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December 20, 2001

2CAN120101

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 50-368/2001-002-00

Gentlemen:

In accordance with 10CFR50.73(a)(2)(iv)(A), enclosed is the subject report concerning an automatic actuation of the Reactor Protection System. The enclosure contains no commitments.

Very truly yours,

A handwritten signature in cursive script that reads "Glenn R. Ashley".

Glenn R. Ashley  
Manager, Licensing

GRA/tfs

enclosure

U. S. NRC  
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**LICENSEE EVENT REPORT (LER)**

Estimated burden per response to comply with this mandatory information collection request: 50 hours. Send comments regarding burden estimate to the Records Management Branch (T-6 E6), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202 (3150-0104), Office of Management and Budget, Washington, DC 20503.

<b>FACILITY NAME (1)</b> Arkansas Nuclear One Unit 2	<b>DOCKET NUMBER (2)</b> 05000368	<b>PAGE (3)</b> 1 OF 5
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**TITLE (4)** An Improperly Positioned Mode Select Switch Resulted In An Automatic Actuation Of The Reactor Protection System While Troubleshooting A Dropped Control Element Assembly

EVENT DATE (6)			LER NUMBER (8)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
11	01	2001	2001	002	00	12	20	2001	FACILITY NAME	DOCKET NUMBER

<b>OPERATING MODE (9)</b> 1	<b>THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR: (Check one or more) (11)</b>										
<b>POWER LEVEL (10)</b> 024	<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> 50.73(a)(2)(vii)							
	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)							
	<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)							
	<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)							
	<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input checked="" type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)							
	<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(4)							
	<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)							
	<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> OTHER							
	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	<input type="checkbox"/> Specify in Abstract or NRC Form 366A							

<b>LICENSEE CONTACT FOR THIS LER (12)</b>										
<b>NAME</b> T. F. Scott, Nuclear Safety and Licensing Specialist								<b>TELEPHONE NUMBER (Include Area Code)</b> 501-858-4623		

<b>COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)</b>										
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
X	JD	JS	E146	Y						

<b>SUPPLEMENTAL REPORT EXPECTED (14)</b>						<b>EXPECTED SUBMISSION DATE (15)</b>			<b>MO</b>	<b>DAY</b>	<b>YEAR</b>
<input checked="" type="checkbox"/> YES (If yes, complete EXPECTED SUBMISSION DATE)	<input type="checkbox"/> NO	X									

**ABSTRACT (16)**

While troubleshooting a dropped Control Element Assembly (CEA) with reactor power approximately 24 percent, an automatic actuation of the Reactor Protection System (RPS) occurred. The CEA Operator (CEAO) inadvertently selected the Mode Select Switch to a position that resulted in insertion of all CEAs in one group (consisting of two subgroups) instead of only the CEA that had dropped. This resulted in a deviation between the positions of the two subgroups and generated a penalty factor that caused a trip of the Core Protection Calculators. Plant response to the trip was normal and uncomplicated. All CEAs fully inserted and the plant was stabilized in hot standby conditions. Work practice root causes were that the CEAO did not monitor diverse CEA positions during CEA movement and did not apply self-checking to verify that the Mode Select Switch was in the correct position. A management methods root cause was that management expectations concerning peer checking during reactivity manipulations were not adequately understood and applied. The event was determined to have had minimal safety significance.

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## NARRATIVE (17)

## A. Plant Status

At the time of this event, Arkansas Nuclear One Unit 2 (ANO-2) was operating at approximately 24 percent power.

## B. Event Description

An automatic actuation of the Reactor Protection System (RPS) [JC] occurred while troubleshooting of a dropped Control Element Assembly (CEA) [AB] was in progress.

Insertion or withdrawal of CEAs provides a mechanism to control short-term reactor core reactivity changes and core power distribution. Dropping the CEAs into the core provides a method for rapid shutdown. The Control Element Drive Mechanism Control System (CEDMCS) [AA] moves the CEAs in groups to satisfy requirements of shutdown margin, power level changes, and operational maneuvering. The CEAs are divided into shutdown and regulating groups. Each group is divided into subgroups. CEA movement is achieved by the CEDMCS supplying power to the Control Element Drive Mechanisms (CEDMs) [AA] from motor-generator sets via power switches. A Mode Select Switch allows selection of the modes of CEDMCS operation. These modes include Manual Individual (MI) to move a single CEA without affecting any other CEA and Manual Group (MG) to allow operation of a single group without affecting any other group.

On April 20, 2001, CEDM-43 was discovered to have missing phases on the upper gripper coil and lift coil. Repair activities were initiated to repair or replace the power switch, and the CEA was placed on the lower gripper. On July 27, 2001, while performing routine CEA exercising, CEA-43 dropped to the bottom of the core. The CEA was recovered and restored to the lower gripper. After a review of relevant industry operating experience, it was determined that, if the CEA was not moved, it was acceptable to maintain that configuration until an outage of sufficient duration allowed the power switch to be replaced. A Technical Specification change was requested to prevent testing of CEA-43 until the repair could be made. The approved Technical Specification amendment was received on October 22, 2001.

On November 1, 2001, while operating at full power, CEA-43 dropped into the core at 1010 CST. Reactor power reduction began at 1017. The breaker for CEDM-43 had tripped. After resistance of the CEDM coils was checked, the breaker was closed but it tripped again when withdrawal was attempted. The CEDM was found to have a phase firing continuously on its lift coil which, when combined with the normal current to the lower gripper, caused the

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breaker to trip. To correct the condition, the power switch for Subgroup 11, the subgroup of Regulating Group 1 that includes CEA-43, was replaced. At 1228 CST, post-maintenance testing (PMT) began. The Control Room Supervisor (CRS) assigned a licensed Operator to serve as a CEA Operator (CEAO) for the PMT. CEA-43 was withdrawn 4 or 5 steps (approximately 4 inches from the bottom) and a CEA trace was taken. (A CEA trace is a plot of voltage and current supplied to the CEDM coil during insertion or withdrawal that is used to determine if the CEDMCS is energizing the coils in proper sequence and applying proper voltages for the proper length of time.) The trace was analyzed and found to be normal. An insert command was requested for CEA-43. The CEAO inadvertently placed the Mode Select Switch to MG position instead of MI. The insertion command resulted in all eight CEAs in Group 1 (Subgroups 10 and 11) inserting. CEA-43 was observed to insert, but insertion was not continuous. It appeared to be slow or intermittent. The CEAO stopped CEA movement and discussed the apparent sluggish motion of CEA-43 with Maintenance personnel. They requested that he continue CEA insertion and he did. When CEA-43 reached the lower electrical limit, its motion and the motion of the other three CEAs in Subgroup 11 stopped. The CEAO did not realize that CEA-43 had reached the bottom and continued to give an insert command on the CEA Control Switch. This resulted in the four CEAs in Subgroup 10 continuing to insert. The Core Protection Calculators (CPCs) [JC] detected the deviation between the subgroups and generated a planar radial peaking penalty factor that was applied to Departure from Nucleate Boiling Ratio (DNBR) and Linear Power Distribution (LPD) calculations. This caused a trip of the CPCs and at 1230 CST a reactor trip occurred. Plant response to the trip was normal and uncomplicated. The plant was stabilized in hot standby (Mode 3) conditions. All CEAs fully inserted. No actuation of an Engineered Safety Features (ESF) system occurred.

Following an investigation of the cause of the trip, the results of which are described below, the reactor was critical at 1416 CST on November 2, 2001. The turbine generator was placed on line at 2344 CST on November 2, 2001. The plant was stabilized at full power at 0325 on November 4, 2001.

## C. Root Cause

Two root causes for this event were identified. The first root cause involved two error detection work practice deficiencies. The first was that the CEAO did not adequately monitor diverse CEA position indications when moving CEAs. The CEAO concentrated on only one method of indication, the digital indication for CEA-43 on the CEAC screen, and did not observe other indications.

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The second was not applying self-checking to ensure that the Mode Select Switch was in the correct position.

The second root cause involved management methods. The CEO did not adequately understand and did not apply management expectations regarding peer checking during reactivity manipulations. He believed that peer checks were not required at that time because other Control Room Operators were involved in activities demanding their attention.

## D. Corrective Actions

A review of information from the Plant Computer [ID] determined that the Mode Select Switch had been selected to Manual Group (MG) instead of Manual Individual (MI) at the time of the trip. A check of the switch by Maintenance personnel revealed that the switch had been functioning correctly. The CEA Control Switch was also determined to have been functioning correctly.

The apparent sluggish CEA movement was investigated. A missing phase was found on CEDM-41. This CEDM is contained in the same subgroup as CEDM-43. This was the cause of the sluggish movement. The condition was corrected before plant startup.

A Human Performance Error Review was performed. A briefing was conducted with the operating crew concerning this event. Emphasis was placed on self-checking and peer checking. The need to monitor diverse indications of CEA position while they are being moved was also reinforced.

A senior management representative was present to monitor the reactor startup.

An Individual Action Plan for the CEO was initiated and completed. This involved improvement of the individual's monitoring of diverse indications and self-check practices.

Management expectations regarding peer checking are being reviewed with each ANO-2 Operations crew during simulator training on this event.

The applicable Common Operations Directive has been revised to clarify management expectations concerning peer checks during reactivity manipulations.

An independent human performance review of this event is being conducted to provide additional recommendations for improvements.

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E. Safety Significance

The safety systems operated as expected to initiate the automatic reactor trip. All CEAs fully inserted. There were no actuations of any Engineered Safety Features system. The plant was established in stable hot standby conditions without complications. Therefore, this event had minimal safety significance.

F. Basis for Reportability

An automatic actuation of the Reactor Protection System is being reported in accordance with 10CFR50.73(a)(2)(iv)(A). A report of this event was made to the NRC Operations Center at 1413 CST on November 1, 2001, in accordance with 10CFR50.72(b)(2)(iv)(B).

G. Additional Information

The failed power switch for CEDM-43 is model PN-27200 manufactured by Electro-Mechanics, Inc, manufacturer identification code E146.

There have been no previous similar events reported by ANO as Licensee Event Reports.

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