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2CAN030703

March 26, 2006 <sup>7</sup>

U.S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, DC 20555-0001

Subject: Licensee Event Report 50-368/2007-001-00  
Arkansas Nuclear One – Unit 2  
Docket No. 50-368  
License No. NFP-6

Dear Sir or Madam:

In accordance with 10CFR50.73(a)(2)(i)(A), enclosed is the subject report concerning completion of a plant shutdown required by Technical Specifications.

Commitments contained in this submittal are documented in the attachment.

Sincerely,

A handwritten signature in black ink, appearing to read "Dale E. James".

Dale E. James  
Manager, Licensing

DEJ/rs  
Enclosure

JE22

cc: Dr. Bruce S. Mallett  
Regional Administrator  
U. S. Nuclear Regulatory Commission  
Region IV  
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**LICENSEE EVENT REPORT (LER)**

(See reverse for required number of digits/characters for each block)

Estimated burden per response to comply with this mandatory collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to [infocollects@nrc.gov](mailto:infocollects@nrc.gov), and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

<b>1. FACILITY NAME</b> Arkansas Nuclear One – Unit 2	<b>2. DOCKET NUMBER</b> <b>05000368</b>	<b>3. PAGE</b> 1 OF 4
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**4. TITLE** Completion of a Plant Shutdown Required by Technical Specifications Because a Control Element Assembly Dropped Into the Core as a Result of a Failed Upper Gripper Coil

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
1	25	2007	2007	- 001 -	00	3	26	2007	FACILITY NAME	<b>05000</b>
									FACILITY NAME	<b>05000</b>

<b>9. OPERATING MODE</b>  1	<b>11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§:</b> (Check all that apply)									
	<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 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 checked="" type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> OTHER	Specify in Abstract below or in NRC Form 366A					
	<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)							

<b>10. POWER LEVEL</b>  47	
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**12. LICENSEE CONTACT FOR THIS LER**

NAME R.H. Scheide, Nuclear Safety and Licensing Specialist	TELEPHONE NUMBER (Include Area Code) 479-858-4618
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**13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT**

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
X	AA	CL	C490	Y					

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

**ABSTRACT** (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

At 1717 CST, on January 25, 2007, Arkansas Nuclear One, Unit 2 (ANO-2), initiated a plant shutdown as required by Technical Specifications because a Control Element Assembly (CEA) had dropped into the core and could not be returned to within seven inches of the other CEAs in its group. At 1821, the reactor was manually tripped in accordance with the plant shutdown procedure. All CEAs inserted into the core, as designed. CEA 35 dropped into the core at 1109 on January 25, during maintenance activities associated with an abnormal voltage indication on the subject CEA. CEA 35 fell into the core as a result of the failure of its upper gripper coil which caused the circuit breakers that feed the CEA to trip. Repairs were completed on the affected CEA and the plant was returned to power operation at 0200 CST, on February 2, 2007. The preliminary root cause of the coil failure was determined to be thermal degradation of the coil insulation over its twenty year service life that resulted in electrical shorting within the coil. It is believed that periods of elevated voltage on the coil in the 1992-1993 timeframe may have accelerated the degradation. During the next refueling outage, additional gripper coils will be removed and examined to finalize the root cause.

## LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET NUMBER (2)	6. LER NUMBER			3. PAGE
Arkansas Nuclear One – Unit 2	05000368	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	2 OF 4
		2007	- 001	- 00	

17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

## A. Plant Status

At the time Control Element Assembly (CEA) 35 dropped into the reactor core, Arkansas Nuclear One, Unit 2 (ANO-2) was operating in Mode 1 at approximately 100 percent power. Troubleshooting activities were in progress investigating abnormal voltage indications on the upper gripper coil of the subject CEA. At the time plant shutdown was initiated, reactor power had been reduced to approximately 47 percent to comply with Technical Specifications (TS) actions associated with azimuthal power tilt.

## B. Event Description

At 1109 CST, on January 25, 2007, during troubleshooting activities associated with abnormal upper gripper coil voltages on CEA 35, which was fully withdrawn, the circuit breakers that feed the subject CEA tripped unexpectedly and the CEA dropped into the reactor core. The dropped CEA resulted in entry into several TS action statements, the most limiting of which was TS 3.1.3.1.d, which requires that a trippable CEA that is misaligned from its group by more than 7 inches be restored to group alignment within 2 hours or place the plant in at least Hot Standby within the following 6 hours. Other TS action statements entered included; TS 3.2.3 (Azimuthal Power Tilt), TS 3.2.1.b (Linear Heat Rate), TS 3.2.4.c (DNBR Margin), and TS 3.1.3.5 (Shutdown CEAs Fully Withdrawn)

At 1115, Reactor Coolant System [AB] boration was commenced to reduce reactor power, as required by TS. At 1406, reactor power was stabilized at 47 percent, as required by TS 3.2.3.b.2.

Subsequent troubleshooting and repair efforts did not resolve the problem, and at 1717 on January 25, a normal plant shutdown was commenced. The reactor was manually tripped at 1821, in accordance with the plant shutdown procedure.

Repairs were completed and the plant was returned to power operation at 0200 on February 2, 2007.

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1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
Arkansas Nuclear One – Unit 2	05000368	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	3 OF 4
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17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

C. Root Cause

The Control Element Drive Mechanism Control System [AA] moves CEAs in steps by sequencing power to five coils in a coil stack. In the normal holding mode, only the upper gripper coil is energized.

On November 1, 2006, it was identified that CEA 35 had transferred to its lower gripper coil as a result of the presence of elevated voltage on the upper gripper coil. CEA 35 was left on its lower gripper coil pending troubleshooting and repair efforts.

Inspection of the failed gripper coil indicated that the preliminary root cause of the failure was degradation of the coil insulation over its 20 year service life that led to internal shorting of the coil. It is believed that periods of elevated voltage on the upper gripper coils of the CEAs in the sub-group containing CEA 35 in the 1992-1993 timeframe may have accelerated the degradation.

The simple nature of the checks performed during outages and limited analysis of coil traces taken while the plant was at power are considered contributing causes of this event since they did not detect the degradation of the CEA coil.

D. Corrective Actions

The upper gripper coil of CEA 35 was replaced while the plant was shut down.

The plant was returned to power operation at 0200 CST, on February 2, 2007.

The upper gripper coils of the remaining CEAs in the sub-group containing CEA 35, which were exposed to periods of elevated voltage in the past, will be replaced during the next refueling outage to reduce the likelihood of a similar failure.

To further reduce the likelihood of the occurrence of similar events, a system monitoring plan will be developed which will include specific acceptance and replacement criteria for CEA coil trace reviews.

Additional upper gripper coils will be removed during the next refueling outage to gather information to finalize the root cause of the CEA 35 coil failure.

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1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
Arkansas Nuclear One – Unit 2	05000368	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	4 OF 4
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17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

**E. Safety Significance**

CEAs misaligned from their group position, specifically dropped CEAs, affect the power distribution within the core. In the case where a CEA which is normally fully withdrawn is dropped, power in the vicinity of the dropped CEA is reduced to a very low value. If reactor power remains substantially unaffected, power density increases in the rest of the core.

A dropped CEA event has been previously analyzed and specific compensatory actions are prescribed in the licensing basis documents.

Since the compensatory actions contained in the Technical Specifications and Core Operating Limits Report were complied with during this event, it is considered to be of minimal safety significance.

**F. Basis for Reportability**

10CFR50.72(b)(2)(i) requires an 8 hour notification regarding the initiation of any nuclear plant shutdown required by the plant's Technical Specifications whereas 10CFR 50.73(a)(2)(i)(A) requires a 60 day report regarding the completion of any nuclear plant shutdown required by the plant's Technical Specifications.

All required reports were made, as required by regulation.

**G. Additional Information**

A similar previous event in which a failed upper gripper coil resulted in a dropped CEA was reported in Licensee Event Report 2-1984-26-00. There were no actions to prevent recurrence taken with respect to this event. However, because it was believed that high voltage events during the early years of operation may have degraded the coils, all of the CEA upper gripper coils were replaced with coils containing different potting material which had better heat transfer characteristics between 1983 and 1988. Most of the coils (65 of 81), including that of CEA 35, were replaced in 1988. The upper gripper coil failure discussed in this report is the first involving one of the replacement coils.

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

Attachment

2CAN030703

List of Regulatory Commitments

List of Regulatory Commitments

The following table identifies those actions committed to by Entergy in this document. Any other statements in this submittal are provided for information purposes and are not considered to be regulatory commitments.

COMMITMENT	TYPE (Check One)		SCHEDULED COMPLETION DATE (If Required)
	ONE TIME ACTION	CONTINUING COMPLIANCE	
Develop a system monitoring plan to include specific acceptance and replacement criteria for CEA coil trace reviews.	X		
Remove additional upper gripper coils during the next refueling outage (2R19) to gather information to finalize the root cause of the CEA 35 coil failure.	X		
The upper gripper coils of the remaining CEAs in the sub-group containing CEA 35 will be replaced during the next refueling outage.	X		