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

March 20, 1986

REGULATORY GUIDE DISTRIBUTION LIST (DIVISION 3)

SUBJECT: ISSUANCE OF REVISION 2 TO REGULATORY GUIDE 3.4 AND WITHDRAWAL OF REGULATORY GUIDE 3.41

With the issuance of Revision 2 to Regulatory Guide 3.4, "Nuclear Criticality Safety in Operations with Fissionable Materials at Fuels and Materials Facilities," the NRC staff is withdrawing Regulatory Guide 3.41, "Validation of Calculational Methods for Nuclear Criticality Safety."

Revision 2 to Regulatory Guide 3.4 endorses ANSI/ANS-8.1-1983, "Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors," which is a consolidation of ANSI N16.1-1975/ANS-8.1 (endorsed by Revision 1 of Regulatory Guide 3.4) and ANSI N16.9-1975/ANS-8.11 (endorsed by Regulatory Guide 3.41). Regulatory Guide 3.41 is therefore obsolete. However, withdrawal of Regulatory Guide 3.41 is in no way intended to alter any prior or existing licensing commitments based on its use.

Regulatory guides may be withdrawn when they are superseded by the Commission's regulations, when equivalent recommendations have been incorporated in applicable approved codes and standards, or when changes in methods and techniques or in the need for specific guidance have made them obsolete.

Robert B. Minogue

Robert B. Minogue, Director
Office of Nuclear Regulatory Research

Revision 2 *
March 1986

U.S. NUCLEAR REGULATORY COMMISSION

REGULATORY GUIDE

OFFICE OF NUCLEAR REGULATORY RESEARCH

REGULATORY GUIDE 3.4
(Task CE 404-4)

NUCLEAR CRITICALITY SAFETY IN OPERATIONS WITH FISSIONABLE MATERIALS AT FUELS AND MATERIALS FACILITIES

A. INTRODUCTION

Section 70.22, "Contents of Applications," of 10 CFR Part 70, "Domestic Licensing of Special Nuclear Material," requires that applications for a specific license to own, acquire, deliver, receive, possess, use, or initially transfer special nuclear material contain proposed procedures to avoid accidental criticality. This guide describes procedures acceptable to the NRC staff for preventing accidental criticality in operations with fissionable materials at fuels and materials facilities (i.e., fuel cycle facilities other than nuclear reactors) and for validating calculational methods used in assessing nuclear criticality safety.

Any information collection activities mentioned in this regulatory guide are contained as requirements in 10 CFR Part 70, which provides the regulatory basis for this guide. The information collection requirements in 10 CFR Part 70 have been cleared under OMB Clearance No. 3150-0009.

B. DISCUSSION

ANSI/ANS-8.1-1983, "Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors,"** was prepared by Subcommittee 8, Fissionable Materials Outside Reactors, of the Standards Committee of the American Nuclear Society as a consolidation of revisions to ANSI N16.1-1975/ANS-8.1 and ANSI N16.9-1975/ANS-8.11. ANSI/ANS-8.1-1983 was approved by the American National Standards Committee N16, Nuclear Criticality Safety, in 1982 and by the American National Standards Institute (ANSI) on October 7, 1983.

ANSI/ANS-8.1-1983 applies to handling, storing, processing, and transporting fissionable material outside nuclear reactors. The standard presents generalized basic criteria and specific limits (maximum subcritical) for some single units of simple shape containing ^{233}U, ^{235}U, ^{239}Pu, but not for multi-unit arrays. Further, the subcritical limits specified in the standard allow for uncertainties in the calculations and experimental data used in their derivation but not for contingencies such as double batching or failure of analytical techniques to yield accurate values.

This standard also delineates requirements for establishing the validity and area of applicability of a calculational method used in assessing nuclear criticality safety. However, it is concerned only with validating calculational methods and does not address important related questions such as the margin of safety to be used with the method or the qualifications of the personnel responsible for the data input.

This standard does not apply to the assembly of fissionable materials under controlled conditions, e.g., in critical experiments. Nor does the standard include the details of administrative controls, the design of processes or equipment, the description of instrumentation for process control, or detailed criteria to be met in transporting multi-unit arrays of fissionable materials.

C. REGULATORY POSITION

The nuclear criticality safety practices, the single-parameter limits for fissionable nuclides, and the guidance for multiparameter control contained in ANSI/ANS-8.1-1983 provide procedures acceptable to the NRC staff for preventing accidental conditions of criticality in handling, storing, processing, and transporting special nuclear materials at fuels and materials facilities. However, use of ANSI/ANS-8.1-1983 is not a substitute for detailed nuclear criticality safety analyses for specific operations.

The guidelines for validating calculational methods for nuclear criticality safety contained in ANSI/ANS-8.1-1983

*Lines indicate substantive changes from Revision 1.

**Copies may be obtained from the American Nuclear Society, 555 North Kensington Avenue, La Grange Park, Illinois 60525.

USNRC REGULATORY GUIDES

Regulatory Guides are issued to describe and make available to the public methods acceptable to the NRC staff of implementing specific parts of the Commission's regulations, to delineate techniques used by the staff in evaluating specific problems or postulated accidents, or to provide guidance to applicants. Regulatory Guides are not substitutes for regulations, and compliance with them is not required. Methods and solutions different from those set out in the guides will be acceptable if they provide a basis for the findings requisite to the issuance or continuance of a permit or license by the Commission.

This guide was issued after consideration of comments received from the public. Comments and suggestions for improvements in these guides are encouraged at all times, and guides will be revised, as appropriate, to accommodate comments and to reflect new information or experience.

Written comments may be submitted to the Rules and Procedures Branch, DRR, ADM, U.S. Nuclear Regulatory Commission, Washington, DC 20555.

The guides are issued in the following ten broad divisions:

1. Power Reactors
2. Research and Test Reactors
3. Fuels and Materials Facilities
4. Environmental and Siting
5. Materials and Plant Protection
6. Products
7. Transportation
8. Occupational Health
9. Antitrust and Financial Review
10. General

Copies of issued guides may be purchased from the Government Printing Office at the current GPO price. Information on current GPO prices may be obtained by contacting the Superintendent of Documents, U.S. Government Printing Office, Post Office Box 37082, Washington, DC 20013-7082, telephone (202)275-2060 or (202)275-2171.

Issued guides may also be purchased from the National Technical Information Service on a standing order basis. Details on this service may be obtained by writing NTIS, 5285 Port Royal Road, Springfield, VA 22161.

provide a procedure acceptable to the NRC staff for establishing the validity and area of applicability of calculational methods used in assessing nuclear criticality safety. However, it will not be sufficient merely to refer to this guide in describing the validation of a method. The details of validation indicated in Section 4.3.6 of the standard should be provided to demonstrate the adequacy of the safety margins relative to the bias and criticality parameters and to demonstrate that the calculations embrace the range of variables to which the method will be applied.

Section 7 of ANSI/ANS-8.1-1983 lists additional documents referred to in the standard. Endorsement of ANSI/ANS-8.1-1983 by this regulatory guide does not constitute an endorsement of these documents.

D. IMPLEMENTATION

The purpose of this section is to provide information to applicants and licensees regarding the NRC staff's plans for using this regulatory guide.

The methods described in this guide were applied to a number of specific cases during reviews and selected licensing actions. These methods reflect the latest general NRC approach to criticality safety in operations with fissionable materials at fuels and materials facilities. Therefore, except in those cases in which the applicant proposes an acceptable alternative method for complying with specified portions of the Commission's regulations, the methods described in this guide will be used in the evaluation of submittals in connection with license applications submitted under 10 CFR Part 70.

VALUE/IMPACT STATEMENT

The NRC staff performed a value/impact assessment to determine the proper procedural approach for updating Revision 1 of Regulatory Guide 3.4, "Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors," issued in February 1978, which endorsed ANSI N16.1-1975/ANS-8.1. The NRC staff has been involved in the development, review, and approval of a revision to ANSI N16.1-1975/ANS-8.1 (designated ANSI/ ANS-8.1-1983), which was approved by the American National Standards Institute on October 7, 1983. The assessment resulted in a decision to develop a revision to Regulatory Guide 3.4 that would endorse, with possible supplemental provisions, ANSI/ ANS-8.1-1983. The results of this assessment were included in a proposed Revision 2 to Regulatory Guide 3.4 that was issued for public comment in April 1985. No comments have been received from the public, and additional NRC staff review has shown that, except for minor clarifications, there was no need to change the regulatory position of the proposed Revision 2 to Regulatory Guide 3.4. Therefore, the value/impact statement published with the proposed revision is applicable. A copy of the draft regulatory guide and the associated value/impact statement (identified by its task number, CE 404-4) is available for inspection or copying for a fee at the Commission's Public Document Room at 1717 H Street NW., Washington, DC.

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

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE, $300

FIRST CLASS MAIL
POSTAGE & FEES PAID
USNRC

PERMIT No. G-67