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U. S. Nuclear Regulatory Commission
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Washington, D. C. 20555

SUBJECT: Arkansas Nuclear One - Unit 2
Docket No. 50-368
License No. NPF-6
Licensee Event Report 50-368/91-015-00

Gentlemen:

In accordance with 10CFR50.73(a)(2)(ii)(B) enclosed is the subject report concerning emergency diesel generator design electrical load capacity.

Very truly yours,

James J. Fisicaro
Director, Licensing

JJF/TFS/mmg

Enclosure

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

FACILITY NAME (1) Arkansas Nuclear One, Unit Two

DOCKET NUMBER (2) 050003681004
PAGE (3) 4

TITLE (4) Inadequate Vendor Analysis Of Coolant Cross Flow Resulted In The Potential For Emergency Diesel Generators Having Been Unable To Provide Design Electrical Output For Worst Case Accident Conditions

EVENT DATE (5)			LER NUMBER (6)		REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
Month	Day	Year	Sequential Number	Revision Number	Month	Day	Year	Facility Names	Docket Number(s)
09	12	91	015	00	01	01	91		050003681004

OPERATING MODE (9) 1 THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §:

(Check one or more of the following) (11)

POWER LEVEL (10)	20.402(b)	20.405(a)(1)(i)	20.405(a)(1)(ii)	20.405(a)(1)(iii)	20.405(a)(1)(iv)	20.405(a)(1)(v)	20.405(c)	50.36(c)(1)	50.36(c)(2)	50.73(a)(2)(i)	50.73(a)(2)(ii)	50.73(a)(2)(iii)	50.73(a)(2)(iv)	50.73(a)(2)(v)	50.73(a)(2)(vi)	50.73(a)(2)(vii)	50.73(a)(2)(viii)(A)	50.73(a)(2)(viii)(B)	50.73(a)(2)(ix)	73.71(b)	73.71(c)	Other (Specify in Abstract below and in Text, NRC Form 366A)
100																						

LICENSEE CONTACT FOR THIS LER (12)

Name

Thomas F. Scott, Nuclear Safety and Licensing Specialist

Telephone number

Area Code 501964-5000

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

Cause	System	Component	Manufacturer	Reportable to NRC	Cause	System	Component	Manufacturer	Reportable to NRC

SUPPLEMENT REPORT EXPECTED (14)

EXPECTED SUBMISSION DATE (15)

Month Day Year

☐ Yes (If yes, complete Expected Submission Date) ☒ No

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

On September 12, 1991, COLTEC Industries, the vendor for ANO-2 emergency diesel generators, provided revised information that identified a problem with the generators' ability to provide design electrical load under worst case accident conditions. This information was provided to address an inquiry by ANO as part of an internal Electrical Distribution System Functional Inspection. A cross flow path between the cooling water systems for combustion inlet air and engine jacket cooling had been provided as part of the initial design. This cross flow path added additional heat burden to the air cooler resulting in reduced generator capacity. The reduced capacity would only have resulted in a problem during a large break loss of coolant accident with concurrent worst case (hottest) ambient conditions and coincident loss of normal cooling water supply requiring shifting to the emergency cooling pond and one diesel being unavailable. Corrective action was to shut an isolation valve in the cross flow path of each engine. This condition resulted in the plant having operated outside its design basis by potentially not having been able to ensure a safe shutdown during all design accident conditions.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)						PAGE (3)
		Year	Sequential Number	Revision Number				
Arkansas Nuclear One, Unit Two	05000368	91	015	00				02 OF 04

TEXT (If more space is required, use additional NRC Form 366A's) (17)

A. Plant Status

At the time this condition was discovered, Arkansas Nuclear One Unit 2 (ANO-2) was operating at 100% power (Mode 1) with Reactor Coolant System (RCS) [AB] temperature at 580 degrees and pressure 2250 psia.

B. Event Description

On September 12, 1991, information that identified a potential problem with the emergency diesel generators (EDGs') [EK] ability to provide design electrical load under worst case accident conditions was received from COLTEC Industries, the vendor for ANO-2 EDGs. This information was provided to address an inquiry by ANO as part of an internal Electrical Distribution System Functional Inspection.

The problem resulted from a cross flow path between the combustion inlet air cooler and jacket water cooler for each engine. The cross flow condition had been identified during the last refueling outage when thermal performance testing of EDG Service Water (SW) [BI] heat exchangers revealed that the Air Coolant SW heat exchanger design heat duty was less than the actual heat duty. Analysis of the test results at that time indicated that the heat exchangers would provide sufficient cooling to support long term design basis accident loads. The cross flow was measured at approximately 43 gpm. This cross flow path had been provided in the vendor's design. The jacket cooling water and combustion air cooling systems are connected at three points to allow coolant expansion when the engine is started and to allow these systems to be maintained warm when the diesel is in standby. When the diesel is running, two of these same points allow coolant to be exchanged between the systems (cross flow) which added additional heat burden to the air cooler and resulted in reduced generator capacity.

COLTEC provided to ANO an engineering assessment on August 30, 1991 that confirmed the EDGs' capability to supply required electrical load under worst case design basis conditions of SW and ambient temperatures. This assessment stated that results included consideration of 43 gpm cross flow between the air and jacket water cooling systems. However, on September 12, 1991, COLTEC revised this assessment based upon a re-evaluation of the cross flow effect. This new information predicted a reduced capacity at design conditions. The new information was evaluated by the ANO Mechanical Design Engineering. On September 16, 1991, it was determined that during prior periods of plant operation the EDG's could not have supplied the required electrical output if the design basis scenario described in the "Safety Significance" section would have occurred.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)						PAGE (3)
		Year	Sequential Number	Revision Number				
Arkansas Nuclear One, Unit Two	05000368	91	--	015	--	00		03OF04

TEXT (If more space is required, use additional NRC Form 366A's) (17)

C. Root Cause

The root cause of this condition is a failure of the EDG vendor, COLTEC Industries, to properly analyze the effect of coolant cross flow upon engine capacity as part of the original equipment design.

D. Corrective Action

Corrective action was to close a valve to isolate the cross flow path for each engine. This was based upon a recommendation from COLTEC. Since the purpose of this line was to provide warming during cold weather and the EDGs at ANO are in a controlled environment inside the Auxiliary Building [NF], there are no adverse consequences from having these valves normally closed. With the valves closed, the EDGs are capable of meeting required output at design conditions. The appropriate operating procedure has been revised to require that these valves be closed.

E. Safety Significance

The EDGs were operable during past summer conditions. The design conditions for which EDG capacity could have been inadequate were: large break Loss of Coolant Accident (LOCA) on Unit 2, temperature of the Emergency Cooling Pond at its Technical Specification limit at the start of the accident, outside ambient air temperature at 113 degrees (design hot day), an event that resulted in normal cooling water from Lake Dardanelle being unavailable and required all cooling loads (including Unit 1 shut down loads) being shifted to the Emergency Cooling Pond, and unavailability of one EDG. With these conditions, capability is projected to have been inadequate at various periods throughout the accident and by a maximum of approximately 228KW at 26.6 hours into the accident scenario. Since it is unlikely that these events could have occurred this condition is considered to have little safety significance.

F. Basis For Reportability

The design basis for the plant includes the requirements for EDG operability to ensure the capability for safe shutdown. Since this condition resulted in the plant not being able to meet this requirement for all design basis conditions, it represented a condition outside the design basis of the plant reportable pursuant to 10CFR50.73(a)(2)(ii)(B).

The condition was reported pursuant to 10CFR50.72(b)(1)(ii)(B) at 1647 on September 16, 1991.

A 10CFR21 report was made on this condition by COLTEC via fax on September 13, 1991 followed by a letter dated September 16, 1991.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)						PAGE (3)
		Year	Sequential Number		Revision Number			
Arkansas Nuclear One, Unit Two	05000368	91	--	015	--	00	04	OF 04

TEXT (If more space is required, use additional NRC Form 366A's) (17)

G. Additional Information

The Unit 1 EDGs were manufactured by a different vendor. Their configuration precludes the cross flow condition from occurring on the EDG heat exchangers.

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

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