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**Richard L. Anderson**  
Vice President - Operations  
Arkansas Nuclear One

2CAN061704

June 26, 2017

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

Subject: Licensee Event Report 50-368/2017-002-00  
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 automatic start of an emergency diesel generator caused by the momentary loss of offsite power due to severe weather for 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 50-368/2017-002-00

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  
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**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/>)

Estimated burden per response to comply with this mandatory 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 Information Services Branch (T-2 F43), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to Infocollects.Resource@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> 05000368	<b>3. PAGE</b> 1 OF 4
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**4. TITLE** Automatic Start of an Emergency Diesel Generator Due to the Momentary Loss of Offsite Power due to Severe Weather

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
04	26	2017	2017	002	00	06	26	2017	Arkansas Nuclear One, Unit 1	05000313
									FACILITY NAME	DOCKET NUMBER
									N/A	

<b>9. OPERATING MODE</b>  6	<b>11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)</b>											
	<input type="checkbox"/> 20.2201(b)			<input type="checkbox"/> 20.2203(a)(3)(i)			<input type="checkbox"/> 50.73(a)(2)(ii)(A)			<input type="checkbox"/> 50.73(a)(2)(viii)(A)		
	<input type="checkbox"/> 20.2201(d)			<input type="checkbox"/> 20.2203(a)(3)(ii)			<input type="checkbox"/> 50.73(a)(2)(ii)(B)			<input type="checkbox"/> 50.73(a)(2)(viii)(B)		
	<input type="checkbox"/> 20.2203(a)(1)			<input type="checkbox"/> 20.2203(a)(4)			<input type="checkbox"/> 50.73(a)(2)(iii)			<input type="checkbox"/> 50.73(a)(2)(ix)(A)		
<b>10. POWER LEVEL</b>  0	<input type="checkbox"/> 20.2203(a)(2)(i)			<input type="checkbox"/> 50.36(c)(1)(i)(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)(ii)			<input type="checkbox"/> 50.36(c)(1)(ii)(A)			<input type="checkbox"/> 50.73(a)(2)(v)(A)			<input type="checkbox"/> 73.71(a)(4)		
	<input type="checkbox"/> 20.2203(a)(2)(iii)			<input type="checkbox"/> 50.36(c)(2)			<input type="checkbox"/> 50.73(a)(2)(v)(B)			<input type="checkbox"/> 73.71(a)(5)		
	<input type="checkbox"/> 20.2203(a)(2)(iv)			<input type="checkbox"/> 50.46(a)(3)(ii)			<input type="checkbox"/> 50.73(a)(2)(v)(C)			<input type="checkbox"/> 73.77(a)(1)		
	<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)(D)			<input type="checkbox"/> 73.77(a)(2)(i)		
	<input type="checkbox"/> 20.2203(a)(2)(vi)			<input type="checkbox"/> 50.73(a)(2)(i)(B)			<input type="checkbox"/> 50.73(a)(2)(vii)			<input type="checkbox"/> 73.77(a)(2)(ii)		
			<input type="checkbox"/> 50.73(a)(2)(i)(C)			<input type="checkbox"/> OTHER			Specify in Abstract below or in NRC Form 366A			

**12. LICENSEE CONTACT FOR THIS LER**

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

<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)

On April 26, 2017, ANO-2 was in day 28 of a refueling outage with the core completely off loaded to the spent fuel pool (SFP). Power to ANO-2 plant equipment was supplied from Start Up Transformer 2 (SU2) while SU3 was out of service for planned maintenance. 500kV and 161kV offsite power lines were in service. The area around the plant was experiencing severe weather from thunderstorms and tornado warnings had been issued from the National Weather Service for the four county area. Switchyard work was ceased.

At approximately 1002 CST switchyard breakers for 500kV lines opened on fault current. High winds had damaged the transmission towers approximately 16 miles away from ANO and caused phase to ground faults. This resulted in a loss of all offsite power lines to the 500 kV bus. The autotransformer also locked out, as designed, when the 500 kV transmission lines faulted.

When the 500kV bus tripped, the 4.16kV bus that feeds a vital 480 volt bus was subjected to a voltage transient; subsequently, the #1 emergency diesel generator (EDG) auto started. The EDG output breaker never closed due to the fact that voltage was restored to normal almost immediately. This EDG was secured due to running unloaded. Both SFP cooling pumps were out of service after the transient. A SFP cooling pump was restarted at 1020 CST. The temperature of the SFP did not change during this event.



**LICENSEE EVENT REPORT (LER)  
CONTINUATION SHEET**

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1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Arkansas Nuclear One, Unit 2	05000-368	2017	002	00

**NARRATIVE**

**A. PLANT STATUS**

Arkansas Nuclear One, Unit 2 (ANO-2) was operating at 0% rated thermal power with the core completely offloaded to the Spent Fuel Pool (SFP) when the condition was discovered. Startup Transformer No. 3 (SU3) (one normal off-site power source) and the 4160-volt bus 2A2 were out of service for planned maintenance. The 500kV transmission line to the substation at Pleasant Hill was out of service for planned maintenance. The area around the plant was experiencing severe weather from thunderstorms and tornado warnings had been issued from the National Weather Service for the four county area. There were no other structures, systems, or components (SSCs) that were inoperable at the time that contributed in the event.

**B. BACKGROUND**

The switchyard 500kV bus is a ring bus design, which allows transmission of 500kV power through three transmission lines to substations in Mabelvale, Ft. Smith, and Pleasant Hill, Arkansas. A fourth line supplies power to the bus tie auto-transformer. The autotransformer interconnects the 500kV and 161kV busses. It has two tertiary windings to provide 22kV power from the 500kV or 161kV busses to SU1, which supplies power to ANO-1, and to SU3, which supplies power to ANO-2. The 161kV bus is also a ring bus design, and includes two transmission lines to substations at Russellville East and Pleasant Hill, Arkansas, and a distribution line to the London, Arkansas, substation. It also supplies power to the SU2 which can supply power to both ANO-1 and ANO-2.

During normal operation of ANO-2, station equipment is supplied from the main generator through the Unit Auxiliary Transformer (UAT). During startup and shutdown conditions, the switchyard is used as a means of supplying station equipment from the utility grid through one of the startup transformers.

There are four 4160-volt buses. The main buses, 2A1 and 2A2 [EA], provide power to non-Engineering Safeguard Features (ESF) motors and supply transformers that feed 480-volt non-ESF load centers. The 4160-volt ESF buses, 2A3 and 2A4 [EB], are powered through 2A1 and 2A2, and supply equipment essential for the safe shutdown of the plant. Two 6.9kV buses, 2H1 and 2H2 [EA], supply the reactor coolant pumps. During shutdown, all of these buses are supplied from either SU3 or SU2.

SU3, which only supplies ANO-2, can support buses 2A1, 2A2, 2H1, and 2H2 simultaneously. Since SU2 has limited capacity and is shared by both units, it must be protected from overload. Procedures administratively limit automatic transfer of loads to SU2 only to ANO-1 buses A1 and A3, and ANO-2 buses 2A1 and 2A3. This is assured by normally maintaining the supply breakers from SU2 to ANO-1 buses A2, H1, and H2, and ANO-2 buses 2A2, 2H1, and 2H2 in pull-to-lock. In this condition, the associated supply breakers from SU2 to these buses will not close automatically after a loss of power from another power source.

Another source of power to ESF bus 2A3 / 2A4 cross-tie is the alternate AC diesel generator (AACDG). The AACDG is an independent, non-safety related power source intended to be used in the event of a station blackout (SBO). The AACDG is started using a touch screen in the ANO-2 Control Room or the AACDG building.



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Arkansas Nuclear One, Unit 2	05000-368	2017	002	00

**C. DESCRIPTION OF EVENT**

On April 26, 2017, ANO-2 was in day 28 of a refueling outage with a complete core off load that had moved all fuel to the SFP. Power to ANO-2 plant equipment was supplied from SU2 while SU3 was out of service for planned maintenance. 500kV lines to Fort Smith and Mabelvale, Arkansas, were in service. 161kV transmission lines to Russellville and Pleasant Hill, Arkansas, were also in service.

ANO- 1 was operating normally at full power. The area around the plant was experiencing severe weather from thunderstorms, and tornado warnings had been issued from the National Weather Service for the four county area. Switchyard work was ceased.

At approximately 1002 CST switchyard breakers for 500kV lines to Fort Smith and Mabelvale, Arkansas, opened on fault current. These two transmission lines run offsite in the same right-of-way. High winds had damaged the transmission towers approximately 16 miles away from ANO and caused phase to ground faults. This resulted in a loss of all offsite power lines to the 500 kV bus. The autotransformer also locked out, as designed, when the 500kV transmission lines faulted. This also resulted in an ANO-1 unplanned scram because the ANO-1 main generator was connected to the 500 kV bus with no transmission lines available (addressed in LER 50-313/2017-001-00).

When the 500kV bus tripped, 4160-volt bus 2A1, which feeds 2A3 vital 480 volt bus, was subjected to a voltage transient and the #1 EDG [EK] auto started. The EDG output breaker never closed due to the fact that 2A3 bus voltage was restored to normal almost immediately from SU2. This EDG was secured due to running unloaded. Bus 2A2 was out of service for maintenance. Both SFP cooling pumps were out of service after the transient (pumps required manual re-start following loss of power). A SFP cooling pump was restarted at 1020 CST. The temperature of the SFP did not change during the time no forced cooling was available. SFP temperature remained at approximately 91 °F.

**D. EVENT CAUSES**

The identified condition occurred due to a very short voltage transient on SU2. The voltage lowered to ~149.8kV and immediately restored to ~ 160kV. The transformer remained operable and capable of performing its required function. The #1 EDG performed as designed and remained capable of performing its 30-day mission time.

**E. CORRECTIVE ACTIONS**

The following corrective actions were completed upon identification

- Entered the Spent Fuel Pool Emergencies procedure and restarted both SFP cooling pumps.
- Secured the #1 EDG due to running unloaded.



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**F. SAFETY CONSEQUENCES**

This event had no actual safety consequences impacting plant or public safety. In general, when the unit is shut down, the Technical Specifications requirements ensure that the unit has the capability to mitigate the consequences of postulated accidents that are assumed to potentially occur during shutdown conditions. However, assuming a single failure and concurrent loss of all offsite or all onsite power is not required. The rationale for this is based on the fact that many Design Basis Accidents (DBAs) that are analyzed in Modes 1, 2, 3, and 4 have no specific analyses in Modes 5 and 6 or when the fuel is completely offloaded from the reactor vessel and placed in the SFP. Worst case bounding events are deemed not credible in Modes 5 and 6 or when the vessel is defueled because the energy contained with the reactor pressure boundary, reactor coolant temperature and pressure, and the corresponding stresses result in the probabilities of occurrence being significantly reduced or eliminated, and have minimal consequences.

The #1 EDG automatically started properly when a loss of AC power was detected, as designed. All other systems functioned normally.

**G. BASIS FOR REPORTIBILITY**

This event is reportable pursuant to the following criteria:

- 10 CFR 50.73(a)(2)(iv)(A) Any event or condition that resulted in manual or automatic actuation of any of the systems listed in paragraph (a)(2)(iv)(B) of this section. Paragraph (B)(8) of 10 CFR 50.73 lists "Emergency ac electrical power systems, including: emergency diesel generators (EDGs)".

The guidance provided in NUREG 1022 states under 10 CFR 50.73(a)(1):

*The holder of an operating license for a nuclear power plant (licensee) shall submit a Licensee Event Report (LER) for any event of the type described in this paragraph within 60 days after the discovery of the event.*

**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 reporting guidance states that term "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 LERs for the previous three years was performed. There were no similar events identified at ANO during this time period.

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