PHILADELPHIA ELECTRIC COMPANY

2301 MARKET STREET

P.O. BOX 8699

PHILADELPHIA, PA. 19101

(215) 841-4502

JOHN S. KEMPER
VICE-PRESIDENT
ENGINEERING AND RESEARCH

JUN 05 1984

Mr. A. Schwencer, Chief
Licensing Branch No. 2
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Docket Nos.: 50-352
50-353

Subject: Limerick Generating Station, Units 1&2
Control Systems Failures

Reference: Letter from A. Schwencer to E. G. Bauer, Jr. dated February 1, 1984.

File: GOVT 1-1 (NRC)

Dear Mr. Schwencer:

Your reference letter requested additional information to complete the review of our responses to questions 421.10 and 421.11. Attached are the responses to the questions transmitted by the reference letter. The attachment to this letter completes our submittal of information necessary to satisfactorily close open item thirteen of the Limerick SER.

Sincerely,

J. W. Gallagher
for
J. S. Kemper

JLP/gra/0515841015

cc: See Attached Service List

B001
1/1

cc: Judge Lawrence Brenner (w/enclosure)
Judge Richard F. Cole (w/enclosure)
Troy B. Conner, Jr., Esq. (w/enclosure)
Ann P. Hodgdon, Esq. (w/enclosure)
Mr. Frank R. Romano (w/enclosure)
Mr. Robert L. Anthony (w/enclosure)
Charles W. Elliot, Esq. (w/enclosure)
Zori G. Ferkin, Esq. (w/enclosure)
Mr. Thomas Gerusky (w/enclosure)
Director, Penna. Emergency Management Agency (w/enclosure)
Angus R. Love, Esq. (w/enclosure)
David Wersan, Esq. (w/enclosure)
Robert J. Sugarman, Esq. (w/enclosure)
Spence W. Perry, Esq. (w/enclosure)
Jay M. Gutierrez, Esq. (w/enclosure)
Atomic Safety & Licensing Appeal Board (w/enclosure)
Atomic Safety & Licensing Board Panel (w/enclosure)
Docket & Service Section (w/enclosure)
Martha W. Bush, Esq. (w/enclosure)
Mr. James Wiggins (w/enclosure)
Mr. Timothy R. S. Campbell (w/enclosure)
Ms. Phyllis Zitzer (w/enclosure)
Judge Peter A. Morris (w/enclosure)

RESPONSES TO REQUESTS FOR ADDITIONAL INFORMATION ON LIMERICK CONTROL SYSTEM FAILURE EVALUATION ANALYSES

1. Appendix B of the "Control Systems Failures Evaluation Report" provides the criteria for elimination of systems and components from the control systems failure analysis. Regarding these criteria:

   (a) Criterion N6 eliminates systems not used during normal power operations. Start-up, shutdown and refueling systems are not evaluated. It is the staff's concern that control system failures during plant evolutions where water level, pressure or reactivity are changing in response to turbine load or an operator's command may be of greater consequence than failures at steady state conditions. Therefore, the evaluation should be revised, or additional justification provided to support this criterion.

   (a) RESPONSE:

   The methodology employed in the Control Systems Failures Evaluation is directed towards analyzing the automatic transient response of the plant during normal power operations. The startup, shutdown and refueling modes, in general, pose a less threatening condition than normal power operations.

   To further address this question, in the case of the Limerick Generating Station note that the application of Criterion N6 resulted in the exclusion of fourteen (14) systems.* Five (5) of these systems (Diesel Oil Storage and Transfer, Fuel Oil Storage and Transfer, Auxiliary Boiler, Auxiliary Steam, and Refueling Interlock) were also eliminated by Criterion N5. Three (3) other systems (RHR Service Water Radiation Monitoring, Primary Containment Post LOCA Radiation Monitoring and Post Accident Sampling) were also eliminated under Criterion N2. Two (2) systems (Diesel Generator and Diesel Generator Enclosure Ventilation) were also eliminated under Criterion N8. One (1) system (MSIV LCS) was also excluded under both Criterion N5 and Criterion N6. The remaining three (3) systems (Combustible Gas Control, Fire Protection and Suppression, and Remote Shutdown) are not used in normal startup, shutdown, and/or refueling operations. Note also that the Remote Shutdown System is powered by a 1E source.

*Complete System Elimination List Attached.

(b) Criterion N2 eliminates operator actions as a result of indications. It is the staff's concern that operator response to erroneous indication could exacerbate the control system failure. Therefore, the evaluation should be revised or additional justification provided to support this criterion.

(b) RESPONSE:

The methodology of Control Systems Failure Analysis deals with electrical failure only, and as such, does not model operator actions. This approach is consistent with the original questions (421.10 and 421.11) leading to the Analysis. Electrical failures within systems provide indications to an operator, but the resultant operator action is not part of the analysis. Operator error is, however, considered in the events analyzed in the FSAR Chapter 15.

(c) Criterion N5 eliminates systems or components which cannot affect reactor parameters within 30 minutes of the loss. It is the staff's concern that the 30 minute criterion may not allow sufficient time to detect a failure and either restore the failed components to operable status or place the reactor in safe condition. Therefore, the evaluation should be revised or additional justification provided to support this criterion.

(c) RESPONSE:

The FSAR/Licensing criteria for operator response is that no action is credited as mitigating the event until 10 minutes past event initiation. All the major reactor parameters are monitored and alarmed for all systems, including the control systems, so that appropriate steps can be taken to detect a failure and place the reactor in a safe condition. Using a 30 minute time frame is then conservative and with control room indication of the power loss, should provide more than sufficient time to restore the failed component to an operable status or to begin placing the reactor in a safe condition.

(d) Criterion N8 eliminates safety systems except for their response to conditions brought about by control systems failures. The evaluation should be revised to include a confirmation that where a safety system response was required one additional random, non-mechanistic failure was considered within the responding safety system.

(d) RESPONSE:

The original question (421.10 and 421.11) did not include a requirement for the assumption of one additional random failure. However, all events considered here are bounded by Chapter 15 analyses which consider the effects of additional single failures or operator errors. In addition, assuming an additional failure beyond the initiating event would change the frequency classification from a transient event to an accident event. Accident

events are less frequent than transient events and therefore, less restrictive limits would be applied to the results of the analysis.

2. Although the criteria for elimination of systems and components from the "Common Sensor Evaluation Report" has not been provided, it appears from statements contained in Section 3.1 of the Report that the criteria from the "Control Systems Failure Evaluation Report" were used. Provide the criteria used for the "Common Sensor Evaluation Report" to eliminate systems and components from the evaluation. If this criteria is the same criteria used for the "Control Systems Failure Report" address those concerns identified in Question 1 above.

2. RESPONSE:

The same criteria for the elimination of systems and components was used for the "Common Sensor Evaluation Report" as for the "Control Systems Failure Evaluation Report." The responses to Question 1 apply equally to both reports.

3. The NRC Staff's question on instrument sensing line failures (421.11) requested confirmation that a single failure in a common instrument line or tap would not defeat required protection system redundancy. Section 4.0 of the "Common Sensor Failure Evaluation Report" which includes a summary of the results of the study does not address this concern. From a review of Table 4.1 it appears that certain failures can disable redundant engineered safety feature functions (e.g., instrument line #3 - manual initiation of MSIV leakage control inoperable). It is the staff's concern that a single failure such as a plugged instrument tap could result in failures of multiple instrument channels. Such failures in combination with a design basis event may not be bounded by a Design Basis Event, therefore, evaluation should be revised to address the above stated concerns.

3. RESPONSE:

Section 2.0, which provides the generalized conclusions of the report, states that a single failure in a common instrument line would not defeat the required protection system redundancy. Section 4.0 details the interaction of consequences arising from the analysis. The example iterated in the question is not an exception since in each case listed, there is a loss of 1-out-of-2 only (one is a back-up to the loss of the other).

MPL	SYSTEMS	REASON
VI.	LEAK DETECTION SYSTEMS	
M25	MAIN STEAM LINE LEAK DETECTION	
M25	RCIC SYSTEM LEAK DETECTION	
M25	RWCU SYSTEM LEAK DETECTION	
M25	HPCI SYSTEM LEAK DETCTION	
M43	RECIRC. PUMP SEAL LEAK DETECTION	
M25	RHR SYSTEM LEAK DETECTION	
M61	DRYWELL LEAK DETECTION	N2
M61	SAFETY/RELIEF VALVE LEAK DETECTION	N2
M41	REACTOR VESSEL HEAD LEAK DETECTION	
M52	CORE SPRAY SYSTEM LEAK DETECTION	
VII.	RADIATION MONITORING SYSTEMS	
	AREA RADIATION MONITORING	
M26	SOUTH STACK EFFLUENT RADIATION MONITORING	
"	NORTH STACK " " "	
"	MAIN STEAM LINE RADIATION MONITORING	
"	REACTOR ENCLOSURE VENT. EXHAUST	
"	REFUELING FLOOR VENT. EXHAUST RAD. MONITORING	
"	CONTROL ROOM VENT. RADIATION MONITORING	
"	CONTROL ROOM EMERGENCY FRESH AIR	
"	PRIMARY CONTAINMENT POST-LOCA RAD. MONITORING	N6/N2
"	RHR SERVICE WATER RADITION MONITORING	N6/N2
"	STAND-BY GAS TREATMENT SYSTEM	
"	CHARCOAL OFF-GAS TREATMENT VENTILATION	
"	CHARCOAL OFF-GAS TREATMENT EFFLUENT	
"	RECOMBINER COMPARTMENT H_2 /O_2 ANALYZER	
"	STEAM SEAL EFFLUENT RADIATION MONITORING	
"	RADWASTE ENCLOSURE VENT. EXHAUST	
"	AIR EJECTOR OFF-GAS EFFLUENT	
"	PRIMARY CONTAINMENT LEAK DETECTION	
"	HOT MAINTENANCE SHOP VENT. EXHAUST	N3
"	LIQUID RADWAST DISCHARGE	
M26	SERVICE WATER RADIATION MONITORING	
VIII.	RADWASTE SYSTEM	
M69,70	GASEOUS RADWASTE	N3
M61,62, 63,64	LIQUID RADWASTE	N3
M66,67	SOLID RADWASTE	N3

MPL	SYSTEMS	REASON
III.	AUXILIARY SYSTEMS	
M20	DIESEL GENERATOR	N6/N8
M20	DIESEL OIL STORAGE & TRANSFER	N5/N6
M20	FUEL OIL STORAGE & TRANSFER	N5/N6
M20	AUXILIARY BOILER	N5/N6
M21	AUXILIARY STEAM	N5/N6
	NON-CLASS 1E BATTERY	
	CLASS 1E BATTERY	
M22	FIRE PROTECTION & SUPPRESSION	N6
M15	COMPRESSED AIR SYSTEM	
M24	CHLORINATION SYSTEM	N5
M68	PLANT WASTE WATER EFFLUENT	N3
M13	REACTOR ENCLOSURE COOLING WATER	
M14	TURBINE ENCLOSURE COOLING WATER	
M19	LUBE OIL (OTHER THAN TURBINE)	N1
M9,10	SERVICE WATER	
	COMMUNICATION	N3
	REFUELING INTERLOCK	N5/N6
M23	PROCESS SAMPLING	N1
M17	MAKE-UP WATER TREATMENT	N5
M18	MAKE-UP WATER DEMINERALIZER	N5
IV.	HEATING, VENTILATION AIR COND. & COOLING	
M78	CONTROL ROOM & CONTROL STRUCT. VENT.	
M78	CONTROL ROOM (HVAC)	
M78	AUXILIARY EQUIPMENT ROOM (HVAC)	
M78	EMERGENCY FRESH AIR SUPPLY	
M78	CONTROL STRUCTURE (HVAC) FROM TURBINE ENCLOUSRE	
M78	SGTS. EQUIPMENT COMPARTMENT (HVAC)	
M78	EMERGENCY SWITCHGEAR & BATTERY COMP. & BATTERY	
M76	REACTOR ENCLOSURE VENTILATION	
M76	REACTOR ENCLOSURE (HVAC) FOR NORMAL OPERATION	
M76	SAFETY RELATED REACTOR ENCLOSURE (AIR COOL)	
M79	RADWASTE ENCLOSURE VENTILATION	
M75	TURBINE ENCLOSURE VENTILATION	
M76	PRIMARY CONTAINMENT VENTILATION	
M57	CONTAINMENT ATMOSPHERIC CONTROL	
M77	DRYWELL AIR COOLING	
M81	DIESEL - GENERATOR ENCLOSURE VENT.	N6/N8
M81	SPRAY POND PUMP STRUCTURE VENTILATION	N5
M82	HOT MAINTENANCE SHOP VENTILATION	N3
M81,80 83	MISCELLANEOUS STRUCTURE VENTILATION	N3
V.*	POWER DISTRIBUTION	
	NON-CLASS 1E AC	
	CLASS 1E AC	
	CLASS 1E DC	

MPL	SYSTEMS	REASON
I.	REACTOR SYSTEMS	
	RPS	N8
M55	HPCI	N8
M41,42	ADS	N8
M52	CORE SPRAY	N8
M51	RHR	N8
M41,42, 60	PRIMARY CONT.& REACTOR VESSEL ISOLATION	N8
M10	RHR SERVICE WATER	
M11	EMERGENCY SERVICE WATER	N5
M57	COMBUSTIBLE GAS CONTROL	N6
M57	PRIMARY CONT. VACUUM RELIEF SYSTEM	N1
M40	MAIN STEAM LINE ISOL. VALVE LEAKAGE CONTROL	N6/N5/N8
M76	STAND-BY GAS TREATMENT	
M76	REACTOR ENCLOSURE RECIRCULATION	
M76	REACTOR ENCLOSURE ISOLATION	
	REMOTE SHUTDOWN	N6
M48	STAND-BY LIQUID CONTROL (SLC)	N8
M49	REACTOR CORE ISOL. COOL (RCIC)	N8
	NEUTRON MONITORING IRM/LPRM/APPM	
M41	SAFETY RELIEF, VALVE POSITION INDICATION	N2
M59	CONTAINMENT INST. GAS SYSTEM AND ADS-CONTROL	
	REACTOR MANUAL CONTROL	
M43	REACTOR RECIRCULATION	
M44	REACTOR WATER CLEAN-UP	
M30	POST ACCIDENT SAMPLING	N6/N2
II.	TURBINE/GENERATOR SYSTEM	
M1	MAIN TURBINES	
	TURBINE CONTROL	
M2	EXTRACTION STEAM	
M7	STEAM SEAL	
M1	TURBINE BY-PASS	
M5,9,2, 1	CONDENSER	
M7	AIR REMOVAL	
	CONDENSER TUBE LEAK DETECTION	N5
M9,5,6, 16	CONDENSATE PUMPS	
M2,3,4	HEATERS VENTS & DRAINS	N5
M16	CONDENSATE FILTER & DEMINERALIZER	N5
M8	CONDENSATE & REFUELING WATER STORAGE AND TRANSFER	N5
	FEEDWATER/CONDENSATE	
	GEMERATOR	
	EXCITATION	
M28	H_2 COOLING & CO_2 PURGE	
	GENERATOR LIQUID COOLING	
	SEAL OIL	
	BUS DUCT COOLING	