UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W.
ATLANTA, GEORGIA 30303

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Report No. 70-1113/83-30

Docket No. 70-1113 License No. SNM-1097 Safeguards Group No. III

Licensee: General Electric Company
Wilmington, NC 28401

Date of Inspection: October 17-21, 1983

Type of Inspection: Unannounced Material Control and Accountability

Inspector: D W Jones 11/22/83
D. W. Jones, Statistician Date Signed

Approved by: E J McAlpine 11/23/83
E. J. McAlpine, Chief, Material Control and Accountability Section Safeguards Branch
Division of Emergency Preparedness and Materials Safety Programs Date Signed

Inspection Summary

Areas Inspected: Statistical controls associated with nuclear material control and accountability measurements.

The inspection involved 30 inspector hours by one NRC inspector and was begun during the regular hours.

Results: The licensee was found to be in compliance with NRC requirements in the area examined during the inspection.

REPORT DETAILS

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1. Key Persons Contacted

*D. W. Brown, Powder Production Manager
*D. A. Burns, Materials Services Manager
*W. J. Hendry, Regulatory Compliance Manager
*G. R. Pearson, Uranium Fuel Fabrication Manager
*G. R. Mallett, Measurements & Statistics Senior Engineer
*H. Stern, Manufacturing Technology Consulting Engineer
*F. H. Wolz, Fuel Manufacturing Specialist
*C. M. Vaughan, Licensing and Nuclear Materials Management Manager

The inspector also interviewed several other licensee employees.

*Denotes those present at the exit interview

2. Statistical Controls

The licensee's statistical program for the evaluation of the biases and uncertainties associated with the measurement systems utilized to account for special nuclear material was inspected. The inspection consisted of an examination of the measurement control data used to evaluate the statistical parameters and the statistical methods applied in the evaluation of the data base. The performance of the program during the material balance period August 10, 1982 through August 8, 1983, was inspected. The program data for the following statistical parameters were inspected: the bias, systematic and random analytical errors and random sampling errors associated with the materials analyzed by the dichromate titration and the gravimetric methods; the systematic and random weighing errors, the bias, systematic and random elemental and isotopic analytical errors associated with uranium hexafluoride; the systematic and random errors associated with the volume measurements of liquid discards; and the bias, systematic and random errors associated with the fuel rod active scanner measurements. In most cases the licensee uses the same measurement system for several groups of material types and determines the uncertainties associated with each group. The program data for one group per measurement system was selected for inspection.

It was found, for the measurement systems inspected, that the biases, the systematic errors and the random bulk measurement errors were determined from measurements of standards and that the random sampling and analytical errors were determined from replicate measurements of process materials. The mathematical models of the measurement systems used by the licensee to evaluate the measurement control data appeared to be appropriate and the data bases were sufficient, except for the mass spectrographic and gravimetric analyses performed by the licensee's offsite contractor laboratory (Ledoux). The licensee determined the biases and systematic errors for

these two measurement systems from data generated between August 9, 1982 and March 7, 1983. This matter was deemed an unresolved item pending the licensee's acquisition of the measurement control data for the rest of that material balance period and demonstrating that the failure to use the program data for the entire material balance period did not have a significant effect on the limit of error of the inventory difference (83-30-01).

The licensees analytical laboratory reports the mean, standard deviation and number of standards measurements on a quarterly basis. These data must then be pooled in order to evaluate the biases and systematic errors for an entire material balance period. The licensee indicated that revision of the reporting method is being explored in an effort to obtain the reported results on a material balance period basis which would be readily usable in evaluating measurement biases and systematic errors. This matter is deemed an inspector follow-up item (83-30-02).

The licensee determined the uncertainties associated with each of the three systems used for liquid discard volume measurements and then pooled the results. [redacted] The licensees indicated that propagation of errors separately for the next limit of error calculation would be evaluated. This matter is deemed an inspector follow-up item (83-30-02).

The relative contributions from the measurement systems which had a significant impact on the total variance associated with the uranium and uranium-235 inventory differences for the period under review are presented in Table 1.

3. Unresolved Items

Unresolved items are matters about which more information is required to determine whether they are acceptable or may involve violations or deviations. One new unresolved item identified during this inspection is discussed in Paragraph 2.

4. Exit Interview

The inspection scope and findings were summarized on October 21, 1983, with those persons indicated in paragraph 1 above.

[redacted]

TABLE I

Variance Components of LEID
GE Material Balance Period August 82 - August 83

[redacted]

[redacted]