Therefore, the condition is reportable under 10CFR50.73(a)(2)(ii) as a condition outside the design basis of the plant. The condition was reported per 10CFR50.72(b)(1)(ii) on 11/20/87 at 1538 hours. The function of the control room habitability systems is to minimize the control room operators radiation exposure following a design basis loss of coolant accident. The probability of occurrence of such an accident is extremely remote. Additionally, it should be noted that research conducted over the past few years indicates it may be possible to eliminate consideration of such an accident for the purpose of determining appropriate design criteria for certain plant systems and equipment. Notwithstanding these considerations, even if such an accident had occurred the excessive unfiltered air leakage would not have resulted in incapacitation of the operators, but could have resulted in long-term health effects due to increased exposure levels. An unaffected redundant system was available. No event had occurred requiring use of the systems during the time the condition existed. Therefore, the condition alone presented no significant degradation to the health and safety of the general public.

III. Corrective Actions

A. Immediate

Following verification that a condition existed for VSF-9 which was outside the design bases for control room habitability requirements, a limiting condition of operation was entered by both units per their applicable technical specifications.

B. Subsequent

A modification was made to seal the motor to shaft opening for VSF-9 and the system was then declared operable.

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Arkansas Nuclear One, Unit One		<table border="1"> <tr> <th data-bbox="1004 400 1120 429">Year</th> <th data-bbox="1120 400 1285 429">Sequential Number</th> <th data-bbox="1285 400 1400 429">Revision Number</th> </tr> <tr> <td data-bbox="1004 429 1120 459">05</td> <td data-bbox="1120 429 1285 459">003</td> <td data-bbox="1285 429 1400 459">1</td> </tr> </table>	Year	Sequential Number	Revision Number	05	003	1	04
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C. Future

The control room habitability systems reviews are continuing. If additional discrepancies are identified, these will be reported as appropriate. AP&L does not believe that the inadequate design and review conducted in 1977 reflects on the present design review process; therefore, no design process related actions are planned.

IV. Additional Information

A. Similar Events

This event is related to LER 50-313/86-003, Breaches in Control Room Isolation Integrity Capability, in that the events both represented sources of unfiltered air leakage into the control room.

B. Supplemental Information

No supplemental report will be issued.



ARKANSAS POWER & LIGHT COMPANY

December 18, 1987

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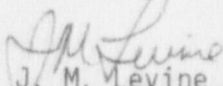
U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

SUBJECT: Arkansas Nuclear One - Unit 1
Docket No. 50-313
License No. DPR-51
Licensee Event Report No. 313/87-008-00

Gentlemen:

In accordance with 10CFR50.73(a)(2)(ii), attached is the subject report concerning an inadequate design modification which created a pathway for unfiltered air inleakage into the control rooms in excess of the design basis for control room habitability following a loss of coolant accident.

Sincerely,


J. M. Levine
Executive Director,
ANO Site Operations

JML:DJM:dm
attachment

cc w/att: Regional Administrator
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