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50-388 Susquehanna Steam Electric Station, Unit 2, Pennsylva 05000388
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RECIP.NAME RECIPIENT AFFILIATION
BUTLER,W.R. Project Directorate I-2

SUBJECT: Requests exemption from requirements of Reg Guide 1.97,Rev 2 w/respect to satisfying sys accuracy requirements.

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SUSQUEHANNA STEAM ELECTRIC STATION
CONFORMANCE TO REGULATORY GUIDE 1.97, REV. 2
PLA-3039 FILE R41-2

Docket Nos. 50-387
and 50-388

Dear Dr. Butler:

This letter requests an exemption from the requirements of Regulatory Guide 1.97, Rev. 2 with respect to satisfying the system accuracy requirements for high range primary containment area radiation monitoring. Specifically, the regulatory guide requires a minimum of two monitors at widely separated locations with detectors that respond to gamma radiation photons within any energy range from 60KeV to 3 MeV with an energy response accuracy of ±20 percent at any specific photon energy from 0.1 MeV to 3 MeV. Additionally, overall system accuracy is required to be within a factor of 2 over the entire required range of 1 R/hr to 10^7 R/hr.

PP&L had previously committed to satisfy these requirements. However, an NRC audit of the Susquehanna SES Environmental Qualification Program in November 1986 revealed a problem with the plant's high range radiation monitoring system's in-containment cable when exposed to anticipated high post-accident primary containment temperature. The Rockbestos cable EQ test for the cable used in the monitor reported a lower insulation resistance at temperatures greater than 225°F than that which was specified in the high range radiation monitor installation and operations manual. The system manufacturer, Sorrento Electronics, has filed a 10CFR21 report with the NRC with respect to this problem.

Subsequent calculations were performed utilizing Sorrento Electronics' Analysis of Error and Rockbestos' Analysis of Insulation Resistance at worst case conditions for Susquehanna SES (FSAR Table 3.11-6). The worst case insulation resistance error was calculated using the aged cable insulation resistance at 340°F and actual lengths of cable inside and outside containment. Worst-case conditions result in the following downscale offset errors:

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RITS-15720A: 22 R/hr
RITS-15720B: 6 R/hr
RITS-25720A: 25 R/hr
RITS-25720B: 12 R/hr

The lower cable insulation resistance causes some of the current developed in the detector to leak to ground, which results in less current to the indication circuit, causing a downscale offset error. The degree of error increases with cable age and containment temperature increase, but will not exceed the worst-case error listed above. The worst-case error listed above, uncorrected, causes system accuracy to be greater than a factor-of-two for dose rates less than 500 R/hr when containment temperatures exceed 225°F.

Correction for Cable IR Error

Based on the above, we have elected to use a correction factor to compensate for insulation resistance induced error. The correction factor is only applied when containment temperature exceeds 225°. At lower temperatures, the insulation resistance satisfies the system specifications.

Since the correction factor is based on worst case installation and worst case conditions, it could overcompensate under less severe conditions. However, calculations show that the application of the correction factor when containment temperature exceeds 225°F will provide information within a factor of two accuracy over the entire system range with one exception: the accuracy upper bound will be greater than a factor-of-two for dose rates less than 100 R/hr when containment temperature exceeds 225°F.

Consequently, we are requesting that our commitment to Regulatory Guide 1.97, Rev. 2, requirements be revised to reflect the following manually-corrected system accuracies:

1. Containment Temperature $\leq$ 225°F
   Range: 1 R/hr to 10^7 R/hr
   Accuracy: +100%, -50%

2. Containment Temperature >225°F
   Range: 100 R/hr to 10^7 R/hr
   Accuracy: +100%, -50%

3. Containment Temperature >225°F
   Range: 1 R/hr to 100 R/hr
   Accuracy: +100%, -50% (plus a maximum +25 R/hr over-correction)

Justification

The use of a manually added correction factor of 25 R/hr and revised system accuracy limits is justified for the following reasons:

1) Increased low-end error at peak accident temperature is primarily justified by the system's limited use in plant operation (classification of abnormal events; also see FSAR Section 7.6.1b.1.5.7). The lowest dose rate level used by plant operations to classify abnormal events is 200 R/hr, at which the accuracy is within a factor of two under all conditions. In addition, this system is only one of the indications which can be used to classify an abnormal event. Parameters used to classify an ALERT, a SITE EMERGENCY, and a GENERAL EMERGENCY involving loss of fission barriers include: off-gas pretreatment radiation, reactor coolant activity, main steam line radiation, or containment radiation. Only at the level of 2000 R/hr (General Emergency - Core Melt) is the high range radiation monitoring system the only parameter used to make the emergency classification decision.

2) Historically, the regulatory requirements have stressed the importance of monitoring in the upper end of the range. NUREG-0578 and NUREG-0537 detail the necessity for redundant, safety grade, high range radiation monitoring. A brief reference is made to low level indication for personnel safety in NUREG 0737, Clarification II.F.1. This reference is not applicable to Susquehanna because the inerted containment precludes personnel entry during plant operation. Additionally, personnel safety is not identified as a system purpose in R.G. 1.97, Rev. 2.

3) Utilization of a correction factor provides the required accuracy except for dose rates below 100 R/hr, when containment temperature exceeds 225°F. At these low levels, the information will be conservatively inaccurate and, in addition, no operator action is required by procedure.

4) A feasible method of eliminating the insulation resistance error has not been determined. Sorrento Electronics is currently working on both electronics modifications and cable modifications. As yet there has been no success in these areas. This is an industry-wide problem to which no solution is immediately available.

Pursuant to 10CFR170, the appropriate fee is enclosed.

Very truly yours,

H. W. Keiser

Enclosure

cc: NRC Document Control Desk (original)
NRC Region I
Mr. F. I. Young, NRC Sr. Resident Inspector-SSES
Mr. M. C. Thadani, NRC Project Manager-Bethesda