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Mr. Robert Gilbert
Project Manager
Operating Reactors Branch No. 5
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Dresden 2 - SEP Integrated Assessment
Topic VII-1.A, Isolation of Reactor Protection
System From NonSafety Systems, Including
Qualification of Isolation Devices
NRC Docket 50-237

Reference: (a) R.F. Janecek letter to G.C. Lainas dated January 22, 1981.
(b) B. Rybak letter to H.R. Denton dated April 20, 1983.

Dear Mr. Gilbert:

The NRC staff is concerned that non-safety systems which are electrically connected to the Reactor Protection System (RPS) are not properly isolated from the RPS and if the isolation devices used or techniques used meet current licensing criteria. The following are responses to those items as identified in chapter 4 of the Integrated Plant Assessment Report.

Item 1:
paragraph 4.2.4.1

The analog signals from the Nuclear flux monitoring system intermediate range monitors (IRMs), local power range monitors (LPRMs), and average power range monitors (APRMs) are not isolated from the control room process recorders and indicating meters as required by IEEE Standard 279. A limited Probalistic Risk Assessment (PRA) was performed for this issue. The PRA determined that a fault in the non-safety part of the nuclear flux monitoring channel or APRM could fail the high neutron flux signal or APRM. However, the probability of reactor protection systems (RPS) failure is totally dominated by common-mode mechanical faults associated with the control rod drive system, and eliminating the isolation problem would not effect RPS unavailability. Thus, the PRA classified the issue of low importance to risk. However, the NRC staff disagrees with the PRA.

Response:

The above referenced letter (a) related information regarding the degree of isolation between the nuclear instrumentation (NI) system signals. The original design of the NI system included the consideration of the effects of a failure of non-safety component on the NI system. General Electric Topical Report NEDO-10139, "Compliance of Protection Systems to Industry Criteria, General Electric BWR Nuclear Steam Supply System (June 1970)," presents the analysis performed for the neutron monitoring system with respect to IEEE-279. The results of the analysis of the interaction between the systems is in Section 2.2.8.7 as follows: "Within the IRM and APRM modules prior to their output trip unit driving the RPS, analog outputs are derived for use with control room meters, recorders, and the process computer. Electrical isolation has been incorporated into the design at this interface to prevent any single failure from influencing the protective output from the trip unit." Also the Failure Mode and Effects Analysis (FMEA), NSC-GC&L-GEN-0129-03 (8-2-74), Evaluation Report Common Mode Failure Vunerability of Reactor Protection Systems Instrumentation for the Dresden 2/3 and Quad-Cities 1/2 Nuclear Generating Stations, conclude that there is no single failure within the NI system that can prevent the RPS from tripping. The results are that a single failure in NI causes either no effect on RPS or alters the tripping logic from 1/2 to 1/1.

A short circuit analysis was done to determine the effects on the IRM, SRM, LPRM and APRM circuits.

IRM and SRM Circuits

The IRMs and SRMs have current limiting resistor, and or voltage divider networks for all remote meters and recorder outputs. There are no IRM or SRM inputs to the process computer. The voltage change at the output of the DC amplifier due to a short circuit at a remote meter or recorder would be very minimal. Through circuit analysis the worst case would be an open circuit at the remote meter. This would cause an approximate 1 milliamp change in current, resulting in a voltage change of approximately 1/10 of a volt. With a 0 to ± 10 volt swing, which the trip circuit operates, the voltage change would not prevent this circuit from performing its intended function.

LPRM and APRM Circuits

The LPRMs and APRMs have voltage divider networks for computer outputs. The APRMs have voltage divider networks for remote recorders but there are no remote meters. A short circuit or open circuit at the remote terminal or computer output would have virtually no effect on the LPRM or APRM circuit. The output from the computer is derived from a voltage divider network, made up of a 12.1 kilohm resistor in series with A 1.13 kilohm resistor and a 215 ohm resistor. Through circuit analysis, a short circuit at the computer terminal would cause an approximate 12 microamp change in current, resulting in a voltage drop of approximately 1 millivolt. With a 0 to ± 10 volt swing, where the trip circuit operates, the voltage change would not prevent this circuit from performing its intended function.

**Item 2:**
**paragraph 4.24.2**

The APRM scram function is derived from relay actuation resulting from amplified analog signals sensed by these relays. The amplified analog signals are input directly to the process computer with fuses as the isolation devices. Fuses do not meet the intent of IEEE 279 for isolation devices (e.g. fuses will not isolate ground faults). It is the NRC staff's position that Commonwealth Edison should address the adequacy of the isolation circuitry to ensure that the RPS is protected from potential common-mode electrical faults that could be propagated from the process computer.

**Response:**

Due to new process computer installation per Dresden Units 2 and 3 modification M12-2/3-83-16, APRM inputs will have Class IE isolators rated at 1 meg-ohm with separate power supplies. The output from the computer to the recorder will be isolated as well. This modification will be completed during the January, 1984 Dresden Unit 3 outage.

**Item 3:**
**paragraph 4.24.3**

Power to the RPS buses is supplied from two motor-generator sets. The isolation of each RPS channel and its motor-generator set does not conform with current licensing criteria as defined in IEEE Standard 208-1974, part 5.2. This concerns the requirement for Class IE protection for the power supplies for the RSP. Commonwealth Edison committed by letter dated December 11, 1980 to install Class IE protection at the interface between the RPS power supply and the RPS. Commonwealth Edison has stated that the system will be in accordance with the conceptual design proposed by the General Electric Company and found acceptable by the NRC staff.

**Response:**

Dresden modification M12-2-81-18 was done during the past Unit 2 refueling outage to install class IE relays for overvoltage, undervoltage and underfrequency protection. This modification provides redundant Class IE protection at the interface of the non-Class IE power supply and the RPS. The relay setpoints for the RPS power supplies as stated in the Draft Technical Specification surveillance requirements are the following:

(1) Overvoltage: 126.5 V $\pm$ 2.5%
Min. 123.3 V
Max. 129.6 V

(2) Undervoltage: 108V $\pm$ 2.5%
Min. 105.3 V
Max. 110.7 V

(3) Underfrequency: 56.0 $H_2$ $\pm$ 1% of 60 $H_2$
Min. 55.4 $H_2$
Max. 54.6 $H_2$

These setpoints will guard against spurious trips. Commonwealth Edison provided a Draft Technical Specifications for the RPS power supply monitor system per Reference (b). This draft in its format if found acceptable to the NRC, will also be applicable to the remaining three units, Dresden 3, Quad Cities 1 and 2. Commonwealth Edison has determinded that the operation with this modification installed in accordance with 10CFR 50.59 and without applicable technical Specifications does not in any way compromise the safe operation of these facilities.

Please address any questions you may have concerning this matter to this office.

One (1) signed original and thirty-nine (39) copies of this transmittal have been provided for your use.

Very truly yours,

Bob Rybak
Nuclear Licensing Administrator
Boiling Water Reactors

DSS/rr
1378a
cc: RIII Resident Inspector, Dresden
Don Chery, SEP Integrated Assessment Project Manager