U.S. NUCLEAR REGULATORY COMMISSION

Revision 1*
February 1984

REGULATORY GUIDE

OFFICE OF NUCLEAR REGULATORY RESEARCH

REGULATORY GUIDE 5.53
(Task SG 049-4)

QUALIFICATION, CALIBRATION, AND ERROR ESTIMATION METHODS FOR NONDESTRUCTIVE ASSAY

A. INTRODUCTION

Section 70.58, "Fundamental Nuclear Material Controls," of 10 CFR Part 70, "Domestic Licensing of Special Nuclear Material," requires certain licensees to establish a measurement quality assurance program for material control and accounting. Specifically, paragraph 70.58(f) requires that a program be established, maintained, and followed for the maintenance of acceptable measurement quality in terms of measurement bias and for the evaluation and control of the quality of the measurement system.

Nondestructive assay (NDA) constitutes a unique measurement technology. When applied under appropriate rigorous controls, it can enhance the ability of the material control and accounting system to detect unaccounted-for loss or diversion of special nuclear material (SNM) to unauthorized uses. This guide describes methods and procedures acceptable to the NRC staff for meeting the provisions of paragraph 70.58(f) of 10 CFR Part 70 as it relates to the use of nondestructive assay.

Any guidance in this document related to information collection activities has been cleared under OMB Clearance No. 3150-0009.

B. DISCUSSION

Nondestructive assay has been applied to virtually every chemical or physical form of special nuclear material encountered in contemporary reactor fuel processing. Special considerations are required to achieve high-accuracy assay results and to properly estimate the errors associated with NDA applications. Recognizing these considerations, the American National Standards Institute has developed a standard, ANSI N15.20-1975, "Guide to Calibrating Nondestructive Assay Systems."[1] This standard was reviewed and reaffirmed without modification in 1980. This guide endorses the entire standard as supplemented in the regulatory position.

C. REGULATORY POSITION

The methods, procedures, and guidance relating to the application of NDA in ANSI N15.20-1975, "Guide to Calibrating Nondestructive Assay Systems," are acceptable to the NRC staff for use in material protection programs as supplemented by the following.

1. METHOD SELECTION

Prior to selecting an assay method, a study should be made to determine the required performance for that application. The specific NDA method should be selected to provide results that are compatible with plant material balance requirements. Methods to enhance attainable performance should be considered (e.g., container selection and packaging procedures for bulk materials discussed in Regulatory Guide 5.11, "Nondestructive Assay of Special Nuclear Material Contained in Scrap and Waste"[2]).

2. INSTRUMENT SPECIFICATIONS

An evaluation of each new NDA application, including the proposed placement of the instrument, should be conducted prior to procurement. Studies of existing NDA applications should be conducted periodically to evaluate their performance and substantiate the basis for their continued use. The impact of each of the measurement-to-measurement sources of error encountered in practice or anticipated should be established as a part of each of these efforts.

[1] Copies may be obtained from the American National Standards Institute, 1430 Broadway, New York, New York 10018.

* The substantial number of changes in this revision has made it impractical to indicate the changes with lines in the margin.

[2] A proposed revision to this guide has been issued for comment as Task SG 043-4.

A decision should be made to reduce each potentially significant source of error through (1) appropriate instrument design considerations, (2) operational controls, or (3) supplementary measurements made to establish bias corrections (see also Reference 1). Instrument procurement specifications and operational instructions should be developed and followed to reflect each error-reduction decision.

To minimize operator-related errors and to promote uniform measurement practices, NDA instruments used for fixed-station operations should be automated to control (1) data acquisition and analysis, (2) diagnostic testing of instrument performance stability and calibration validity, and (3) calculation of associated error estimates. It is recognized that, for some less complicated NDA measurements, consistency of operation may be achieved through the implementation of carefully written and tested standard operating procedures.

Instruments should be tested to ensure that they meet procurement specifications prior to calibration.

3. OPERATORS

Adequate operator qualification requirements are crucial to proper calibration and effective measurement control of an NDA instrument. The qualification requirements should include a general knowledge of the assay technique being used and an understanding of the typical behavior and the limitations of the instrument and the technique. A knowledge of the external factors to which the measurement technique is sensitive (factors such as matrix composition, background, material forms, and container type) is also necessary. Only then can proper standards be chosen for calibration and measurement control data be interpreted effectively.

If the operators have only a general knowledge of external factors, the NDA measurement program must be overseen by a director with a detailed knowledge of all related factors. Only qualified operators should be permitted to make SNM assays.

4. STABILITY TESTING

A preventive maintenance program should be devised and implemented to ensure the long-term stability and reliability of each instrument.

As part of an ongoing program of measurement control, more working standards[3] should be fabricated to periodically test the performance stability of the instrument. Each working standard should contain a different amount of the species of SNM to be assayed. Current licensing review criteria require the use of four working standards. On a rotating basis, one or two of these standards are used to check the system each day.

It should be noted that, in general, a working standard need not be fabricated from the same type of material being assayed. Even a material from a different radioactive species may be acceptable if carefully chosen and prepared. The essential requirements for a working standard are that (1) the radiation characteristics of the working standard are sufficiently stable to ensure that fluctuations in instrument response during measurement control can confidently be attributed to aberrations in instrument parameters rather than to variations in source characteristics and (2) the working standard induces a response in the NDA instrument that is characteristic of the expected response to real assay material. The most convenient means of achieving this "representative response" characteristic is to use material similar to the material that will be assayed.

A study should be made to determine the frequency with which the working standards are to be measured. If there is some instability, a working standard should be measured before and after each assay of an unknown item, and the calibration should be normalized to reflect the average of the before-assay and after-assay tests. In general, excessive instabilities should not be tolerated; they should be remedied by frequent recalibration. If instabilities persist, an alternative technique, an alternative instrument, or another measurement environment should be sought. In any case, a working standard should be measured a minimum of twice per shift, once at the beginning of the shift and again at some random time during the shift.

As a general principle, working standards should be run with a frequency directly proportional to the frequency of measurements (i.e., increase as the measurement frequency increases and decrease as the measurement frequency decreases). Also, the quantity of SNM in the standards measurements should closely follow the quantities of SNM being measured (i.e., the frequency of high-SNM-content working standards measurements increases as the frequency of assays of like items increases). These procedures provide a useful estimate of the bias when determined at the end of the inventory period. In addition, working standards should be run frequently enough for each measurement system so that no one system could contribute excessively to the inventory difference (ID) by being out of control for an extended period. A minimum of 16 control measurements should be made per material balance period. Assuming two systems having equal material flows in SNM quantity and number of items, the system with the greater uncertainty per measurement should run more working standards to reduce its potential impact on the ID.

Each response to a working standard should be compared to the previous calibration data as well as to the mean value

[3]Working standards are used to check the performance of an NDA instrument. They should be nominally representative of the items to be assayed. They should be fabricated and handled to ensure their internal integrity so that deviations in the measured response of the assay system can be attributed to the instrument. As stated in ANSI N15.20-1975, working standards built to meet these requirements are *not* acceptable as calibration standards. Calibration standards are defined in ANSI N15.20-1975 as "physically and chemically similar to the items to be assayed, for which the mass of the nuclide(s) of interest and all properties to which the measurement technique is sensitive are known." *Calibration standards can be used as working standards, but working standards cannot be used as calibration standards.* When calibration standards meet the requirements for working standards, licensees may elect to maintain only calibration standards. However, calibration standards may deteriorate through extensive use or may be prohibitively expensive for stability monitoring purposes.

of previous measurements of that working standard (under the same calibration) that were accumulated during the preceding material balance period. The difference should be plotted on a control chart. Control chart limits should be established at 0.05 and 0.001 levels of significance. Whenever control data exceed the 0.05 control limits, the test should be repeated. Whenever the control data exceed the 0.001 control limits, normal assay operations should cease. Normal operations should not resume until the out-of-control performance has been remedied and the instrument has been recalibrated.

The control chart of the working standard responses should be examined at frequent intervals to detect indications of drift, which should be compensated. The frequency for such examinations should be determined by the operating characteristics of each instrument. The minimum frequency for examining the control chart of a regularly used instrument for indications of drift should be once per week.

5. CALIBRATION

Calibration of NDA instruments should be accomplished by measuring the response to calibration standards as described in ANSI N15.20-1975. The nuclear material content of these standards should be characterized through established assay procedures (e.g., chemical assays) that are calibrated relative to national standards or nationally accepted measurement systems. The calibration standards should represent the unknown items in all physical and chemical characteristics that affect the response of the instrument. Calibration data should be obtained by averaging the responses from repeated measurements of the calibration standards and should be corrected to remove observed nonrandom variations.

Recalibration of an instrument is required following repair or replacement of parts if measurement of one or more working standards shows the instrument response to have changed. In addition, the calibration should be checked following a power outage or any unusual mechanical or electrical shock to the system. Recalibration data are also required if the characteristics of the items to be assayed change to the extent that previous calibration standards no longer adequately represent the unknown items.

Criteria for segregating and packaging different forms of SNM should be developed and implemented. Each material category should be established to enhance assay performance, consistent with safety requirements and subsequent processing needs. Guidance for material categorization is provided in Regulatory Guides 5.11, "Nondestructive Assay of Special Nuclear Material Contained in Scrap and Waste,"[2] and 5.34, "Nondestructive Assay for Plutonium in Scrap Material by Spontaneous Fission Detection."[4]

For all categories of materials to be assayed, with the exception of small-content miscellaneous categories (e.g., furnace liner bricks, contaminated tools, or machine parts), the calibration relationship should be determined by a suitable method such as a least-squares fit to an appropriate function as described in ANSI N15.20-1975. The graphical calibration method is acceptable only for miscellaneous categories of material that contain a total of no more than 0.1 effective kilogram[5] of SNM in each category during a material balance period. The combined contribution from all assays calibrated through the graphical method should be less than 10 percent of the total plant standard error (estimator) of inventory difference (SEID).

6. CALIBRATION STANDARDS

Calibration standards should be obtained to serve as the basis for the initial calibration of each instrument for each separate measurement technique or category of material. The number of standards in each set should be greater than the number of free parameters in the calibration function for that set. It is recognized that, in some special cases, one set of calibration standards may suffice for more than one measurement technique or material category with proper analysis of the raw calibration data. Furthermore, if the NDA instrument is intended for use over a very narrow range of SNM loadings, a more restricted range of SNM content in the calibration standards (confined to bracket the expected assay range) would prove adequate. The calibration standards should be completely characterized, including the mass and isotopic composition of the species of SNM to be assayed and *all physical or chemical variables to which the response of the instrument is sensitive.*

In general, the mass of SNM contained in the standards should extend over the range of loadings encountered in routine assays. This is especially true for NDA instruments whose responses are not linear functions of SNM content (e.g., some neutron-based NDA instruments). However, if the assay response (after application of appropriate corrections) is known to be highly linear and to have zero offset (i.e., zero response for zero SNM content), it may be more advantageous to avoid using standards with low loading, where calibration precision would suffer because of low count rates. In such a case, calibration in the upper half of the range of expected SNM loadings, combined with the constraint of zero response for zero loading, can produce a higher precision calibration than a least-squares fitting of measured responses to the standard over the full range of expected loadings, including values at low concentrations of SNM. If such a calibration procedure is used, careful initial establishment of the zero offset and instrument linearity followed by occasional verification of both assumptions is strongly recommended. Such verification could be accomplished by an occasional extended measurement of a low-loading standard.

Unless isotopic composition is being measured, the isotopic composition of the material used in all calibration standards should be similar to the isotopic composition of the material being assayed. This is especially important for

[4] A proposed revision to this guide has been issued for comment as Task SG 046-4.

[5] The term "effective kilogram" is defined in paragraph 70.4(t) of 10 CFR Part 70.

assays employing passive neutron coincidence counting or calorimetry. When the isotopic composition changes so that the response per gram of SNM differs by 10 percent or more from the value of the calibration standards, the material should be identified as a new material category. The NDA system should be recalibrated for that category using new calibration standards made up using the new isotopic composition. When the change in response per gram is less than 10 percent, a bias correction should be determined and applied to the assay data.

The uncertainty in the bias correction should be determined and accounted for in estimating the total assay uncertainty. Appropriate error propagation procedures are described in Regulatory Guide 5.18, "Limit of Error Concepts and Principles of Calculation in Nuclear Materials Control."

When the response is sensitive to ingrowth or decay of a daughter product, the procedures described in the preceding paragraphs are appropriate and should be applied.

Once fabricated, the calibration standards should be handled with extreme care to attempt to ensure that the distribution of contents remains fixed. It should be noted that solution standards lose their integrity over time because of evaporation and diffusion (Ref. 2) and radiolysis (Ref. 3). Calibration standards prepared by the mixing of different powders or densities tend to stratify or segregate. The containers should be tumbled periodically to reblend the constituents. Calibration standards should be used only when developing the initial calibration or when recalibrating the instrument following a repair or power outage. Working standards should be used to test the continued stability of the instrument (see footnote 3).

The degree of effort that should be expended in fabricating the calibration standards depends on the method used to estimate the assay uncertainty, as described in the next section.

7. METHODS FOR ESTIMATING UNCERTAINTY

Instrument errors associated with NDA should be estimated periodically by means of replicate assays as described in ANSI N15.20-1975.

Three methods are acceptable to estimate the uncertainties associated with calibrations and bias corrections for NDA. The first two procedures, graphical estimation and analytical estimation through the calibration relationship, are detailed in ANSI N15.20-1975. The third procedure, comparative evaluation, is not described in the standard.

7.1 Graphical Estimation

Use of the graphical error estimation technique should result in a conservative error estimate that is acceptable for miscellaneous unusual assay categories, as described in Regulatory Position 5 of this guide.

7.2 Analytical Estimation Through the Calibration Relationship

When the calibration standards can be shown to represent adequately the unknown items, the bias associated with the NDA of an inventory of items can be estimated through the calibration relationship as demonstrated in ANSI N15.20-1975. The calibration standards should be fabricated from different batches of material. The uncertainty associated with the content of SNM elements and response-related isotopes contained in each calibration standard should be based on an extensive characterization as described in ANSI N15.20-1975. The uncertainty associated with the contained mass of the response-related isotopes should be included in the calibration as described in the standard. Further, the element uncertainty should be factored into the estimated total assay uncertainty.

Using this procedure, it is necessary to periodically ensure that the calibration standards adequately represent the unknown items. This can be accomplished by isolating and characterizing the extraneous interference factors that affect the response of the instrument. Typically, this separation and characterization is most easily accomplished when the items are either finished fuel items or uniform containers of feed or intermediate product material.

To ensure that the calibration standards continue to adequately represent unknown items, key parameters[6] that affect the observed response (i.e., item-to-item variations) should be monitored through separate tests. Measurements of the key parameters should be compiled and analyzed at least twice a month to catch any large instrument drift. For more timely measurement control, a superior approach would be to perform such analyses on a continuing basis and repeat measurements of unknowns where standards exceed control limits. This latter approach minimizes the backfitting of measurement data and provides a timely basis for measurement control.

When the mean value of a parameter shifts from its previously established value, the impact of the shift on the response of the assay instrument should be measured through an appropriate experiment or calculation (Ref. 4). An appropriate bias correction should be determined and applied to all items that were assayed after the best estimate of when the parameter changed. The uncertainty in that bias estimate should be combined with the uncertainty in the assay values as predicted through the calibration function to estimate the total assay uncertainty.

The uncertainty due to a bias correction may significantly increase the standard error of the assay. In severe cases, the effect may increase the SEID above the level acceptable for the total plant. In such cases, new calibration standards should be obtained and the assay system should be recalibrated.

[6] See Section 5.4 of ANSI N15.20-1975. See Regulatory Position 6 of this guide for provisions to include the effects of changing isotopic compositions.

As a further check on the continued validity of the calibration standards, a program to periodically introduce new calibration standards should be implemented. The rate of replacement of standards with fresh material depends on the intrinsic durability and stability of the standard in question. Some solution standards lose their calibrated concentration values in a matter of days or weeks. On the other hand, standard fuel rods are much more durable and may last indefinitely with careful handling. In any case, calibration standards should be replaced with new standards at a rate sufficiently above their failure rate to ensure continued high quality in the instrument calibration.

7.3 Comparative Evaluation

The procedure described in this section is not included in ANSI N15.20-1975 but is appropriate for determining the validity of the calibration of NDA instruments.

When two measurement methods are used for each of a series of items and one of the methods is considerably more accurate than the other, corresponding measurements can be usefully compared. The comparison can be used to establish an estimate of bias between the measurement methods. The comparison can also be used to estimate the total uncertainty associated with the less accurate measurement method.

To determine the uncertainty associated with the NDA of an inventory of items using this method, unknown items should be randomly selected for comparative measurements. The SNM content of the items selected should span the range of contents normally encountered, subject to the qualification pointed out in Regulatory Position 6. Random error should be estimated through replicate analyses. To estimate the remaining contributions to the total assay uncertainty, each item should be repeatedly assayed to reduce the random assay error to less than 10 percent of the estimated or previously established total uncertainty. Then, to determine the SNM content of each item selected for comparative evaluation, one of the following procedures should be employed:

1. Each item should be completely dissolved, independently, and the resulting solution should be analyzed by high-accuracy elemental and isotopic assay procedures, which in turn are calibrated relative to national standards or nationally accepted measurement systems. It should be recognized that dissolution residues may be present in such a procedure. These residues should also be assayed for a complete analysis. Items composed of an aggregate of similar units, e.g., fuel rods containing discrete pellets, should be opened and the contained units should be weighed, pulverized, blended, and sampled for assay through appropriate high-accuracy elemental and isotopic assay procedures. The emptied container should be examined for indications of residual accumulations and cleaned, leached, or assayed nondestructively to determine the residual SNM content.

2. For plutonium-bearing items only, each item can be assayed through calorimetric procedures (see Reference 5). Large items should be subdivided into smaller containers. Each small container should be assayed calorimetrically. Samples should be taken from at least three of the smaller containers. The samples should be measured by microcalorimetry and then assayed through highly accurate elemental and isotopic procedures that, in turn, are calibrated relative to national standards or nationally accepted measurement systems (Ref. 6). The isotopic measurement data should be examined for evidence of nonhomogeneous isotopic content. Isotopically nonhomogeneous materials should be blended and reanalyzed. On the basis of the average grams of plutonium per watt of the samples measured by microcalorimetry, the total amount of plutonium in each of the smaller containers should be determined. The total plutonium content of the items selected for comparison is then estimated as the combined contents of the smaller containers.

For the first full material balance period during the initial implementation of this guide, two items from each category of assay items should be randomly selected each week for a check of the validity of the instrument calibration. Following this initial implementation period, licensees may reduce the verification measurement frequency to two items per month per category. When fewer than 100 new items of a given category are created per week, at least two of the item-comparison verification measurements should be made per material balance period per category through the procedures described above. In such cases, to provide an adequate data base to update the uncertainty estimates for NDA, licensees may pool the verification data provided the measurements are in statistical control, i.e., when repeated samples from the portion of the measurement system under test behave as random samples from a stable probability distribution. Under such conditions, data sets may be combined provided the parameters based on the current set of data and the previous set of data are not significantly different on the basis of acceptable statistical tests.

As an alternative to this selection criterion, licensees may elect the latter frequency for a specific category when it can be demonstrated that the contribution to the SEID from that category is less than 100 grams in any material balance period.

At the close of the reporting period, differences between assay values and verification values should be recorded and tested for outliers. Methods for detecting outliers are described in ANSI/ASTM E178-80, "Practice for Dealing with Outlying Observations."[7] See also Regulatory Guide 5.36, "Recommended Practice for Dealing with Outlying Observations," for further details.

[7]Copies may be obtained from the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103.

A straight line with a nonzero intercept should be fitted to the nondestructive assay vs. verification measurement data as described in ANSI N15.20-1975. The slope and intercept should be jointly tested for one and zero, respectively, using the "F" ratio at the 5 percent significance level (Ref. 7). If this result is significant, separate tests on the slope equal to one and the intercept equal to zero should be made to determine the presence of either proportional or constant bias or both. When bias is indicated, the assay results during the preceeding operating period should be corrected. The variance associated with the bias corrections should be estimated by the standard error of estimate of the verification line. This variance must be included in the estimate of the variance of an assay result as described in ANSI N15.20-1975.

Whenever a bias exceeding 50 percent of its estimated uncertainty is indicated, its cause should be investigated. This investigation should include a review of the assumptions factored into the NDA system's calibration. In particular, instrument stability and the stability of parameters that may influence the response of the assay system should be investigated. The investigation should also address the comparative measurement method, including sampling, sample handling, analytical procedures, interference compensation, and calibration validity. Results from the investigation, if they show the NDA system to have been incorrectly calibrated, should be employed to recalibrate the instrument for the forthcoming material balance period. Conversely, when the source of bias can be attributed to errors in the comparative measurements, bias corrections should not be made to the items assayed by NDA. Results from such investigations should be documented, and the documents should be maintained in accordance with Regulatory Position 8 of this guide.

8. RECORDS RETENTION

All records generated in connection with the activities discussed in this guide, including control charts, should be retained for a period of 5 years, as specified in paragraph 70.51(e)(4)(iii) of 10 CFR Part 70.

REFERENCES

1. T. E. Shea, "Reduction, Control, and Estimation of Nondestructive Assay Errors," *Nuclear Materials Management,* Vol. III, No. 3, 1974.

2. G. J. Curtis, J. E. Rein, and S. S. Yamamura, "Comparative Study of Different Methods of Packaging Liquid Reagents," *Analytical Chemistry,* Vol. 45, No. 6, p. 996, 1973.

3. J. R. Weiss and E. E. Pietri, "Calculation of Hydrogen Generation from Pu-Induced Alpha Radiolysis of Nitric, Sulfuric, and Perchloric Acids," *Radiation Effects,* Vol. 19, p. 191, 1973.

4. R. A. Forster, D. B. Smith, and H. O. Menlove, "Error Analysis of a Cf-252 Fuel-Rod-Assay System," Los Alamos Scientific Laboratory, LA-5317, 1974.

5. U.S. Nuclear Regulatory Commission, "Calorimetric Assay for Plutonium," NUREG-0228, 1977.

6. F. S. Stephens et al., "Methods for the Accountability of Plutonium Dioxide," U.S. Nuclear Regulatory Commission, WASH-1335, 1975.

7. F. A. Graybill, *An Introduction to Linear Statistical Models,* McGraw-Hill, New York, Vol. I, p. 128, 1961.

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.

This report details 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.

Brouns, R. J., F. P. Roberts, and U. L. Upson, "Considerations for Sampling Nuclear Materials for SNM Accounting Measurements," U.S. Nuclear Regulatory Commission, NUREG/CR-0087, 1978.

This report presents principles and guidelines for sampling nuclear materials to measure chemical and isotopic content of the material. Development of sampling plans and procedures that maintain random and systematic errors of sampling within acceptable limits for SNM accounting purposes are emphasized.

Cooper, B. E., *Statistics for Experimentalists,* Pergamon Press, New York, 1969.

This book provides a complete discussion of statistical procedures and describes a variety of statistical tests of experimental data. Examples are provided.

Reilly, T. D., and M. L. Evans, "Measurement Reliability for Nuclear Material Assay," *Nuclear Materials Management,* Vol. VI, No. 2, 1977.

This paper provides an overview of experience in nuclear material assay by analytical chemistry, calorimetry, and nondestructive assay. Ranges of accuracy and precision obtained in the assay of nuclear material are given.

Sher, R., and S. Untermeyer, *The Detection of Fissionable Materials by Nondestructive Means,* American Nuclear Society Monograph, 1980.

This book contains a helpful overview of a wide variety of nondestructive assay techniques for special nuclear material. In addition, it contains a rather extensive discussion of error estimation and measurement control techniques, as well as a presentation on measurement statistics.

VALUE/IMPACT STATEMENT

1. PROPOSED ACTION

1.1 Description

Licensees authorized to possess at any one time more than one effective kilogram of special nuclear material (SNM) are required in paragraph 70.58(f) of 10 CFR Part 70 to establish, maintain, and follow a program for the maintenance of acceptable measurement quality in terms of measurement bias and for the evaluation and control of the quality of the measurement system.

This guide describes methods and procedures acceptable to the NRC staff for meeting the provisions of paragraph 70.58(f) of 10 CFR Part 70 for nondestructive assay (NDA) systems.

The proposed action would revise the guide, which is still basically sound.

1.2 Need

The regulatory guide endorses ANSI N15.20-1975, "Guide to Calibrating Nondestructive Assay Systems." This standard was reaffirmed without modification in 1980 and the regulatory guide should be revised to indicate this. Further, revisions are needed in some sections to make the guide clearer and more consistent with current thinking.

This proposed action is needed to bring Regulatory Guide 5.53 up to date.

1.3 Value/Impact

1.3.1 NRC

The regulatory positions will be brought up to date.

1.3.2 Other Government Agencies

Not applicable.

1.3.3 Industry

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

1.3.4 Public

No impact on the public can be foreseen.

1.4 Decision

The guide should be revised to reflect the affirmation of ANSI N15.20-1975 in 1980 and to make it more consistent with current usage.

2. TECHNICAL APPROACH

Not applicable.

3. PROCEDURAL APPROACH

Of the procedural alternatives 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, in particular § 70.51 of 10 CFR Part 70.

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

A revised guide should be prepared to bring Regulatory Guide 5.53 up to date.

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