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2CAN101001

October 21, 2010

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

Subject: Licensee Event Report 50-368/2010-002-00
Plant Shutdown Required By Technical Specifications
Arkansas Nuclear One – Unit 2
Docket No. 50-368
License No. NPF-6

Dear Sir or Madam:

In accordance with 10 CFR 50.73(a)(2)(i)(A), attached is the subject report concerning the completion of a plant shutdown required by Technical Specifications. Additionally, the subject report is submitted to address the reporting requirements pursuant to 10 CFR 50.73(a)(2)(i)(B). Subsequent to the required shutdown to Mode 3, the unit entered a condition prohibited by Technical Specifications due to a delayed entry into Mode 4.

There are no new commitments contained in this submittal. Should you have any questions concerning this issue, please contact me.

Sincerely,

Original signed by Stephenie L. Pyle

SLP/fpv

Attachment: Licensee Event Report 50-368/2010-002-00

cc: Mr. Elmo Collins
Regional Administrator
U. S. Nuclear Regulatory Commission
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NRC FORM 366 (9-2007) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES 8/31/2010

Estimated burden per response to comply with this mandatory information collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records Management Branch (T-6 E6), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to bjs1@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 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 Completion of a Plant Shutdown Required By Technical Specifications Due to the Inability to Restore an Emergency Diesel Generator to Operable Status within the Allowed Outage Time.

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
08	23	2010	2010	002	00	10	21	2010	FACILITY NAME	DOCKET NUMBER

9. OPERATING MODE

1

10. POWER LEVEL

100

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

☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(i)(C)	☐ 50.73(a)(2)(vii)
☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☐ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
☐ 20.2203(a)(2)(v)	☒ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(C)	☐ OTHER- Specify in Abstract below or in NRC Form 366A
☐ 20.2203(a)(2)(vi)	☒ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(v)(D)	

12. LICENSEE CONTACT FOR THIS LER

NAME	TELEPHONE NUMBER (Include Area Code)
Stephenie L. Pyle, Acting Manager, Licensing	479-858-4710

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
B	EK	DG	F010	Y					

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 August 9, 2010, at 0330 CDT, Arkansas Nuclear One, Unit 2 (ANO-2) removed one Emergency Diesel Generator (EDG) from service for planned maintenance and entered the appropriate Technical Specification (TS) action statements. The TS required the EDG to be restored to operable status within 14 days. The scheduled maintenance was not completed within the allowed outage time due to unresolved issues associated with crankcase pressure anomalies. Therefore, a plant shutdown was initiated at 0252 CDT on August 23, 2010 to comply with the EDG TS action statement. The shutdown was completed by entering Mode 3 at 0443 CDT on August 23, 2010. Subsequent to the shutdown, due to deficiencies in the tracking process for TS Limiting Condition for Operation compliance, an operation prohibited by Technical Specifications occurred when entry into Mode 4 was not achieved in accordance with the most restrictive TS completion time. A root cause investigation postulated that two possible conditions involving degraded subcomponents were the most likely and most significant causes of the EDG crankcase pressure anomalies. A degraded gasket between the crankcase oil separator and bulkhead was identified, along with evidence of piston ring blow-by which was most noticeable on 4 lower pistons. Following the replacement of all piston rings on the lower pistons, repair and inspection of the oil separator gasket, plus additional desired maintenance, the EDG was successfully tested and restored to operable status on September 2, 2010. ANO-2 resumed power operation on September 4, 2010.

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NARRATIVE

A. Plant Status

Prior to the initiation of the plant shutdown, Arkansas Nuclear One, Unit 2 (ANO-2) was operating in Mode 1 at 100% power.

B. Event Description

On August 9, 2010, at 0330 CDT, the 2K-4B Emergency Diesel Generator (EDG) [EK, DG] was removed from service for planned maintenance. The purpose of the scheduled maintenance was to perform vendor and owner's group recommended checks and testing, as well as to perform any necessary corrective maintenance activities. The appropriate Technical Specification (TS) action statement for one inoperable EDG was entered, which required the component to be restored to operable status within 14 days or be in Hot Standby (Mode 3) within the next 6 hours and Cold Shutdown (Mode 5) within the following 30 hours. During the period that the EDG was out of service, extensive planned preventive maintenance was performed on the equipment. During post maintenance testing on August 15, 2010, the EDG exhibited unacceptable crankcase pressure conditions which prevented restoration of the equipment to operable status. Following additional maintenance and testing to correct the condition, the plant staff determined that additional troubleshooting and repair efforts were not expected to be completed prior to expiration of the 14-day outage time allowed by the EDG TS Limiting Condition for Operation (LCO). Accordingly, a plant shutdown was initiated at 0252 CDT on August 23, 2010, in accordance with the EDG TS action statement described above. The shutdown was completed upon entry into the first shutdown condition required by the LCO (Mode 3) at 0443 CDT on August 23, 2010.

In addition to the EDG TS actions required for one inoperable EDG, a second shutdown action statement had been entered and was applicable at the time of shutdown initiation. This additional TS action statement was applicable due to an inoperable emergency power supply (i.e., EDG) for the Reactor Coolant System [AB] pressurizer [PZR] heaters [EHTR]. The plant shutdown was performed in accordance with the EDG LCO required actions for one inoperable EDG, which required entry into Mode 3 within 6 hours and Mode 5 within the following 30 hours. However, the applicable pressurizer TS LCO invoked an additional shutdown requirement to place the unit in Hot Shutdown (Mode 4) within 12 hours after expiration of the EDG 14-day allowed outage time. During document reviews of the shutdown, it was discovered that following entry into Mode 3, the additional pressurizer LCO shutdown requirement for Mode 4 entry had not been satisfied. The unit shutdown had been performed to comply solely with the requirements of the EDG TS LCO for one inoperable EDG. Consequently, entry into Mode 4 was not accomplished in accordance with the pressurizer LCO shutdown requirement. Actual entry into Mode 4 occurred at 2148 CDT, 6 hours and 18 minutes later than required by the pressurizer LCO. This resulted in a condition prohibited by Technical Specifications.

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C. Cause

The ANO-2 EDGs are manufactured by Fairbanks-Morse. They are 12 cylinder, two cycle, opposed piston, turbo-charged engines with skid mounted auxiliaries and a 4160 Volt AC Generator. Although evidence from the ensuing investigation and root cause analysis did not point to a single cause that would fully explain the crankcase pressure anomalies, the analysis postulated that the discovery of the following two equipment conditions involved degraded subcomponents that were the most direct and most significant causes. The first condition was a degraded gasket located between the engine crankcase oil separator and bulkhead. The gasket was found to be distorted and the bolts were loose. The EDG's scavenging air sub-system provides motive air for an air ejector to take suction on the crankcase and establish negative pressure during engine operation. Gases from the crankcase pass through an oil separator mounted to the inside wall of the crankcase. The separator is a dual canister filter with a screen mesh that separates the oil from the gas. The oil, once separated from the gas, drains back to the crankcase, and the gas/air mixture is exhausted via the EDG exhaust outlet. The degraded gasket exhibited indications that it may have been crushed or otherwise stressed, creating a path for oil to directly enter the air ejection line bypassing the screen mesh, thereby reducing the efficiency of the air ejection process. The second significant condition that would adversely affect crankcase pressure was evidence of piston ring blow-by that was most noticeable on four of the lower pistons. This condition would introduce excess pressurized gases into the crankcase. Piston blow-by communicates directly with the crankcase volume, and due to the high cylinder pressures, can significantly impact crankcase parameters. An evaluation of the historical crankcase vacuum trend indicated gradual degradation associated with normal piston ring wear, but was within the required specifications prior to the planned maintenance outage. Activities during the maintenance outage appear to have disturbed the sealing function of the piston rings, ultimately contributing to the inability to maintain crankcase pressures within expected ranges.

An evaluation was also performed to determine the cause for the failure to enter Mode 4 in accordance with the LCO shutdown action associated with the pressurizer heater inoperable emergency power supply. The evaluation determined that limitations of an electronic LCO tracking tool was the most significant contributing cause of the inadvertent delay in entering Mode 4. This computerized tracking tool was the primary method used to provide assistance for compliance with LCO time limits. At the point the EDG shutdown LCO was entered, the LCO tracking tool indicated that the pressurizer shutdown action was satisfied. The LCO tracking tool was not capable of electronically tracking the additional pressurizer LCO requirement to enter Mode 4 within 12 hours. Additionally, the apparent cause evaluation determined that Operations personnel believed that compliance with EDG TS LCO completely satisfied the pressurizer heater TS LCO time requirement.

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D. Corrective Actions

The degraded gasket between the oil separator and the crankcase housing was replaced and the joint was made up, torqued with the nuts lock-wired and inspected to ensure that the bypass flow described above no longer existed. New piston rings were installed on the lower pistons and one upper piston. Other potential sources of air in-leakage into the crankcase or degraded air ejection performance were also addressed. Following completion of the planned and corrective maintenance, the EDG was tested with satisfactory results and restored to operable status on September 2, 2010.

Regarding the delayed entry into Mode 4 subsequent to the plant shutdown, a procedure based tool which has the capability to track multiple TS actions for shutdown and cooldown operations has been implemented as an operator aid. The new tool provides instructions to determine mode specific times for all TS required shutdown and cooldown actions that apply.

E. Safety Significance

The ANO-2 emergency power supply system is designed to provide redundant power sources capable of furnishing adequate power to safely shut down the reactor, remove residual heat, and maintain the unit in a safe shutdown condition upon the loss of preferred power, with or without a coincident Design Basis Event. The opposite train safety related EDG and the Alternate AC Diesel Generator (station blackout diesel generator) were both fully operable in standby mode during the affected EDG maintenance outage and during the duration of the ANO-2 plant shutdown.

The unit was placed in the appropriate shutdown condition (Mode 3) in accordance with the applicable EDG TS. The subsequent condition prohibited by Technical Specifications caused by the inadvertent delay in reaching Mode 4 conditions did not introduce any adverse conditions, nor did it present any risk to public health and safety. During the 6 hours and 18 minutes that this TS requirement was not met, the redundant pressurizer heater emergency power supply remained operable.

During the plant shutdown, safety related systems, structures, and components performed normally without complications, and there was no risk to public health and safety or to the safety of on-site personnel as a result of this event.

F. Basis for Reportability

On August 23, 2010, upon initiation of the plant shutdown, an immediate report was made pursuant to 10 CFR 50.72(b)(2)(i).

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F. Basis for Reportability - continued

10 CFR 50.73(a)(2)(i)(A) requires submittal within 60 days of a report for any event involving the completion of a plant shutdown required by the plant's Technical Specifications. NUREG-1022, Revision 2 defines the completion of a plant shutdown as the point in time when the plant enters the first shutdown condition required by an LCO (e.g., hot standby – Mode 3 for Pressurized Water Reactors).

A condition prohibited by the plant's Technical Specifications occurred as a result of the failure to enter Mode 4 in accordance with an applicable TS action statement. Accordingly, this report is also submitted pursuant to 10 CFR 50.73(a)(2)(i)(B) "Operation or Condition Prohibited by Technical Specifications."

G. Additional Information

There have been no previous similar events reported by ANO.

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