CATEGORY 1

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FACIL:50-400 Shearon Harris Nuclear Power Plant, Unit 1, Carolina 05000400

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DONAHUE,J.W.	Carolina Power & Light Co.
RECIP.NAME	RECIPIENT AFFILIATION

SUBJECT: LER 96-023-01:on 961114,design deficiency in EDG protection circuitry was identified.Caused by inadequate original plant design.Surveillance test procedures OST-1013 & OST-1073 revised.W/970529 ltr.

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NOTES:Application for permit renewal filed. 05000400

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MAY 29 1997

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Serial: HNP-97-110
10CFR50.73

SHEARON HARRIS NUCLEAR POWER PLANT UNIT 1
DOCKET NO. 50-400
LICENSE NO. NPF-63
LICENSEE EVENT REPORT 96-023-01

Sir or Madam:

In accordance with Title 10 to the Code of Federal Regulations, the enclosed revision to Licensee Event Report 96-023 is submitted. This revision provides additional information related to the design deficiency identified in the Emergency Diesel Generator protection circuitry.

Sincerely,

J. W. Donahue
Director of Site Operations
Harris Plant

JHE
Enclosure

IE22/1

c: Mr. J. B. Brady (HNP Senior NRC Resident)
Mr. L. A. Reyes (NRC Regional Administrator, Region II)
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NRC FORM 366 (4-95) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
EXPIRES 04/30/98

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY INFORMATION COLLECTION REQUEST: 50.0 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-6 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.

LICENSEE EVENT REPORT (LER)

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

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Harris Nuclear Plant Unit-1	50-400	1 OF 3

TITLE (4)

Design deficiency in Emergency Diesel Generator protection circuitry.

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 05000
11	14	96	96 --	023 --	01	5	29	97	FACILITY NAME	DOCKET NUMBER 05000

OPERATING MODE (9): 1

POWER LEVEL (10): 100%

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)

	20.2201(b)		20.2203(a)(2)(v)		50.73(a)(2)(i)		50.73(a)(2)(viii)
	20.2203(a)(1)		20.2203(a)(3)(i)	X	50.73(a)(2)(ii)		50.73(a)(2)(x)
	20.2203(a)(2)(i)		20.2203(a)(3)(ii)		50.73(a)(2)(iii)		73.71
	20.2203(a)(2)(ii)		20.2203(a)(4)		50.73(a)(2)(iv)		OTHER
	20.2203(a)(2)(iii)		50.36(c)(1)		50.73(a)(2)(v)		Specify in Abstract below or in NRC Form 366A
	20.2203(a)(2)(iv)		50.36(c)(2)		50.73(a)(2)(vii)		

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Johnny Eads Project Engineer - Licensing	(919) 362-2646

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS

SUPPLEMENTAL REPORT EXPECTED (14)				EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
	YES (If yes, complete EXPECTED SUBMISSION DATE).	X	NO				

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

On November 14, 1996, with the plant operating in Mode-1 at 100% power, a design deficiency was identified in the protection circuitry for the safety-related Emergency Diesel Generators (EDG). Section 8.3.1.1.2.14.g of the Harris Plant Final Safety Analysis Report (FSAR) states that "Protection is provided for the diesel generator and the safety related electrical system during periodic testing of the diesel generator coincident with a loss of off-site power by the voltage restrained over-current relay (51V) at the diesel generator feeder. This relay senses over-current due to overloading of the diesel generator in conjunction with reduction of voltage. The relay is arranged to trip the feeder breaker to the diesel generator."

During an engineering review resulting from NRC Generic Letter 96-01, the ability of the 51V relay to provide the described protection during a loss of off-site power (LOOP) event was questioned. Subsequent investigation concluded on December 4, 1996, that the relay would not provide this protection.

As a result of this condition, if a LOOP had occurred while the EDG was synchronized to the off-site electrical grid during periodic testing, the undervoltage relays for the safety-related 6.9 kV bus may not have actuated and the associated emergency sequencer would not have recognized the LOOP condition and sequenced the safety bus loads as required.

This condition was reported to the NRC on December 4, 1996 per 10 CFR 50.72 via the emergency notification system as operation outside the design basis of the plant. Immediate corrective actions included revising the applicable EDG test procedures to verify that stable grid voltage exists prior to paralleling and declaring the EDG inoperable during this testing. Additional corrective action included the design and installation of a modification to the EDG protection circuitry to return the system to its original functional design basis. The initial 10 CFR 50.73 LER was submitted on December 16, 1996. This revision provides additional information related to the deficient 51V relay configuration.

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Shearon Harris Nuclear Plant - Unit #1	50-400	96	023	01	2 OF 3

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

EVENT DESCRIPTION:

On November 14, 1996, with the plant operating in Mode-1 at 100% power, a design deficiency was identified in the protection circuitry for the safety-related Emergency Diesel Generators (EDG). Section 8.3.1.1.2.14.g of the Harris Plant Final Safety Analysis Report (FSAR) states that "Protection is provided for the diesel generator and the safety related electrical system during periodic testing of the diesel generator coincident with a loss of off-site power by the voltage restrained over-current relay (51V) at the diesel generator feeder. This relay senses over-current due to overloading of the diesel generator in conjunction with reduction of voltage. The relay is arranged to trip the feeder breaker to the diesel generator."

During an engineering review resulting from NRC Generic Letter 96-01, the ability of the 51V relay to provide the described protection during a loss of off-site power (LOOP) event was questioned. Subsequent investigation concluded on December 4, 1996, that the relay would not provide this protection. To simplify the discussion, the concern will be described for Division A of the onsite power system but is also applicable to Division B. To perform required Technical Specification surveillance testing of the EDGs, it is necessary to connect an EDG in parallel with the off-site power system. This is accomplished by connecting a running-EDG to its associated safety bus (closing EDG output breaker 106) while the safety bus remains connected to its associated non-safety bus through the two tie breakers (104 and 105). The non-safety bus is connected to the off-site power system via either the Start-up Transformer or the Unit Auxiliary Transformer. This electrical distribution system configuration allows the EDG to assume the additional load required for testing.

In the original design, if an EDG was in the test mode and a LOOP event occurred, the logic would have held the tie breakers between the non-safety bus (1D) and safety bus (1A-SA) closed with the objective of producing an overload condition on the safety bus while dragging the voltage down to allow operation of the bus undervoltage relay or the voltage controlled overcurrent relay (51V). The 51V is operational in the test mode only. The original EDG logic used the safety-related 6.9 kV bus undervoltage relays to detect a LOOP. The premise of the logic was that if the off-site power source was lost then the load on the diesel from connected loads would exceed of the EDG capacity and cause an undervoltage condition. To ensure that the connected load was large enough, the original logic inhibited, if the EDG was in the test configuration, the tripping of the 105 breaker by a LOOP detection relay (CR1/1748). However, if the available loading on the safety bus and non-safety bus did not exceed the capacity of the EDG, the UV on the safety bus (or the 51V) would not actuate and the sequencer would not receive a signal to perform its LOOP program. In summary, the evaluation of possible loading conditions revealed that the EDG would not respond as described in the FSAR when distribution system load was insufficient to actuate the 51V or UV relays.

This condition was reported to the NRC on December 4, 1996 per 10 CFR 50.72 via the emergency notification system as operation outside the design basis of the plant. This condition was then reported in LER 96-023, dated December 16, 1996. Corrective actions identified at that time included declaring the EDG inoperable during periodic testing and entering the appropriate Technical Specification Action Statements. In addition, the EDG protection circuitry was modified to provide protection from a LOOP during EDG load testing.

The EDG circuitry modification returns the onsite power system to its original functional design basis and minimizes the need for operator action if a LOOP occurs during EDG testing. This change also eliminates the need to declare the EDG inoperable during periodic testing. However, the modification required deviations from existing licensing commitments. Specifically, the deviations included:

1) The use of non-class 1E equipment to provide inputs to a Class 1E device in support of a safety function. The modification design takes credit for the response of the LOOP relay and its supporting power supply and inputs; and
2) The use of operator action as a contingency response in case the non-class 1E equipment fails to provide the automatic action.

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Shearon Harris Nuclear Plant - Unit #1	50-400	96	023	01	3 OF 3

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

EVENT DESCRIPTION: (cont.)
Because of these deviations, the EDG protection circuitry modification was determined to be an Unreviewed Safety Question. The proposed change was submitted to the NRC in accordance with 10 CFR 50.59(c) and 10 CFR 50.90 on April 18, 1997. On May 8, 1997, the NRC issued HNP License Amendment No. 72 approving the changes to the EDG protection circuitry.

CAUSE:
This condition was caused by inadequate original plant design.

SAFETY SIGNIFICANCE:
There were no actual safety consequences associated with this event. However, the HNP Probabilistic Safety Assessment (PSA) was used to estimate the increase in core damage risk if the EDGs are assumed to be unavailable when operated in parallel with off-site power. The model includes events representing the EDG being unavailable. The probability of the EDGs being unavailable was increased to account for an additional 24 hours per year per EDG. The increase in annual core damage frequency was found to be less than one percent, which is not considered to be risk significant in accordance with the EPRI PSA Applications Guide.

The HNP PSA model includes initiating events for a number of transients, such as reactor trip, turbine trip, loss of off-site power, and inadvertent safety injection. The model also includes various loss of coolant accidents, steam generator tube rupture, and ATWS scenarios. The calculated increase in annual core damage frequency of less than one percent represents the increased risk from the greater number of hours of the EDGs being unavailable. Operator action to return the EDG being tested to service is not credited. The change in core damage frequency includes the relative importance of the EDGs in mitigating the effects of the various scenarios included in the PSA.

This condition is being reported in accordance with 10 CFR 50.73.a.2.ii(B) as a condition that was outside the design basis of the plant.

PREVIOUS SIMILAR EVENTS:
There have been no previous deficiencies reported related to the design of EDG protection circuitry.

CORRECTIVE ACTIONS COMPLETED:
1. Surveillance test procedure OST-1013 (1A-SA EDG Operability Test - Monthly Interval) was revised on December 4, 1996.
2. Surveillance test procedure OST-1073 (1B-SB EDG Operability Test - Monthly Interval) was revised on February 17, 1997.
3. A modification to the EDG protection circuitry to return the system to its original functional design basis was installed and turnover completed on May 26, 1997 during Refueling Outage 7. Implementation of this modification included appropriate revisions to testing procedures and the Final Safety Analysis Report.

CORRECTIVE ACTIONS PLANNED:
None.