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RECORD #171

TITLE: Lower Technical Specification Limit of Detection For Liquid Effluents

FICHE: 69118-073

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

DEC 07 1987

MEMORANDUM FOR: Wayne D. Shafer, Chief
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Division of Reactor Safety
Region III

FROM: LeMoine J. Cunningham, Chief
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SUBJECT: INTENT OF THE TECHNICAL SPECIFICATION REQUIREMENT FOR LOWER LIMIT OF DETECTION FOR LIQUID EFFLUENTS AND THE RELATED ISSUE AT DAVIS BESSE

This is in response to questions posed by Marty Schumacher (Region III) concerning the Davis Besse Technical Specification on lower limits of detection (LLD) for radioactive liquid effluents. The Davis Besse procedures were designed to detect Cs-134 at the required level in distilled water but not in a normal effluent sample. Clearly this did not meet the intent of the Davis Besse Technical Specifications. We have attempted to clarify the LLD requirements (see NUREG/CR-4007) but some ambiguity seems to persist. It is hoped that the following discussions will help.

The requirements are a priori; that is, they are requirements on the sampling and analysis system (equipment and procedures) rather than requirements for individual samples. Licensees are required to have equipment and procedures that attain the specified LLDs under normal conditions. When the requirements were formulated it would have been impractical to achieve the specified LLDs for individual samples under some circumstances without extraordinary efforts. (For example, it would have been impractical to detect 500 pCi/L of Ce-141 in the presence of a large quantity of entrained noble gases.) Thus an occasional failure of an analysis to achieve the specified LLDs with an actual sample is not a failure to comply. Repeated failures to achieve the specified LLDs, however, are indicative of a system deficiency and do constitute a violation of the technical specifications.

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To perform the required measurements, licensees must account for the presence of various nuclides in the samples. This may require measures such as increasing the counting time and/or the use of up-to-date software to resolve peaks with similar energies. The Technical Specifications indicate this by requiring the use of "blank samples as appropriate" for determining the background count rate. The Davis Besse problem suggests that further clarification of this point might be appropriate in the next version of the standard.

While unrelated to the Davis Besse problem, it seems appropriate to mention the potential problems with the Technical Specification LLDs. That is, the specified LLDs may not result in measurements good enough to show compliance with the Appendix I criteria. For example, the LLD for Cs-134 is 500 pCi/L while the permissible average release concentration, where there are fresh water fish, is only 0.6 pCi/L (or less if other nuclides, particularly Cs-137, are present). Therefore more sensitive measurements may be necessary for any radioactive liquid effluent stream which is not diluted by a factor of 1,000 or more prior to release. This situation is not clearly identified in the present Technical Specification but will be detailed in the next edition of the standard.

Original signed by LeMoine J. Cunningham

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