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2CAN110401

November 29, 2004

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

Subject: Licensee Event Report 50-368/2004-002-00
Arkansas Nuclear One – Unit 2
Docket No. 50-368
License No. NPF-6

Dear Sir or Madam:

In accordance with 10CFR50.73(a)(2)(i)(B), enclosed is the subject report concerning operation prohibited by technical specifications due to an inoperable containment cooling fan.

New commitments contained in this submittal are summarized in Attachment 1.

Sincerely,

Dennis Boyd

for Dale E. James
Manager, Licensing

DEJ/dh

attachment
enclosure

IE22

cc: Dr. Bruce S. Mallett
Regional Administrator
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Attachment 1

2CAN110401

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	
Maintenance surveillance tests that have the potential to render safety-related equipment inoperable will be reviewed and the model work orders for these activities will be revised to incorporate guidance for the performance of adequate post-maintenance testing.	X		Prior to refueling outage 2R17

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APPROVED BY OMB: NO. 3150-0104 EXPIRES: 06/30/2007

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, 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.

LICENSEE EVENT REPORT (LER)

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

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4. TITLE

Operation Prohibited by Technical Specification due to an Inoperable Containment Cooling Fan Resulting from the Failure to Perform an Adequate Verification and Post-Maintenance Test

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
										05000
09	29	2004	2004	- 002 -	00	11	29	2004	FACILITY NAME	DOCKET NUMBER 05000

9. OPERATING MODE

4

10. POWER LEVEL

000

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: *(Check all that apply)*

- ☐ 20.2201(b)
- ☐ 20.2201(d)
- ☐ 20.2203(a)(1)
- ☐ 20.2203(a)(2)(i)
- ☐ 20.2203(a)(2)(ii)
- ☐ 20.2203(a)(2)(iii)
- ☐ 20.2203(a)(2)(iv)
- ☐ 20.2203(a)(2)(v)
- ☐ 20.2203(a)(2)(vi)
- ☐ 20.2203(a)(3)(i)
- ☐ 20.2203(a)(3)(ii)
- ☐ 20.2203(a)(4)
- ☐ 50.36(c)(1)(i)(A)
- ☐ 50.36(c)(1)(ii)(A)
- ☐ 50.36(c)(2)
- ☐ 50.46(a)(3)(ii)
- ☐ 50.73(a)(2)(i)(A)
- ☒ 50.73(a)(2)(i)(B)
- ☐ 50.73(a)(2)(i)(C)
- ☐ 50.73(a)(2)(ii)(A)
- ☐ 50.73(a)(2)(ii)(B)
- ☐ 50.73(a)(2)(iii)
- ☐ 50.73(a)(2)(iv)(A)
- ☐ 50.73(a)(2)(v)(A)
- ☐ 50.73(a)(2)(v)(B)
- ☐ 50.73(a)(2)(v)(C)
- ☐ 50.73(a)(2)(v)(D)
- ☐ 50.73(a)(2)(vii)
- ☐ 50.73(a)(2)(viii)(A)
- ☐ 50.73(a)(2)(viii)(B)
- ☐ 50.73(a)(2)(ix)(A)
- ☐ 50.73(a)(2)(x)
- ☐ 73.71(a)(4)
- ☐ 73.71(a)(5)
- ☐ OTHER

Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER (Include Area Code)
Arkansas Nuclear One / Dee Hawkins	479-858-5589

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX

14. SUPPLEMENTAL REPORT EXPECTED

☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☒ NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR

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

On October 3, 2003, during a scheduled refueling outage, a containment cooling fan circuit breaker was tested and inspected. Inspection of the breaker required it to be de-terminated and removed from its cubicle. When the breaker was placed back in its cubicle, two of the motor leads were incorrectly terminated. The failure to perform an adequate verification and a post-maintenance test (PMT) following maintenance activities on the breaker resulted in a technical specification required containment cooling fan being left in an inoperable condition. Due to changing plant conditions following the refueling outage, and the normal rotation of containment cooling fans, the abnormal rise in containment temperature was not positively correlated to 2VSF-1B operation until the fan was placed in service in March 2004. At that time, an inaccurate operability evaluation determined that VSF-1B remained operable. On September 29, 2004, during an online containment entry, 2VFS-1B was found to be rotating in the reverse direction. The motor leads were correctly terminated in the circuit breaker and a PMT was satisfactorily completed, confirming fan motor rotation to be in the correct direction. A maintenance action plan has been implemented to provide guidance regarding self-checking and second-person verification. In addition, maintenance surveillance tests that have the potential to render safety-related equipment inoperable will be reviewed and the model work orders for these activities will be revised to incorporate guidance for the performance of adequate post-maintenance testing.

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

A. Plant Status

At the time this condition was discovered, Arkansas Nuclear One, Unit 2 (ANO-2) was shut down for a forced outage to repair a feedwater [SJ] vent socket weld. The reactor was in Hot Shutdown (Mode 4) with a reactor coolant system (RCS) [AB] temperature of approximately 209 degrees and RCS pressure of approximately 263 psig.

B. Event Description

On September 29, 2004, Containment Cooling Fan 2VSF-1B was found to be rotating in the reverse direction. At the time this condition was discovered, the "A" containment spray train was inoperable. Containment Cooling Fan 2VSF-1B was declared inoperable and Technical Specification (TS) 3.6.2.3 was entered.

The safety-related function of the containment cooling system [BK] is to provide adequate heat removal capacity, in conjunction with the containment spray system [BE], during post loss-of-coolant-accident (LOCA) conditions to ensure that the design temperature and pressure of the containment building are not exceeded.

The containment cooling system consists of two independent cooling groups, each capable of providing 100 percent of total containment cooling necessary following any postulated LOCA. Each cooling group consists of two cooling units (2VSF-1A/B and 2VSF-1C/D), each consisting of a vane axial fan and two sets of cooling coils. One set of coils is for main chilled water for normal cooling and the other is for service water for emergency cooling following a LOCA. The fans start automatically on a containment cooling actuation signal (CCAS). ANO-2 TS 3.6.2.3 requires both containment cooling groups, with two operational cooling units in each group, and both containment spray trains to be operable in Modes 1, 2, 3 and 4.

In November 2000, the containment cooling fan flow switches were determined to be inoperable due to incorrectly installed sensing lines. The switches were declared inoperable, but because they provided alarms only and did not provide any control function, the containment cooling fans were determined to be operable and capable of fulfilling their required safety function. The switches were replaced in October 2003.

On October 1, 2003, during refueling outage 2R16, a containment cooling fan flow test of cooling units 2VSF-1A and 2VSF-1B was successfully performed. The following day, 2VSF-1B fan flow switch 2FS-8207-1B was replaced; however, a post-modification test was not performed to verify that the new flow switch was functional; therefore, the switch was not declared operable.

On October 3, 2003, 2VSF-1B Circuit Breaker 2B-53L2 was tested and inspected. Inspection of 2B-53L2 required the breaker to be de-terminated and removed from its cubicle. When 2B-53L2 was placed back in its cubicle, two of the motor leads were incorrectly terminated. Second-person verification was performed as required by site procedures, but both self-checking and second-person

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verification failed to identify the error. Neither the test procedure nor the inspection procedure required a post-maintenance test (PMT) to be performed.

On October 10, 2003, a Containment Cooler 14-Day Test was performed. The purpose of the surveillance was to demonstrate operability of the containment cooling system. The surveillance required verification of fan motor start, but did not require verification of flow or the absence of low-flow alarms.

Typically, only three of four containment cooling fans are in service during normal plant operation. Although an increase in containment temperature was noted immediately following heatup from the refueling outage, the temperature returned to normal before an investigation could be initiated. Due to changing plant conditions following the refueling outage, and the normal rotation of containment cooling fans, the abnormal rise in containment temperature was not positively correlated to 2VSF-1B operation until the fan was placed in service in March 2004. Biweekly surveillance tests performed during this period verified containment cooling fan start, but the surveillance did not include checking the flow switches or air flow. Flow Annunciator 2K06-J7 did not provide an alarm when Containment Cooling Fan 2VSF-1B was operating, even though the fan was rotating in the reverse direction.

On March 10, 2004, a condition report was written to document that the containment building temperature was trending higher than in the past. This condition corresponded to 2VSF-1B being placed in service. The initial operability assessment and failure modes analysis determined that VSF-1B flow was potentially degraded, but that the fan remained operable by engineering judgment. The evaluation relied on the fan flow test that was performed on October 1, 2003, without recognizing that breaker inspection/testing had been performed subsequent to the flow test. The operability position also relied on the lack of low-flow annunciation as an indication of flow.

During an on-line containment entry to repair a feedwater vent socket weld on September 27, 2004, Containment Cooling Fan 2VSF-1B was inspected. The inspection revealed that the back-draft damper for 2VSF-1B appeared to be stuck in an undetermined position. On September 29, 2004, 2VSF-1B was started and its back-draft damper was again inspected. The damper remained closed when it was expected to have opened. The damper was manually stroked open and was noted to have more resistance than when the fan was secured. A local test port between the fan's discharge and the back-draft damper was examined and was noted to draw air into the duct, indicating that the fan was potentially rotating backwards. At 0010 CST, 2VSF-1B was declared inoperable and TS 3.6.2.3 was entered. An investigation of the reverse rotation of the 2VSF-1B containment cooler fan motor revealed that two leads between the load side of the circuit breaker and the line side on the contactor in the motor control center cubicle for 2B53-L2 were reversed. The motor leads were correctly re-terminated and 2VSF-1B fan rotation was confirmed to be in the correct direction.

At 2203 on September 29, 2004, Containment Cooling Fan 2VSF-1B was declared operable and TS 3.6.2.3 was exited.

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C. Root Cause

The inspection of Circuit Breaker 2B53-L2 required the breaker to be de-terminated and removed from its cubicle. The lead electrician incorrectly documented the lifted leads on the breaker lifted lead data sheet. The error was not identified by the electrician that performed the second-person verification. Inadequate self-checking and peer-checking resulted in the motor leads being left in an incorrectly terminated condition in 2B53-L2.

The failure to perform a PMT following maintenance activities on Breaker 2B53-L2 resulted in leaving Containment Cooling Fan 2VSF-1B in an inoperable condition. An adequate PMT would have revealed that the motor leads were incorrectly terminated.

D. Corrective Actions

On September 29, 2004, the motor leads for Containment Cooling Fan 2VSF-1B were correctly terminated in Circuit Breaker 2B53-L2. A PMT was satisfactorily completed, confirming fan motor rotation to be in the correct direction. Before 2VSF-1B was returned to service, an assessment was performed to demonstrate functional performance and reliability. Field inspections, post-maintenance testing, vendor reviews and an environmental qualification assessment provided a basis to conclude that the backward rotation did not result in damage to the containment cooling fan.

A maintenance action plan has been implemented to provide guidance regarding the proper use of human performance tools, including self-checking and second-person verification.

Maintenance activities for ANO-1 and ANO-2 were reviewed to identify other components that could have been rendered inoperable by incorrectly terminated leads. These components were verified to be rotating in the correct direction.

A subcommittee of the On-site Safety Review Committee performed a review of open condition reports with operability determinations based on engineering judgment to ensure that the evaluations were adequately rigorous.

Maintenance surveillance tests that have the potential to render safety-related equipment inoperable will be reviewed and the model work orders for these activities will be revised to incorporate guidance for the performance of adequate post-maintenance testing. This action will be completed prior to the next refueling outage.

E. Safety Significance

The containment heat removal system, which consists of the containment spray system and the containment cooling system, is designed to reduce and maintain post-accident containment pressure and temperature. The two diverse systems are both designed with redundant components so that a

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single failure of a component of either system will not prevent the fulfillment of this function.

In addition, each train of the containment cooling system is designed to exceed the heat removal capacity assumed in the ANO-2 safety analysis; therefore, the unavailability of one containment cooling fan was determined to have minimal safety significance.

F. Basis for Reportability

This report of operation prohibited by TS is submitted in accordance with 10CFR50.73(a)(2)(i)(B).

G. Additional Information

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

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