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Nuclear Business Unit

FEB 03 1997

LR-N970076

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Dear Sir:

HOPE CREEK GENERATING STATION
DOCKET NO. 50-354
UNIT 1
LICENSEE EVENT REPORT 97-001-00

This Licensee Event Report entitled "Emergency Diesel Generator and Fire Suppression System Interaction Results in the Plant Being in a Condition Outside of the Design Basis" is being submitted pursuant to the requirements of 10CFR50.73(a)(2)(ii)(B).

Sincerely,

Mark Bezille
General Manager -
Hope Creek Operations

LMK
SORC Mtg. 97-006

C Distribution
LER File

IE221

9702180233 970203
PDR ADOCK 05000354
S PDR

The power is in your hands.

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: 50.0 HRS.
REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE
LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD
COMMENTS REGARDING BURDEN ESTIMATES 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.

FACILITY NAME (1)

Hope Creek Generating Station

DOCKET NUMBER (2)

05000354

PAGE (3)

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TITLE (4)

Emergency Diesel Generator and Fire Suppression System Interaction Results
In The Plant Being In a Condition Outside of the Design Basis

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MCNTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
01	03	97	97	-- 001	-- 00	02	03	97	FACILITY NAME	DOCKET NUMBER
OPERATING MODE (9)		1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)							
POWER LEVEL (10)		100	20.2201(b)		20.2203(a)(2)(v)		x		50.73(a)(2)(i)(B)	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

Lisa Kepley, Licensing Engineer

TELEPHONE NUMBER (Include Area Code)

(609) 339-1106

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)

YES (If yes, complete EXPECTED SUBMISSION DATE).	NO	EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
	x				

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

On January 3, 1997 at 1958 hours, during a design review of the interface between the Emergency Diesel Generator (EDG) Room Fire Suppression System logic and the EDG Room Ventilation System logic, a common mode failure potential was discovered. As a result, all four EDGs were declared inoperable and Technical Specification Limiting Condition of Operation 3.0.3 was entered. A one hour report was made to the NRC in accordance with the requirements of 10CFR50.72(b)(1)(ii)(B) to report the condition as any event or condition during operation that results in the condition of the nuclear power plant being in a condition that is outside the design basis of the plant. A temporary modification to limit the interface between the systems was immediately implemented. Compensatory actions were taken in accordance with the Fire Protection Program. No reactor power reduction was necessary. The cause of this event is attributed to inadequate analysis to support the approved exception to the Standard Review Plan as described in Section 9.5.1.6.30 of the Hope Creek Updated Final Safety Analysis Report. Human performance issues contributed to the delayed identification of this problem. A design change to implement a permanent correction to the design deficiency is under review.

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PLANT AND SYSTEM IDENTIFICATION

General Electric - Boiling Water Reactor (BWR/4)
Emergency Diesel Generators; EIIS Identifier: EK
Fire Suppression System; EIIS Identifier: IC

IDENTIFICATION OF OCCURRENCE

Event Date: January 3, 1997
Event Time: 1958 hours
Problem Report: 970103128

CONDITIONS PRIOR TO OCCURRENCE

The plant was in OPERATIONAL CONDITION 1 (POWER OPERATION) at 100% of rated thermal power. There were no other structures, systems, or components that were inoperable at the beginning of the event that contributed to the event.

DESCRIPTION OF OCCURRENCE

On January 3, 1997 at 1958 hours, during a design review of the interface between the Emergency Diesel Generator (EDG) Room Fire Suppression System logic and the EDG Room Ventilation System logic, a common mode failure potential was discovered. Specifically, a failure of the non-Class 1E EDG Fire Suppression System (FSS) logic was determined to potentially impact the ability of the EDG Room Ventilation System recirculation fans to support EDG operation during specific degraded voltage conditions.

Upon discovery of this design deficiency at 1958 hours on January 3, 1997, all four EDGs were declared inoperable and Technical Specification Limiting Condition of Operation 3.0.3 was entered. A one hour report was made to the NRC in accordance with the requirements of 10CFR50.72(b)(1)(ii)(B) to report the occurrence as any event or condition during operation that results in the condition of the nuclear power plant being in a condition that is outside the design basis of the plant. A temporary modification to limit the interface between the systems was immediately implemented. Compensatory actions were taken in accordance with the Fire Protection Program. No reactor power reduction was necessary.

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ANALYSIS OF OCCURRENCE

The standby AC power system at Hope Creek consists of four independent Class 1E EDGs. Each EDG room is provided with an independent safety related ventilation system, each with two independent recirculation fans which circulate and cool the air in the associated EDG room. Temperature is maintained in a range suitable to ensure the reliable operation of the EDG and its associated equipment. This ventilation system is safety-related and is required for EDG operability.

Each EDG room utilizes an automatic carbon dioxide flooding system. The system is actuated by any one of seven thermal detectors located in the EDG room. This fire suppression system is non-safety related and supported by a non-Class 1E, uninterruptible power supply. System components have been seismically qualified. The fire dampers within the EDG room ventilation system utilize an electro thermal link release mechanism which causes the dampers to spring close when the link melts. The dampers are designed to close upon a FSS signal to maintain the required carbon dioxide concentration during the FSS operation. Melting of the link may be caused by 1) the heat of a fire or 2) an electric coil which energizes when the fire suppression system is actuated.

In November 1984, the damper manufacturer (Ruskin) issued a 10CFR21 notification indicating that the dampers may not fully close against ventilation system flow. As a result, a design change was implemented to trip the recirculation fans upon an FSS signal to support closure of the dampers and prevent leakage of carbon dioxide. The design change included the installation of an interposing relay (3ZZ relay) as the interface between the non-Class 1E FSS circuit and the Class 1E EDG room ventilation circuit that would trip the recirculation fan upon receipt of an FSS signal. The 3ZZ relay was purchased as a qualified Class 1E isolation device.

In February 1996, an NRC inspector was investigating a Fire Protection related issue which affected the EDGs. The inspector questioned the design basis of the interaction between the EDG room fire suppression system and the EDG room ventilation system. The NRC Inspector documented his findings in Inspection Report 354/96-03, dated April 26, 1996. Inspection Report 354/96-03 identified a concern relative to the interaction between Hope Creek's EDGs and the FSS.

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ANALYSIS OF OCCURRENCE (cont'd)

A telecon meeting between PSE&G management and NRC management was conducted on July 12, 1996. The objective of this telecon was to achieve a mutual understanding of the potential concern and establish a time frame for investigation and resolution. PSE&G provided the results of the investigation to the NRC in letter LR-N96296 dated October 4, 1996.

Inspection Report 354/96-09, dated December 5, 1996, contained a Notice of Violation of 10CFR50.59 in that the as-built configuration of the FSS did not meet the design description provided in specific sections of the UFSAR.

PSE&G re-evaluated the design of the EDG room fire suppression system based upon the information provided in the Inspection Report. This review determined that the approved exception to Standard Review Plan (NUREG-0800) criteria which is described in Section 9.5.1.6.30 of the UFSAR did not consider all required scenarios with regard to the recirculation fan trip.

The non-Class 1E FSS and the Class 1E EDG room ventilation systems interact through the 3ZZ relay which is a qualified Class 1E isolation device powered by non-Class 1E, non UPS electrical power. Upon initiation of the Fire Suppression System, the system is designed such that the non-Class 1E Fire Suppression System ES-1 electrical contact closes, energizing the Class 1E 3ZZ relay. This 3ZZ contact in the EDG room ventilation recirculation fan circuitry trips the safety related EDG room recirculation fan to assure closure of the dampers. In the event of a loss of voltage condition, when the EDGs are required to perform their safety function, the system was designed such that the non-Class 1E, non UPS backed 3ZZ relay could not energize and the fans would be available to support EDG operation.

In the event of sustained degraded voltage from the non-Class 1E offsite power sources (<92%), the EDG is required to start and load to support plant safe shutdown loads. It can be postulated that if a fault develops in the non-Class 1E Fire Suppression System, and the non-Class 1E degraded power remains available (above the 90% trip setpoint) the 3ZZ relay could energize. If not detected, this condition could prevent the fan from starting or trip the fan if running, and thus impact continuous operation of the associated EDG per UFSAR section 9.4.6.2.

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ANALYSIS OF OCCURRENCE (cont'd)

For non-LOP (Loss of Power) conditions (i.e., Loss of Coolant Accident, manual initiation of Core Spray logic, manual initiation of the EDG), the EDGs receive a start signal. As discussed in UFSAR section 15.6.5.2.1.1, the EDGs remain idling unloaded in anticipation of a LOP. If a LOP occurs, the same situations as above may occur. If no LOP occurs, the EDGs will operate without ventilation, however, no accident mitigation response is required. Therefore, the sustained degraded voltage is the most limiting scenario for this design deficiency.

Based on these findings, PSE&G concluded that a design discrepancy existed which resulted in Hope Creek operating outside of its design basis for conditions for which the EDG is required.

CAUSE OF OCCURRENCE

The cause of this event is inadequate analysis during plant construction to support the exception to the Standard Review Plan as described in Section 9.5.1.6.30 of the UFSAR. When the FSS was modified in 1985 to install the 3ZZ relay, PSE&G relied on Section 9.5.1.6.30 of the UFSAR as written to provide a licensing basis for implementing the design change without fully understanding the basis for this exception.

Several human performance issues led to the delayed identification of this problem including: 1) poor communications; 2) a mindset that no problem existed; and 3) a narrow focus on problem assessment.

ASSESSMENT OF SAFETY CONSEQUENCES

The Hope Creek EDG FSS is supported to Seismic II/I criteria and designed to preclude inadvertent actuation in a seismic event. There are no documented instances of EDG room fire detector failures or spurious actuations. However, as described in the UFSAR, in the event of an inadvertent actuation of the fire suppression system, only the associated EDG would become inoperable.

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ASSESSMENT OF SAFETY CONSEQUENCES (cont'd)

A Probabilistic Safety Analysis was performed to determine the probability of a loss of offsite power, and more than one inadvertent actuation of a fire suppression system. The calculated risk is $2.8 \text{ E-}7$ occurrences per year. This number is very conservative considering the scenario is limited to sustained undervoltage conditions of 90% - 92%.

There were no actual safety consequences and the probability of potential consequences was extremely low. In addition, Hope Creek has the capability of accommodating a LOP event with only 2 EDGs provided both are in the same mechanical division.

PREVIOUS OCCURRENCES

A review of Hope Creek LERs over the last two years revealed LER 95-037-00, LER 96-006-01, and LER 96-015-00 which involved design deficiencies which resulted in conditions of the plant being outside the design basis. The causes and corrective actions in LERs 96-006-01 and LER 96-015-00 were unrelated to this event. However, a corrective action as a result of LER 95-037-00 to ensure compliance with Hope Creek's design and licensing basis is ongoing.

CORRECTIVE ACTIONS

A temporary modification was implemented to disconnect the 3ZZ relay from the non-Class 1E Fire Suppression System circuit. Compensatory actions in accordance with the Hope Creek Fire Protection Program for the degraded fire protection system were implemented. These actions will remain in effect until permanent correction of the design deficiency is complete.

Permanent correction of the design deficiency will be completed prior to startup following the next refueling outage.

This occurrence and the lessons learned will be presented to the Training Review Group for approval by February 25, 1997. Training will be complete by December 31, 1997.

PSE&G will evaluate performance deficiencies for personnel involved and implement disciplinary actions as appropriate by February 23, 1997.