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REGULATORY GUIDE

OFFICE OF NUCLEAR REGULATORY RESEARCH

REGULATORY GUIDE 5.34
(Task SG 046-4)

NONDESTRUCTIVE ASSAY FOR PLUTONIUM IN SCRAP MATERIAL BY SPONTANEOUS FISSION DETECTION

A. INTRODUCTION

Section 70.51, "Material Balance, Inventory, and Records Requirements," of 10 CFR Part 70, "Domestic Licensing of Special Nuclear Material," requires certain licensees authorized to possess at any one time more than one effective kilogram of special nuclear material to establish and maintain a system of control and accountability so that the standard error (estimator) associated with the inventory difference (SEID), obtained as a result of a measured material balance, meets minimum standards. This guide is intended for those licensees who possess plutonium scrap materials and who are also subjected to the requirements of § 70.51 of 10 CFR Part 70.

Included in a typical material balance are containers of inhomogeneous scrap material that are not amenable to assay by the traditional method of sampling and chemical analysis. With proper controls, the nondestructive assay (NDA) technique of spontaneous fission detection is one acceptable method for the assay of plutonium in containers of bulk scrap material. The use of spontaneous fission detection thus facilitates the preparation of a complete plant material balance whose SEID meets established requirements.

This guide describes procedures acceptable to the NRC staff for applying the NDA technique of spontaneous fission detection to plutonium in scrap.

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

B. DISCUSSION

Plutonium in scrap material can contribute significantly to the inventory difference and its associated standard error. Unlike the major quantity of material flowing through the process, scrap is typically inhomogeneous and difficult to sample. Therefore, a separate assay of the entire content of each container of scrap material is a more reliable method of scrap accountability. NDA is a method for assaying the entire content of every container of scrap.

The term "scrap" refers to material that is generated from the main process stream because of the inefficiency of the process. Scrap material is generally economically recoverable. Scrap, therefore, consists of rejected or contaminated process material such as pellet grinder sludge, sweepings from gloveboxes, dried filter sludge, and rejected powder and pellets. Scrap is generally distinguished from "waste" by the density or concentration of heavy elements in the two materials, but it is the recovery cost (per mass unit of special nuclear material) that determines whether a material is "scrap" or "waste." The concentration of uranium and plutonium in scrap is approximately the same as it is in process material, i.e., 85-90 percent (uranium + plutonium) by weight. However, on occasion the fraction in both process and scrap material can be less than 25 percent. Plutonium in fast reactor scrap material is 15-20 percent by weight and in thermal reactor recycle material, 2-9 percent by weight. The main difference between scrap and process material is that scrap is contaminated and inhomogeneous. Waste, on the other hand, contains a low concentration of uranium and plutonium, i.e., a few percent or less (uranium + plutonium) by weight. However, the recovery of combustible waste by incineration may produce ash that is high in uranium and plutonium concentrations. Such incinerator ash is also considered "scrap" in this guide. However, it should be noted that ash may be more homogeneous in

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

its characteristics compared to most scrap and may, therefore, be accountable using sampling and chemical analysis methods.

NDA of plutonium can be accomplished primarily by the passive methods of gamma ray spectrometry, calorimetry, and spontaneous fission detection. Active neutron methods using total count rates or delayed neutron detection can also be used in scrap assay measurements. Regulatory Guide 5.11, "Nondestructive Assay of Special Nuclear Material Contained in Scrap and Waste," provides a framework for the use of these NDA methods.[1]

The NDA of dense scrap materials using gamma ray spectroscopy can be unreliable because of severe gamma ray attenuation. However, the isotopic composition of plutonium in scrap materials, with the exception of ^{242}Pu, can be obtained quite reliably using high-resolution gamma ray spectrometry measurements (Ref. 1).

Calorimetry is an accurate method of plutonium assay when there is an accurate knowledge of the relative abundance of each plutonium isotope and ^{241}Am. Scrap may contain a mixture of materials of different radionuclide compositions, especially different ^{241}Am concentrations, thereby necessitating the measurement of the average radionuclide composition. The average radionuclide abundances can be accurately measured only when the scrap is reasonably homogeneous. When the radionuclide abundances can be accurately measured or controlled, calorimetry can be applied to scrap assay (Ref. 2). However, calorimetry is time consuming for materials of high heat capacity and may not be a practical method for the routine assay of large numbers of containers.

Spontaneous fission detection is a practical NDA technique for the assay of plutonium in scrap material. The assay method involves the passive counting of spontaneous fission neutrons emitted primarily from the fission of ^{240}Pu. Neutron coincidence counters are used to detect these time-correlated neutrons. The theory and practice of neutron coincidence counting for plutonium assay are discussed thoroughly in References 3 through 6. Spontaneous fission neutrons are sufficiently penetrating to provide a representative signal from all the plutonium within a container. Since the neutron coincidence signal is dependent on both the quantity and relative abundance of ^{238}Pu, ^{240}Pu, and ^{242}Pu, the plutonium isotopic composition must be known for assay of total plutonium by spontaneous fission detection. The quantity of scrap material on inventory when a material balance is computed can be reduced through good management, and the scrap remaining on inventory can be assayed by spontaneous fission detection to meet the overall plant inventory difference (ID) and SEID constraints required by paragraph 70.51(e)(5) of 10 CFR Part 70.

[1] Revision 1 to this guide was issued in April 1984.

This guide gives recommendations useful for the assay by spontaneous fission detection of containers, each containing a few liters of scrap and having contents ranging from a few grams to 10 kilograms of plutonium or up to approximately 2 kilograms of effective ^{240}Pu[2] (see Ref. 7). Containers with a significant plutonium content (i.e., 50 grams or more) give a spontaneous fission response that must be corrected for the effects of neutron multiplication (Refs. 8, 9). Scrap materials that have large loadings of plutonium in addition to fluorine, oxygen, or other alpha/neutron-producing elements are difficult to measure and correct for multiplication effects because of the large random neutron flux from the (α,n) reactions in the matrix materials. These samples should be segregated into smaller quantities for measurements. In general, a large quantity of plutonium can be assayed by spontaneous fission detection by subdividing the scrap into smaller amounts, or the items may be more amenable to assay by calorimetry.

C. REGULATORY POSITION

The spontaneous fission detection method for the NDA of plutonium in bulk inhomogeneous scrap material should include (1) discrimination of spontaneous fission radiations from random background by coincidence techniques and (2) measurement of the relative plutonium isotopic composition of the scrap. An acceptable spontaneous fission detection method of plutonium assay is described below.

1. SPONTANEOUS FISSION DETECTION SYSTEM

1.1 Detectors

Instruments based on moderated thermal neutron detectors, i.e., neutron well coincidence counters, are recommended for applications in which the gross neutron detection rate does not exceed 2×10^5 neutrons/sec. The dead time inherent in these slow coincidence systems can be reduced by employing a shift-register coincidence circuit. If the gross neutron detection rate is primarily due to random background and exceeds 2×10^5 neutrons/sec, a fast-neutron-detection, single-coincidence system can be used, provided adequate corrections can be made for matrix effects. Matrix effects are more severe in fast-neutron-detection systems, as shown in Table 1.

[2] The effective ^{240}Pu mass is a weighted average of the mass of each of the plutonium isotopes. The weighting is equal to the spontaneous fission neutron yield of each isotope relative to that of ^{240}Pu. Since only the even-numbered isotopes have significant spontaneous fission rates, the effective ^{240}Pu mass is given approximately by:

$$M(240)_{eff} = M(240) + (1.64 \pm 0.07)M(242) + (2.66 \pm 0.19)M(238)$$

where M is the mass of the isotope indicated in parentheses. The uncertainties in the coefficients and in the effective ^{240}Pu abundances in the table are from the reported standard deviations in the most reliable data available (Ref. 7). The mathematical procedure for converting from $M(240)_{eff}$ to M(total Pu) is presented in the appendix to this guide together with a sample calculation.

TABLE 1

MATRIX MATERIAL EFFECTS ON NEUTRON ASSAY

Matrix Material (in ∿4-liter can)	Mass (kg)	Neutron Detection Efficiency (Ref. 11) ^{3}He Detector, Thermal	^{4}He Detector, Fast	ZnS Detector, Fast	Coincidence Efficiency, ^{3}He Detector, Thermal	Corrected[a] (Ref. 10) Coincidence Efficiency, ^{3}He Detector, Thermal
Empty Can	–	1.00	1.00	1.00	1.00	1.00
Carbon Pellets	1.89	1.03	–	–	1.05	0.97
Metal	3.60	1.04	0.83	0.75	1.09	1.02
Slag-Crucible	1.80	1.03	0.94	0.91	1.08	1.01
Concrete	3.24	1.05	0.84	0.79	1.10	1.02
String Filters	0.60	1.07	0.95	0.86	1.17	1.05
CH_2 (ρ=0.65 g/cc)	0.27	1.06	0.96	0.92	1.11	1.00
CH_2 (ρ=0.12 g/cc)	0.43	1.09	0.92	0.90	1.19	0.98
CH_2 (ρ=0.27 g/cc)	0.97	1.19	0.71	0.67	1.36	0.04
H_20 (ρ=1.00 g/cc)	3.62	0.98	0.36	0.35	0.98	0.96

[a]Corrected using the source addition technique (see Ref. 7).

1.2 Detection Chamber

The chamber should permit reproducible positioning of standard-sized containers in the location of maximum spatial response uniformity.

1.3 Fission Source

A spontaneous fission source with a neutron intensity comparable to the intensity of the largest plutonium mass to be assayed should be used for making matrix corrections using the source addition technique (Ref. 10). A nanogram of ^{252}Ca is approximately equivalent to a gram of effective ^{240}Pu.

1.4 Readout

Readout should allow computation of the accidental-to-real-coincidence ratio in addition to the net real-coincidence rate. Live-time readout or a means of computing the dead time should also be provided.

1.5 Performance Specifications

The performance of a spontaneous fission detection instrument should be evaluated according to its stability, uniformity of spatial response, and insensitivity to matrix effects. Therefore, information should be obtained regarding:

1. The precision of the coincidence response as a function of the real-coincidence counting rate and the accidental-to-real-coincidence ratio. Extremes in the background or accidental-coincidence rate can be simulated by using a source of random neutrons (nonfission).

2. The uniformity of spatial response. Graphs should be obtained on the relative coincidence response to a small fission neutron source as a function of position in the counting chamber.

3. The sensitivity of matrix interference. A table of the relative coincidence response to a small fission neutron source as a function of the composition of the matrix material surrounding the point source should be obtained. Included in the matrix should be materials considered representative of common scrap materials. Table 1 is an example of such a tabulation of the relative response for a wide range of materials.

This information should be used for evaluating the expected instrument performance and for estimating

errors. The above performance information can be requested from the instrument suppliers during instrument selection and should be verified during preoperational instrument testing.

2. ANALYST

A trained individual should oversee spontaneous fission detection assay of plutonium and should have primary responsibility for instrument specification, preoperational instrument testing, standards and calibration, an operation manual, measurement control, and error analysis. Experience or training equivalent to a bachelor's degree in science or engineering from an accredited college or university and a laboratory course in radiation measurement should be the minimum qualifications of the analyst. The spontaneous fission detection analyst should frequently review the spontaneous fission detection operation and should authorize any changes in the operation.

3. CONTAINERS AND PACKAGING

A single type of container should be used for packaging all scrap in each category. A uniform container that would facilitate accurate measurement and would standardize this segment of instrument design, e.g., a thin-walled metal (steel) can with an inside diameter between 10 and 35 cm, is recommended. For further guidance on container standardization in NDA measurements, see Reference 12.

4. REDUCING ERROR DUE TO MATERIAL VARIABILITY

The variation in spontaneous fission detection response due to material variability in scrap should be reduced by (1) segregating scrap into categories that are independently calibrated, (2) correcting for matrix effects using the source addition technique (Ref. 10), or (3) applying both the categorization and the source addition technique. Categorization should be used if the spontaneous fission detection method is more sensitive to the material variability from scrap type to scrap type than to the material variability within a scrap type. Application of the source addition technique reduces the sensitivity to material variability and may allow the majority of scrap types to be assayed under a single calibration. Material characteristics that should be considered in selecting categories include:

1. Plutonium isotopic composition and content,

2. Uranium/plutonium ratio,

3. Types of container and packaging,

4. Abundance of high-yield alpha/neutron material, i.e., low-atomic-number impurities,

5. Size and distribution of materials in packages,

6. Density (both average density and local density extremes should be considered), and

7. Matrix composition.

5. CALIBRATION

Guidelines for calibration and measurement control for NDA are available in Regulatory Guide 5.53, "Qualification, Calibration, and Error Estimation Methods for Nondestructive Assay," which endorses ANSI N15.20-1975, "Guide to Calibrating Nondestructive Assay Systems."[3] The guide and standard include details on calibration standards, calibration procedures, curve fitting, and error analysis. Guidelines relevant to spontaneous fission detection are given below.

Calibration can be used for either a single isotopic composition or variable isotopic mixtures. In the former case, the resulting calibration curve will be used to convert "net real-coincidence count" to "grams plutonium." In the latter case, the conversion is from "net real-coincidence count" to "effective grams ^{240}Pu." The mathematical procedure for converting from effective grams ^{240}Pu, $M(240)_{eff}$, to total grams plutonium, M(total Pu), is presented in the appendix to this guide together with a sample calculation.

A minimum of four calibration standards with isotopic compositions similar to those of the unknowns should be used for calibration. If practicable, a calibration curve should be generated for each isotopic blend of plutonium. When plutonium of different isotopic composition is assayed using a single calibration, the effect of isotopic composition on the spontaneous fission detection response should be determined over the operating ranges by measuring standards of different plutonium isotopic compositions. This is necessary because the use of the effective ^{240}Pu concept can lead to error owing to the uncertainty in the spontaneous fission half-lives and the variation in response with isotopic composition. Table 2 illustrates the uncertainty in effective ^{240}Pu abundance with different isotopic compositions (Ref. 13).

Calibration standards should be fabricated from material having a plutonium content determined by a technique traceable to or calibrated with the standard reference material of the National Bureau of Standards. Well-characterized homogeneous material similar to the process material from which the scrap is generated can be used to obtain calibration standards.

Fabrication of calibration standards that are truly representative of the unknowns is impossible for scrap assay. To measure the reliability of the calibration based on the fabricated standards discussed above and to improve this calibration, unknowns that have been

[3] Copies of this standard may be obtained from the American National Standards Institute, Inc., 1430 Broadway, New York, New York 10018.

TABLE 2

EFFECTIVE ^{240}Pu ABUNDANCE AND UNCERTAINTY[a,b] CORRESPONDING TO DIFFERENT ISOTOPIC COMPOSITION

BURNUP (MWd/t)	Approximate Abundance (%)					
	^{238}Pu	^{239}Pu	^{240}Pu	^{241}Pu	^{242}Pu	$^{240}Pu_{eff}$
8,000-10,000	0.10	87	10	2.5	0.3	10.75 ± 0.03(0.3%)
16,000-18,000	0.25	75	18	4.5	1.0	20.30 ± 0.08(0.4%)
25,000-27,000	1.0	58	25	9.0	7.0	39.14 ± 0.50(1.3%)
38,000-40,000	2.0	45	27	15.0	12.0	52.00 ± 0.87(1.7%)

[a]Computed using the equation given in footnote 2.

[b]Plutonium isotopic compositions were selected based on light-water-reactor fuel exposures.

assayed by spontaneous fission detection should periodically be selected for assay by an independent technique. Calorimetry (Ref. 2) can be used to assay a random selection of scrap in containers and to provide reliable data that should be fed back into the calibration fitting procedure to improve spontaneous fission detection calibration. The original calibration standards should be retained as working standards.

6. MEASUREMENT CONTROL

For proper measurement control, on each day that scrap is assayed, a secondary standard should be assayed as a background measurement. Also, on each day that scrap is assayed, control (or working) standards should be assayed for normalization and for ensuring reliable operation.

The source addition technique (Ref. 10) is recommended for correcting the spontaneous fission detection response for each assay. If not used routinely, the source addition technique should be applied to a random selection of items with a frequency comparable to the assay schedule. The results of random applications of the source addition technique can be used in two ways:

1. As an average correction factor to be applied to a group of items, and

2. As a check on the item being assayed to verify that it is similar to the standards used in calibration and that no additional matrix effects are present, i.e., purely as a qualitative assurance that the calibration is valid.

7. ERROR ANALYSIS

The sources of error in spontaneous fission detection are discussed in Regulatory Guide 5.11. Analysis of the error in the calibration is discussed in ANSI N15.20-1975 and in References 4 and 13.

REFERENCES

1. J. F. Lemming and D. A. Rakel, "Guide to Plutonium Isotopic Measurements Using Gamma-Ray Spectroscopy," MLM-2981, August 1982.

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

3. N. Ensslin et al., "Neutron Coincidence Counters for Plutonium Measurements," *Nuclear Materials Management*, Vol. VII, No. 2, p. 43, 1978.

4. R. Sher, "Operating Characteristics of Neutron Well Coincidence Counters," Brookhaven National Laboratory, BNL-50332, 1972.

5. K. Boehnel, "Determination of Plutonium in Nuclear Fuels Using the Neutron Coincidence Method," AWRE-Trans-70(54/4252) (English translation of KfK 2203), 1978.

6. M. S. Zucker, "Neutron Correlation Counting for the Nondestructive Analysis of Nuclear Materials," in *Analytical Methods for Safeguards and Accountability Measurements of Special Nuclear Materials*, NBS Special Publication 528, pp. 261-283, November 1978.

7. J. D. Hastings and W. W. Strohm, "Spontaneous Fission Half-Life of ^{238}Pu," *Journal of Inorganic and Nuclear Chemistry*, Vol. 34, p. 25, 1972.

8. N. Ensslin, J. Stewart, and J. Sapir, "Self-Multiplication Correction Factors for Neutron Coincidence Counting," *Nuclear Materials Management*, Vol. VIII, No. 2, p. 60, 1979.

9. M. S. Krick, "Neutron Multiplication Corrections for Passive Thermal Neutron Well Counters," Los Alamos Scientific Laboratory, LA-8460-MS, 1980.

10. H. O. Menlove and R. B. Walton, "4π Coincidence Unit for One-Gallon Cans and Smaller Samples," Los Alamos Scientific Laboratory, LA-4457-MS, 1970.

11. H. O. Menlove, "Matrix Material Effects on Fission-Neutron Counting Using Thermal- and Fast-Neutron Detectors," Los Alamos Scientific Laboratory, LA-4994-PR, p. 4, 1972.

12. K. R. Alvar, H. R. Lukens, and N. A. Lurie, "Standard Containers for SNM Storage, Transfer, and Measurement," U.S. Nuclear Regulatory Commission, NUREG/CR-1847, 1980.

13. J. Jaech, "Statistical Methods in Nuclear Material Control," Atomic Energy Commission, TID-26298, Section 3.3.8, 1974.

BIBLIOGRAPHY

American National Standards Institute, "Standard Test Methods for Nondestructive Assay of Special Nuclear Materials Contained in Scrap and Waste," ANSI/ASTM C 853-79, 1979.

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.

APPENDIX

Procedure for Converting $M(240)_{eff}$ to M(total Pu) and Sample Calculation

When the measurement situation dictates the expression of the primary assay result as "effective grams of ^{240}Pu," it is necessary to convert this result to total grams of plutonium using the relationship between these two quantities and the known isotopic composition of the plutonium sample. Let f_{238}, f_{239}, f_{240}, f_{241}, f_{242} represent the weight fractions of the plutonium isotopes in the unknown sample. The effective ^{240}Pu mass from coincidence counting, $M(240)_{eff}$, and the individual masses of the spontaneously fissioning plutonium isotopes are related by:

$$M(240)_{eff} = M(240) + 1.64M(242) + 2.66M(238) \quad (1)$$

The masses of the ^{242}Pu and ^{238}Pu isotopes can be expressed in terms of M(240), using the isotopic weight fractions, so that:

$$M(240)_{eff} = M(240)[f_{240} + 1.64f_{242} + 2.66f_{238}]/f_{240} \quad (2)$$

Since $M(240)/f_{240}$ = M(total Pu), we have the final results:

$$M(\text{total Pu}) = M(240)_{eff}/[f_{240} + 1.64f_{242} + 2.66f_{238}] \quad (3)$$

The quantity in the denominator of Equation 3 is called the "^{240}Pu effective weight fraction, f_{240}(effective)." Thus the total plutonium mass can be expressed as the ^{240}Pu effective mass divided by the ^{240}Pu effective weight fraction:

$$M(\text{total Pu}) = M(240)_{eff}/f_{240}(\text{effective}) \quad (4)$$

As an example, suppose that the net coincidence count from an unknown sample indicates 10.0 ± 0.5 effective grams of ^{240}Pu. Furthermore, suppose that the plutonium isotopic composition of the unknown sample was previously established to be:

$f_{238} = (1.0 \pm 0.5)\% = 0.010 \pm 0.005$

$f_{239} = (73.0 \pm 0.5)\%$

$f_{240} = (20.0 \pm 0.4)\% = 0.200 \pm 0.004$

$f_{241} = (4.0 \pm 0.2)\%$

$f_{242} = (2.0 \pm 0.2)\% = 0.020 \pm 0.002$

Using these results in Equation 3, we have:

$$M(\text{total Pu}) = 10.0/[0.20 + 1.64 \times 0.02 + 2.66 \times 0.01]$$
$$= 10.0/0.259$$
$$= 38.6 \text{ grams}$$

To obtain the value of the variance of the M(total Pu) result, we must propagate the variances of the $M(240)_{eff}$ and the isotopic weight fractions. Let the variance in $M(240)_{eff} = \sigma^2_{eff}$, and let the variances in the relevant plutonium weight fractions be σ^2_{238}, σ^2_{240}, and σ^2_{242}. The variance of the total plutonium mass, σ^2_{Pu}, is given by:

$$\sigma^2_{Pu} = [M(\text{total Pu})]^2 \left\{[\sigma_{eff}/M(240)_{eff}]^2 + [\sigma^2_{240} + (1.64\sigma_{242})^2 + (2.66\sigma_{238})^2]/[f_{240} + 1.64f_{242} + 2.66f_{238}]^2\right\} \quad (5)$$

In our example calculation, σ_{eff} = 0.5 gram, σ_{238} = 0.005, σ_{240} = 0.004, and σ_{242} = 0.002. The variance in the total plutonium mass is therefore given by:

$$\sigma^2_{Pu} = [M(\text{total Pu})]^2 [(0.5/10.0)^2 + 0.000204/(0.259)^2]$$

$$\sigma_{Pu} = M(\text{total Pu}) [(0.5/10.0)^2 + 0.000204/(0.259)^2]^{1/2}$$
$$= 38.6 \times 0.074$$
$$= 2.9 \text{ grams}$$

Thus the final assay result from this coincidence count is quoted as:

M(total Pu) = 38.6 ± 2.9 grams.

For most plutonium samples, the dominant measurement uncertainties will be in the ^{240}Pu effective mass and the ^{240}Pu isotopic weight fraction, f_{240}. Thus good precision in M(total Pu) is achieved primarily through minimizing the uncertainties in these quantities.

VALUE/IMPACT STATEMENT

1. PROPOSED ACTION

1.1 Description

Licensees authorized to possess at any one time more than one effective kilogram of plutonium are required in § 70.51 of 10 CFR Part 70, "Domestic Licensing of Special Nuclear Material," to establish and maintain a system of control and accountability so that the standard error (estimator) associated with the inventory difference (SEID) ascertained as a result of a measured material balance meets minimum standards.

Included in a typical material balance are containers of inhomogeneous scrap material that are not amenable to assay by the traditional method of sampling and chemical analysis. With proper controls, the nondestructive assay (NDA) technique of spontaneous fission detection is one acceptable method for the assay of plutonium in containers of bulk scrap material. The use of spontaneous fission detection thus facilitates the preparation of a complete plant material balance whose SEID meets established requirements.

Regulatory Guide 5.34 was issued in June 1974 to describe procedures acceptable to the NRC staff for applying the NDA technique of spontaneous fission detection to plutonium in scrap.

1.2 Need for Proposed Action

Improvements in technology have occurred since Regulatory Guide 5.34 was issued, and the proposed action is needed to bring it up to date.

1.3 Value/Impact of Proposed Action

1.3.1 NRC Operations

The improvements in technology that have occurred since the guide was issued will be made available for the regulatory procedure. 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 the technique and to bring the language of the guide into conformity 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 this guide is derived from the safety requirements of the Atomic Energy Act 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 NDA techniques.

6. SUMMARY AND CONCLUSIONS

Regulatory Guide 5.34 should be updated.

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