

## REFERENCES

1. R. B. Walton et al., "Measurements of  $UF_6$  Cylinders with Portable Instruments," *Nuclear Technology*, Vol. 21, p. 133, 1974.
2. T. D. Reilly et al., "A Continuous In-Line Monitor for  $UF_6$  Enrichment," *Nuclear Technology*, Vol. 23, p. 318, 1974.
3. P. Matussek and H. Ottmar, "Gamma-Ray Spectrometry for In-Line Measurements of  $^{235}U$  Enrichment in a Nuclear Fuel Fabrication Plant," in *Safeguarding Nuclear Materials*, IAEA-SM-201/46, pp. 223-233, 1976. Available from the International Atomic Energy Agency, UNIPUB, Inc., P.O. Box 433, New York, New York 10016.
4. R. B. Walton, "The Feasibility of Nondestructive Assay Measurements in Uranium Enrichment Plants," Los Alamos Scientific Laboratory, LA-7212-MS, 1978.
5. L. A. Kull, "Guidelines for Gamma-Ray Spectroscopy Measurements of  $^{235}U$  Enrichment," Brookhaven National Laboratory, BNL-50414, March 1974.
6. J. H. Hubbell, "Photon Cross Sections, Attenuation Coefficients, and Energy Absorption Coefficients from 10 keV to 100 GeV," National Bureau of Standards, NSRDS-NBS 29, 1969.
7. E. Storm and H. J. Israel, "Photon Cross Sections from .001 to 100 MeV for Elements 1 through 100," Los Alamos Scientific Laboratory, LA-3753, 1967.
8. G. Gunderson and M. Zucker, "Enrichment Measurement in Low Enriched  $^{235}U$  Fuel Pellets," in "Proceedings: 13th Annual Meeting," *Journal of the Institute of Nuclear Materials Management*, Vol. 1, No. 3, p. 221, 1972.

## BIBLIOGRAPHY

Alvar, K., H. Lukens, and N. Lurie, "Standard Containers for SNM Storage, Transfer, and Measurement," U.S. Nuclear Regulatory Commission, NUREG/CR-1847, 1980. Available through the NRC/GPO Sales Program, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555.

This report describes the variations of container properties (especially wall thicknesses) and their effects on NDA measurements. A candidate list of standard containers, each sufficiently uniform to cause less than 0.2 percent variation in assay results, is given, along with comments on the value and impact of container standardization.

Augustson, R. H., and T. D. Reilly, "Fundamentals of Passive Nondestructive Assay of Fissionable Material," Los Alamos Scientific Laboratory, LA-5651-M, Albuquerque, New Mexico, 1974.

This report contains a wealth of information on nondestructive assay techniques and their associated instrumentation and has an extensive treatise on gamma ray enrichment measurements.

Sher, R., and S. Untermeyer, "The Detection of Fissionable Materials by Nondestructive Means," American Nuclear Society Monograph, La Grange Park, Illinois, 1980.

This book contains a helpful overview of a wide variety of nondestructive assay techniques, including enrichment measurement by gamma ray spectrometry. In addition, it contains a rather extensive discussion of error estimation, measurement control techniques, and measurement statistics.

8401310072 831231  
PDR REQDD  
05.21 R PDR

## VALUE/IMPACT STATEMENT

### I. PROPOSED ACTION

#### 1.1 Description

Licenses authorized to possess at any one time more than one effective kilogram of special nuclear material (SNM) are required in § 70.51 of 10 CFR Part 70 to determine the inventory difference (ID) and the associated standard error (SEID) for each element and the fissile isotope of uranium contained in material in process. The determination is made by measuring the quantity of the element and of the fissile isotope for uranium.

It is not usually possible to determine both element and isotope with one measurement. Therefore, a combination of techniques is required to measure the SNM ID and the SEID by element and by fissile isotope. Passive gamma ray spectroscopy is a nondestructive method for measuring the relative concentration of the fissile isotope  $^{235}\text{U}$  in uranium. This technique is then used in conjunction with an assay for the element uranium to determine the amount of  $^{235}\text{U}$ .

Regulatory Guide 5.21 describes conditions for  $^{235}\text{U}$  enrichment measurements using gamma ray spectroscopy that are acceptable to the NRC staff. The proposed action will revise the guide to conform to current usage and to add information on the state of the art of this technique.

#### 1.2 Need

The proposed action is needed to bring Regulatory Guide 5.21 up to date.

#### 1.3 Value/Impact Assessment

##### 1.3.1 NRC Operations

The experience and improvements in technology that have occurred since the guide was issued will be made available for use in the regulatory process. Using these updated techniques should have no adverse impact.

##### 1.3.2 Other Government Agencies

Not applicable.

##### 1.3.3 Industry

Since industry is already applying the techniques discussed in the guide, updating these techniques should have no adverse impact.

##### 1.3.4 Public

No impact on the public can be foreseen.

#### 1.4 Decision on Proposed Action

The guide should be revised to reflect improvements in technique and to bring the guide into conformity with current usage.

### 2. TECHNICAL APPROACH

Not applicable.

### 3. PROCEDURAL APPROACH

Of the alternative procedures considered, revision of the existing regulatory guide was selected as the most advantageous and cost effective.

### 4. STATUTORY CONSIDERATIONS

#### 4.1 NRC Authority

Authority for the proposed action is derived from the Atomic Energy Act of 1954, as amended, and the Energy Reorganization Act of 1974, as amended, and implemented through the Commission's regulations.

#### 4.2 Need for NEPA Assessment

The proposed action is not a major action that may significantly affect the quality of the human environment and does not require an environmental impact statement.

### 5. RELATIONSHIP TO OTHER EXISTING OR PROPOSED REGULATIONS OR POLICIES

The proposed action is one of a series of revisions of existing regulatory guides on nondestructive assay techniques.

### 6. SUMMARY AND CONCLUSIONS

Regulatory Guide 5.21 should be revised to bring it up to date.

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

OFFICIAL BUSINESS  
PENALTY FOR PRIVATE USE, \$300

FIRST CLASS MAIL  
POSTAGE & FEES PAID  
USNRC  
WASH D C  
PERMIT No. 682

120555064215 1 1QP  
US NRC  
ADM-DIV OF TIDC  
DOCUMENT CONTROL DESK - PDR  
016  
WASHINGTON DC 20555