

LICENSEE EVENT REPORT (LER)

(See reverse for required number of
digits/characters for each block)ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY
INFORMATION COLLECTION REQUEST: 500 HRS. REPORTED LESSONS LEARNED ARE
INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO INDUSTRY.
FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND
RECORDS MANAGEMENT BRANCH (T-8 F33), U.S. NUCLEAR REGULATORY
COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION
PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC
20503

FACILITY NAME (1)

Cook Nuclear Plant Unit 1

DOCKET NUMBER (2)

05000-315

PAGE (3)

1 of 3

TITLE (4)

Air System for Emergency Diesel Generators (EDG) May Not Support Long Term Operability Due to Original Design Error

EVENT DATE (5)			LER NUMBER (6)				REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER	
04	07	1999	1999	-- 011 --	00	05	04	1999	Cook Unit 2	05000-316	
OPERATING MODE (9)			THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)								
5			20.2201 (b)				20.2203(a)(2)(v)			50.73(a)(2)(i)	50.73(a)(2)(viii)
POWER LEVEL (10)			00				20.2203(a)(1)			X 50.73(a)(2)(ii)	50.73(a)(2)(x)
							20.2203(a)(2)(i)			50.73(a)(2)(iii)	73.71
							20.2203(a)(2)(ii)			50.73(a)(2)(iv)	OTHER
							20.2203(a)(2)(iii)			50.73(a)(2)(v)	Specify in Abstract below or in NRC Form 366A
							20.2203(a)(2)(iv)			50.73(a)(2)(vii)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Ms. M. B. Depuydt, Compliance Engineer	616/465-5901, x1589

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX

SUPPLEMENTAL REPORT EXPECTED (14)

X	YES (If Yes, complete EXPECTED SUBMISSION DATE).	NO	EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
				07	01	1999

Abstract (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

In February 1999, during the Expanded System Readiness Review of the Emergency Diesel Generator (EDG) system, the ability of the starting air/control air system to support long term operability of the EDGs was questioned due to the non-safety related design of the compressors. An operability determination was performed which concluded that the EDGs could not maintain long term operability without reliance on the non-safety related, non-seismic starting air compressors, and were therefore inoperable. On April 7, 1999 an ENS notification was made in accordance with 10CFR50.72(b)(2)(i), for an unanalyzed condition with potential safety significance.

The apparent cause of the inadequacy of the EDG starting/control air system is original design error. The designers apparently failed to consider that the starting air system provides the control air to the EDG, and loss of air could result in shutdown of the engine. A temporary modification to supply makeup air capability in Modes 5 and 6 is being prepared. Options for the permanent solutions are currently under review and the method selected will be implemented via a design change prior to restart of each unit.

The control air leakage rate and expected EDG run time without makeup air capability has not yet been quantified for the current system configuration. Testing is being conducted as part of the proposed temporary modification to quantify the expected leakage rate. Once the leakage rate is known, the results will be evaluated to determine the safety significance of the identified condition.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER(2)	LER NUMBER (6)				PAGE (3)
		YEAR	SEQUENTIAL NUMBER		REVISION NUMBER	
		1999	--	011	--	00

Cook Nuclear Plant Unit 1

05000-315

2 of 3

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

Conditions Prior to Event

Unit 1 was in Mode 5, Cold Shutdown

Unit 2 was in Mode 5, Cold Shutdown

Description of Event

On February 18, 1999, during the Expanded System Readiness Review of the Emergency Diesel Generator (EDG) system, the ability of the starting air/control air system to support long term operability of the EDGs was questioned due to the non-safety related design of the compressors.

The compressors, compressor drive motors, the piping between each compressor and the respective discharge check valve are not safety related components. Although the EDG starting air compressors are supplied from a Class 1E power source and are anchored per Seismic Class 1 criteria, they are neither safety related, or seismically qualified.

When this question arose, Operations requested additional information from Engineering, which led to an operability determination being performed. The determination considered the design function of the EDGs, the starting air compressors and the control air function of the starting air system. Central to the determination is the design function of the control air for the EDG, which is discussed in detail in the Analysis section of the LER, and the "mission time" or how long the EDGs would need to run after an accident.

In the course of performing the operability determination, no finite statement could be found in the design or licensing basis documentation that defined the mission time of the EDGs. A decision was made to use a value of seven days, which is supported by the Technical Specification requirements for the amount of fuel oil that is required to be on hand to run the EDGs.

Using this information, the operability determination concluded that the EDGs could not maintain long term operability without reliance on the non-safety related, non-seismic starting air compressors and were therefore inoperable.

Cause of Event

The cause of this event was a design deficiency in the EDG and its supporting systems that occurred during original plant design. The designers apparently failed to consider that the starting air system provides the control air to the EDG, and loss of control air could result in shutdown of the engine. Although the EDG starting air compressors are supplied from a Class 1E power source and are anchored per Seismic Class 1 criteria, they might not function in a seismic event because of their lack of qualification. The EDG air system was modified in 1994 and replacement compressors were installed, however, the replacement compressors were also classified non-safety.

Analysis of Event

On April 7, 1999, at 1601 hours EDT, an ENS notification was made in accordance with 10 CFR 50.72(b)(2)(i), any event found while the reactor is shut down, that, had it been found while the reactor was in operation, would have resulted in the nuclear power plant being in an unanalyzed condition that significantly compromises plant safety. This LER is therefore submitted in accordance with 10 CFR 50.73(a)(2)(ii)(A), for the same criteria.

The EDG system is a safety related system that provides reliable and readily available onsite AC power in the event of the loss of offsite power supply to the essential loads necessary to safely shutdown the reactor under any normal operating or accident conditions. The EDGs are designed to start automatically upon receipt of a safety injection signal and/or a loss of offsite power signal and be ready to accept loads within 10 seconds of receiving a start signal.

The starting air system supplies compressed air for starting the EDG. Each EDG has its own starting air system consisting of two redundant starting air compressors. Each compressor has one receiver of sufficient volume, 285 cubic feet, for at

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		1999	--	011	--	00

Cook Nuclear Plant Unit 1

05000-315

3 of 3

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least two EDG start attempts when pressurized to 220 psig. Each of the two starting air trains supplies starting air within the pressure range of 220 to 247.5 psig. Both starting air trains are independently actuated by the diesel engine control system upon receipt of an EDG start signal. If either compressor/receiver should fail the other is capable of starting the EDG. The system is designed to have the EDG at speed and ready to accept load within .10 seconds of start initiation. The starting air system also provides compressed air for the starting air supply valve actuators, the diesel engine control system and the turbocharger aftercooler cooling water regulating valves.

The starting air system consists of two independent trains of one air compressor and one air receiver each. Each starting air receiver is replenished by its associated starting air compressor that cycles as necessary to maintain the receiver air pressure between 220 and 247.5 psig. The air receivers also supply the diesel engine pneumatic control system with 100 psig air via pressure reducing valves. The 100 psig engine control air is required to maintain the throttle control cylinder's actuating rod retracted and thus maintain fuel flow to the engine. The minimum control air pressure required to maintain the throttle control cylinder's actuating rod fully retracted is 60 psig.

If the starting air compressors are unavailable to replenish the air receivers following an EDG start, the volume of air remaining to supply the control air requirements is limited. Based on pre-operational test data, starting air receiver pressure could range from 188 to 132 psig following an emergency start. It was postulated that the leakage from the system would result in a loss of air receiver pressure of approximately 25 psi in a twelve hour period. At this postulated leakage rate, the control air pressure could drop below the critical value of 60 psig in a period less than 7 days.

However, since the evaluation was based on engineering judgement, the actual leakage rate and expected EDG run time without air makeup after start of the engine has not been quantified for the current system configuration. Testing is being conducted as part of a temporary modification to quantify the leakage rate. When this testing is completed, the safety significance of the identified condition will be evaluated and provided as a supplement to this LER.

Corrective Actions

This condition was discovered with both units in cold shutdown. All four EDGs had previously been declared inoperable on January 11, 1999 due to HFA relay problems (see LER 315/99-001-00). No immediate corrective actions were necessary to maintain compliance with the Technical Specifications since the EDGs were already inoperable.

In order to support EDG operability in Modes 5 and 6, a method of supplying control air makeup for extended EDG operation, without reliance on the starting air compressors, will be established. This will be done via the temporary modification process, and any required operator actions will be controlled by an approved procedure. Prior to declaring any EDG operable, a test of the makeup air method will be performed to demonstrate the acceptability of operator actions and to verify performance of the makeup air source.

A permanent solution for the control air problem will be developed to restore conformance with the plant design basis and to support EDG operability in all Modes. Options for the permanent solution are currently under review and the method selected will be implemented via the design change process prior to restart of each unit.

Actions to prevent recurrence have been previously provided in AEP:NRC:1260GH, "Enforcement Actions 98-150, 98-151, 98-152 and 98-186, Reply to Notice of Violation Dated October 13, 1998", dated March 19, 1999.

Previous Similar Events

315/98-019-02	315/88-014-00
315/98-031-01	315/87-024-00
315/98-029-00	315/87-020-00
315/98-046-00	315/98-049-00