

NRC Form 366
(9-83)

U.S. Nuclear Regulatory Commission
Approved OMB No. 3150-0104
Expires: 8/31/85

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

FACILITY NAME (1) Arkansas Nuclear One, Unit 1 DOCKET NUMBER (2) PAGE (3)
10501001 31 1310F014
TITLE (4) Inadvertent Signals From Radiation and Chlorine Detectors Due to System Design Deficiencies Result in Automatic Actuations of the Control Room Emergency Ventilation 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	31	88	01	1	01	04	25	ANO, Unit 2	0501003168

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)	<input type="checkbox"/>	20.402(b)	<input type="checkbox"/>	20.405(c)	<input checked="" type="checkbox"/>	50.73(a)(2)(iv)	<input type="checkbox"/>	73.71(b)
	<input type="checkbox"/>	20.405(a)(1)(i)	<input type="checkbox"/>	50.36(c)(1)	<input type="checkbox"/>	50.73(a)(2)(v)	<input type="checkbox"/>	73.71(c)
	<input type="checkbox"/>	20.405(a)(1)(ii)	<input type="checkbox"/>	50.36(c)(2)	<input type="checkbox"/>	50.73(a)(2)(vii)	<input type="checkbox"/>	Other (Specify in
	<input type="checkbox"/>	20.405(a)(1)(iii)	<input type="checkbox"/>	50.73(a)(2)(i)	<input type="checkbox"/>	50.73(a)(2)(viii)(A)	<input type="checkbox"/>	Abstract below and
	<input type="checkbox"/>	20.405(a)(1)(iv)	<input type="checkbox"/>	50.73(a)(2)(ii)	<input type="checkbox"/>	50.73(a)(2)(viii)(B)	<input type="checkbox"/>	in Text, NRC Form
	<input type="checkbox"/>	20.405(a)(1)(v)	<input type="checkbox"/>	50.73(a)(2)(iii)	<input type="checkbox"/>	50.73(a)(2)(x)	<input type="checkbox"/>	366A)

LICENSEE CONTACT FOR THIS LER (12)

Name	Telephone Number
Larry A. Taylor, Nuclear Safety and Licensing Specialist	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)

<input type="checkbox"/> Yes (If yes, complete Expected Submission Date)	<input checked="" type="checkbox"/> No	EXPECTED SUBMISSION DATE (15)	Month	Day	Year

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

Between March 26 and April 21, 1988, the Control Room Emergency Ventilation System (CREVS) has unexpectedly automatically actuated thirteen times as a result of spurious initiation signals from a radiation monitor or chlorine concentration detector. Following each start of the CREVS, the radiation monitor or chlorine detector was reset and the CREVS was returned to standby. During these events, the CREVS actuated as designed although no actual high radiation or high chlorine concentration condition existed. The root cause for the majority of the actuations appears to be directly related to deficiencies associated with the system design. As the result of these and previous events, an evaluation of the CREVS has been initiated to determine the root cause of the inadvertent actuations and the appropriate corrective actions required to reduce the occurrence of future inadvertent actuations. Interim corrective actions include efforts to minimize occurrence of the types of evolutions which are known to result in spurious radiation monitor or chlorine detector signals and subsequent CREVS actuations (i.e., use of hand held radios in vicinity of chlorine detectors, closure of the normal ventilation system isolation dampers which causes spiking of the radiation monitor, etc.). Additionally, a temporary modification to the control circuit associated with the isolation dampers for the normal ventilation system to the ANO-2 Control Room was performed in an attempt to prevent radiation monitor spiking caused by operation of the dampers.

8905030415 890425
PDR ADOCK 05000313
S PDC

1E22

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1) Arkansas Nuclear One, Unit One	DOCKET NUMBER (2)			LER NUMBER (6)			PAGE (3)
				Sequential	Revision		
	Year	Number		Number			
	01510101013113	89	--	0111	--	01	012101014

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

A. Plant Status

At the time of the events on March 26 and March 27, 1989, Arkansas Nuclear One, Unit 1 (ANO-1) was in Cold Shutdown operating condition. At the time of the remaining events, ANO-1 was in the Power Operation operating condition.

Arkansas Nuclear One, Unit 2 (ANO-2) was in Mode 1 (Power Operation) on the dates of the events with the exception of those on April 18 and 19. On April 18, ANO-2 was in Mode 3 (Hot Standby) following a reactor trip earlier in the day. On April 19 and 21, the unit was in Mode 5 (Cold Shutdown).

B. Event Description

On March 26, 1989, as a result of previous inadvertent actuations of the Control Room Emergency Ventilation System (CREVS) [VI] (see Additional Information section of this report), the isolation dampers for the ANO-2 Control Room normal ventilation system were being opened and closed in an attempt to troubleshoot problems with spurious high indications (spiking) of radiation monitor 2RE-8750-1. During thirty strokes of the isolation dampers, radiation monitor 2RE-8750-1 spiked three times causing the CREVS to automatically actuate. The radiation monitor was reset after each actuation and the CREVS returned to a standby condition.

On March 27, 1989, at approximately 1028, the CREVS unexpectedly actuated during the performance of an Instrumentation and Controls (I&C) maintenance periodic test procedure for chlorine detector calibration. During the testing of the chlorine detectors, which includes simulating a high chlorine concentration at the detector and results in detector trip and CREVS actuation, radiation monitor 2RE-8750-1 spiked high resulting in an inadvertent actuation signal to the CREVS. The radiation monitor was reset and the CREVS returned to standby at 1045.

On April 4, 1989, at approximately 1310, the CREVS unexpectedly actuated due to initiation signals from chlorine detectors 2CLS-8762-2 and 2CLS-8763-1. A hand held radio was being used in the area of the chlorine monitors at the time of the CREVS actuation. The chlorine monitors were reset and the CREVS returned to standby.

On April 11, 1989, at approximately 1120, the CREVS unexpectedly actuated due to an initiation signal from radiation monitor 2RE-8750-1. The normal Control Room ventilation system chiller unit had tripped previously and could not be immediately restarted resulting in a slight increase in the Control Room ambient temperature. During the temperature increase, the indication for radiation monitor 2RE-8750-1 spiked high resulting in the CREVS actuation. The radiation monitor was reset and the CREVS returned to standby.

On April 13, 1989, at 0149, the CREVS unexpectedly actuated during the performance of routine monthly surveillance testing of the Control Room emergency air conditioning system. As part of the surveillance test, the Control Room normal ventilation system is isolated by closing isolation dampers in the ventilation supply and exhaust ductwork. Immediately after closing the supply isolation damper, 2RE-8750-1 momentarily spiked high causing actuation of the CREVS. Within a few seconds, the radiation monitor indication decreased to less than the trip setpoint, the monitor was reset, and the CREVS returned to standby.

On April 13, 1989, at approximately 2240, and April 14, 1989, at 1057, the CREVS unexpectedly actuated due to spiking of radiation monitor 2RE-8750-1. No evolutions were in progress at the time which could be related to causing the monitor spike. The monitor was reset and the CREVS returned to standby.

On April 14, 1989, at 1313 hours, the isolation dampers for the ANO-2 Control Room normal ventilation system dampers were manually closed in preparation for performing a temporary modification to the electrical circuitry for the dampers in an attempt to minimize inadvertent actuations of the CREVS caused by spikes of 2RE-8750-1. Immediately following positioning of the control switches for the dampers to the closed position, 2RE-8750-1 spiked high resulting in actuation of the CREVS.

On April 18, 1989, at 1835, the CREVS unexpectedly actuated due to an initiation signal from radiation monitor 2RE-8750-1. The monitor was observed to be indicating approximately 1E4 counts per minute (cpm) with a trip setpoint of 200 cpm. After approximately 45 seconds the monitor reading returned to a normal value of 100 cpm and the monitor was reset. The CREVS returned to standby.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		Year	Sequential	Revision	
			Number	Number	
Arkansas Nuclear One, Unit One	0510003113	89	011	0	03 OF 04

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

On April 19, 1989, at 2117, the CREVS unexpectedly actuated due to 2RE-8750-1 spiking high. The conditions at the time of this occurrence were similar to those present on April 11, 1989, when the CREVS spurious actuation occurred. The radiation monitor was reset and the CREVS returned to standby.

On April 21, 1989, at 1403, the CREVS unexpectedly actuated during the performance of a service water flow test which resulted in the tripping of the normal Control Room ventilation system chiller. The indication for radiation monitor 2RE-8750-1 spiked high resulting in the CREVS actuation. The radiation monitor was reset and the CREVS returned to standby.

C. Safety Significance

The CREVS for ANO-1 and ANO-2 combined Control Rooms consists of two redundant filter trains, both of which are located outside the ANO-1 section of the Control Room. Each filter train includes a centrifugal fan, roughing filter, absolute filter, and charcoal absorbent. In addition to recirculation and filtration of Control Room air, filtered outside makeup air is also provided to pressurize the Control Rooms to minimize unfiltered air inleakage into the Control Rooms under isolated conditions. The CREVS trains are normally isolated from the Control Room by isolation dampers. In the event of detection of high radiation or high chlorine concentration, the normal Control Room air ventilation systems of both ANO-1 and ANO-2 are automatically isolated and the CREVS is automatically started.

Two quick acting chlorine detectors (2CLS-8760-2 and 2CLS-8761-1) are provided at the normal ventilation system supply duct for ANO-1 and two detectors (2CLS-8762-2 and 2CLS-8763-1) at the ANO-2 supply air duct. Any one of these detector signals will initiate operation of the CREVS. Additionally, radiation monitors RE-8001 (an area radiation monitor located in the ANO-1 Control Room area) and 2RE-8750-1 (a process radiation monitor located in the ANO-2 normal ventilation system outside air intake ductwork) are provided to automatically actuate CREVS upon detection of high radiation. If either one of these radiation monitors detects radiation levels above predetermined values (i.e., setpoints), the CREVS will be automatically actuated.

During these events, the system actuated as designed although no actual high radiation or high chlorine concentration condition existed. Therefore, there was no actual safety significance related to these events.

D. Root Cause

The cause of the CREVS actuations on March 26 was spiking of the radiation monitor output caused by spurious voltage induced on the detector circuit when closing the ANO-2 Control Room normal ventilation system isolation dampers. The induced voltages appeared to be caused by deenergizing the DC operated solenoid valves used in the operating air supply line for the dampers (see Corrective Action section of this report).

The cause of the CREVS actuation on April 4 was inadequate corrective actions taken as the result of two previous similar events. On February 26 and March 6, 1989, inadvertent actuations of the CREVS occurred which were attributed to the use of hand held radios in the vicinity of the chlorine monitors. Following these events, the areas were posted by installing information placards in the areas warning against the use of hand held radios. However, information concerning these restrictions was not widely disseminated to plant personnel such as security personnel who frequently use hand held radios throughout the plant.

The cause of the actuations on April 11, 13, 14, 18, 19, and 21 have not been determined at this time.

The actuations of the CREVS discussed in this report and previous actuations reported in LER 50-313/89-009-00 constitute a total of twenty inadvertent actuations of this system which have occurred in an approximate two month time period. Although, the cause(s) of the individual actuations vary somewhat in nature, the root cause for the majority of the actuations appears to be directly related to deficiencies associated with the system design. For example, the detector output from radiation monitor 2RE-8750-1 appears to be affected by moisture, vibration, electrical noise induced into the detector output circuitry, rapid changes in air flow or pressure in the ventilation system ductwork where the detector is located, etc.. These factors in conjunction with the design of the initiating logic for system actuation (i.e., any one of six different

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1) Arkansas Nuclear One, Unit One	DOCKET NUMBER (2)		LER NUMBER (6)				PAGE (3)
			Sequential		Revision		
			Year	Number	Number		
05000313		89	01	1	0	04	04

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

monitoring instruments spuriously actuating will cause system actuation) make the CREVS highly susceptible to inadvertent actuations. Additionally, ANO-2 Technical Specification 3.3.3.1 requires that 2RE-8750-1 have an alarm/trip setpoint of less than or equal to 2 times the normal background radiation levels. Normal background radiation level in the ventilation system intake duct is approximately 100 cpm, therefore the alarm/trip setpoint is usually set at 200 cpm. Under these conditions even extremely small fluctuations in the radiation monitor output signal are sufficient to cause the monitor to trip resulting in actuation of the CREVS.

E. Basis for Reportability

These events are reportable pursuant to 10CFR50.73(a)(2)(iv), automatic actuation of an Engineered Safety Feature (ESF). Each event was also reported pursuant to 10CFR50.72(b)(2)(ii) as required.

F. Corrective Actions

Interim corrective actions taken to minimize the occurrence of system actuations similar to those discussed in this report include:

- The I&C maintenance periodic test procedure being performed during the CREVS actuation on March 27, 1989, has been revised to delete the actual tripping of the chlorine monitors and subsequent CREVS actuation. Additional reviews following the event determined that this test was redundant to a chlorine monitor functional test performed monthly by operations personnel and therefore was not necessary.
- On April 14, 1989, a temporary modification was performed in an attempt to reduce or eliminate the spiking of 2RE-8750-1 and subsequent CREVS actuations which have occurred whenever the normal ventilation system isolation dampers for the ANO-2 Control Room are closed. The isolation dampers are air operated with the operating air supplied to each damper through two DC solenoid operated valves (SOVs). The modification consisted of installation of suppression diodes in the electrical circuits (i.e., across the coils) of the SOVs and is intended to prevent spiking of the radiation monitor output caused by voltage induced on the detector circuit when the SOVs are deenergized to close the isolation dampers.
- To reduce or eliminate the spiking of 2RE-8750-1 which appears to be caused by changes in the moisture content or temperature of the air in the ventilation ductwork, sealants were applied to parts of the detector assembly which might be susceptible to moisture intrusion.

A work plan is being developed to perform testing to better identify the affect of radio transmissions from hand-held radios on the chlorine monitors. The results of this testing will be evaluated to determine if shielding of the monitors in some manner is possible to reduce their sensitivity to radio frequencies.

Additionally a memorandum will be issued to inform plant personnel of the recent events involving actuations of the CREVS due to effects of radio frequencies on the chlorine monitors and to ensure personnel are cognizant of the restriction on the use of hand held radios in the vicinity of the chlorine monitors. This memo will be required reading for those station personnel such as security personnel who use hand held radios as part of their routine duties.

As the result of these and previous events, an evaluation of the CREVS has been initiated to determine the root cause of the inadvertent actuations and the appropriate corrective actions required to reduce the occurrence of future inadvertent actuations.

G. Additional Information

Between February 24 and March 13, 1989, the CREVS unexpectedly automatically started seven times as a result of an initiation signal from a radiation monitor or chlorine concentration detector (See LER 50-313/89-009-00). As the result of those events, an evaluation of the CREVS was initiated and is currently in progress to determine the root cause of the inadvertent actuations and the appropriate corrective actions required to reduce the occurrence of future inadvertent actuations.

As previously committed to in LER 50-313/89-009-00, upon completion of the evaluations and corrective actions taken, a supplement to that report will be submitted.

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



ARKANSAS POWER & LIGHT COMPANY

April 25, 1989

ICAN#48911

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. 50-313/89-011-00

Gentlemen:

In accordance with 10CFR50.73(a)(2)(iv), attached is the subject report concerning inadvertent signals from the radiation and chlorine detectors due to system design deficiencies that resulted in automatic actuations of the Control Room Emergency ventilation system.

Very truly yours,

J. M. Levine / SMD

J. M. Levine
Executive Director,
Nuclear Operations

JML:DAH:sgw
attachment

cc w/att: Regional Administration
Region IV
U. S. Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 1000
Arlington, TX 76011

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

IE22
||