Entergy Operations, Inc.
1448 S.R. 333
Russellville, AR 72802
Tel 479-858-3110

Richard L. Anderson
Vice President - Operations
Arkansas Nuclear One

10 CFR 50.73

2CAN111602

November 15, 2016

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

Subject: Licensee Event Report 50-368/2016-001-00
Arkansas Nuclear One, Unit 2
Docket No. 50-368
License No. NPF-6

Dear Sir or Madam:

Pursuant to the reporting requirements of 10 CFR 50.73, attached is the subject Licensee Event Report concerning the failure of one Emergency Diesel Generator and subsequent required shutdown of Arkansas Nuclear One, Unit 2.

There are no new commitments contained in this submittal.

Should you have any questions concerning this issue, please contact Stephenie Pyle, Manager, Regulatory Assurance, at 479-858-4704.

Sincerely,

ORIGINAL SIGNED BY RICHARD L. ANDERSON

RLA/rwc

Attachment: Licensee Event Report 50-368/2016-001-00

cc: Mr. Kriss Kennedy
Regional Administrator
U. S. Nuclear Regulatory Commission
Region IV
1600 East Lamar Boulevard
Arlington, TX 76011-4511

NRC Senior Resident Inspector
Arkansas Nuclear One
P.O. Box 310
London, AR 72847

Institute of Nuclear Power Operations
700 Galleria Parkway
Atlanta, GA 30339-5957
LEREvents@inpo.org

NRC FORM 366 (06-2016) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 10/31/2018

LICENSEE EVENT REPORT (LER)

(See Page 2 for required number of digits/characters for each block)

(See NUREG-1022, R.3 for instruction and guidance for completing this form http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Arkansas Nuclear One, Unit 2	05000368	1 OF 5

4. TITLE

Failure of One Emergency Diesel Generator and Subsequent Required Shutdown of Arkansas Nuclear One, Unit 2

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
									N/A	
09	16	2016	2016	001	00	11	15	2016	FACILITY NAME N/A	DOCKET NUMBER

9. OPERATING MODE	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: *(Check all that apply)*			
1	☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
	☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
	☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
	☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
10. POWER LEVEL	☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
	☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☒ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
100%	☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(C)	☐ 73.77(a)(1)
	☐ 20.2203(a)(2)(v)	☒ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(D)	☐ 73.77(a)(2)(i)
	☐ 20.2203(a)(2)(vi)	☒ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(vii)	☐ 73.77(a)(2)(ii)
		☐ 50.73(a)(2)(i)(C)	☐ OTHER Specify in Abstract below or in NRC Form 366A	

12. LICENSEE CONTACT FOR THIS LER

LICENSEE CONTACT	TELEPHONE NUMER *(Include Area Code)*
Stephenie L. Pyle, Manager, Regulatory Assurance	(479) 858-4704

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
A	LA	LG	F010	N/A	N/A	N/A	N/A	N/A	N/A

14. SUPPLEMENTAL REPORT EXPECTED

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

15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
	N/A	N/A	N/A

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

On September 28, 2016, Arkansas Nuclear One, Unit 2, initiated a plant shutdown due to the inability to restore one of the Emergency Diesel Generators (EDGs) to an operable status prior to exceeding the Limited Condition Operation action time. It was determined the EDG was inoperable due to the lack of sufficient lubrication in the inboard generator bearing leading to bearing failure. The lack of lubrication was determined to be caused by improper bearing lube oil level indication due an inverted oil sight glass. It was further determined that the insufficient bearing oil level condition had existed since the performance of maintenance activities in June of 2016. The corrective action plan addresses the root cause, contributing cause, extent of condition, and extent of cause.

1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Arkansas Nuclear One, Unit 2	05000368	2016	- 001	- 00

NARRATIVE

A. Plant Status

At the time this condition was identified, Arkansas Nuclear One, Unit 2 (ANO-2), was operating at approximately 100% power. No structures, systems or components were out of service at the time of this event that contributed to this event.

B. Event Description

The ANO-2 "A" Emergency Diesel Generator (EDG) [EK] was started for a 24-hour surveillance test in accordance with station procedures, on September 15, 2016, at 1047. At approximately 0031 on September 16, 2016, Control Room Operators noted an anomaly in the EDG output. An Operator was dispatched to investigate who subsequently identified sparks in the area of the inboard generator bearing. The "A" EDG was secured on September 16, 2016, at 0036.

The EDG was declared inoperable and ANO-2 entered Technical Specification (TS) 3.8.1.1 Action b (EDG) and TS 3.4.4 Action b (Pressurizer Proportional Heaters). This resulted in an unplanned entry into a 72-hour shutdown requirement which was later extended to a 14-day Allowable Outage Time (AOT) after operational contingencies were established in accordance with TS 3.8.1.1. Ultimately, ANO-2 was taken offline on September 28, 2016, at 0745, when it was determined that repairs could not be completed within the required 14-day time period. ANO-2 entered Mode 3 (HOT STANDBY) at 0932 on September 28, 2016, and Mode 4 (HOT SHUTDOWN) at 2002 on September 28, 2016. The EDG was repaired and returned to operable status on October 22, 2016. ANO-2 was returned to 100% rated thermal power on October 28, 2016.

C. Background – System Design

The EDGs are High Critical/Safety-Related equipment. The emergency power supply system is designed to provide redundant emergency power sources capable of providing adequate power to safely shut down the reactor, remove reactor residual heat, and maintain the unit in a safe shutdown condition upon the loss of off-site power with or without a coincident design basis event.

During investigation and repairs, the generator inboard bearing housing was removed, revealing the inboard generator bearing to be significantly damaged. The oil level scribe mark on the inboard generator oil sight glass [LA][LG] should be established at an elevation to ensure oil level is maintained at approximately the middle of the lowest roller in the bearing. Per the vendor technical manual, the location of the scribe mark should be 5.625 inches below the center of the shaft. Follow-up investigations determined the scribe mark on the inboard bearing oil sight glass was 6.25 inches below the shaft centerline, 0.625 inches lower than the level stated in the technical manual.

NARRATIVE

The scribe mark that is used to designate proper oil level is approximately 0.062 inch wide. With the scribe mark 0.625 inch low, 0.062 inch is the difference between having oil on the bottom of the rollers if oil level is at the top of the notch and not having any oil on the rollers if oil is at the bottom of the notch. Operating procedures specify an oil level of ± 0.125 of an inch to the scribe mark.

Although it appears the site glass was inverted during maintenance to correct an oil leak in December 2014, the actual bearing oil level is believed to have been sufficient based on multiple successful monthly surveillance tests and a 24-hour test performed since the sight glass maintenance occurred. In June 2016, the bearing oil was sampled and replaced with no oil degradation noted. Based on no EDG or oil degradation evidenced from December 2014 to June 2016, it is believed the bearing oil was replenished to a level insufficient to support long term EDG operation at the time of the June 2016 bearing oil replacement. Monthly surveillance tests were completed successfully thereafter until the bearing failure occurred on September 16, 2016, during the 24-hour test.

Based on the above, it was determined that the “A” EDG was inoperable since June 26, 2016. A review of the operability of the “B” EDG was performed. It was determined that there were instances from June 2016 through September 2016 that the “B” EDG was out of service.

D. Event Cause

The direct cause of this event is the ”A” EDG inboard bearing had insufficient lubrication. This cause is supported by the identified bearing damage and the Failure Modes Analysis.

The root cause of this event was determined to be inadequate Work Planning Standards associated with EDG inboard bearing sight glass maintenance. Specifically, there were no detailed instructions for performing as-left measurements following repair of the inboard bearing oil sight glass.

A contributing cause of this event was that the craft failed to identify the critical parameters of the sight glass scribe mark and, therefore, did not recognize that the work order lacked sufficient instruction to take measurements after maintenance was completed.

E. Corrective Actions

The extent of condition for safety related equipment or equipment used for safe shutdown of either unit with the potential of a similar sight glass configuration was completed. Sight glasses were verified to have the markings at the appropriate level as documented. Where available, temperature monitoring, vibration, and oil analysis, along with past equipment performance was reviewed. No equipment issues or adverse trends were identified during the review.

Detailed instructions for measuring the EDG bearing sight glass elevation is planned in support of future bearing-related work order development.

Additional actions planned to address the root cause include performing a dynamic learning activity with the craft and planning department on identifying critical measurements in work orders, and establishing a work release challenge board for outage critical work orders.

Actions to address the contributing cause include training on oil sight glasses in addition to the dynamic learning activity described above.

F. Safety Significance Evaluation

Systems and components required to shut down the reactor, maintain safe shutdown conditions, remove residual heat, and control the release of radioactive material were available at the time that this condition was discovered.

In reviewing the time period in which both EDGs were inoperable simultaneously, it was determined that both required offsite AC power sources were operable as well as the Station Blackout Diesel Generator during the subject time frame. These power sources could have been utilized to support equipment safety functions if needed.

There were no actual consequences related to the subject event with regards to nuclear safety.

1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Arkansas Nuclear One, Unit 2	05000368	2016	- 001	- 00

NARRATIVE

G. Basis for Reportability

This event is reported pursuant to the following criteria:

10 CFR 50.73(a)(2)(i)(B) – Any operation or condition which was prohibited by the plant's Technical Specifications.

ANO-2 TS 3.8.1.1, Action b, requires that if one EDG is inoperable, the EDG must be restored within 14 days or the plant placed in at least HOT SHUTDOWN within the next 6 hours and in HOT SHUTDOWN within the following 6 hours.

10 CFR 50.73(a)(2)(i)(A) – Plant Shutdown Required by Technical Specification

Event Notification 52267 was made on September 28, 2016. In accordance with the guidelines presented in NUREG-1022, since the shutdown was completed, an LER is required. As noted in NUREG-1022, this reporting is required when initiating of a shutdown due to expected inability to restore equipment prior to exceeding the LCO action time.

10 CFR 50.73(a)(2)(v) –Event or Condition that Could Have Prevented Fulfillment of a Safety Function

At the time of discovery, the "B" EDG was operable; however, in reviewing the plant status from June of 2016 when the "A" EDG was determined to be inoperable to the time of this event, there were instances in which the "B" EDG was out of service. With both EDGs inoperable at the same time, the associated safety function could not be met. In accordance with the NUREG-1022 guidelines, only an LER is required if the condition could have prevented the fulfillment of a safety function any time within 3 years of the date of discovery, but not at the time of discovery.

H. Additional Information

10 CFR 50.73(b)(5) states that this report shall contain reference to "any previous similar events at the same plant that are known to the licensee." NUREG-1022, Revision 3, reporting guidance states that the phrase "previous occurrences" should include previous events or conditions that involved the same underlying concern or reason as this event, such as the same root cause, failure, or sequence of events.

A review of the ANO corrective action program and Licensee Event Reports for the previous three years was performed. No relevant similar events were identified.

Energy Industry Identification System (EIIS) codes and component codes are identified in the text of this report as [XX].