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AUTH.NAME AUTHOR AFFILIATION
KEISER,H.W. Pennsylvania Power & Light Co.
RECIP.NAME RECIPIENT AFFILIATION
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SUBJECT: Documents 911206 telcon re rept on 1D 125V DC battery failure w/degraded grid actuation.

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PP&L Pennsylvania Power & Light Company
Two North Ninth Street • Allentown, PA 18101-1179 • 215/774-5151

Harold W. Keiser
Senior Vice President–Nuclear
215/774-4194

DEC 31 1991

Director of Nuclear Reactor Regulation
Attention: Mr. C. L. Miller, Project Director
Project Directorate I-2
Division of Reactor Projects
U.S. Nuclear Regulatory Commission
Washington, DC 20555

SUSQUEHANNA STEAM ELECTRIC STATION
50.9 REPORT ON 1D 125V DC BATTERY FAILURE
WITH DEGRADED GRID ACTUATION **Docket Nos. 50-387**
PLA-3706 **FILE R41-2** **and 50-388**

Dear Mr. Miller:

The purpose of this letter is to document the phone call of December 6, 1991 among NRC-Region personnel (Mr. J. White and staff), NRC-NRR personnel (Mr. J. Raleigh and staff) and PP&L personnel (Mr. J. Kenny and staff). The subject of the phone call was that the failure of the 1D 125V DC battery was not adequately addressed in our proposal to raise the degraded grid setpoint from 84% to 93% (PLA-3452, dated October 19, 1990). This inadequacy was discovered during the disposition of an engineering discrepancy report on the failure of the 1D 125V DC battery resulting in inadequate voltages. This engineering discrepancy was reported to the NRC in PLA-3436 dated September 24, 1990. A discussion of the specific concern follows:

For a Unit 1 LOCA with the failure of the "1D" 125V DC battery, the Plant Auxiliary LOCA Load Shed scheme is not actuated and does not perform its function. With the loss of the Plant Auxiliary LOCA Load Shed scheme, the plant auxiliary loads from Auxiliary Buses 11A and 11B are not shed. The failure of these loads to shed causes a degraded voltage condition on the 1A and 1C 4.16Kv ECCS buses at approximately 45 seconds after the start of the event. The degraded 4.16Kv bus voltage causes the degraded grid protection scheme

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to actuate which transfers the source of power to an alternate source. During the transfer the ECCS pumps which are connected to the 1A and 1C buses lose power and reset their starting sequence timers. This loss of power and resetting causes interruption to some ECCS injection to the vessel. After alternate power is supplied to the bus and the ECCS pumps have restarted, the ECCS flow is restored within approximately 19 seconds. During this time frame, the required number of operating ECCS pumps does not meet the number described in the FSAR. PP&L has analyzed the effect on peak clad temperature due to this interruption and has determined that any heatup of the fuel during this flow interruption does not exceed the heatup during the same period of time as predicted by the existing LOCA break spectrum analyses for a 100% recirculation pump suction line break. Therefore, fuel peak clad temperature is no worse than the current analysis.

A detailed time line for the Unit 1 A Recirc. Suction Line Break is provided as Attachment A. Attachment B contains the minimum equipment required to operate in the current analysis.

In addition to the above, the following other scenarios were evaluated:

- *Recirculation Discharge Line Break On Unit 1 And The 1D 125V DC Battery Failure*

  For a recirculation discharge line break, the operation and availability of RHR and Core Spray is identical to the recirculation suction line break. However, for this event the injection into the vessel does not occur until approximately 78 seconds from the initiation of the event, based on the pressure permissive interlock to the RHR and Core Spray injection valves. Therefore, the interruption of RHR and Core Spray pump operation does not impact the capability of mitigating a recirculation discharge line break since the ECCS pumps are restarted and are at rated speed before injection could occur.

- *Affect On Unit 2 Equipment Operation Due To A Unit 1 LOCA With A 1D Battery Failure*

  For a Unit 1 LOCA with Unit 1D battery failure, the Unit 2 4.16Kv voltages on busses 2A and 2C drop below the 93% degraded grid setpoint and do not recover above the degraded grid timer reset voltage. Since the LOCA is not on Unit 2, the 5 minute timer on the 2A and 2C buses governs the transfer of these buses to an alternate power source.

  The automatic load tap changer on startup transformer 10 is expected to readjust and reestablish the bus voltages above the timer reset voltage. A failure of the tap changer to readjust during the 5 minute period will actuate the degraded grid scheme and transfer buses 2A and 2C to an alternate power supply.

During this time period, the voltage on the Unit 2 4.16Kv buses 2B and 2D are unaffected. Per FSAR Table 8.3-1 the equipment necessary for safe shutdown of Unit 2 with a Unit 1 LOCA can be supplied from one division.

Therefore, although the Unit 2 4.16Kv voltages on 2A and 2C are degraded for a period of time, possibly as long as 5 minutes, sufficient equipment is available on Unit 2 to achieve safe shutdown.

Unit 2 LOCA With A Unit 1D Battery Failure

For a Unit 2 LOCA with battery 1D single failure, the Unit 2 13.8Kv auxiliary load shed scheme fails, which results in additional 13.8Kv loads being transferred to startup bus 20 at approximately 45 seconds. Although specific voltage calculations are not available for analysis of the effects of a Unit 2 LOCA with the Unit 1D battery failure, it is reasonable to assume that the interruption of core cooling flow is no worse than the interruption of coolant injection for a Unit 1 LOCA. This conclusion is based on the fact that more low pressure ECCS equipment (RHR 2D pump and Core Spray 2D pump) in Unit 2 remains in operation during the period of concern than for the Unit 1 LOCA. Therefore, the Unit 1 LOCA is more limiting.

Based on the above, this issue has little safety significance for Susquehanna SES; however, Pennsylvania Power & Light Company is reporting this issue under 10 CFR 50.9 based on its possible effect on other plants.

Pennsylvania Power & Light Company has formed a team to investigate how this information was missed in the submittal to raise the degraded grid setpoint. Information from this investigation will be made available to the Senior Resident Inspector by the end of the First Quarter of 1992.

If you have any questions, please contact Mr. C.T. Coddington at (215) 774-7915.

Very truly yours,

H. W. Keiser

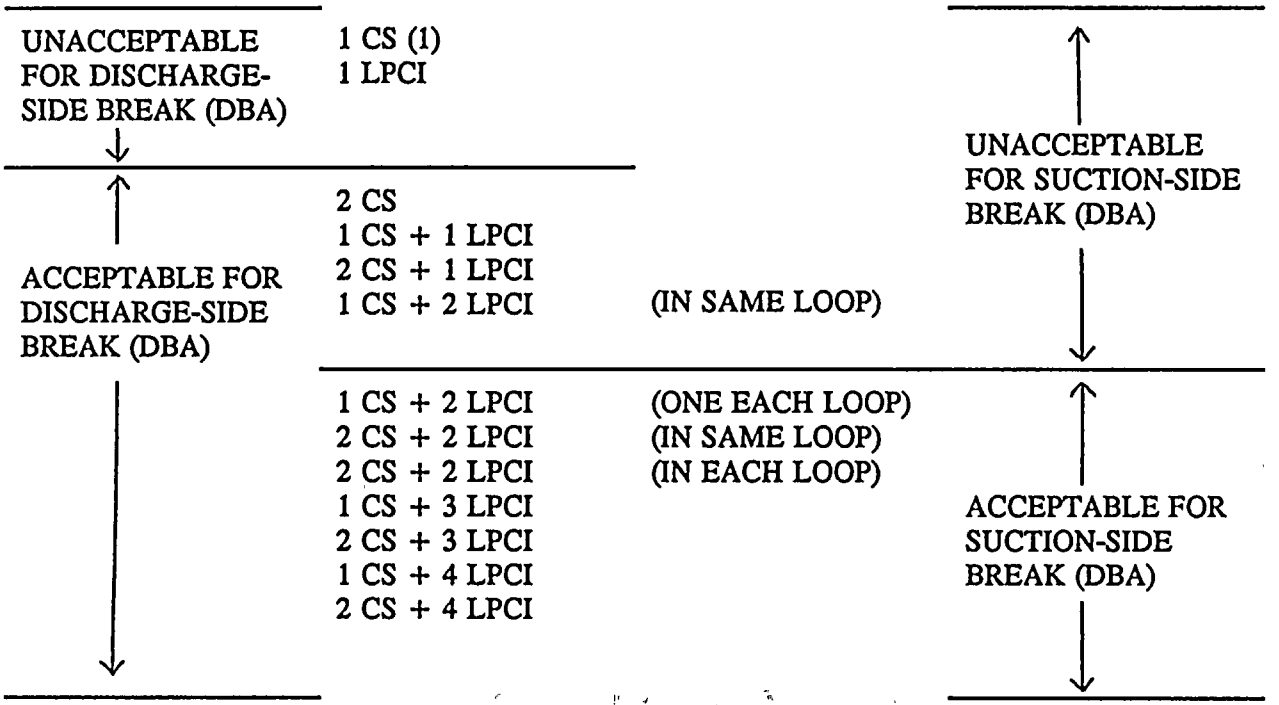
Attachment

cc: NRC Document Control Desk (original)
NRC Region I
Mr. G. S. Barber - NRC Resident Inspector
Mr. J. J. Raleigh - NRR Project Manager

UNIT 1D BATTERY FAILURE
A RECIRC. SUCTION LINE
UNIT 1 LARGE BREAK LOCA, T10 & T20 IN SERTICE

T = 0	HIGH DRYWELL PRESSURE, D/G START (A,B,C), D BATTERY FAILS.
T = 5.3	START RHR A & B.
T = 12.8	START RHR C / RHR A & B AT RATED SPEED.
T = 20.3	START CORE SPRAY A, B, & C / RHR C AT RATED SPEED.
T = 23.4	CORE SPRAY A, B, & C AT RATED SPEED.
T = 38	VESSEL PRESSURE IS APPROXIMATELY 400 PSI. RHR & CORE SPRAY INJECTION VALVES START TO OPEN.
T = 44	VESSEL PRESSURE IS APPROXIMATELY 280 PSI. RHR B & CORE SPRAY A, B, & C START TO INJECT.
T = 45+/-2	UNIT 1 TRIP, AUX. LOAD TRANSFER INITIATED, AUX. LOAD SHED SCHEME FAILS DUE TO D BATTERY FAILURE, DEGRADED VOLTAGE <93% OCCURS ON 4.16Kv BUSES 1A & 1C.
T = 46.3	START ESW A & B.
T = 50	CORE SPRAY INJECTION VALVES FULLY OPEN.
T = 50.3	START ESW C.
T = 52	VESSEL PRESSURE IS APPROXIMATELY 200 PSI, INITIATE RECIRC. DISCHARGE VALVE CLOSING.
T = 55	10 SECOND DEGRADED GRID TIMER TIMES OUT ON 4.16Kv BUSES 1A & 1C, TRIP 4.16Kv LOADS ON BUSES 1A & 1C, INITIATE TRANSFER OF BUS 1A TO ALTERNATE SOURCE (T20 THRU XFMR OX203), INITIATE TRANSFER OF BUS 1C TO D/G C, AND RHR A RESTARTS. ESW A & C DO NOT RESTART AUTOMATICALLY.
T = 56	D/G SUPPLIES 4.16Kv BUS 1C.
T = 59	RESTART RHR C.
T = 62	RHR INJECTION VALVES FULLY OPEN.
T = 66.5	RHR C AT RATED SPEED, RESTART CORE SPRAY C.
T = 70	CORE SPRAY C AT RATED SPEED, RESTART CORE SPRAY A.
T = 73.3	CORE SPRAY A AT RATED SPEED.
T = 85	RECIRC. DISCHARGE VALVE FULLY CLOSED.

GENERAL ELECTRIC ECCS COMBINATIONS



(1) CORE SPRAY REQUIREMENTS ARE FOR NUMBER OF EFFECTIVE LOOPS, NOT THE NUMBER OF OPERATING PUMPS.