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SEP 0 1 1988

Alabama Power Company
ATTN: Mr. W. G. Hairston, III
Senior Vice President-Nuclear
Operations
P. O. Box 2641
Birmingham, AL 35291-0400

Gentlemen:

SUBJECT: NRC INSPECTION REPORT NOS. 50-348/88-10 AND 50-364/88-10

Thank you for your response of June 24, 1988, to our Notice of Violation issued on May 20, 1988, concerning activities conducted at your Farley facility. We have evaluated your response and found that it meets the requirements of 10 CFR 2.201.

We have reviewed the information provided in the response dated June 24, 1988. The regulations require that licensees make reasonably accurate measurements of radioactive materials discharged in effluents. Your failure to correct for the self-absorption of gamma photons in solid matrix calibration standards when counting gas samples resulted in inaccurate measurements. The fact that the inaccuracy of your gaseous effluent measurements overestimated the quantities of radioactive materials discharged to the environment was taken into consideration when determining the severity level of the violation. Enclosed is a technical assessment of the specific information provided in your letter of June 24, 1988.

Based on the above referenced review, we have concluded that the violation occurred as stated in the Notice of Violation. Measurement results were in error and sufficient actions were not taken to eliminate the error. Your response of June 24, 1988, stated that polymer matrix standards would be replaced by August 5, 1988, with low density foam standards which are minimally impacted by attenuation considerations. This action should correct the self absorption problem. Therefore it will not be necessary for you submit to this Office further corrective actions regarding the violation.

We appreciate your cooperation in this matter.

Sincerely,
original signed by
JPS
J. Philip Stohr, Director
Division of Radiation Safety
and Safeguards

Enclosure: (See page 2)

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PDR ADOCK 05000348
Q PDC

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Enclosure:
Staff Assessment of Licensee Response

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ENCLOSURE

STAFF ASSESSMENT OF LICENSEE RESPONSE

Restatement of Violation

10 CFR 20.201(b) requires that each licensee make or cause to be made such surveys as may be necessary to demonstrate compliance with the regulations and which are reasonable under the circumstances to evaluate the extent of radiation hazards that may be present.

10 CFR 20.201(a) defines survey to mean an evaluation of the radiation hazards incident to the production, use, release, disposal, or presence of radioactive materials.

Contrary to the above, the requirement to perform evaluations necessary to demonstrate compliance with 10 CFR 20.201(b) and 20.201(a) was not met in that the licensee failed to make attenuation corrections for calibrating detectors with solid geometries which resulted in inaccurate gamma spectroscopy measurements of gaseous radioactive material released to the environment. These measurements were used to determine compliance with 10 CFR 20.106, Technical Specifications and the Offsite Dose Calculation Manual requirements.

Licensee Response

Since the density of the polymer matrix was greater than that of an actual gaseous standard, it was known that the analytical results were biased in a conservative direction (high) and were known to be accurate within an acceptable variance.

NRC Evaluation

Although the analytical results were biased conservatively, this bias was not quantified nor corrected in the final isotopic determinations. Calibration procedures for laboratory instrumentation should entail corrections for identifiable biases whether positive or negative. The licensee's Radiochemistry Incident Report O-87-027 presented a summary of the results of the gaseous calibration crosschecks for one liter and four liter Marinelli geometries. The ratios of the "counted" results to the "known" spiked values indicated counted activities varied from -19% to +76% of the known values. The licensee discounted the Xe-127 isotopic ratios due to summing problems. The licensee's "acceptable variance" of $\pm 20\%$ for analytical results was incorrectly based upon the NRC's confirmatory measurements criteria for comparing analytical measurements. The confirmatory measurements acceptance criteria for comparable results are action points used by the NRC to determine if there is a need to further evaluate counting methodology because of potential counting inaccuracies. They are not intended to be criteria utilized by licensees to establish acceptable counting system accuracy.

NRC Conclusion

The licensee's statement did not provide information to show reasonable surveys were made in that the bias was neither quantified nor corrected in final measurements.

Licensee Response

Due to the limited commercial availability of acceptable gas standards and the errors associated with the transfer of gas standards from vendor containers to FNP geometries, the investigative data were inconsistent such that an assessment of the precise degree of bias could not be made.

NRC Evaluation

Acceptable gaseous standards have been commercially available since 1983. Gas transfer errors are normally identified and minimized by utilizing proper laboratory techniques. Problems with supplied vendor materials (i.e., leaky gaseous Marinelli containers) should be pursued aggressively by the individual user.

NRC Conclusion

The licensee's response did not provide information to show that reasonable surveys were made in that the bias was not quantified nor corrected in final measurements.

Licensee Response

"Surveys" were performed per 10 CFR 20.201(a) in that gaseous samples were analyzed.

Evaluation and Conclusion

Surveys were performed although not with reasonable accuracy in that the isotopic gaseous quantities were established but included an unquantified bias.

Licensee Response

Surveys (i.e., analyses) were performed to comply with the regulations as required by 10 CFR 20.201(b)(1) in that the analyses of such samples were performed as specified in the FNP Technical Specifications and the analytical results were reasonable as required by 10 CFR 20.201(b)(2) in that they were known to be accurate with an acceptable variance. It should be noted that the bias had the effect of increasing the assurance that the limits specified by the FNP Technical Specifications would not be exceeded.

NRC Evaluation

The licensee had performed a series of comparison studies with data available beginning in 1985. As indicated in a previous response, the "counted" results varied from -19% to +76% of the "known" spiked values with the highest variance from known values recorded for the four liter gaseous Marinelli. The licensee had utilized the four liter geometry to determine the isotopic quantities in plant gaseous effluents. These gaseous effluent activities were then utilized to show compliance with 10 CFR 20.106, Technical Specifications and the Offsite Dose Calculation Manual requirements. The "acceptable variance" as related to the NRC's confirmatory measurements criteria for comparing analytical results was not applicable to gamma spectroscopy calibrations. Also, this experimentally determined variance of $\pm 20\%$ indicated in the licensee's RCIR O-87-027, applied only to the one liter Marinelli geometry, and not the four liter Marinelli which was used for effluent determinations.

NRC Conclusion

The requirements of 10 CFR 20.201(b) were not met since the radioactive contents of effluents were not accurately measured.

Licensee Response

Detection equipment calibration provided as accurate and reliable quantitative measurements as reasonably achievable as opposed to the stated requirement of "the most accurate and reliable quantitative measurements possible", as stated in the NRC Inspection Report.

NRC Evaluation

Since the equipment calibration did not include gaseous attenuation corrections, the equipment did not provide as accurate and reliable quantitation measurements as "reasonably" achievable. Routine calibrations of gamma spectroscopy systems are expected to include different sample geometries which would take into account various sample forms, types, volumes, and densities. The "most accurate and reliable quantitative measurement possible" as stated in the NRC inspection report would include corrections for sample densities. It should be noted that the violation was for failure to make reasonable measurements of radioactive content of effluents.

NRC Conclusion

The exhortation to the "most accurate and reliable quantitative measurements possible" was not part of the violation but was included in the report details.

The licensee statement did not provide information to show that reasonable surveys were made in that the bias was neither quantified nor corrected in final measurements.

Licensee Response

The pursuit of the "most accurate and reliable quantitative measurements possible" is not consistent with the "reasonable" condition set forth in 10 CFR 20.201(b). It would be an unnecessary expenditure of funds to continually attempt to procure and develop the most technologically advanced (and most accurate) instrumentation available.

NRC Evaluation

The purpose of equipment calibration is to determine the accuracy of an existing measuring instrument and does not automatically imply the utilization of the most technologically advanced system possible. As stated in the preceding evaluation, the requirement is to make reasonably accurate measurements of the radioactivity content of effluents. Using a biased system, even biased high, does not meet this requirement.

NRC Conclusion

The licensee's statement did not provide information to show that reasonable surveys were made in that the bias was neither quantified nor corrected in final measurements.

Licensee Response

Evaluations to determine the accuracy of gaseous geometries were pursued from 1981 to 1987.

NRC Evaluation

Studies established the need for correction factors, but these studies were not completed within a reasonable time. The factors were not applied when obtained.

NRC Conclusion

This statement shows that the licensee worked for several years to resolve the bias, but the licensee did not make corrections. The licensee's actions does not meet the "prompt" corrective action criteria for classification of the finding as a self-identified violation.

Licensee Response

The use of the four liter gaseous geometry was terminated and the use of the one liter geometry was initiated for more accurate gaseous analysis as a result of the FNP evaluation and consideration of comments by the NRC in August 1987.

NRC Evaluation

Prior to August 1987, the licensee had utilized the four liter geometry to determine isotopic quantities of gaseous effluents. Discontinued use of the four liter geometry during 1987 did not alter previously determined analytical results.

NRC Conclusion

The licensee's statement reflected changes that were identified but did not provide information to show reasonable surveys were made in that the bias was not quantified nor corrected in final measurements.

Licensee Response

The bias of the existing methodology was determined and reported to the NRC, in the July - December 1987, Semi-Annual Effluent Release Report submitted in February 1988, as requested by the NRC.

Procurement actions for a new, state-of-the-art, gamma spectroscopy system which is required to have the capability of utilizing foam matrix standards as well as actual gas standards for calibrations were initiated in October 1986.

Procurement of foam matrix standards for evaluation and calibration of gaseous geometries was accomplished in March 1988, and calibrations are underway.

NRC Evaluation and Conclusion

These statements described corrective actions initiated with respect to the acknowledged bias but do not provide information to show that reasonable surveys had been made in the past.

Licensee Response

Paragraph 3 of Section 3 (page 3) of the NRC Inspection Report states, "Also, there was no basis for disregarding the Xe-127 isotopic results because of the complex summary corrections needed for the Xe-127 gamma photons." Contrary to the above statement, FNP personnel provided to the NRC inspector during the period of inspection and subsequently to the Region II NRC office the basis for excluding consideration of the Xe-127 data in the form of a paper entitled, "Test Report, Efficiency Calibration of Germanium Detectors for GA-MA and Associates, Inc. Model G-130G and G-430G Gas Marinelli Beakers," written by Mr. Dale W. Nix, dated February 27, 1984.

NRC Evaluation

The reference paper stated that D. Nix did not use the Xe-127 peak due to complex summing corrections. These corrections can be accomplished although lengthy calculations are involved. However, it should be noted that the

primary purpose of the paper was to describe a method to simulate a gas standard with radionuclides dissolved in water and then to determine appropriate correction factors for the absorption of gamma photons in the water. The correction factors to allow for density differences between liquid and gaseous samples must be applied in order to obtain accurate results.

NRC Conclusion

The licensee's statement referenced a study which described a method to determine absorption correction factors. This statement did not provide information that showed reasonable measurements had been made.

Licensee Response

Paragraph 4 of Section 3 of the NRC Inspection report states, "...correction factors should not have been averaged among detectors." This statement implies that averaged correction factors were used in the routine production of analytical results. This was not the case. The error (not correction factor) was determined for each detector. Once this information was known, it was decided that it was unnecessary to review every historical analytical result to establish how much each result was affected since the bias was conservative. It was reasoned that since there was an equal probability for any gaseous sample to be analyzed on any of the detectors, an average of the errors for all detectors would provide a reasonable overall assessment of the bias impact on data reported in previous Semi-Annual Effluent Release Reports.

NRC Evaluation

The NRC statement did not indicate average correction factors among detectors were used for normal sample counting. This comment was based on review of RIR O-98-027. Attachment 2 of this document listed "detected" activities as compared to "known" for various gaseous isotopes. The detected activities were averaged among four detectors and an average percent error was calculated for the four detectors. Since efficiency correction factors are detector specific, it was not correct to average errors among detectors. The averaging of reported activities would be applicable only if every routine sample was counted on all detectors.

NRC Conclusion

The licensee statement did not provide information to show reasonable surveys were made in that the bias was not quantified nor corrected in final measurements.