PSE&G

Public Service Electric and Gas Company P.O. Box 236 Hancocks Bridge, New Jersey 08038

Hope Creek Generating Station

August 28, 1994

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

Dear Sir:

HOPE CREEK GENERATING STATION
DOCKET NO. 50-354
UNIT NO. 1
LICENSEE EVENT REPORT 94-011-00

This Licensee Event Report is being submitted pursuant to the requirements of 10CFR 50.73(a)(2)(iv).

Sincerely,

R.J. Hovey
General Manager -
Hope Creek Operations

LAA/

Attachment
SORC Mtg. 94-059
C Distribution

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LICENSEE EVENT REPORT

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
HOPE CREEK GENERATING STATION	0 5 0 0 0 3 5 4	1 OF 5

TITLE (4): Reactor Protection System actuation - Reactor Scram during routine surveillance testing due to faulty test equipment

EVENT DATE (5)			LER NUMBER (6)					REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	*	NUMBER	*	REV	MONTH	DAY	YEAR	FACILITY NAME(S)	DOCKET NUMBER(S)
0 8	0 1	9 4	9 4	-	0 1 1	-	0 0	0 8	2 8	9 4		

OPERATING MODE (9)	1
POWER LEVEL %	1 0 0

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10CFR: (CHECK ONE OR MORE BELOW) (11)

	20.402(b)		20.405(c)	xx	50.73(a)(2)(iv)		73.71(b)
	20.405(a)(1)(i)		50.36(c)(1)		50.73(a)(2)(v)		73.71(c)
	20.405(a)(1)(ii)		50.36(c)(2)		50.73(a)(2)(vii)		OTHER (Specify in Abstract below and in Text)
	20.405(a)(1)(iii)		50.73(a)(2)(i)(B)		50.73(a)(2)(viii)(A)		
	20.405(a)(1)(iv)		50.73(a)(2)(ii)		50.73(a)(2)(viii)(B)		
	20.405(a)(1)(v)		50.73(a)(2)(iii)		50.73(a)(2)(x)		

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
Lou Aversa, Senior Staff Engineer - Technical	6 0 9 3 3 9 3 3 8 6

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS?	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS?
				no					

SUPPLEMENTAL REPORT EXPECTED? (14)	YES		NO	x	DATE EXPECTED (15)	MONTH	DAY	YEAR

ABSTRACT (16)

On 8/1/94, Instrument and Controls technicians (I&C techs non-licensed) were in the process of installing measuring and test equipment (M&TE) in order to perform an intermediate range neutron monitor (IRM) surveillance. As the final connection was being made, a spark occurred at the connector shocking the technician and causing two average power range monitors (APRM's) (one each in channel A and B) to invalidly indicate upscale high initiating a reactor scram. The plant response was per design and the operator response was appropriate and effective. The root cause was a damaged isolation transformer that placed a 120VAC signal on the IRM C cable shield. The voltage on the IRM C cable shield induced currents in the adjacent LPRM signal cables resulting in a sensed false high neutron flux input to APRM's C and D. Additionally, failure to inspect the test equipment prior to use, failure to perform routine activities which the technicians are trained to perform and inadequate procedural guidance to enable the testing to be performed in a safe manner, collectively contributed to this event. Corrective actions for this event include a program to provide periodic maintenance and inspection of non-calibrated test equipment and a review of the event with appropriate personnel for lessons learned in regard to the hazards to personnel and the plant when working with intentionally ungrounded equipment. Personnel have been instructed that any equipment which has been inadvertently bumped or dropped must be checked and repaired prior to use. Additionally, all procedures which utilize "floated" test equipment will be revised, as necessary, to provide clear instructions within the body of the procedure on how test equipment is to be "floated" and checked for personnel safety.

PLANT AND SYSTEM IDENTIFICATION

General Electric - Boiling Water Reactor (BWR/4)
Reactor Protection System (SB) EEIS Identifier (BH)
Neutron Monitoring System (SE) EEIS Identifier (JC)

IDENTIFICATION OF OCCURRENCE

TITLE (4): Reactor Protection System Actuation - Reactor scram during routine surveillance testing due to faulty test equipment

Event Date: 8/1/94
Event Time: 2055
This LER was initiated by Incident Report No. 94-131

CONDITIONS PRIOR TO OCCURRENCE

Plant in OPERATIONAL CONDITION 1 (Power Operation)
Reactor Power 100% of rated.

DESCRIPTION OF OCCURRENCE

On 8/1/94, Instrument and Controls technicians (I&C techs non-licensed) were in the process of installing measuring and test equipment (M&TE) in order to perform an intermediate range neutron monitor (IRM) surveillance. As the final connection was being made, a spark occurred at the connector shocking the technician and causing two average power range monitors (APRM's) (one each in channel A and B) to invalidly indicate upscale high initiating a reactor scram. The plant response was per design and the operator response was appropriate and effective.

ANALYSIS OF OCCURRENCE

The reactor protection system (RPS) design is based on two separate trip systems, A and B. Each of these trip systems has two independent trip logic channels, A1/A2 and B1/B2. A reactor scram occurs when either A1 or A2 and B1 or B2 channels are tripped.

The Neutron Monitoring System (NMS) sensor channels (R, S, T, and U) are part of the NMS and not the RPS. The output logics of the IRM system and APRM system are combined to actuate the logic of one of the four RPS logic channels. The NMS channel R, S, T, and U are run in separate conduits from other class 1E channels; likewise the RPS channels A1, A2, B1, and B2 are run in separate conduits from other 1E channels.

ANALYSIS OF OCCURRENCE (Con't)

The neutron monitoring channels are required to be verified operable by performance of a channel calibration at the frequencies specified in technical specifications. The channel calibration tests require the use of portable M&TE to generate simulated signals for setpoint verification. The portable equipment utilized during the channel calibration is powered via a portable 120VAC isolation transformer. The isolation transformers smooths surges and filters high frequency spikes. To prevent ground loops that would interfere with the channel calibration testing, the isolation transformer was intentionally ungrounded by removing the grounding prong from its power plug.

A review, conducted by a Significant Event Response Team (SERT), determined that the isolation transformer was internally and externally damaged. Some damage was apparent on the underside of the transformer, but this damage was not readily apparent, to the technicians, prior to the start of the testing. Internally, the transformer hot lead was contacting the outer case which energized the casing and ground side of the equipment when it was plugged in. Had the transformers' ground prong not been removed, the 120 VAC system breaker would have tripped when the transformer was plugged in. During the equipment setup portion of the channel calibration, the I&C tech attempted to connect a coaxial signal cable between the IRM "C" pre-amplifier and the maintenance and test equipment (M&TE). The technician had connected the coaxial cable to the pre-amplifier and was attempting to connect the coaxial cable to the M&TE. When the coaxial cable connector touched the M&TE output jack, the technician received a 120 VAC shock and heard the nearby HCUs scram.

NMS channel T consists of the SRM C, IRM C, IRM G, and the LPRM inputs to APRM C and APRM D. IRM C was undergoing channel calibration when the faulty equipment placed 120VAC on the shields of both the IRM C signal cable and low voltage input cable. The installed pre-amp is not grounded at this location, but rather at the IRM C drawer located in the main control room. The resulting current along the IRM shield induced transient currents in the shields of the adjacent LPRM signal cables. The LPRM cable shields are capacitively coupled to their center conductors (signal conductor). The induced currents that produced voltage gradients along the shield of the adjacent LPRM's, resulted in voltage and current spikes on the center conductor of the LPRM cables within the raceway for NMS channel T causing these LPRM's to spike upscale. These LPRM cables share raceways with the IRM C cables for slightly more than 200 feet. This essentially parallel cable run is considered a sufficient length to cause currents and voltages via inductive and capacitive coupling sufficient for the LPRM's to spike upscale, as the LPRM's operating current is extremely low (between 100 to 1000 micro amps.)

ANALYSIS OF OCCURRENCE (Con't)

The additional area of concern was the 120VAC shock received by the controls technician. Procedures did not give specific guidance on compensatory precautions to be taken (i.e. pre-use safety checks) prior to use of ungrounded M&TE.

SAFETY SIGNIFICANCE

This incident posed minimal safety significance as all plant systems functioned as required.

PREVIOUS OCCURRENCES

There has been one event reported where the installation of faulty test equipment resulted in an inadvertent ESF actuation. See LER 93-009-00. The previous event only referenced corrective actions in regard to the specific equipment involved in the event.

APPARENT CAUSE OF OCCURRENCE

The root cause of the scram was a damaged isolation transformer which produced a 120VAC signal on IRM C cable shield that caused an invalid APRM C and D upscale high. Additionally, failure to inspect the test equipment prior to use, failure to perform routine activities which the technicians are trained to perform and inadequate procedural guidance to enable the testing to be performed in a safe manner, collectively contributed to this event.

CORRECTIVE ACTIONS

Installed plant equipment that was subject to the transient voltage has been inspected and repaired as necessary.

Non-calibrated M&TE has been assigned a frequency for periodic inspection and maintenance as necessary. Maintenance department administrative procedures will be revised to assure that new test equipment is included within the program.

This event has been discussed with Maintenance - Controls Department personnel with emphasis placed on precautions when using ungrounded test equipment, and expectations regarding the use of potentially damaged equipment. This item will again be covered with all department personnel in scheduled training.

Maintenance personnel are checking the availability of test equipment and will attempt to purchase equipment that is better suited to meet the testing requirements and station safety standards.

CORRECTIVE ACTIONS

M&TE has been inspected for grounds and returned for restoration as necessary. Adaptors have been obtained to establish a standard method of floating test equipment.

Procedures governing work on plant systems requiring ungrounded interface will be revised as necessary to incorporate standardized floating techniques.

Training will be enhanced to include precautions when using ungrounded equipment, and acceptable methods for floating M&TE.

IRM and SRM calibration procedures are being revised, prior to their next scheduled performance date, to ensure a full scram condition will not result from a similar fault during testing.

Sincerely,

R.J. Hovey
General Manager -
Hope Creek Operations

LAA/

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