PSEG

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

Hope Creek Operations

April 17, 1990

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 90-003-00

This Licensee Event Report is being submitted pursuant to the requirements of 10CFR50.73(a)(2)(iv).

Sincerely,

J.J. Hagan
General Manager -
Hope Creek Operations

RBC/

Attachment
SORC Mtg. 90-037

C Distribution

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 6

TITLE (4): OFFSITE MARSH FIRE CAUSES TRANSMISSION LINE FAULTS WHICH RESULTS IN REACTOR SCRAM

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)
											SALEM NGS, UNIT 1	05000271
0 3	1 9	9 0	9 0	-	0 0 3	-	0 0	0 4	1 1	9 0	SALEM NGS, UNIT 2	05000274

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10CFR: (CHECK ONE OR MORE BELOW) (11)			
POWER LEVEL	0 9 8	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)	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
Richard Cowles, Senior Staff Engineer - Technical	6 0 9 3 3 9 3 4 3 1

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?
					\\\\\\\					

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

ABSTRACT (16)

On March 19, 1990 at 1850, a reactor scram occurred on low reactor vessel level (+12.5") when all feedwater pumps tripped in response to a loss of the primary and secondary condensate pumps. Following the scram, reactor vessel level decreased to below the High Pressure Coolant Injection (HPCI) and Reactor Core Isolation Cooling (RCIC) systems initiation setpoint (vessel level 2, -38"). The HPCI and RCIC systems automatically initiated and were utilized to restore vessel inventory to normal level.

Investigation subsequent to the event determined that the primary and secondary condensate pumps tripped in response to a perturbation in the station electrical distribution system caused by an electrical fault in an offsite 500KV transmission line. This electrical fault was caused by flashover between two phases of the transmission line as a result of combustion particles generated during an offsite marsh fire. Switchyard relay protection cleared the fault, and during this process, a voltage reduction was propagated through all station electrical distribution systems. Investigation and testing by PSE&G Nuclear Electrical Engineering Department concluded that the voltage reduction sensed at the 120VAC (control power) level was of sufficient magnitude and duration to cause the tripping of the condensate system, which ultimately resulted in the tripping of the operating feedwater pumps. Corrective actions include continuing discussions with the local municipality on control of marsh fires, reviewing all system responses to the scram, and reviewing possible electrical system enhancements to improve electrical system stability during transients.

PLANT AND SYSTEM IDENTIFICATION

General Electric - Boiling Water Reactor (BWR/4)
Condensate System (EIIS Designation: SG)
Feedwater System (EIIS Designation: SJ)
Offsite Electrical Distribution (EIIS Designation: FK)
Onsite AC Electrical Distribution (EIIS Designation: EC)
High Pressure Coolant Injection System (EIIS Designation: BJ)
Reactor Core Isolation Cooling System (EIIS Designation: BN)

IDENTIFICATION OF OCCURRENCE

Offsite Marsh Fire Causes Transmission Line Fault Which Results In Scram
Event Date: 03/19/90
Event Time: 1850
This LER was initiated by Incident Report No. 90-021

CONDITIONS PRIOR TO OCCURRENCE

The plant was in Operational Condition 1 (POWER OPERATION), with reactor power at 98% due to a feedwater heater drain cooler being isolated. Control room personnel were aware of a fire burning in marsh area outside of the owner controlled area in the vicinity of 500KV transmission line 5021 (Salem - Deans Switching Station line). The local municipality fire department and PSE&G's site fire department had responded to the marsh fire.

DESCRIPTION OF OCCURRENCE

On 3/19/90 at 1850, control room operators received multiple alarms and indications in the control room. The Nuclear Control Operators' (NCO, RO licensed) initial reaction to the alarms was that an inverter had failed, but being aware of the above described marsh fire, suspected some sort of limited electrical failure. He immediately verified all offsite power infeeds to be in the proper position, and noted that no indication of AC power failures were present (no AC electrical system alarms were present; only 1 DC electrical system alarm was annunciating).

Approximately 8 seconds into the event, the reactor scrammed on reactor vessel low level. The NCO immediately proceeded to the reactor feed portion of the inner control room panel, and noted that all condensate and feedwater pumps were tripped. When vessel level reached -38" (vessel level 2), the High Pressure Coolant Injection System (HPCI) and Reactor Core Isolation Cooling System (RCIC) initiated, along with other expected level 2 actuations and isolations.

DESCRIPTION OF OCCURRENCE, CONT'D

Vessel level was restored with HPCI and RCIC, and maintained with the feedwater system following reset. All rods were verified to be inserted, and at 1854, the scram was reset. With the following exceptions, all safety related and non-safety related systems responded as expected:

1. The full core display dimmed and went blank approximately 2 minutes into the event. Indication returned with no operator intervention about 5 minutes later.
2. The "A" Control Area Chiller (1AK400) tripped.
3. The "B" Reactor Recirc Motor Generator (MG) set scoop tube locked up and did not run back, as did the "A" MG set.
4. All primary and secondary condensate pumps tripped.

All immediate notifications were made, and an Unusual Event was declared at 1900 due to the HPCI injection. The Unusual Event was terminated at 1925. At 1925, another Unusual Event was declared due to the marsh fire that caused an operational condition change. This Unusual Event was terminated at 2035 when the marsh fire was declared under control.

APPARENT CAUSE OF OCCURRENCE

The primary cause of this event was a marsh fire outside of the owner (PSE&G) controlled area which caused the flashover of two phases of an offsite 500KV transmission line. The subsequent low voltage transient was propagated through all station electrical distribution systems. The low voltage transient, at the 120VAC tier, caused a trip of the condensate system, the tripping of the feedwater pumps via the condensate pump trip logic, and the reactor scram.

ANALYSIS OF OCCURRENCE

At 1850, a trip of the previously described 500KV line occurred due to flashover of two phases caused by ionized air and carbon ash generated by the fire. This is a well understood phenomena on high voltage lines when exposed to fire residue.

PSE&G Nuclear Electrical Engineering investigated the response of both the yard relay protection and the stations' in-house electrical distribution system response, and determined the following:

ANALYSIS OF OCCURRENCE, CONT'D

The phase to phase flashover caused the Hope Creek 500KV switchyard voltage to drop to approximately 50% of its normal voltage for a short period of time (3 to 4 cycles). Two breakers in the Salem switchyard opened and successfully cleared the fault. One of the breakers then closed to restore the line, as designed.

The voltage reduction in the Hope Creek switchyard was propagated through the other lower voltage systems within the station, but not at the same magnitude. The in-house 4KV and 7.2KV bus voltages dropped to about 80% of normal. This is due to the large inductive (motor) loads on the busses, which actually function to maintain bus voltage for a brief period of time (a few electrical cycles). Because the voltage transient was only on the order of 3 to 4 cycles, no bus undervoltage conditions were sensed on the higher voltage electrical busses, and no major equipment tripped due to bus undervoltage.

In contrast, the low voltage electrical systems (120 VAC) consist primarily of resistive loads and small motor loads which serve to draw voltage down further as line voltage decays. These busses dropped to about 50% of normal voltage, which was below the dropout threshold for many control system devices. Of particular interest in this instance is the temporary interruption of control power to the condensate system. The condensate system control circuitry responded to the voltage reduction by changing state and tripping the primary and secondary condensate pumps. When the condensate pumps tripped, all operating feedwater pumps tripped on a logic trip signal from the condensate pump trip logic, and the resultant low water level scram occurred.

PLANT TRANSIENT RESPONSE

In general, non-safety related loads fed from safety related busses through standard isolation have the capability of being restarted, via diesel back up, following a loss of power event. Motors are fed by motor control centers with in line starter contacts. The coils from this starter control are powered from 480/120 VAC control transformers within the breaker cubicle, and are energized with momentary start contacts, and then sealed in. A momentary dip below the dropout value of these starter coils, which is about 60 VAC, would de-energize and stop these loads. This does not affect the ability to restart these loads at any time.

PLANT TRANSIENT RESPONSE, CONT'D

With regard to the previously described system responses which did not occur as expected, investigation determined:

1. The power perturbation experienced by the full core display was unrelated to the transient and resulted primarily from an overload of the power supply feeding the display. Testing following the scram confirmed this. When multiple alarm lamps illuminated from the power supply following the scram, current was drawn and the lights dimmed to the point of appearing extinguished.

2. Control Area Chiller 1AK400 was the only safety related load affected by this transient. All its power and control circuitry has been verified to be safety related. Its control circuitry, however, contains normally energized (when operating), sealed in control relays which drop out in approximately 2 cycles. As previously noted, the voltage reduction transient existed for 3 to 4 cycles.

3. The "B" Recirc MG set scoop tube lockup was caused by de-energization of the K14A and/or the K1A relays. Based on the magnitude of the voltage dip, it is believed that the same relays on the "A" Recirc MG set did not drop out due to the tolerance (10%) of the relay setpoints (approximately 50 VAC). Dropout voltages are factory set and non-adjustable.

4. The primary and secondary condensate pumps were tripped on receipt false process control input signals, caused by a voltage dip in the interrogation voltage on the instruments sending these signals.

Submittal of this report also satisfies the requirements of Technical Specification 3.5.1, Action g., which directs submittal of a report within 90 days of an ECCS actuation to document the injection. As previously noted, HPCI initiated in response to the valid low level condition, and injected to the vessel for approximately two minutes. At the onset of the injection, vessel temperature was approximately 500 deg.F, with a vessel pressure of approximately 900 PSIG, and a HPCI discharge flow of 5600 GPM. As of the date of this event, HPCI has experienced eleven (11) injections to the vessel over the life of the plant. By design, 120 injections are permitted. Because of the early life of the plant, the HPCI nozzle usage factor has not been calculated.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION																		
FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)												PAGE (3)				
		YEAR	\\	NUMBER			\\	REV										
HOPE CREEK GENERATING STATION	05000354	90	-	0	0	3	-	0	0					0	6	OF	0	6

SAFETY IMPACT ASSESSMENT

This incident was bounded by analyses in the UFSAR for a scram, loss of feedwater flow, and total loss of offsite power. Based on review of the incident against these analyses by the Significant Event Response Team and the Nuclear Electrical Engineering Department, it has been concluded that all plant safety systems responded as required and designed. This incident posed no threat to plant safety or the health and safety of the general public.

PREVIOUS OCCURRENCES

No previous instances of unit trips at the Hope Creek or Salem Generating Stations have occurred due to electrical perturbations caused by offsite fires.

CORRECTIVE ACTIONS

1. PSE&G is continuing discussions with the local municipality to determine if the potential for marsh fires can be reduced by reed cutting, controlled burns, or other means.

2. This incident will be reviewed with all licensed personnel during upcoming requalification cycles by the Nuclear Training Department.

3. Nuclear Electrical Engineering is continuing to review this event to identify any necessary improvements which would enhance electrical system reliability during voltage transients.

Sincerely,

J. J. Hagan
General Manager -
Hope Creek Operations

RBC/

SORC Mtg. 90-037