NRC Form 366 (9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO 3150-0104
EXPIRES 8/31/85

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Susquehanna Steam Electric Station - Unit 1	0 5 0 0 0 3 8 7	1 OF 0 3

TITLE (4)
Unit 1 and Unit 2 Reactor Scram Due to Loss of ESS Transformer 111.

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 NAMES	DOCKET NUMBER(S)
1 2	0 2	8 5	8 5	0 3 4	0 0	1 2	3 1	8 5	SSES - Unit 2	0 5 0 0 0 3 8 8
										0 5 0 0 0

OPERATING MODE (9): 1

POWER LEVEL (10): 1 0 0

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

20.402(b)	20.405(c)	X 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, NRC Form 366A)
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 (AREA CODE)
T.N. Creasy	7 1 7 5 4 2 - 3 2 4 2

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

CAUSE	SYSTEM	COMPONENT	MANUFAC TURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFAC TURER	REPORTABLE TO NPRDS
C	E A	6 3	0 0 1 1	Y					

SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE)   X NO

EXPECTED SUBMISSION DATE (15): MONTH | DAY | YEAR

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

On December 2, 1985 at approximately 1504 a 'Sudden Pressure' relay associated with Emergency Safeguards System (ESS) Transformer 111 misoperated. This caused a trip of ESS Transformer 111 which normally supplies ESS buses 1C and 2C. The momentary power loss to the 1C and 2C busses and the associated AC distribution panels caused the speed of all three feedwater pumps on each unit to lockup (fail constant) and caused a simultaneous runback and lockup of the A reactor recirculation pumps. The speed of the A reactor recirc pump on each unit decreased slightly before locking up which caused reactor vessel water level to increase. Unit 1 scrammed on high vessel water level. Unit 2 scrammed on low vessel water level when attempts to restore feedwater level control were unsuccessful.

An uninterruptable power supply to the feedwater control circuitry has been added to Unit 1 and Unit 2. This will enable the feedwater system to respond to vessel level transients during electrical system perturbations.

4pp.

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

On December 2, 1985 at approximately 1504 a 'Sudden Pressure' relay associated with Emergency Safeguards System (ESS) Transformer 111 (EIIS Code: EA) spuriously actuated. This caused a trip of ESS Transformer 111 which normally supplies the 1C and 2C 4.16 KV ESS busses on Unit 1 and Unit 2, respectively. ESS busses 1C and 2C transferred to their alternate supply, ESS Transformer 211, as designed, and the C Diesel Generator started but did not pick up any load.

The momentary loss of power on Unit 1 to the 1C ESS bus and associated AC distribution panel 1Y218 during the transfer caused a loss of signal to the feedwater control circuitry and the A reactor recirculation pump circuitry. This caused a lockup (speed fails constant) of all three feedwater pumps and a lockup and runback of the A reactor recirc pump. The B reactor recirc pump was unaffected since its control circuitry is supplied by an uninterruptable power supply (UPS). The speed of the A reactor recirc pump dropped approximately 4% before locking up. Since feedwater flow was constant and reactor power (steam flow) decreased due to the drop in recirc flow, reactor vessel level began to rise. When vessel level reached +54 inches at 1508 hours the main turbine tripped and the Unit 1 reactor scrammed from 100% power on turbine control valve fast closure. During the event, two out of three status lights which energize to warn the operator of a feedwater control signal loss did not light. Two safety relief valves actuated to limit reactor pressure to 1080 psig and reseated satisfactorily. The Reactor Core Isolation Cooling (RCIC) System (EIIS Code: BN) automatically initiated when vessel level dropped to -27 inches and the A Reactor Feed Pump was reset to restore vessel level. The lowest vessel water level during the transient was -30 inches. The High Pressure Coolant Injection (HPCI) System (EIIS Code: BJ) was out of service for preventive maintenance work activities, but its automatic initiation setpoint was never reached.

A similar sequence of events occurred on Unit 2 which was operating at 81% power. The momentary loss of power to ESS bus 2C and AC power distribution panel 2Y218 caused the feedwater pumps to lockup and caused the A reactor recirc pump to lockup and runback. As described on Unit 1, this led to an increasing reactor vessel level. Actions to bring the transient under control caused vessel water level to decrease and the reactor scrammed on low vessel level (+13 inches) at 1510 hours. As on Unit 1, two of three status lights indicating a feedwater control signal loss failed to light. In addition, the feedwater controller outputs did not return to their pre-transient levels following the loss of power but remained downscale. The Main Steam Isolation Valves isolated when two out of four low level switches pick up (within their allowable tolerances). RCIC was manually started at -27 inches and HPCI was manually started for pressure and level control. The lowest reactor water level during the transient was approximately -32 inches. One safety relief valve was manually opened to limit reactor pressure to 1020 psig.

Plant modifications have been installed on both Unit 1 and Unit 2 to provide an uninterruptable power supply to the feedwater control circuitry. This will enable the feedwater system to respond to vessel level transients if electrical system perturbations occur. The Unit 2 feedwater control circuitry has been modified to enable the controllers to return to approximate

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LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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pre-transient outputs following a loss of power. The Unit 1 feedwater circuitry already functions in this manner. The feedwater control signal loss status lights have been repaired on both units. A study is currently being conducted to identify critical control room lights that are not normally lit. The results of this study will be used to develop methods to test these critical lights. The cause of the 'sudden pressure' relay failure is not known. The relay (Qualitrol 910 Series Rapid Pressure Rise Relay) was partially disassembled and inspected on site but a failure mechanism could not be identified. The relay has been returned to the manufacture for further analysis. In the interim, the sudden pressure relay trip function has been bypassed on all four ESS transformers (101, 111, 201, 211). The sudden pressure relays only provide transformer protection, and bypassing their function does not reduce the reliability of the ESS buses. Differential protection is still provided for all four ESS transformers.

SSES DCRDR Chronology

1980 - PP&L submits Preliminary Design Assessment (PDA) per NUREG-0660 and NUREG-0694. 42 HEDs scheduled for correction.

1981 - DCRDR Program Plan submitted.

1981 - General Physics hired; DCRDR initiated.

1982 - Supplement 1 to NUREG-0737 published, December.

1983 - Integrated schedule for emergency response elements submitted, per Supplement 1 to NUREG-0737.

1983 - NRC comments on DCRDR Program Plan.

1983 - DCRDR Summary Report submitted, as scheduled on Nov. 11. Committed to correcting all HEDs by May 1985.

1984 - March 12 meeting including NRC, SAI, PP&L, and GP to discuss review of the DCRDR. NRC described concerns over inadequate task analysis and some proposed corrective actions on HEDs. As a result, additional information was requested by the NRC (short term) in addition to a Supplemental DCRDR Summary Report (longer term).

1984 - May 1 - Letter from NRC regarding work not complete and commenting on 45 "To do" HEDs.

1984 - On-site audit of Susquehanna's DCRDR by NRC and consultants, October 1 - 4.

1985 - SER, based on the on-site audit, received by PP&L on January 31.

1985 - Supplemental Summary Report to the Detailed Control Room Design Review submitted by PP&L on March 1 indicates corrective actions to be implemented by June 1987 (over two years later than original commitment).

1985 - July 16 meeting with technical staff on open issues in DCRDR.

1985 - August 19, letter from Novak to Curtis (PP&L, VP) discussing open issues and scheduling management meeting.

1985 - August 28 meeting with PP&L management; one issue resolved - Implementation of committed corrective actions to be accomplished on both units by end of Unit 2 first refueling outage November 15, 1986.

1985 - November 27, 1985 subject letter from PP&L.