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ACCESSION NBR:9709100210 DOC.DATE: 97/09/05 NOTARIZED: NO DOCKET #
FACIL:50-387 Susquehanna Steam Electric Station, Unit 1, Pennsylva 05000387
50-388 Susquehanna Steam Electric Station, Unit 2, Pennsylva 05000388
AUTH.NAME AUTHOR AFFILIATION
JONES,G.T. Pennsylvania Power & Light Co.
RECIP.NAME RECIPIENT AFFILIATION
Document Control Branch (Document Control Desk)

SUBJECT: Provides response to NRC questions in 970625 submittal "Summary of Single Failure Analysis for GE Supplied Instruments Connected to Class 1E for SSES Units 1 & 2."

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NOTES: 05000387

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PP&L Pennsylvania Power & Light Company
Two North Ninth Street • Allentown, PA 18101-1179 • 610/774-5151

George T. Jones
*Vice President - Nuclear Operations*
610/774-7602
Fax: 610/774-7797

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**SUSQUEHANNA STEAM ELECTRIC STATION**
**RESPONSE TO NRC QUESTIONS ON GE SCOPE**
**OF SUPPLY EQUIPMENT**
**PLA-4665** **FILE R41-2**

**Docket Nos. 50-387**
**and 50-388**

The following documents Pennsylvania Power & Light Company's (PP&L) responses to questions from the NRC Staff on PP&L's submittal of June 25, 1997, titled, "Summary of Single Failure Analysis for GE Supplied Instruments Connected to Class 1E Circuits for Susquehanna SES Units 1 and 2."

Question 1

In Section 3.0 of the submittal, it is stated that the failure of the GE supplied Non-1E instruments connected to Q classified circuits result in the initiation of the protective action for SLDS, RWCU and HPCI systems, even when degraded by a second failure. These failure degradation criteria should also be applicable to neutron monitoring and the area radiation monitoring system.

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Response

The GE supplied non-Class 1E instruments are connected to all trip channels in the neutron monitoring system. The failure of these instruments results in the SCRAM of the reactor. The reactor SCRAM does not result in a plant condition that requires protective actions. Therefore, no further failures have to be considered.

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For plant conditions requiring protective action (Design Basis Accident (DBA)), the failure in the non-Class 1E instruments connected to neutron monitoring system does not prevent 1) the initiation of reactor SCRAM from the neutron monitoring system or 2) any other protective action. The result of this failure is a reactor SCRAM which is the protective action for the neutron monitoring system. Therefore, the protective action initiation is completed and no further failures have to be considered.

The failure of the GE supplied non-Class 1E instruments connected to area radiation monitoring system results in initiating the Standby Gas Treatment System LOCA Trip and Reset logic. Operation of the Standby Gas Treatment System LOCA Trip and Reset logic results in:

- Isolation of Reactor Building Zone III HVAC
- Initiation of Standby Gas Treatment System
- Initiation of Recirculating Fans

Operation of this equipment does not result in a plant condition that requires protective actions. Also operation of this equipment does not prevent operation of any protective action. Therefore, no further failures have to be considered.

For plant conditions requiring protective action (Design Basis Accident (DBA)), the failure in the non-Class 1E instruments connected to area radiation monitoring system does not prevent the initiation of any protective action. The results of this failure are as listed above which are the safety functions for the area radiation monitoring system. Therefore, no further failures have to be considered.

The failure of the GE supplied non-Class 1E instruments connected to Steam Leak Detection System, Reactor Water Clean Up System or the High Pressure Coolant Injection System does not result in a plant condition that requires protective actions.

The analysis in EC-QDET-1004 Rev 0 is based upon plant conditions existing that require protective action.

The analysis in EC-QDET-1004 Rev 0 for Steam Leak Detection System, Reactor Water Clean Up System and High Pressure Coolant Injection System goes beyond the requirements of IEEE 279-1971 par. 4.7.3 as discussed below.

As defined in IEEE 279-1971, "A protective action can be at the channel level or the system level

(1) A protective action at the channel level is the initiation of a signal by a single channel when the variable sensed exceeds limits,

(2) A protective action at the system level is initiation of the operation of sufficient number of actuators to effect a protective function."

IEEE 279-1971 defines channel and system as:

"**channel.** An arrangement of components and modules as required to generate a single protective action signal when required by a generating station condition. A channel loses its identity where single action signals are combined."

**system.** "For the purpose of these criteria, the nuclear power generating station protection system encompasses all electrical and mechanical devices and circuitry (from the sensors to actuation device input terminals) involved in generating those signals associated with the protective function."

Steam Leak Detection System

The separate channels that generate signals to the RCIC, RHR, HPCI and RWCU containment isolation valves consist of:

Channel 1 - separate dual element thermocouples for High Ambient Temperature connected to a separate temperature switch

Channel 2 - separate dual element thermocouples for High Differential Temperature connected to a separate temperature switch

The separate temperature switches initiate the relay logic to close the appropriate containment isolation valves. The analysis for the second failure is beyond the requirements of IEEE 279-1971 par. 4.7.3 since the failure of one thermocouple in either channel, due to the failure of non-Class 1E recorder connected to the other thermocouple element, does not result in a generating station condition requiring a protective action.

Reactor Water Clean Up

The channels that generate signals to the RWCU containment isolation valves consist of:

RWCU High Differential Flow
High Ambient Temperature
High Differential Temperature
High Differential Pressure
Reactor Water Level

These signals initiate the relay logic to close the RWCU containment isolation valves. The analysis for the second failure is beyond the requirements of IEEE 279-1971 par. 4.7.3 since the failure of RWCU High Differential Flow or High Ambient Temperature or High Differential Temperature, due to failure of non-Class 1E instruments, does not result in a generating station condition requiring a protective action.

HPCI

HPCI by itself is not required to meet the single-failure criterion since it is backed up by the independent and redundant auto-depressurization system. The auto-depressurization system is provided to reduce reactor pressure in case HPCI is not sufficient to maintain the reactor level. There are no non-Class 1E instruments connected to ADS. However the HPCI initiation sensors and wiring up to the HPCI relay logic do meet the single failure criterion. The GE supplied non-Class 1E instruments are not connected to the HPCI initiation sensors or relay logic. The analysis is beyond the requirements of IEEE 279-1971 par. 4.7.3 because HPCI controller is not part of the HPCI initiation sensors or relay logic and is not required to meet the single failure criterion.

Question 2

In Section 6.1 of the submittal it is stated that the impressed voltage on the cables to GE non-1E instruments may cause loss of power supply to HPCI Controller.

Attachment 1 lists power supply cables from Class 1E distribution cabinets to non-1E GE supplied instruments. Are these power supplies in the same raceway as class 1E HPCI controller power supply (not listed in attachment 1) or is the HPCI controller power supply non-1E? Please clarify.

Response

The power supply to the HPCI Controller is Class 1E. This power supply, ES-E41-1(2)K600, provides 24 VDC output and also supplies power to SRU1 and SRU2. Power is supplied from the SRUs to various Pressure Boundary Transmitters. Outputs from the transmitters are connected to GE non-Class 1E instruments.

Class 1E 125 VDC input to ES-E41-1K600 and ES-E41-2K600 is provided from circuits 1D624-06 and 2D624-06 respectively.

For impressed voltages on the GE Non Class 1E instruments or cables to these instruments, the transmitters and power supply ES-E41-1(2)K600 could be lost due to overvoltage from the impressed voltages.

The cables from 1D624-06 to the Class 1E power supply ES-E41-1K600 are not in the same raceways as the cables to the Class 1E power supplies listed in Attachment 1.

The cable from 2D624-06 to the Class 1E power supply ES-E41-1K600 and the cable from 2D246-01 to TR-E41-2R605 are routed in one common raceway, F2KD13 (Division II). This is the only raceway where cables from 2D624-06 to the Class 1E power supply ES-E41-1K600 are in the same raceway as the cables to the Class 1E power supplies listed in Attachment 1. Both of these cables are Division II Control cables which are allowed to be routed in Division II control raceway.

Question 3

Section 6.3 analyzes the affects of non-1E components failure on neutron monitoring system and attachment 3 lists the cables from Q classified neutron monitoring channels to non-1E recorders. Causes of open circuits and impressed voltages are compared to the withstand capabilities of the circuit components (reference 7.9-DRF-A00-01511) such as operational amplifiers, fuses and resistors to establish no affect on neutron monitors safety function. However, section 2.2.8.7 of NEDO 10139 states that electrical isolation has been incorporated into the design at this interface. Clarify the NEDO document applicability to SSES neutron monitoring system design and provide reference 7.9 and 7.10 documents for our reference.

Response

The requested references have been forwarded to the NRC.

The NRC Safety Evaluation Report (SER), dated June 28, 1991, page 16 requested PP&L to change FSAR Section 7.2.2.1.2.3.1.7 to more accurately describe the installed equipment. The SER specifically states, "FSAR section 7.2.2.1.2.3.1.7 will be revised to note electrical isolation is not provided between the IRM/APRM modules and the computer. The resolution of the problem is part of the generic issue that is discussed in Section 3.1.1 of this SER."

Revision 44 to SSES FSAR, dated August 29, 1991, changed FSAR Section 7.2.2.1.2.3.1.7 to read "Within the IRM and APRM modules (i.e. prior to their output trip unit driving the RPS), analog outputs are derived for use with control room meters, recorders, and the process computer. An analysis has shown that faults in the control room meters, recorders, and process computers do not degrade the protective output from the trip units below an acceptable level. The issue of providing electrical isolation devices at the IRM and APRM interfaces is being addressed by a GE generic program. The trip unit outputs are physically separated and electrically isolated from other plant equipment in their routing to the RPS panels."

The NRC letter to PP&L, dated October 28, 1994, indicated that the NRC Office of Research decided that Generic Issue 161 "Use of Non-Safety-Related Power Supplies in Safety-Related Circuits" should not be addressed generically but should be resolved on a plant-specific basis. This letter also stated that the review of GI 161 determined that non-Class 1E circuits that receive signals from Class 1E equipment do not need to be electrically isolated by isolation devices if an analysis or test can demonstrate that the Class 1E circuit will not be degraded below an acceptable level when postulating credible failures occurring at the non-Class 1E circuits.

Question 4

High differential pressure and the diverse low reactor water level signal provide back-up signal for closing RWCUs containment isolation valves as indicated in the second paragraph of Section 6.5. Confirm that the primary and back-up signal cables are not routed in common raceway.

Response

The RWCU containment isolation valves HV-G33-1(2)F001 receives signals from Division I and HV-G33-1(2)F004 receives signals from Division II. The signals that initiate closing of these valves, including High differential pressure and the diverse low reactor water level signals, are divided into Division I and Division II.

The redundant Division I and Division II cables containing signals to initiate closing the RWCU containment isolation valves are not routed in the same raceway.

Question 5

PP&L letter to the NRC dated April 26, 1991, committed to install approximately 38 qualified isolation devices in lieu of relying upon cable melt to maintain isolation (June 28, 1991, SER Section 3.1.4). However MPR Associate Inc. final report dated June 27, 1994, stated that revision 2 of SEA-EE-183 does not address installation of 38 qualified devices and PP&L letter to NRC dated November 14, 1991, described plant modifications which would be made in lieu of installing isolation devices for all 38 switches. Please confirm installation of the isolation devices as committed in your April 26, 1991 letter or identify NRC acceptance of the plan modification in lieu of the 38 isolation devices.

Response

The 38 qualified isolation devices were to be installed for computer inputs developed from the 4 KV mechanically operated switches. PP&L letter, PLA-3535, to the NRC dated April 26, 1991, committed to using contacts from the 4KV circuit breaker drawout position switches instead of the mechanically operated switches for the computer inputs. This change is needed for the following Class 1E Westinghouse circuit breakers:

- Preferred incoming supply circuit breakers
- Alternate incoming supply circuit breakers
- Diesel Generator circuit breakers
- ESW pump circuit breakers
- RHR pump circuit breakers
- Control Structure chiller circuit breakers.

PP&L letter, PLA-3674, to the NRC dated November 14, 1991, committed to using contacts from the 4KV circuit breaker drawout position switches instead of the mechanically operated switches for the computer inputs for the Core Spray circuit breakers in addition to the circuit breakers listed above.

These changes required modifications to rewire the circuit breakers. Modifications to all of the above listed circuit breakers have been completed.

If you have any questions, please contact Mr. C. T. Coddington at (717) 542-3294.

Very truly yours,

G. T. Jones

copy: NRC Region I
Mr. K. Jenison, NRC Sr. Resident Inspector
Mr. C. Poslusny, NRC Sr. Project Manager